AP42 Section:	4.12, draft 1997
Related:	8
Title:	Tables and section with comments, mostly hand written by Ron Ryan

~~File~~ 2.1
VII
AP-42 Draft
3/21/97 RR
(But vol 1.2 was sent by Dale as hard copy @ one point)
12-16-97
→ d04s12a.wpd draft section

~~SECTION 1~~

4.12 Manufacture of Rubber Products

~~Emissions Factor Development Approach~~

~~1.1~~ 4.12.1 General Process Description — non-bold

Many of the rubber manufacturing facilities in the United States produce pneumatic tires for automobile, trucks, airplanes and farm machinery. However, the majority of rubber manufacturing facilities produce other engineered rubber products. The processes involved in these industries are very similar. Differences basically consist of the raw rubber material (natural or synthetic) used, the chemical additives, and the type of curing employed. The following is a description of a generic rubber manufacturing facility applicable to both tire and other manufactured rubber products, except where noted.

The manufacturing of rubber products involves several processing steps. Initially, the raw rubber (natural or synthetic) is mixed with several additives which are chosen based upon the desired properties of the final product. The mixed rubber is often milled and transferred to an extruder where it can be combined with other rubbers. Many rubber products contain synthetic fabric or fibers for strengthening purposes. These fibers are typically coated with mixed rubber using a calendering machine. The extruded rubber and rubber coated materials are then assembled into its final shape and cured. It is during the curing process that the rubber vulcanizes (crosslinks), producing the characteristic properties of finished rubber. Once the final product is cured, it is often ground to remove rough surfaces and/or to achieve symmetry.

Mixing consists of taking the raw rubber and mixing it with several chemical additives. These additives consist of an accelerator (accelerates the vulcanization rate), zinc oxides (assists in accelerating vulcanization), retarders (prevents premature vulcanization), antioxidants (prevents aging), softeners (facilitates processing of the rubber), carbon black or other fillers (reinforcing/strengthening agents), and inorganic or organic sulfur compounds (vulcanizing agent).

Mixing is typically performed in an internal batch mixer. The internal mixer contains ~~2~~ two rotors which shear the rubber mix against the wall of the vessel. Internal mixing is performed at elevated temperatures up to approximately 330°F.

Non-productive compounds consist of the polymers, process oils, reinforcing materials such as carbon black and/or silicia and the antioxidant/antiozonant protection system. These materials are usually mixed together in ~~2~~ two or more stages called non-productives which are mixed at temperatures around 330°F. The last non-productive stage is then taken and the activators, accelerators and sulfur curing agents are mixed into it, making what is called the productive stage. This stage is mixed at a lower temperature (around 230°F) because the rubber compound will now scorch and cure at elevated temperatures.

The majority of rubber products ~~produced~~ in the United States are composed of ~~1~~ one or more of 23 generic rubber compounds shown in Table ~~2.1~~ 4.12-1. Emissions factors were derived from the specific compound recipes shown in Table ~~2.2~~ 4.12-2. Emissions from manufacturing aids such as solvents, adhesives and mold release compounds ARE NOT included in these emission factors.

4.12-1

Table ~~2~~.1

Index of Rubber Compounds

Compound #1:	Tire Inner Liner (BrIIR/NR)
Compound #2:	Tire Ply Coat (Natural Rubber/Synthetic Rubber)
Compound #3:	Tire Belt Coat (Natural Rubber)
Compound #4:	Tire Base/Sidewall (Natural Rubber/Polybutadiene Rubber)
Compound #5:	Tire Apex (Natural Rubber)
Compound #6:	Tire Tread (Styrene Butadiene Rubber/Polybutadiene Rubber)
Compound #7:	Tire Bladder (Butyl Rubber)
Compound #8:	EPDM 1 (EPDM Sulfur Cure)
Compound #9:	EPDM 2 (Peroxide Cure)
Compound #10:	EPDM 3 (Non-Black EPDM Sulfur Cure)
Compound #11:	CRW (Polychloroprene W Type)
Compound #12:	CRG (Polychloroprene G Type)
Compound #13:	Paracryl OZO (NBR/PVC)
Compound #14:	Paracryl BLT (NBR)
Compound #15:	Hypalon (CSM)
Compound #16:	Fluoroelastomer (FKM)
Compound #17:	AEM (Vamac)
Compound #18:	Hydrogenated Nitrile (HNBR)
Compound #19:	Silicone (VMQ)
Compound #20:	Acrylate Rubber (ACM)
Compound #21:	Chlorinated Polyethylene (CPE)
Compound #22:	Emulsion SBR (SBR 1502)
Compound #23:	Epichlorohydrin (ECO)
Compound #24:	Oil - Extended SBR (SBR 1712)
Compound #25:	Emulsion SBR (SBR 1500)
Compound #26:	Solution SBR (Duradene 707)

4.12-2

Table 2.1

Rubber Compound Recipes

Compound #1: Tire Inner Liner (BrIIR/NR)

Recipe:

Brominated IIR X-2	85.00
SMR 20 Natural Rubber	15.00
GPF Black	60.00
Stearic Acid	1.00
Paraffinic Medium Process Oil	15.00
Unreactive Phenol Formaldehyde Type Resin (Arofene 8318, SP1068)	5.00
Zinc Oxide	3.00
Sulfur	.50
MBTS	1.50
	186.00

Number of Passes/Temperature:
1 (NP Temperature: 320°F; Chlorobutyl or 290°F Bromobutyl)
2 (P) Temperature: 220°F

Compound #2: Tire Ply Coat (Natural Rubber/Synthetic Rubber)

Recipe:

50472 Natural Rubber

SMR-GP Natural Rubber	70.00
Duradene 707	30.00
N330	36.50
Sundex 790	20.00
Flectol H	1.50
Santoflex IP	2.30
Sunproof Super Wax	1.20
Zinc Oxide	5.00
Stearic Acid	1.00
Sulfur	2.30
CBS	.80
	170.60

Number of Passes/Temperature:
1 (NP) Temperature: 330°F
2 (P) Temperature: 220°F

Table 2.2 (cont.)

Rubber Compound Recipes

Compound #3: Tire Belt Coat (Natural Rubber)

Recipe:

#1RSS Natural Rubber	100.00
HAF Black (N330)	55.00
Aromatic Oil	5.00
N-(1,3 dimethylbutyl)-N-phenyl-P-pnenylene diamine (Santoflex 13)	1.00
Zinc Oxide	10.00
Stearic Acid	2.00
n-tertiary-butyl-2-benzothiazole disulfide (Vanax NS)	.80
Sulfur	4.00
Cobalt Neodecanate (20.5% cobalt)	2.50
	180.30

Number of Passes/Temperatures:
1 (NP) Temperature: 330°F; add 1/2 black, add 1/2 oil
2 (NP) Temperature: 330°F, add remainder of black and oil
3 (remill) Temperature: 300°F
4 (P) Temperature: 220°F

Compound #4: Tire Base/Sidewall (Natural Rubber/Polybutadiene Rubber)

Non-Productive Recipe:

NR-SMR-5 CV	50.00
Taktene 1220	50.00
N330 Carbon Black	50.00
Zinc Oxide	1.50
Stearic Acid	2.00
Agerite Resin D	2.00
Vulkanox 4020	3.00
Vanwax H Special	3.00
Flexon 580 Oil	10.00
	171.50

Productive Recipe:

Non Productive	171.50
Zinc Oxide	1.50
Rubber Maker Sulfur	1.75
DPG	0.10
CBS	0.60
	175.45

Number of Passes/Temperatures:
1 (NP) Temperature: 330°F
2 (P) Temperature: 220°F

Table 2.2 (cont.)

Rubber Compound Recipes

Compound #5: Tire Apex (Natural Rubber)

Recipe:	
TSR 20 Natural Rubber	100.00
HAF Black (N330)	80.00
Aromatic Oil	8.00
Stearic Acid	1.00
Resorcinol	3.00
Hexamethylenetetramine	3.00
Zinc Oxide	3.00
N-tertiary-butyl-2-benzothiazole disulfide (Vanax NS)	1.50
n-cyclohexythiopthalimide (Santogard PVI)	.30
Sulfur	3.00
	202.80

1 (NP) Temperature: 330°F; add 60 parts black, add 6 parts oil
2 (NP) Temperature: 330°F; add Resorcinol, add 20 parts black, add 2 parts oil
3 (P) Temperature: 200°F; add Hexam

Compound #6: Tire Tread (Styrene Butadiene Rubber/Polybutadiene Rubber)

Non-Productive Recipe #1:	
SBR 1712C	110.00
N299 Carbon Black	60.00
Taktene 1220	20.00
Zinc Oxide	1.50
Stearic Acid	3.00
Vulkanox 4020	2.00
Wingstay 100	2.00
Vanox H Special	2.50
Sundex 8125 Oil	20.00
	221.00
Non-Productive Recipe #2:	
Non-Productive #1:	221.00
N299 Carbon Black	20.00
Sundex 8125 Oil	5.00
	246.00
Productive Recipe:	
Non-Productive #2	246.00
Zinc Oxide	1.50
Rubber Maker Sulfur	1.60
TMTD	0.20
CBS	3.00
	252.30

Number of Passes/Temperatures:
1(NP) Temperature: 330°F; add 60 parts black, add 20 parts oil
2(NP) Temperature: 330°F; add 20 parts black, add 5 parts oil
3 (P) Temperature: 220°F

Table 2.2 (cont.)

Rubber Compound Recipes

Compound #7: Tire Bladder

Recipe:

BUTYL268	100.00
N330	55.00
Castor Oil	5.00
SP 1045 Resin	10.00
Zinc Oxide	5.00
Neoprene W	5.00
	180.00

Number of Passes/Temperatures:
NP 1 All Butyl, Castor Oil, Zinc Oxide, 45 phr N330, discharge approx 330°F/340°F
+Resin, 10 phr N330, discharge approx 270/280°F DO NOT EXCEED 290°F
PROD NP2 = neoprene, discharge approx 250F/260°F

Compound #8: EPDM 1 (EPDM Sulfur Cure)

Non-Productive Recipe:

Vistalon 7000	50.00
Vistalon 3777	87.50
N650 GPF-HS Black	115.00
N762 SRF-LM Black	115.00
Process Oil Type 104B (Sunpar 2280)	100.00
Zinc Oxide	5.00
Stearic Acid	1.00
	473.50

Productive Recipe:

Non-Productive	473.50
Sulfur	0.50
TMTDS	3.00
ZDBDC	3.00
ZDMDC	3.00
DTDM	2.00
	485.00

Number of Passes/Temperatures
1 (NP) Temperature: 340°F; upside down mix, rubber then black and oil
2 (P) Temperature: 220°F

Table 2.2 (cont.)

Rubber Compound Recipes

Compound #9: EPDM 2 (Peroxide Cure)

Non-Productive Recipe:	
Royalene 502	100.00
N 762 Carbon Black	200.00
Sunpar 2280 Oil	85.00
Zinc Oxide	5.00
Stearic Acid	1.00
	391.00
Productive:	
Non-Productive	391.00
DICUP 40C	6.00
SARET 500 (on carrier/2 parts active)	2.56
	399.56

NP Temperature: 330°F
P Temperature: 240°F

Compound #10: EPDM 3 (Non-black EPDM Sulfur Cure)

Recipe:	
Vistalon 5600	50.00
Vistalon 3777	87.50
Hard Clay (Suprex)	180.00
Mistron Vapor Talc	100.00
Atomite Whiting	40.00
Process Oil Type 104B (Sunpar 2280)	60.00
Silane (A-1100)	1.50
Paraffin Wax	5.00
Zinc Oxide	5.00
Stearic Acid	1.00
Sulfur	1.50
Cupsac	0.50
TMTD	3.00
	535.00

Number of Passes/Temperatures:
1 (NP) Temperature: 330°F
2 (P) Temperature: 220°F, add Sulfur, Cupsac, and TMTDS

Table 2.2 (cont.)

Rubber Compound Recipes

Compound #11: CRW (Polychloroprene W Type)

Recipe:	
Non Productive:	
Neoprene WRT	100.00
N 550	13.20
N 762	15.70
Agerite Staylite S	2.00
Sunproof Super Wax	2.00
Santoflex IP	1.00
Magnesium Oxide	4.00
Stearic Acid	0.50
PlastHall Doz	15.00
	153.40
Productive Recipe:	
Non-Productive	153.40
Zinc Oxide	5.00
TMTD	0.50
Dispersed Ethylene Thiourea	1.00
	159.90

Number of Passes/Temperatures:
1 pass at 240°F; add accelerator package at 200°F

Compound #12: CRG (Polychloroprene G Type)

Non-Productive Recipe:	
Neoprene GN	100.00
SRF	50.00
Sundex 790	10.00
Octamine	2.00
Stearic Acid	1.00
Maglite D	4.00
	167.00
Productive Recipe:	
Non-Productive	167.00
TMTM	0.50
Sulfur	1.00
DOTG	0.50
Zinc Oxide	5.00
	174.00

Number of Passes/Temperatures:
1 (NP) Temperatures: 240°F; add zinc oxide and cureatives late at 200°F
2 (P) Temperature: 200°F

Table 2.2 (cont.)

Rubber Compound Recipes

Compound #13: Paracryl OZO (NBR/PVC)

Recipe:

PARACRIL OZO	100.00
Zinc Oxide	5.00
OCTAMINE	2.00
Hard Clay	80.00
FEF (N-550) Black	20.00
Stearic Acid	1.00
MBTS	2.50
TUEX	1.50
ETHYLTUEX	1.50
DOP	15.00
KP-140	15.00
Spider Sulfur	0.20
	243.70

Number of Passes:
(NP) Temperature: 330°F
(P) Temperature: 220°F; add MBTS, TUEX, ETHYLTUEX, Spider Sulfur

Compound #14: Paracryl BLT (NBR)

Recipe:

PARACRIL BLT	100.00
Zinc Oxide	5.00
SRF (N-774) Black	100.00
TP-95	15.00
Paraplex G-25	5.00
AMINOX	1.50
Stearic Acid	1.00
ESEN	0.50
MONEX	1.50
Sulfur	0.75
	230.25

Number of Passes/Temperatures:
(NP) Temperature: 280°F
(P) Temperature: 220°F; add sulfur, MONEX, and possibly ESEN

Table 2.2 (cont.)

Rubber Compound Recipes

Compound #15: Hypalon (CSM)

Recipe:	
Hypalon 40	100.00
CLS 4 PBD	3.00
Carbo wax 4000	3.00
PE 617A	3.00
Mag Lite D	5.00
PE 200	3.00
Whiting (Atomite)	100.00
N650	100.00
TOTM Oil	70.00
MBTS	1.00
Tetrone A	1.50
NBC	0.50
HVA-2	0.50
	390.50

Uses of Formulas/Temperatures:
Number of Passes:
1 (P) Temperature: 280°F

Compound #16: Fluoroelastomer (FKM)

Recipe:	
Viton E60C	100.00
N990 Black	20.00
Calcium Hydroxide	6.00
Maglite D	3.00
	129.00

Compound #17: AEM (Vamac)

Recipe:	
VAMAC*B-124 Masterbatch	124.00
ARMEEN 18D	.50
Stearic Acid	.20
SRF Carbon Black (N-774)	10.00
DIAK #1	4.00
DPG	4.00
	142.70

Table 2.2 (cont.)

Rubber Compound Recipes

Compound #18: Hydrogenated Nitrile (HNBR)

Non-Productive Recipe:	
HNBR Zetpol 2020	100.00
N650 Black	45.00
Flexone 7P	1.00
Agerite Resin D	1.00
ZMTI	1.00
Kadox 911 C	5.00
Stearic Acid	1.00
Trioctyl trimellitate (TOTM)	7.00
	161.00
Productive Recipe:	
Sulfur	0.50
MBTS	1.50
TMTD	1.50
MTD Monex	.50
	165.00

Number of Passes/Temperatures:
1 (NP) Temperature: 275°F
2 (P) Temperature: 210°F

Compound #19: Silicone (VMQ)

Recipe:	
Silicone Rubber	70.00
Silastic NPC-80 silicone rubber	30.00
5 Micron Min - U - Sil	68.00
Silastic HT - 1 modifier	0.80
Vulcanizing agent: Varox DBPH 50	1.00
	169.80

Compound #20: Acrylate Rubber (ACM)

Non-Productive Recipe:	
Hytemp AR71	100.00
Stearic Acid	1.00
N 550	65.00
	166.00
Productive Recipe:	
Non-Productive	166.00
Sodium Stearate	2.25
Potassium Stearate	0.75
Sulfur	0.30
	169.30

Number of Passes/Temperatures:
1 (NP) Temperature: 260°F
2 (P) Temperature: 220°F

Table 2.2 (cont.)

Rubber Compound Recipes

Compound #21: Chlorinated Polyethylene (CPE)

Recipe:

CM 0136	100.00
Maglite D	10.00
N 774 Black	30.00
Sterling VH	35.00
DER 331 DLC	7.00
Agerite Resin D	0.20
TOTM Oil	35.00
Triallyl Isocyanurate Cure 5223 (provided by Gates)	2.90
Trigonox 17/40	10.00
	230.10

Number of Passes/Temperatures:
Single pass mixed to 240°F; add Triallyisocyanurate, Triganox 17/40 at 200°F

Compound #22: Emulsion SBR (SBR 1502)

Non-Productive Recipe:

SBR 1502	100.00
N330 Carbon Black	58.50
Zinc Oxide	10.00
Stearic Acid	2.00
Agerite Resin D (Naugard Q)	2.00
Flexone 7P	1.00
Sunproof Super Wax	1.50
Sundex 790 Oil	7.00
	182.00

Productive Recipe:

Non-Productive	182.00
Rubber Makers Sulfur	2.00
TBBS	1.80
	185.80

Number of Passes/Temperatures:
Non-productive pass mixed to 330°F,
Second pass mixed to 220°F.

Table 2.2 (cont.)

Rubber Compound Recipes

Compound #23: Epichlorohydrin (ECO)	
Recipe:	
Hydrin 2000	100.00
N330 Carbon Black	50.00
Stearic Acid	1.00
Vulkanox MB-2/MG/C	1.00
Calcium Carbonate	5.00
Zisnet F-PT	1.00
Diphenylguanadine	0.50
Santogard PVI	0.50
	159.00

Number of Passes/Temperatures:
1 Pass at 240°F

Compound #24: Oil - Extended SBR (SBR 1712)*	
SBR 1712	137.50
	137.50
Compound #25: Emulsion SBR (SBR 1500)*	
SBR 1500	100.00
	100.00
Compound #26: Solution SBR (Duradene 707)*	
Duradene 708	100.00
	100.00

* - Compounds 24, 25, and 26 were mixes of polymer only, with no fillers or cure system.

Emissions of volatile organic compounds (VOCs) due to use of cements, solvent tackifiers, and release agents in rubber manufacturing are generally determined by either material balance, assuming a 100% loss to the atmosphere or, in some cases, by direct measurement. In cases where solvent emissions are determined by a mass balance calculation which assumes 100% loss at the time of application to the rubber substrate, there is a potential for double-counting a small percentage of the solvent emissions when using the emission factors to determine process volatile organic emissions. This situation is due to the partial absorbtion of some solvents into the rubber surface during manufacturing, and the subsequent volatilization during downstream processing or curing.

It is not possible to determine to what extent typical hydrocarbon solvent constituents reported in the emission factors may have resulted from use of solvents and/or adhesives upstream in the manufacturing process. Anecdotal evidence suggests that as much as 5% (five) of the solvent applied to the surface of the rubber may migrate into the rubber and show up later in the process as a volatile emission. Caution should therefore be exercised when compiling a facility-wide VOC emission inventory which combines the use of process emission factors and mass balance calculations of solvent usage. This methodology will generally result in a slight overstatement of the actual facility-wide VOC emissions.

Once the rubber is properly mixed, it can be extruded. (milling) Extrusion is often performed to combine several types of previously mixed rubber compounds. The extruder consists of a power driven screw within a stationary cylinder. A die is attached to the head of the screw to produce the desired shape or cross section of the extruded rubber. Extrusion can be performed with both warm or cold rubber feed. The extruder is jacketed to maintain the desired operating temperature.

Calendering is often used in the rubber manufacturing industry to apply a rubber coat onto synthetic or steel fibers. These calenders employ either 3 or 4 rolls and are hollow to allow for heating or cooling. The openings between the rolls can be adjusted to control the coating thickness. An example of calendering is in the manufacturing of radial tires where synthetic fibers are rubber coated and subsequently combined with rubber stock to create a more durable product.

The final step in manufacturing of rubber products (platen?) is vulcanizing (curing). There are 3 (three) predominant vulcanizing processes: press mold curing, autoclave curing, and hot air curing. Press mold curing uses high temperature and pressure to cure the final product. The high pressure (600-10,000 psi) forces the rubber to conform to the shape of the mold. Press mold curing is used in tire and engineered products manufacturing.

Autoclave curing utilizes saturated steam at an elevated pressure to cure the rubber mix. Unlike press mold curing, the product is formed into its final shape prior to the curing process. Autoclave curing is the predominant curing method in non-tire rubber manufacturing facilities.

Hot air curing entails passing uncured, green engineered products through a chamber with a heated atmosphere. Temperature and residence times may vary, depending on the product type and formulation. As with the autoclave curing, these products have already been formed into their final shape prior to undergoing the curing process.

5

Grinding is often performed to remove rough edges and other blemishes from the final product or in some cases to actually form and shape the product. The ground rubber is occasionally recycled and utilized as filler in some rubber manufacturing processes. In the tire manufacturing industry, grinding is performed to balance the tire and also to expose the white sidewall or lettering. Relative to the engineered products industry, grinding may actually be used to obtain the correct shape of the final product such as the final shaping of drive belts.

4.12.2 ~~1.2~~ Equipment Scale Considerations – non-bold

Emissions testing was performed on several sizes of similar process equipment. These size differences are the most profound on the sizes of internal mixers tested. Emissions tests were performed on internal mixers ranging from a ~~2~~ two pound laboratory mixer, to a 200 pound pilot scale system up to a 500 pound production mixer. On a pound pollutant emitted per pound of rubber mixed basis, test data indicated that emissions were not dependent on mixer size. This is especially true for the volatiles and semivolatile emissions. There was some variability of metals emissions which is most likely the result of greater particulate losses into the ventilation system on the larger mixers during charging ~~than is~~ experienced on smaller scale equipment. How was this handled?

Since there were no direct correlation to process equipment size and emissions, no scaling factors were developed for equipment size.

4.12.3 ~~1.3~~ Emission And Controls – non-bold

↓ VOL 1.2a 2/26/97 RR — we have 6? + Tirecure

This was stuff in the original draft of 12/47

The mechanically created or externally added heat present during ~~the 6~~ six common processes cause volatile organic chemicals (VOCS) and hazardous air pollutants (HAPS) to be emitted. Particulate matter is primarily emitted from the dry chemicals utilized in mixing and as a result of grinding.

Dust collectors (baghouses, fabric filters) are commonly used to control particulate matter from mixing. Cyclone separators in combination with dust collectors or electrostatic precipitators are typically used in grinding applications.

4.12.4 ~~1.4~~ Emission Factors – non-bold

The following is common to each of the Emission Factors tables:

(1) Total VOCs were analyzed by EPA reference method 25A/FID.

(2) Total speciated organics were analyzed by EPA reference methods TO-14/GC-MS (speciated volatiles), TO-14/GC-FID (volatile ozone precursors) and M8270 (semi-volatiles).
Note: Results from Method 25A and results from the total speciated organics reference methods are not directly comparable due to the inherent differences in the method of analysis.

(3) Total Organic HAPS are hazardous air pollutants as defined by the Clean Air Act of 1990, Section 301 and were analyzed by EPA reference method TO-14/GC-MS and M8240 (Volatiles), M8270 (semi-volatiles), and TO-14/GC/FPD (Sulfur compounds).

(4) Total Metal HAPS are hazardous air pollutants as defined by the Clean Air Act of 1990, Section 301 and were analyzed by EPA reference methods M6010 and M7000 (metals).

(5) Total HAPS are the sum of total organic HAPS and total metal HAPS.

Need clarification

(6) Total Particulate Matter (PM) was analyzed by reference method 5/Gravimetric.

summed?

(7) Target analytes which were not detected in any runs for a particular process and compound were not included in the tables. The assumption is that if a target analyte went undetected in any runs, there is a high probability that even if it was present, the low non-detection limits indicate that its overall contribution is insignificant.

all?

runs?

(8) Target analytes detected in one or more runs were averaged with target analytes at less than detect at the detection limit divided by two.

?

(9) Metals were expected ~~to be detected~~ in the particulate matter emitted during rubber mixing but were not expected to ~~be a significant~~ emission in any other process. To confirm this assumption, ~~metals were analyzed for in the~~ extruder emission. Metals emitted proved to be so insignificant that they could be within the margin of error of the analytical procedure. Metal emissions were therefore considered to be insignificant in other processes.

the extruder emissions were analyzed for metals.

A total of files

Filename	Table #	Table? Name? Process	Rubber Compounds Included	Pg #?
mix1.wpd	4.12-3	Internal Mixing & Milling		
2.wpd	4.12-3 (cont 1)			
3.wpd	4.12-3 (cont 2)			
4.wpd	4.12-3 (cont 3)			

? References?

~~Fig Missing?~~ ~~prob. not.~~

No. just extra CR.

Access dbase only does:

1. sorting
2. L/2 averaging
3. interpolation

3 calc. values imported to Access

1. concentrations $\mu g/m^3$
2. lbs/hr
3. lb/lb

+ some "raw data" - flow rates but these not used in Access for calcs (done by TRC in Lotus)

Non-Detects

- leave just <s in AP-42
- Vol 2 has the actual D.L.s to answer ?'s

~~use~~ use Excel, not WPD & not ZIP?

Hot air oven cure
5, 8, 22 - fed 2, 4 or 5 strips of ribbon into oven
process rate /

#22 - didn't pick up cool down cycle ~~on~~ either of (2) strips (recal. BTHC analyzer)

[POM ? - dropped due to Agency
Moran on what POM is
this is in front of '96 applications

#5 - 4 strips (~100g each) → 3 full strips; 4th strip didn't get cooldown of last 3 minutes of 16 min. oven cure.

#8 - 5 strips → lost cooldown of last 3 minutes of cure on last strip.

#8 → butadiene > D.L. - ozone precursors
does it show in EF table?

Platen #9 Hexa-butadiene
vol <
& semi ✓ } EF should be from semi

Methylene chloride → # in 1000's on table E1-3
not used in EFs; used 20 µg for all 17 platen press
Roy → vol 4 paper copy has different EFs than AP-42

Toluene OK
2-butanone OK - traced to compds 1, 2, 3 back to Lab report.
- matched ~7 compds on Access to Vol 4.

1,1,1-trichloroethane

Formaldehyde → included in totals

What sorts / queries can we do to QA Access database

or new tables

Tire Press A & B ③ ④ tires
spec. vol. mg/m3
sulfur ~~→ tire A~~ > tire A from 2nd sample

Mixer #2 - Runs 1, 2, 3
cmpds 1, 5, 7 > n-hexane
toluene
xylenes > no matches (blank corrections?)

"Truing" Grinding - no data?

Carcass Grinding - the tires were not weighed before & after grinding.

RMA questions

table 2-2, vol 3 (1) What are volatile ozone precursors, if not TVOC or spec volatiles?
(see App. List of cmpds?) — pg. 56 of vol 3

(2) where did PAM'S go? Table 2-3, 2-2 of vol 3.

(3) # of rubber cmpds tested for Platen Press seems higher than 11 in table 1-1 (as shown in text of vol 3?) - Interpolation tables in "proposal" also have # cmpds tested.

(4) handling of size considerations

(5) ratioing technique

(6) Non-detect technique - averaging

(7) whats a "generic" compound? - all 26? then what was tested N.G for Tire cure, Extruder, milling, Int. mixing
- can I use Table 4-1 descriptions in AP-42 for 26?
App C has recipes as well.

(8) wording - "Int" mixer = banbury + drop mill?
Tire press = tire cure?
"engineered" products? = Not Tires

(9) Vol 2 section C-2 "Tire cuts", lab data? used for calcs?
has CO, SO2, NH3 — also vol 1, pg. 4-79

(10) Autoclave - water outlet has most of emissions? See "proposal" final section, table 6.X-8
How were these handled? water emissions?

X (11) Formaldehyde - VOL 2, App K - platen press, cmpds 1 & 7, ~~but not in EF tables~~ footnote.

(12) voc's as methane / as propane?

(13) mold releases & adhesives NOT included

(14) Last page of vol 4 is interpolation factors put in section?
& June 1995 "Proposal" -

(15) How do you interpolate for Tire Curing? Grinding?

(16) How is productive/non-productive mixing thruput accounted for? see ~~vol 4~~ proposal volume "Mixing" sect.

(17) mixed rubber vs. "raw rubber" - see Dan Pyzowski's 6-9-95 presentation, pg 2 of 2

(18) warm-up mills 1 & 2 on vol. 1 pg. 1-6

(19) control efficiency use vs. ~~testing~~ statement

(20) SPEC FACTORS

(21) should Tire Cure table be reduced to 3 types, as opposed to 9 diff. tires?

(22) why was autoclave #9 done twice? pg. I-4-123 → extruded EPDM? pg. 4-3

(23) need to explain autoclave w/ ~~wo~~ steam trap
need to explain 2 passes thru warm-up mills (or more)? → pg. IV-10
need to highlight ~~[illegible]~~ retread buffing - diff units
need to highlight other SDV + mold release

(24) should "speciation factor" tables be dropped?

(25) no mold release used in platen press? - pg. I-3-3 says it is most significant time

(26) I.L. ejection #'s to go back in?

(27) Calender only goes up to CMPD #23 (Not #26)

~~(28) Vol 4, Tab 8 - Int Mixing →~~

- How was "Total VOC" calculated? - what MW?

- How were pollutants selected for PC? ← LAST
  - no metals for Calenders?
  - so many more polls for calenders than Tire Cure

- No warm-up mills etc for calenders?
  one etc needs footnote, or ALL?
  ~~footnotes: Added~~ < = ? times in 3 ~~[illegible]~~?

- How was extrapolation done? Butadiene isn't in either ~~#2~~ or #12. But #2 has more pollut. than most(~~all~~) other cmpds? (#12 is a shorter List)
  ~~#4, #13, #15~~

- SCC's? - 1st 3 digits = Rubber
  next 3 = equipt
  last 2 = compound # or tire #

- I changed "Total HAPs" to "Total other HAP" -
  need a footnote re: metals?
  or put "organic" in Title?

- Need A VOC # → 7 are > M25A
  (~~Footnote~~ to replace M25A value where speciated > M25A

- poll names = CAA? will mess up contents on <?

- Acet + isobutane - dropped <'s

- Need a "see pg ... for general notes on test methods, terms, etc

Data Loading Process

- Will Be Performed By Pechan and LM
- Pechan Will Load All Data That Passes QA into the NET-PC and NET Input Format
- LM Will Load NET Input Format Data into NET Oracle
- NET PC and NET Oracle will be Synchronized and Run in Parallel for a Short Period

Table 4.12-3
Key to Emission Factor Tables and Files

	Table # and Name	File Name	Rubber Compounds Incl.
G	4.12-4 Internal Mixing & Milling - (dry mill ?)	MIX1.WPD	1 - 6
		MIX2.WPD	7 - 12
		MIX3.WPD	13 - 18
		MIX4.WPD	19 - 23
G	4.12-5 ~~Milling~~ warmy ?	MILLING1.WPD	1 - 6
		MILLING2.WPD	7 - 13
		MILLING3.WPD	14 - 19
		MILLING4.WPD	20 - 23
G	4.12-6 Extruder -	EXTRUD1.WPD	1 - 6
		EXTRUD2.WPD	7 - 12
		EXTRUD3.WPD	13 - 18
		EXTRUD4.WPD	19 - 23
NG	4.12-7 Calender - 77	CALEND1.WPD	1 - 7
		CALEND2.WPD	8 - 13
		CALEND3.WPD	14 - 20
		CALEND4.WPD	21 - 23
G	4.12-8 Platen Press Curing - 93	PLATEN1.WPD	1 - 6
		PLATEN2.WPD	7 - 12
		PLATEN3.WPD	13 - 18
		PLATEN4.WPD	19 - 23
G	4.12-9 Autoclave Curing - 112	AUTOCLV1.WPD	1 - 6
		AUTOCLV2.WPD	7 - 12
		AUTOCLV3.WPD	13 - 18
		AUTOCLV4.WPD	19 - 23
	4.12-10 Hot Air Cure - 132	HOTAIR1.WPD	1 - 6
		HOTAIR2.WPD	7 - 12
		HOTAIR3.WPD	13 - 18
		HOTAIR4.WPD	19 - 23
NG	4.12-11 TireCure - 152	TIRECUR1.WPD	A - F
		TIRECUR2.WPD	G - I
NG	4.12-12 Grinding Operations -	GRIND.WPD	

Table 4.12-4. INTERNAL MIXING & MILLING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #1 lb/lb rubber	Cmpd #2 lb/lb rubber	Cmpd #3 lb/lb rubber	Cmpd #4 lb/lb rubber	Cmpd #5 lb/lb rubber	Cmpd #6 lb/lb rubber
Total Method 25A Organics		6.17e-05	3.91e-05	1.36e-04	3.88e-05	2.15e-04	3.86e-05
Total Speciated Organics		5.08e-05	5.53e-05	8.92e-05	5.31e-05	6.18e-05	9.84e-05
Total Organic HAPs		2.10e-05	1.33e-05	5.90e-05	2.54e-05	4.19e-05	4.87e-05
Total Metal HAPs		9.67e-08	9.71e-09	1.74e-07	7.06e-08	7.72e-08	6.43e-09
Total HAPs		2.11e-05	1.33e-05	5.91e-05	2.55e-05	4.19e-05	4.87e-05
Total Particulate Matter		1.75e-04	4.02e-04	9.00e-04	3.00e-04	9.25e-04	4.00e-04
1,1,1-Trichloroethane	71-55-6	<	8.03e-08	3.19e-07	4.23e-08	1.84e-07	<
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<
1,1-Dichloroethane	75-34-3	<	<	<	<	<	<
1,1-Dichloroethene	75-35-4	<	<	<	5.47e-07	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	<	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<	<	<	<
1,2-Dibromoethane	106-93-4	<	<	<	<	<	<
1,2-Dichloroethane	107-06-2	<	<	<	<	<	<
1,2-Dichloropropane	78-87-5	<	<	<	<	<	<
1,3-Butadiene	106-99-0	9.78e-08	<	<	2.17e-07	<	<
1,4-Dichlorobenzene	106-46-7	<	<	2.86e-09	7.30e-10	1.52e-09	1.22e-09
1,4-Dioxane	123-91-1	<	<	<	<	<	<
1,4-Phenylenediamine	106-50-3	<	<	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	<	<	<	<

Table 4.12-4. INTERNAL MIXING & MILLING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #1 lb/lb rubber	Cmpd #2 lb/lb rubber	Cmpd #3 lb/lb rubber	Cmpd #4 lb/lb rubber	Cmpd #5 lb/lb rubber	Cmpd #6 lb/lb rubber
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<	<
2-Butanone	78-93-3	5.91e-06	1.59e-06	9.01e-07	2.74e-06	1.53e-06	4.40e-07
2-Chloroacetophenone	532-27-4	<	<	<	<	<	<
2-Methylphenol	95-48-7	<	<	8.64e-08	8.34e-10	1.30e-08	6.00e-09
3,3'-Dichlorobenzidine	91-94-1	<	<	<	<	<	<
3,3'-Dimethoxybenzidine	119-90-4	<	<	<	<	<	<
3,3'-Dimethylbenzidine	119-93-7	<	<	<	<	<	<
4,4'-Methylenedianiline	101-77-9	<	<	<	<	<	<
4-Aminobiphenyl	92-67-1	<	<	<	<	<	<
4-Methyl-2-Pentanone	108-10-1	<	1.97e-07	1.26e-05	1.49e-05	<	3.06e-05
4-Nitrobiphenyl	92-93-3	<	<	<	<	<	<
4-Nitrophenol	100-02-7	<	<	<	<	<	<
a,a,a-Trichlorotoluene	98-07-7	<	<	<	<	<	<
Acetaldehyde	75-07-0	6.95e-07	<	<	<	<	<
Acetaldehyde + Isobutane		<	<	<	<	6.12e-07	<
Acetonitrile	75-05-8	<	<	<	<	<	<
Acetophenone	98-86-2	2.32e-06	2.13e-08	5.13e-08	3.75e-09	1.85e-08	7.67e-08
Acrolein	107-02-8	<	<	<	<	<	<
Acrylonitrile	107-13-1	<	<	<	<	<	<
Allyl Chloride	107-05-1	<	<	<	<	<	<
Aniline	62-53-3	<	4.80e-07	<	4.30e-07	<	9.97e-08
Benzene	71-43-2	5.46e-08	4.62e-08	1.13e-07	1.14e-07	2.98e-07	<
Benzidine	92-87-5	<	<	<	<	<	<

Table 4.12-4. INTERNAL MIXING & MILLING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #1 lb/lb rubber	Cmpd #2 lb/lb rubber	Cmpd #3 lb/lb rubber	Cmpd #4 lb/lb rubber	Cmpd #5 lb/lb rubber	Cmpd #6 lb/lb rubber
Benzyl Chloride	100-44-7	<	<	<	<	<	<
Biphenyl	92-52-4	<	<	5.63e-08	5.42e-09	<	1.17e-08
bis(2-Chloroethyl)ether	111-44-4	<	<	<	<	<	<
bis(2-Ethylhexyl)phthalate	117-81-7	3.91e-08	3.01e-08	1.19e-07	<	2.29e-08	1.79e-07
Bromoform	75-25-2	2.78e-07	<	<	<	<	<
Bromomethane	74-83-9	<	<	<	<	<	<
Cadmium (Cd) Compounds		9.35e-09	2.40e-09	7.01e-09	2.55e-09	5.05e-09	2.18e-09
Carbon Disulfide	75-15-0	<	<	<	1.99e-07	1.84e-07	3.83e-06
Carbon Tetrachloride	56-23-5	<	<	1.19e-07	<	<	<
Carbonyl Sulfide	463-58-1	<	<	<	<	5.34e-07	1.59e-06
Chlorobenzene	108-90-7	<	<	<	<	<	<
Chloroethane	75-00-3	<	<	<	<	<	<
Chloroform	67-66-3	<	<	<	<	<	<
Chloromethane	74-87-3	<	3.12e-08	<	2.98e-08	<	3.25e-07
Chromium (Cr) Compounds		3.18e-08	6.99e-09	5.91e-08	2.38e-08	2.72e-08	4.26e-09
Cumene	98-82-8	2.92e-09	<	4.00e-09	1.67e-09	1.41e-09	1.21e-08
Di-n-butylphthalate	84-74-2	8.00e-08	1.61e-08	5.49e-08	<	<	1.50e-08
Dibenzofuran	132-64-9	<	2.11e-09	3.42e-08	1.41e-09	<	3.31e-09
Dimethylaminoazobenzene	60-11-7	<	<	<	<	<	<
Dimethylphthalate	131-11-3	<	<	1.57e-08	1.56e-09	<	<
Epichlorohydrin	106-89-8	<	<	<	<	<	<
Ethyl Acrylate	140-88-5	<	<	<	<	<	<
Ethylbenzene	100-41-4	<	1.45e-07	2.13e-07	1.17e-07	1.18e-07	2.43e-07

Table 4.12-4. INTERNAL MIXING & MILLING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #1 lb/lb rubber	Cmpd #2 lb/lb rubber	Cmpd #3 lb/lb rubber	Cmpd #4 lb/lb rubber	Cmpd #5 lb/lb rubber	Cmpd #6 lb/lb rubber
Hexachlorobenzene	118-74-1	<	<	9.29e-09	<	<	<
Hexachlorobutadiene	87-68-3	<	<	<	<	<	<
Hexachlorocyclopentadiene	77-47-4	<	<	<	<	<	<
Hexachloroethane	67-72-1	<	<	<	<	<	<
Hexane	110-54-3	8.24e-06	1.08e-06	1.58e-06	1.56e-06	5.91e-06	1.49e-06
Hydroquinone	123-31-9	<	<	<	8.10e-07	2.62e-05	<
Isooctane	540-84-1	8.95e-08	7.69e-07	2.87e-07	9.60e-08	1.03e-07	1.59e-07
Isophorone	78-59-1	<	6.63e-07	<	5.93e-08	<	<
Lead (Pb) Compounds		6.35e-09	3.24e-10	1.25e-08	3.42e-09	2.03e-08	<
m-Xylene + p-Xylene		2.62e-07	5.79e-07	7.11e-07	5.15e-07	4.11e-07	6.24e-07
Methylene bis-chloroaniline	101-14-4	<	<	<	<	<	<
Methylene Chloride	75-09-2	1.10e-06	9.51e-07	3.86e-05	1.86e-06	4.18e-07	2.49e-06
N,N-Dimethylaniline	121-69-7	<	<	<	<	<	<
N-Nitrosodimethylamine	62-75-9	<	<	<	<	<	<
N-Nitrosomorpholine	59-89-2	<	<	<	<	<	<
Naphthalene	91-20-3	2.50e-08	3.33e-08	3.08e-07	1.73e-08	2.52e-07	5.11e-08
Nickel (Ni) Compounds		4.92e-08	<	9.53e-08	4.09e-08	2.47e-08	<
Nitrobenzene	98-95-3	<	<	<	<	<	<
o-Anisidine	90-04-0	<	<	<	<	<	<
o-Toluidine	95-53-4	<	<	<	<	<	2.23e-07
o-Xylene	95-47-6	9.60e-08	3.89e-07	3.20e-07	3.77e-07	1.52e-07	9.51e-07
Pentachloronitrobenzene	82-68-8	<	<	<	<	<	<
Pentachlorophenol	87-86-5	<	<	<	<	<	<

Table 4.12-4. INTERNAL MIXING & MILLING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #1 lb/lb rubber	Cmpd #2 lb/lb rubber	Cmpd #3 lb/lb rubber	Cmpd #4 lb/lb rubber	Cmpd #5 lb/lb rubber	Cmpd #6 lb/lb rubber
Phenol	108-95-2	7.21e-08	4.90e-08	2.77e-07	1.47e-08	7.61e-07	4.43e-08
Propanal	123-38-6	<	<	<	<	<	<
Propylene Oxide	75-56-9	<	<	<	<	<	<
Styrene	100-42-5	<	<	<	4.44e-08	<	4.25e-06
t-Butyl Methyl Ether	1634-04-4	<	<	<	<	<	3.25e-07
Tetrachloroethene	127-18-4	<	4.10e-06	9.65e-08	6.59e-08	<	1.01e-07
Toluene	108-88-3	1.65e-06	2.06e-06	2.11e-06	5.99e-07	1.73e-06	5.45e-07
Trichloroethene	79-01-6	<	<	<	<	<	<
Trifluralin	1582-09-8	<	<	<	<	<	<
Vinyl Acetate	108-05-4	<	<	<	<	2.35e-06	<
Vinyl Chloride	75-01-4	<	<	<	<	<	<

Emission factor is a combination of emissions from productive and non-productive passes. Emissions from non-productive mixing are approximately 90% of the total.

Particulate matter collection efficiency of 99.3% was observed on a baghouse control device used on this process.

Table 4.12-4. INTERNAL MIXING & MILLING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #7 lb/lb rubber	Cmpd #8 lb/lb rubber	Cmpd #9 lb/lb rubber	Cmpd #10 lb/lb rubber	Cmpd #11 lb/lb rubber	Cmpd #12 lb/lb rubber
Total Method 25A Organics		1.22e-04	1.47e-05	2.91e-05	2.91e-04	3.28e-05	1.54e-05
Total Speciated Organics		8.89e-05	7.38e-05	5.74e-05	2.81e-04	3.52e-05	6.69e-05
Total Organic HAPs		4.19e-05	5.58e-05	1.52e-05	1.20e-04	1.14e-05	5.55e-05
Total Metal HAPs		1.37e-07	3.91e-08	2.65e-09	5.19e-08	1.82e-09	2.86e-08
Total HAPs		4.21e-05	5.58e-05	1.52e-05	1.20e-04	1.14e-05	5.55e-05
Total Particulate Matter		5.66e-04	2.22e-04	4.92e-05	3.58e-04	7.83e-05	1.83e-04
1,1,1-Trichloroethane	71-55-6	<	2.67e-08	7.30e-08	1.34e-07	<	2.94e-08
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<
1,1-Dichloroethane	75-34-3	<	<	<	<	<	<
1,1-Dichloroethene	75-35-4	<	1.00e-07	1.90e-07	<	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	<	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<	<	<	<
1,2-Dibromoethane	106-93-4	<	<	<	<	<	<
1,2-Dichloroethane	107-06-2	<	<	<	<	<	<
1,2-Dichloropropane	78-87-5	<	<	<	<	<	<
1,3-Butadiene	106-99-0	4.67e-07	1.13e-07	1.70e-07	<	3.82e-07	8.57e-08
1,4-Dichlorobenzene	106-46-7	1.82e-09	4.48e-09	<	5.95e-10	1.50e-09	3.30e-09
1,4-Dioxane	123-91-1	<	<	<	<	<	<
1,4-Phenylenediamine	106-50-3	<	<	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<	<

Table 4.12-4. INTERNAL MIXING & MILLING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #7 lb/lb rubber	Cmpd #8 lb/lb rubber	Cmpd #9 lb/lb rubber	Cmpd #10 lb/lb rubber	Cmpd #11 lb/lb rubber	Cmpd #12 lb/lb rubber
2-Butanone	78-93-3	1.40e-06	5.08e-07	4.92e-07	1.18e-06	8.64e-08	8.20e-07
2-Chloroacetophenone	532-27-4	<	<	<	5.46e-10	<	<
2-Methylphenol	95-48-7	<	<	<	<	<	<
3,3'-Dichlorobenzidine	91-94-1	<	<	<	<	<	<
3,3'-Dimethoxybenzidine	119-90-4	<	<	<	<	<	<
3,3'-Dimethylbenzidine	119-93-7	<	<	<	<	<	<
4,4'-Methylenedianiline	101-77-9	<	<	<	<	<	<
4-Aminobiphenyl	92-67-1	<	<	<	<	<	<
4-Methyl-2-Pentanone	108-10-1	<	1.27e-07	1.24e-07	4.15e-07	6.79e-08	<
4-Nitrobiphenyl	92-93-3	<	<	<	<	<	<
4-Nitrophenol	100-02-7	<	<	<	<	<	<
a,a,a-Trichlorotoluene	98-07-7	<	<	<	<	<	<
Acetaldehyde	75-07-0	<	<	<	<	<	<
Acetaldehyde + Isobutane		<	<	<	<	<	<
Acetonitrile	75-05-8	<	<	<	<	<	<
Acetophenone	98-86-2	1.23e-07	1.29e-08	1.47e-06	8.46e-08	2.29e-07	3.45e-07
Acrolein	107-02-8	<	<	<	<	<	<
Acrylonitrile	107-13-1	<	6.81e-08	<	<	<	<
Allyl Chloride	107-05-1	<	<	<	<	<	<
Aniline	62-53-3	<	7.70e-09	5.13e-09	4.71e-09	2.39e-08	<
Benzene	71-43-2	9.13e-08	<	4.90e-08	<	<	3.64e-08
Benzidine	92-87-5	<	<	<	<	<	<
Benzyl Chloride	100-44-7	<	<	<	<	<	<
Biphenyl	92-52-4	<	<	<	<	<	<

Table 4.12-4. INTERNAL MIXING & MILLING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #7 lb/lb rubber	Cmpd #8 lb/lb rubber	Cmpd #9 lb/lb rubber	Cmpd #10 lb/lb rubber	Cmpd #11 lb/lb rubber	Cmpd #12 lb/lb rubber
bis(2-Chloroethyl)ether	111-44-4	<	<	<	<	<	<
bis(2-Ethylhexyl)phthalate	117-81-7	3.34e-08	<	7.07e-09	<	2.69e-07	8.93e-09
Bromoform	75-25-2	<	<	<	<	<	<
Bromomethane	74-83-9	<	<	<	<	<	<
Cadmium (Cd) Compounds		3.89e-09	9.09e-10	1.12e-09	4.08e-09	1.27e-09	7.29e-10
Carbon Disulfide	75-15-0	<	2.81e-05	6.66e-07	1.03e-04	8.64e-06	4.52e-05
Carbon Tetrachloride	56-23-5	<	<	<	<	<	<
Carbonyl Sulfide	463-58-1	<	2.24e-05	1.15e-06	<	<	6.14e-06
Chlorobenzene	108-90-7	<	<	<	<	<	<
Chloroethane	75-00-3	<	<	<	<	<	<
Chloroform	67-66-3	<	<	<	<	<	<
Chloromethane	74-87-3	<	3.74e-08	3.17e-08	9.27e-08	<	2.31e-08
Chromium (Cr) Compounds		1.23e-07	4.41e-09	1.53e-09	1.56e-08	<	6.44e-09
Cumene	98-82-8	8.31e-08	9.65e-08	3.17e-06	8.81e-07	2.68e-09	9.05e-08
Di-n-butylphthalate	84-74-2	<	7.47e-09	1.31e-09	1.47e-08	<	5.94e-09
Dibenzofuran	132-64-9	<	<	<	<	<	<
Dimethylaminoazobenzene	60-11-7	<	<	<	<	<	<
Dimethylphthalate	131-11-3	<	<	<	<	<	<
Epichlorohydrin	106-89-8	<	<	<	<	<	<
Ethyl Acrylate	140-88-5	<	<	<	<	<	<
Ethylbenzene	100-41-4	4.32e-06	1.11e-07	7.36e-08	<	6.81e-08	5.74e-08
Hexachlorobenzene	118-74-1	<	<	<	<	<	<
Hexachlorobutadiene	87-68-3	<	<	<	<	<	<
Hexachlorocyclopentadiene	77-47-4	<	<	<	<	<	<

Table 4.12-4. INTERNAL MIXING & MILLING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #7 lb/lb rubber	Cmpd #8 lb/lb rubber	Cmpd #9 lb/lb rubber	Cmpd #10 lb/lb rubber	Cmpd #11 lb/lb rubber	Cmpd #12 lb/lb rubber
Hexachloroethane	67-72-1	<	<	<	<	<	<
Hexane	110-54-3	1.08e-05	1.28e-06	3.21e-06	1.66e-06	2.84e-07	4.68e-07
Hydroquinone	123-31-9	<	<	<	<	<	<
Isooctane	540-84-1	2.11e-07	2.46e-07	3.86e-07	3.19e-07	7.33e-08	2.47e-07
Isophorone	78-59-1	<	<	<	<	<	<
Lead (Pb) Compounds		1.03e-08	<	<	8.16e-09	5.51e-10	<
m-Xylene + p-Xylene		1.44e-05	4.35e-07	4.82e-07	1.08e-06	1.51e-07	3.65e-07
Methylene bis-chloroaniline	101-14-4	<	<	<	<	<	<
Methylene Chloride	75-09-2	1.14e-06	4.81e-07	6.98e-07	9.04e-06	5.00e-07	6.51e-07
N,N-Dimethylaniline	121-69-7	<	<	<	<	<	<
N-Nitrosodimethylamine	62-75-9	<	<	<	<	<	<
N-Nitrosomorpholine	59-89-2	<	<	<	<	<	<
Naphthalene	91-20-3	4.32e-08	2.72e-08	2.79e-08	8.18e-09	8.87e-09	3.02e-08
Nickel (Ni) Compounds		<	3.38e-08	<	2.40e-08	<	2.15e-08
Nitrobenzene	98-95-3	<	<	<	<	2.02e-08	<
o-Anisidine	90-04-0	<	<	<	<	<	<
o-Toluidine	95-53-4	<	<	<	<	<	8.24e-08
o-Xylene	95-47-6	7.73e-06	1.55e-07	1.66e-07	3.91e-07	1.33e-07	1.68e-07
Pentachloronitrobenzene	82-68-8	<	<	<	<	<	<
Pentachlorophenol	87-86-5	<	<	<	<	<	<
Phenol	108-95-2	2.39e-08	3.19e-08	5.95e-08	1.21e-08	9.20e-09	2.72e-08
Propanal	123-38-6	<	<	<	<	<	<
Propylene Oxide	75-56-9	<	<	<	<	<	<
Styrene	100-42-5	<	4.12e-08	1.63e-07	2.18e-07	5.01e-08	<

Table 4.12-4. INTERNAL MIXING & MILLING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #7 lb/lb rubber	Cmpd #8 lb/lb rubber	Cmpd #9 lb/lb rubber	Cmpd #10 lb/lb rubber	Cmpd #11 lb/lb rubber	Cmpd #12 lb/lb rubber
t-Butyl Methyl Ether	1634-04-4	<	<	<	<	<	<
Tetrachloroethene	127-18-4	<	7.75e-08	1.13e-07	1.22e-07	2.41e-08	7.88e-08
Toluene	108-88-3	1.05e-06	1.32e-06	2.26e-06	1.84e-06	3.92e-07	5.72e-07
Trichloroethene	79-01-6	<	<	<	<	<	<
Trifluralin	1582-09-8	<	<	<	<	<	<
Vinyl Acetate	108-05-4	<	<	<	<	<	<
Vinyl Chloride	75-01-4	<	<	<	<	<	<

Emission factor is a combination of emissions from productive and non-productive passes. Emissions from non-productive mixing are approximately 90% of the total.

Particulate matter collection efficiency of 99.3% was observed on a baghouse control device used on this process.

Table 4.12-4. INTERNAL MIXING & MILLING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #13 lb/lb rubber	Cmpd #14 lb/lb rubber	Cmpd #15 lb/lb rubber	Cmpd #16 lb/lb rubber	Cmpd #17 lb/lb rubber	Cmpd #18 lb/lb rubber
Total Method 25A Organics		2.28e-04	2.30e-04	9.39e-06	8.16e-05	4.44e-04	6.50e-05
Total Speciated Organics		1.53e-04	1.52e-04	6.12e-05	3.04e-05	2.99e-04	1.23e-04
Total Organic HAPs		1.61e-05	4.23e-05	5.56e-05	4.70e-06	1.40e-04	4.66e-05
Total Metal HAPs		4.85e-08	1.28e-08	2.54e-08	1.44e-09	7.67e-08	4.04e-08
Total HAPs		1.61e-05	4.24e-05	5.56e-05	4.71e-06	1.40e-04	4.66e-05
Total Particulate Matter		2.46e-04	1.30e-04	1.42e-04	3.17e-04	8.96e-05	1.92e-04
1,1,1-Trichloroethane	71-55-6	5.32e-08	3.61e-08	1.83e-08	1.75e-08	6.03e-08	<
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<
1,1-Dichloroethane	75-34-3	<	<	<	<	<	<
1,1-Dichloroethene	75-35-4	<	2.19e-07	1.39e-08	<	<	8.80e-08
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	<	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<	<	<	<
1,2-Dibromoethane	106-93-4	<	<	<	<	<	<
1,2-Dichloroethane	107-06-2	<	<	<	<	<	<
1,2-Dichloropropane	78-87-5	<	<	<	<	<	<
1,3-Butadiene	106-99-0	1.12e-07	2.39e-07	6.17e-08	<	<	1.80e-07
1,4-Dichlorobenzene	106-46-7	<	<	<	<	<	<
1,4-Dioxane	123-91-1	<	<	<	<	<	<
1,4-Phenylenediamine	*106-50-3*	<	<	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<	<

Table 4.12-4. INTERNAL MIXING & MILLING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #13 lb/lb rubber	Cmpd #14 lb/lb rubber	Cmpd #15 lb/lb rubber	Cmpd #16 lb/lb rubber	Cmpd #17 lb/lb rubber	Cmpd #18 lb/lb rubber
2-Butanone	78-93-3	3.22e-07	3.10e-07	8.78e-08	3.95e-08	1.04e-06	1.26e-06
2-Chloroacetophenone	532-27-4	<	<	<	<	<	<
2-Methylphenol	95-48-7	<	<	<	<	<	<
3,3'-Dichlorobenzidine	91-94-1	<	<	<	<	<	<
3,3'-Dimethoxybenzidine	119-90-4	<	<	<	<	<	<
3,3'-Dimethylbenzidine	119-93-7	<	<	<	<	<	<
4,4'-Methylenedianiline	101-77-9	<	<	<	<	<	<
4-Aminobiphenyl	92-67-1	<	<	<	<	<	<
4-Methyl-2-Pentanone	108-10-1	9.87e-08	8.26e-07	4.90e-08	8.64e-08	1.65e-07	4.57e-06
4-Nitrobiphenyl	92-93-3	<	<	<	<	<	<
4-Nitrophenol	100-02-7	<	<	<	<	<	<
a,a,a-Trichlorotoluene	98-07-7	<	<	<	<	<	<
Acetaldehyde	75-07-0	<	<	5.12e-07	<	<	<
Acetaldehyde + Isobutane		<	<	<	<	<	<
Acetonitrile	75-05-8	<	<	<	<	<	<
Acetophenone	98-86-2	5.21e-08	1.70e-08	1.10e-08	1.11e-08	1.45e-08	5.72e-08
Acrolein	107-02-8	7.10e-07	8.26e-07	<	<	<	<
Acrylonitrile	107-13-1	9.54e-07	1.17e-05	<	<	<	8.00e-07
Allyl Chloride	107-05-1	<	<	<	<	<	<
Aniline	62-53-3	<	<	<	<	5.13e-07	1.66e-07
Benzene	71-43-2	6.61e-07	5.24e-07	1.74e-08	2.61e-08	<	3.77e-08
Benzidine	92-87-5	<	<	1.80e-08	<	<	<
Benzyl Chloride	100-44-7	<	<	<	<	<	<
Biphenyl	92-52-4	<	1.24e-09	<	<	<	<

Table 4.12-4. INTERNAL MIXING & MILLING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #13 lb/lb rubber	Cmpd #14 lb/lb rubber	Cmpd #15 lb/lb rubber	Cmpd #16 lb/lb rubber	Cmpd #17 lb/lb rubber	Cmpd #18 lb/lb rubber
bis(2-Chloroethyl)ether	111-44-4	<	<	<	<	<	<
bis(2-Ethylhexyl)phthalate	117-81-7	7.40e-07	<	4.60e-08	3.54e-08	2.40e-09	2.20e-08
Bromoform	75-25-2	<	<	<	<	<	<
Bromomethane	74-83-9	<	<	<	<	<	<
Cadmium (Cd) Compounds		5.94e-10	3.38e-09	1.66e-09	6.09e-10	2.65e-09	1.47e-09
Carbon Disulfide	75-15-0	8.32e-07	4.26e-06	1.54e-07	4.50e-08	<	3.54e-05
Carbon Tetrachloride	56-23-5	<	<	4.68e-05	<	<	<
Carbonyl Sulfide	463-58-1	5.85e-07	1.13e-05	2.73e-06	<	<	<
Chlorobenzene	108-90-7	<	<	<	<	<	<
Chloroethane	75-00-3	<	<	<	1.70e-06	2.01e-07	<
Chloroform	67-66-3	<	2.45e-08	6.51e-07	1.23e-08	<	<
Chloromethane	74-87-3	6.43e-08	3.61e-08	1.02e-07	1.44e-08	8.86e-07	<
Chromium (Cr) Compounds		6.58e-09	4.05e-09	1.96e-09	8.29e-10	4.20e-08	<
Cumene	98-82-8	9.86e-08	<	2.92e-09	<	9.43e-09	1.21e-07
Di-n-butylphthalate	84-74-2	3.34e-07	8.95e-09	<	3.68e-09	<	8.27e-08
Dibenzofuran	132-64-9	<	2.41e-09	7.41e-10	<	<	<
Dimethylaminoazobenzene	60-11-7	<	<	1.64e-08	<	<	<
Dimethylphthalate	131-11-3	<	3.00e-09	2.18e-09	3.12e-09	<	<
Epichlorohydrin	106-89-8	<	<	<	<	<	<
Ethyl Acrylate	140-88-5	<	<	<	<	4.73e-06	<
Ethylbenzene	100-41-4	2.08e-07	6.12e-08	4.84e-08	<	<	2.78e-07
Hexachlorobenzene	118-74-1	<	<	<	<	<	<
Hexachlorobutadiene	87-68-3	<	<	<	<	<	<
Hexachlorocyclopentadiene	77-47-4	<	<	<	<	<	<

Table 4.12-4. INTERNAL MIXING & MILLING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #13 lb/lb rubber	Cmpd #14 lb/lb rubber	Cmpd #15 lb/lb rubber	Cmpd #16 lb/lb rubber	Cmpd #17 lb/lb rubber	Cmpd #18 lb/lb rubber
Hexachloroethane	67-72-1	<	<	1.23e-06	<	<	<
Hexane	110-54-3	2.05e-06	6.78e-07	7.88e-07	1.81e-06	1.13e-04	4.03e-07
Hydroquinone	123-31-9	<	<	<	<	<	<
Isooctane	540-84-1	2.37e-07	2.60e-07	4.78e-08	<	<	7.47e-08
Isophorone	78-59-1	<	<	<	<	<	<
Lead (Pb) Compounds		7.10e-09	5.39e-09	2.27e-10	<	<	<
m-Xylene + p-Xylene		7.96e-07	3.35e-07	3.07e-07	1.07e-07	4.76e-07	8.83e-07
Methylene bis-chloroaniline	101-14-4	<	<	<	<	<	<
Methylene Chloride	75-09-2	2.22e-07	1.68e-06	7.02e-07	5.00e-07	1.65e-05	8.68e-07
N,N-Dimethylaniline	121-69-7	<	<	<	<	<	<
N-Nitrosodimethylamine	62-75-9	<	<	2.34e-09	<	<	<
N-Nitrosomorpholine	59-89-2	<	<	<	<	<	<
Naphthalene	91-20-3	1.14e-08	<	2.78e-08	1.13e-08	4.01e-08	3.30e-08
Nickel (Ni) Compounds		3.42e-08	<	2.16e-08	<	3.21e-08	3.89e-08
Nitrobenzene	98-95-3	<	<	<	<	<	<
o-Anisidine	90-04-0	<	<	<	<	<	<
o-Toluidine	95-53-4	<	<	<	<	<	<
o-Xylene	95-47-6	3.55e-07	1.71e-07	8.07e-08	5.49e-08	5.09e-07	3.66e-07
Pentachloronitrobenzene	82-68-8	<	<	<	<	<	<
Pentachlorophenol	87-86-5	4.53e-09	<	<	<	<	<
Phenol	108-95-2	4.20e-08	5.33e-08	2.69e-08	4.56e-08	1.27e-06	5.63e-08
Propanal	123-38-6	3.33e-06	<	<	<	<	<
Propylene Oxide	75-56-9	<	6.97e-06	<	<	<	<
Styrene	100-42-5	5.40e-08	6.50e-08	<	<	<	5.45e-08

Table 4.12-4. INTERNAL MIXING & MILLING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #13 lb/lb rubber	Cmpd #14 lb/lb rubber	Cmpd #15 lb/lb rubber	Cmpd #16 lb/lb rubber	Cmpd #17 lb/lb rubber	Cmpd #18 lb/lb rubber
t-Butyl Methyl Ether	1634-04-4	<	<	<	<	<	<
Tetrachloroethene	127-18-4	1.33e-07	1.42e-07	6.95e-07	<	<	7.66e-08
Toluene	108-88-3	2.79e-06	1.55e-06	3.16e-07	1.75e-07	1.04e-06	6.88e-07
Trichloroethene	79-01-6	2.22e-07	<	<	<	<	<
Trifluralin	1582-09-8	<	<	<	<	<	<
Vinyl Acetate	108-05-4	<	<	<	<	<	<
Vinyl Chloride	75-01-4	<	<	1.32e-08	<	<	<

Emission factor is a combination of emissions from productive and non-productive passes. Emissions from non-productive mixing are approximately 90% of the total.

Particulate matter collection efficiency of 99.3% was observed on a baghouse control device used on this process.

Table 4.12-4. INTERNAL MIXING & MILLING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #19 lb/lb rubber	Cmpd #20 lb/lb rubber	Cmpd #21 lb/lb rubber	Cmpd #22 lb/lb rubber	Cmpd #23 lb/lb rubber
Total Method 25A Organics		2.76e-05	7.52e-06	1.57e-04	1.23e-04	3.07e-05
Total Speciated Organics		1.98e-05	1.38e-05	1.34e-04	8.38e-05	3.54e-05
Total Organic HAPs		3.69e-06	6.66e-06	1.13e-05	2.98e-05	2.97e-05
Total Metal HAPs		2.90e-08	1.07e-08	1.70e-09	1.16e-08	5.15e-08
Total HAPs		3.71e-06	6.67e-06	1.13e-05	2.98e-05	2.97e-05
Total Particulate Matter		6.90e-05	7.84e-04	7.50e-05	4.50e-04	3.39e-04
1,1,1-Trichloroethane	71-55-6	1.14e-07	7.31e-07	1.04e-08	6.55e-08	<
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<
1,1-Dichloroethane	75-34-3	<	<	<	<	<
1,1-Dichloroethene	75-35-4	<	<	<	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<	<	<
1,2-Dibromoethane	106-93-4	<	<	<	<	<
1,2-Dichloroethane	107-06-2	<	<	<	<	<
1,2-Dichloropropane	78-87-5	<	<	<	<	<
1,3-Butadiene	106-99-0	5.79e-08	<	<	1.31e-07	1.43e-07
1,4-Dichlorobenzene	106-46-7	<	<	<	<	<
1,4-Dioxane	123-91-1	<	<	<	<	<
1,4-Phenylenediamine	106-50-3	<	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<
2,4-Dinitrophenol	51-28-5	1.62e-08	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<

Table 4.12-4. INTERNAL MIXING & MILLING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #19 lb/lb rubber	Cmpd #20 lb/lb rubber	Cmpd #21 lb/lb rubber	Cmpd #22 lb/lb rubber	Cmpd #23 lb/lb rubber
2-Butanone	78-93-3	6.30e-08	1.30e-07	4.73e-07	4.37e-06	<
2-Chloroacetophenone	532-27-4	<	<	<	<	<
2-Methylphenol	95-48-7	<	1.01e-09	<	<	<
3,3'-Dichlorobenzidine	91-94-1	<	<	<	<	<
3,3'-Dimethoxybenzidine	119-90-4	<	<	<	<	<
3,3'-Dimethylbenzidine	119-93-7	<	<	<	<	<
4,4'-Methylenedianiline	101-77-9	<	<	<	<	<
4-Aminobiphenyl	92-67-1	<	<	<	<	<
4-Methyl-2-Pentanone	108-10-1	<	1.91e-07	2.76e-08	1.37e-05	<
4-Nitrobiphenyl	92-93-3	<	<	<	<	<
4-Nitrophenol	100-02-7	9.90e-09	<	<	<	<
a,a,a-Trichlorotoluene	98-07-7	<	<	<	<	<
Acetaldehyde	75-07-0	<	<	<	<	<
Acetaldehyde + Isobutane		<	<	<	<	<
Acetonitrile	75-05-8	4.63e-07	<	<	<	<
Acetophenone	98-86-2	2.48e-08	1.61e-07	1.76e-08	2.92e-08	9.02e-09
Acrolein	107-02-8	<	<	2.27e-07	3.00e-07	<
Acrylonitrile	107-13-1	<	<	<	<	<
Allyl Chloride	107-05-1	<	<	<	<	<
Aniline	62-53-3	<	7.20e-09	<	4.68e-07	2.23e-07
Benzene	71-43-2	1.42e-07	5.92e-08	<	8.87e-08	<
Benzidine	92-87-5	<	<	<	<	<
Benzyl Chloride	100-44-7	<	<	<	<	<
Biphenyl	92-52-4	<	<	<	9.77e-09	<

Table 4.12-4. INTERNAL MIXING & MILLING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #19 lb/lb rubber	Cmpd #20 lb/lb rubber	Cmpd #21 lb/lb rubber	Cmpd #22 lb/lb rubber	Cmpd #23 lb/lb rubber
bis(2-Chloroethyl)ether	111-44-4	<	<	<	<	<
bis(2-Ethylhexyl)phthalate	117-81-7	1.31e-08	4.53e-08	1.31e-07	8.41e-09	6.74e-07
Bromoform	75-25-2	<	<	<	<	<
Bromomethane	74-83-9	5.62e-08	<	<	<	<
Cadmium (Cd) Compounds		6.06e-10	1.35e-09	6.27e-10	2.79e-09	1.04e-09
Carbon Disulfide	75-15-0	<	2.60e-07	4.36e-08	9.56e-08	5.07e-07
Carbon Tetrachloride	56-23-5	<	<	<	<	2.36e-07
Carbonyl Sulfide	463-58-1	1.69e-07	1.58e-06	3.52e-07	<	2.88e-06
Chlorobenzene	108-90-7	<	<	<	<	<
Chloroethane	75-00-3	<	4.24e-07	<	<	<
Chloroform	67-66-3	<	<	1.72e-08	<	<
Chloromethane	74-87-3	1.48e-07	3.35e-07	3.93e-07	3.82e-08	<
Chromium (Cr) Compounds		<	9.37e-09	1.08e-09	3.81e-09	2.11e-08
Cumene	98-82-8	1.06e-06	5.22e-09	2.80e-08	5.61e-08	1.99e-09
Di-n-butylphthalate	84-74-2	2.91e-08	2.17e-08	2.86e-07	3.57e-08	8.78e-08
Dibenzofuran	132-64-9	<	9.63e-10	3.06e-10	<	5.31e-10
Dimethylaminoazobenzene	60-11-7	<	<	<	<	<
Dimethylphthalate	131-11-3	<	<	<	<	<
Epichlorohydrin	106-89-8	<	<	<	<	<
Ethyl Acrylate	140-88-5	<	<	<	<	<
Ethylbenzene	100-41-4	3.24e-08	7.92e-08	<	1.28e-07	<
Hexachlorobenzene	118-74-1	<	<	<	<	<
Hexachlorobutadiene	87-68-3	<	<	<	<	<
Hexachlorocyclopentadiene	77-47-4	<	<	<	<	<

Table 4.12-4. INTERNAL MIXING & MILLING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #19 lb/lb rubber	Cmpd #20 lb/lb rubber	Cmpd #21 lb/lb rubber	Cmpd #22 lb/lb rubber	Cmpd #23 lb/lb rubber
Hexachloroethane	67-72-1	<	<	<	<	6.06e-09
Hexane	110-54-3	2.37e-07	4.86e-07	2.53e-07	7.75e-07	6.22e-07
Hydroquinone	123-31-9	<	<	<	<	<
Isooctane	540-84-1	4.56e-08	6.90e-08	2.12e-07	7.95e-07	<
Isophorone	78-59-1	<	<	3.93e-09	3.37e-07	<
Lead (Pb) Compounds		1.86e-09	<	<	4.97e-09	2.73e-10
m-Xylene + p-Xylene		1.01e-07	3.36e-07	1.42e-07	4.22e-07	1.18e-07
Methylene bis-chloroaniline	101-14-4	<	<	<	<	<
Methylene Chloride	75-09-2	3.74e-07	1.03e-06	2.82e-07	1.01e-06	1.10e-06
N,N-Dimethylaniline	121-69-7	<	<	<	<	<
N-Nitrosodimethylamine	62-75-9	<	<	<	<	<
N-Nitrosomorpholine	59-89-2	<	<	<	<	<
Naphthalene	91-20-3	1.23e-08	1.71e-08	1.25e-08	5.52e-08	3.18e-08
Nickel (Ni) Compounds		2.65e-08	<	<	<	2.91e-08
Nitrobenzene	98-95-3	<	<	<	<	<
o-Anisidine	90-04-0	<	<	<	<	<
o-Toluidine	95-53-4	<	<	<	<	<
o-Xylene	95-47-6	4.81e-08	1.25e-07	1.59e-07	3.62e-07	<
Pentachloronitrobenzene	82-68-8	<	<	<	<	<
Pentachlorophenol	87-86-5	1.25e-08	<	<	<	<
Phenol	108-95-2	<	1.84e-08	9.35e-09	6.87e-07	1.25e-08
Propanal	123-38-6	<	<	<	<	<
Propylene Oxide	75-56-9	<	<	<	<	<
Styrene	100-42-5	<	<	6.32e-08	1.48e-06	<

Table 4.12-4. INTERNAL MIXING & MILLING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #19 lb/lb rubber	Cmpd #20 lb/lb rubber	Cmpd #21 lb/lb rubber	Cmpd #22 lb/lb rubber	Cmpd #23 lb/lb rubber
t-Butyl Methyl Ether	1634-04-4	<	<	7.98e-06	<	<
Tetrachloroethene	127-18-4	2.81e-08	7.59e-08	<	1.91e-06	<
Toluene	108-88-3	4.34e-07	4.75e-07	1.38e-07	2.47e-06	2.31e-05
Trichloroethene	79-01-6	<	<	<	<	<
Trifluralin	1582-09-8	<	<	<	<	<
Vinyl Acetate	108-05-4	<	<	<	<	<
Vinyl Chloride	75-01-4	<	<	<	<	<

Emission factor is a combination of emissions from productive and non-productive passes. Emissions from non-productive mixing are approximately 90% of the total.

Particulate matter collection efficiency of 99.3% was observed on a baghouse control device used on this process.

Table 4.12-6. EXTRUDER EMISSION FACTORS

Analyte Name	CAS #	Interpolated Cmpd #1 lb/lb rubber	Interpolated Cmpd #2 lb/lb rubber	Interpolated Cmpd #3 lb/lb rubber	Cmpd #4 lb/lb rubber	Interpolated Cmpd #5 lb/lb rubber	Cmpd #6 lb/lb rubber
Total Method 25A Organics		1.48e-05	9.37e-06	3.25e-05	5.67e-06	5.15e-05	1.23e-05
Total Speciated Organics		2.72e-05	2.97e-05	4.78e-05	2.11e-05	3.31e-05	9.04e-05
Total Particulate Matter		2.12e-08	4.85e-08	1.08e-07	3.11e-08	1.12e-07	7.77e-09
Total Organic HAPs		1.13e-05	7.14e-06	3.16e-05	9.87e-06	2.24e-05	3.51e-05
Total Metal HAPs		5.00e-09	4.31e-10	9.52e-09	4.67e-07	3.20e-09	1.05e-07
Total HAPs		1.13e-05	7.14e-06	3.16e-05	1.03e-05	2.24e-05	3.52e-05
1,1,1-Trichloroethane	71-55-6	<	4.31e-08	1.71e-07	8.47e-08	9.84e-08	9.37e-08
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<
1,1-Dichloroethane	75-34-3	<	<	<	<	<	<
1,1-Dichloroethene	75-35-4	<	<	<	<	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	<	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<	<	<	<
1,2-Dibromoethane	106-93-4	<	<	<	<	<	<
1,2-Dichloroethane	107-06-2	<	<	<	<	<	<
1,2-Dichloropropane	78-87-5	<	<	<	<	<	<
1,3-Butadiene	106-99-0	5.24e-08	<	<	8.92e-08	<	5.06e-07
1,4-Dichlorobenzene	106-46-7	<	<	<	8.36e-09	<	<
1,4-Dioxane	123-91-1	<	<	<	<	<	<
1,4-Phenylenediamine	106-50-3	<	<	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<	<
2-Butanone	78-93-3	3.17e-06	8.52e-07	4.83e-07	1.34e-07	8.20e-07	1.17e-07
2-Chloroacetophenone	532-27-4	<	<	<	6.48e-09	<	1.68e-09

Table 4.12-6. EXTRUDER EMISSION FACTORS

Analyte Name	CAS #	Interpolated Cmpd #7 lb/lb rubber	Interpolated Cmpd #8 lb/lb rubber	Cmpd #9 lb/lb rubber	Interpolated Cmpd #10 lb/lb rubber	Interpolated Cmpd #11 lb/lb rubber	Interpolated Cmpd #12 lb/lb rubber
Total Method 25A Organics		2.92e-05	3.52e-06	1.24e-05	6.97e-05	7.86e-06	3.69e-06
Total Speciated Organics		4.76e-05	3.95e-05	3.51e-05	1.51e-04	1.89e-05	3.59e-05
Total Particulate Matter		6.83e-08	2.67e-08	1.51e-08	4.32e-08	9.45e-09	2.20e-08
Total Organic HAPs		2.25e-05	2.99e-05	1.87e-05	6.43e-05	6.12e-06	2.97e-05
Total Metal HAPs		7.57e-09	2.35e-09	1.95e-07	2.45e-09	<	1.72e-09
Total HAPs		2.25e-05	2.99e-05	1.89e-05	6.43e-05	6.12e-06	2.97e-05
1,1,1-Trichloroethane	71-55-6	<	1.43e-08	6.58e-08	7.19e-08	<	1.58e-08
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<
1,1-Dichloroethane	75-34-3	<	<	<	<	<	<
1,1-Dichloroethene	75-35-4	<	5.37e-08	7.04e-08	<	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	<	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<	<	<	<
1,2-Dibromoethane	106-93-4	<	<	<	<	<	<
1,2-Dichloroethane	107-06-2	<	<	<	<	<	<
1,2-Dichloropropane	78-87-5	<	<	<	<	<	<
1,3-Butadiene	106-99-0	2.50e-07	6.04e-08	6.01e-08	<	2.05e-07	4.59e-08
1,4-Dichlorobenzene	106-46-7	<	<	<	<	<	<
1,4-Dioxane	123-91-1	<	<	1.67e-07	<	<	<
1,4-Phenylenediamine	106-50-3	<	<	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<	<

Table 4.12-6. EXTRUDER EMISSION FACTORS

Analyte Name	CAS #	Interpolated Cmpd #13 lb/lb rubber	Interpolated Cmpd #14 lb/lb rubber	Interpolated Cmpd #15 lb/lb rubber	Interpolated Cmpd #16 lb/lb rubber	Interpolated Cmpd #17 lb/lb rubber	Interpolated Cmpd #18 lb/lb rubber
Total Method 25A Organics		5.46e-05	5.50e-05	2.25e-06	1.96e-05	1.06e-04	1.56e-05
Total Speciated Organics		8.21e-05	8.14e-05	3.28e-05	1.63e-05	1.60e-04	6.58e-05
Total Particulate Matter		2.97e-08	1.57e-08	1.72e-08	3.82e-08	1.08e-08	2.31e-08
Total Organic HAPs		8.61e-06	2.27e-05	2.98e-05	2.52e-06	7.52e-05	2.50e-05
Total Metal HAPs		2.52e-09	2.50e-10	1.45e-09	5.11e-11	4.57e-09	2.40e-09
Total HAPs		8.61e-06	2.27e-05	2.98e-05	2.52e-06	7.52e-05	2.50e-05
1,1,1-Trichloroethane	71-55-6	2.85e-08	1.94e-08	9.80e-09	9.40e-09	3.23e-08	<
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<
1,1-Dichloroethane	75-34-3	<	<	<	<	<	<
1,1-Dichloroethene	75-35-4	<	1.18e-07	7.44e-09	<	<	4.71e-08
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	<	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<	<	<	<
1,2-Dibromoethane	106-93-4	<	<	<	<	<	<
1,2-Dichloroethane	107-06-2	<	<	<	<	<	<
1,2-Dichloropropane	78-87-5	<	<	<	<	<	<
1,3-Butadiene	106-99-0	6.02e-08	1.28e-07	3.31e-08	<	<	9.64e-08
1,4-Dichlorobenzene	106-46-7	<	<	<	<	<	<
1,4-Dioxane	123-91-1	<	<	<	<	<	<
1,4-Phenylenediamine	106-50-3	<	<	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<	<

Table 4.12-6. EXTRUDER EMISSION FACTORS

Analyte Name	CAS #	Interpolated Cmpd #19 lb/lb rubber	Interpolated Cmpd #20 lb/lb rubber	Interpolated Cmpd #21 lb/lb rubber	Cmpd #22 lb/lb rubber	Interpolated Cmpd #23 lb/lb rubber
Total Method 25A Organics		6.61e-06	1.80e-06	3.75e-05	8.30e-06	7.35e-06
Total Speciated Organics		1.06e-05	7.41e-06	7.17e-05	1.81e-05	1.90e-05
Total Particulate Matter		8.32e-09	9.47e-08	9.05e-09	2.34e-08	4.10e-08
Total Organic HAPs		1.97e-06	3.57e-06	6.04e-06	8.54e-06	1.59e-05
Total Metal HAPs		1.63e-09	5.78e-10	6.63e-11	7.55e-07	3.09e-09
Total HAPs		1.98e-06	3.57e-06	6.04e-06	9.30e-06	1.59e-05
1,1,1-Trichloroethane	71-55-6	6.11e-08	3.92e-07	5.59e-09	3.48e-08	<
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<
1,1-Dichloroethane	75-34-3	<	<	<	<	<
1,1-Dichloroethene	75-35-4	<	<	<	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<	<	<
1,2-Dibromoethane	106-93-4	<	<	<	<	<
1,2-Dichloroethane	107-06-2	<	<	<	<	<
1,2-Dichloropropane	78-87-5	<	<	<	<	<
1,3-Butadiene	106-99-0	3.10e-08	<	<	7.83e-08	7.65e-08
1,4-Dichlorobenzene	106-46-7	<	<	<	1.97e-09	<
1,4-Dioxane	123-91-1	<	<	<	<	<
1,4-Phenylenediamine	106-50-3	<	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<
2,4-Dinitrophenol	51-28-5	8.67e-09	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<

Table 4.12-6. EXTRUDER EMISSION FACTORS

Analyte Name	CAS #	Interpolated Cmpd #19 lb/lb rubber	Interpolated Cmpd #20 lb/lb rubber	Interpolated Cmpd #21 lb/lb rubber	Cmpd #22 lb/lb rubber	Interpolated Cmpd #23 lb/lb rubber
2-Butanone	78-93-3	3.37e-08	6.96e-08	2.53e-07	9.28e-08	<
2-Chloroacetophenone	532-27-4	<	<	<	5.35e-09	<
2-Methylphenol	95-48-7	<	5.43e-10	<	<	<
3,3'-Dichlorobenzidine	91-94-1	<	<	<	<	<
3,3'-Dimethoxybenzidine	119-90-4	<	<	<	<	<
3,3'-Dimethylbenzidine	119-93-7	<	<	<	<	<
4,4'-Methylenedianiline	101-77-9	<	<	<	<	<
4-Aminobiphenyl	92-67-1	<	<	<	<	<
4-Methyl-2-Pentanone	108-10-1	<	1.03e-07	1.48e-08	1.63e-06	<
4-Nitrobiphenyl	92-93-3	<	<	<	<	<
4-Nitrophenol	100-02-7	5.30e-09	<	<	<	<
a,a,a-Trichlorotoluene	98-07-7	<	<	<	<	<
Acetaldehyde	75-07-0	<	<	<	<	<
Acetaldehyde + Isobutane		<	<	<	<	<
Acetonitrile	75-05-8	2.48e-07	<	<	<	<
Acetophenone	98-86-2	1.33e-08	8.61e-08	9.41e-09	1.65e-08	4.83e-09
Acrolein	107-02-8	<	<	1.22e-07	1.04e-07	<
Acrylonitrile	107-13-1	<	<	<	<	<
Allyl Chloride	107-05-1	<	<	<	<	<
Aniline	62-53-3	<	3.86e-09	<	2.23e-07	1.19e-07
Benzene	71-43-2	7.59e-08	3.17e-08	<	1.28e-07	<
Benzidine	92-87-5	<	<	<	<	<
Benzyl Chloride	100-44-7	<	<	<	<	<
Biphenyl	92-52-4	<	<	<	4.42e-09	<

Table 4.12-6. EXTRUDER EMISSION FACTORS

Analyte Name	CAS #	Interpolated Cmpd #19 lb/lb rubber	Interpolated Cmpd #20 lb/lb rubber	Interpolated Cmpd #21 lb/lb rubber	Cmpd #22 lb/lb rubber	Interpolated Cmpd #23 lb/lb rubber
bis(2-Chloroethyl)ether	111-44-4	<	<	<	<	<
bis(2-Ethylhexyl)phthalate	117-81-7	7.01e-09	2.43e-08	7.04e-08	1.55e-07	3.61e-07
Bromoform	75-25-2	<	<	<	<	<
Bromomethane	74-83-9	3.01e-08	<	<	<	<
Carbon Disulfide	75-15-0	<	1.39e-07	2.34e-08	1.16e-07	2.72e-07
Carbon Tetrachloride	56-23-5	<	<	<	<	1.27e-07
Carbonyl Sulfide	463-58-1	9.04e-08	8.46e-07	1.89e-07	<	1.54e-06
Chlorobenzene	108-90-7	<	<	<	<	<
Chloroethane	75-00-3	<	2.27e-07	<	5.36e-08	<
Chloroform	67-66-3	<	<	9.21e-09	3.81e-08	<
Chloromethane	74-87-3	7.95e-08	1.79e-07	2.11e-07	1.88e-07	<
Chromium (Cr) Compounds		<	5.78e-10	6.63e-11	2.54e-07	1.30e-09
Cobalt (Co) Compounds		<	<	<	1.02e-08	<
Cumene	98-82-8	5.66e-07	2.80e-09	1.50e-08	1.24e-07	1.07e-09
Di-n-butylphthalate	84-74-2	1.56e-08	1.16e-08	1.53e-07	5.01e-08	4.71e-08
Dibenzofuran	132-64-9	<	5.16e-10	1.64e-10	2.67e-09	2.84e-10
Dimethylaminoazobenzene	60-11-7	<	<	<	<	<
Dimethylphthalate	131-11-3	<	<	<	<	<
Epichlorohydrin	106-89-8	<	<	<	<	<
Ethyl Acrylate	140-88-5	<	<	<	<	<
Ethylbenzene	100-41-4	1.73e-08	4.25e-08	<	3.57e-07	<
Hexachlorobenzene	118-74-1	<	<	<	<	<
Hexachlorobutadiene	87-68-3	<	<	<	<	<
Hexachlorocyclopentadiene	77-47-4	<	<	<	<	<

Table 4.12-6. EXTRUDER EMISSION FACTORS

Analyte Name	CAS #	Interpolated Cmpd #19 lb/lb rubber	Interpolated Cmpd #20 lb/lb rubber	Interpolated Cmpd #21 lb/lb rubber	Cmpd #22 lb/lb rubber	Interpolated Cmpd #23 lb/lb rubber
Hexachloroethane	67-72-1	<	<	<	<	3.25e-09
Hexane	110-54-3	1.27e-07	2.60e-07	1.36e-07	2.49e-06	3.33e-07
Hydroquinone	123-31-9	<	<	<	<	<
Isooctane	540-84-1	2.45e-08	3.70e-08	1.13e-07	3.71e-09	<
Isophorone	78-59-1	<	<	2.11e-09	6.45e-08	<
m-Xylene + p-Xylene		5.39e-08	1.80e-07	7.63e-08	5.22e-07	6.31e-08
Methylene bis-chloroaniline	101-14-4	<	<	<	<	<
Methylene Chloride	75-09-2	2.00e-07	5.49e-07	1.51e-07	8.18e-08	5.87e-07
N,N-Dimethylaniline	121-69-7	<	<	<	<	<
N-Nitrosodimethylamine	62-75-9	<	<	<	<	<
N-Nitrosomorpholine	59-89-2	<	<	<	<	<
Naphthalene	91-20-3	6.59e-09	9.15e-09	6.70e-09	6.30e-08	1.70e-08
Nickel (Ni) Compounds		1.63e-09	<	<	4.91e-07	1.79e-09
Nitrobenzene	98-95-3	<	<	<	<	<
o-Anisidine	90-04-0	<	<	<	<	<
o-Toluidine	95-53-4	<	<	<	<	<
o-Xylene	95-47-6	2.58e-08	6.67e-08	8.54e-08	4.77e-07	<
Pentachloronitrobenzene	82-68-8	<	<	<	<	<
Pentachlorophenol	87-86-5	6.70e-09	<	<	<	<
Phenol	108-95-2	<	9.88e-09	5.01e-09	5.07e-08	6.68e-09
Propanal	123-38-6	<	<	<	<	<
Propylene Oxide	75-56-9	<	<	<	4.42e-07	<
Styrene	100-42-5	<	<	3.39e-08	3.93e-08	<
t-Butyl Methyl Ether	1634-04-4	<	<	4.28e-06	<	<

Table 4.12-6. EXTRUDER EMISSION FACTORS

Analyte Name	CAS #	Interpolated Cmpd #19 lb/lb rubber	Interpolated Cmpd #20 lb/lb rubber	Interpolated Cmpd #21 lb/lb rubber	Cmpd #22 lb/lb rubber	Interpolated Cmpd #23 lb/lb rubber
Tetrachloroethene	127-18-4	1.51e-08	4.07e-08	<	1.71e-07	<
Toluene	108-88-3	2.32e-07	2.55e-07	7.39e-08	3.67e-07	1.24e-05
Trichloroethene	79-01-6	<	<	<	3.30e-07	<
Trifluralin	1582-09-8	<	<	<	<	<
Vinyl Acetate	108-05-4	<	<	<	<	<
Vinyl Chloride	75-01-4	<	<	<	3.26e-08	<

Emission factors for all compounds except 4, 6, 9 and 22 were interpolated.
Cobalt was not found in mixing so ratios could not be set up to determine interpolation values, therefore, it is only reported in compounds tested in extruding.

shut off gridlines thicken lines

Add these Lines

Inc. font

No Controls?

4.12-7. Calender Emission Factors

(All EFs in Lbs/Lb Rubber Processed)

Analyte Name	CAS #	Cmpd #1	Cmpd #2	Cmpd #3	Cmpd #4	Cmpd #5	Cmpd #6	Cmpd #7	Cmpd #8
Total Method 25A Organics		5.33E-05	5.59E-05	1.17E-04	3.35E-05	1.86E-04	3.34E-05	1.05E-04	1.27E-05
Total Speciated Organics		3.68E-05	7.66E-05	6.47E-05	3.85E-05	4.48E-05	7.14E-05	6.45E-05	5.35E-05
Total Organic HAPs		1.52E-05	1.27E-05	4.28E-05	1.84E-05	3.03E-05	3.53E-05	3.04E-05	4.05E-05
Total Other HAPs									
Acetaldehyde	75-07-0	5.04E-07	<	<	<		<	<	<
Acetaldehyde + Isobutane						4.44E-07			
Acetonitrile	75-05-8	<	<	<	<	<	<	<	<
Acetophenone	98-86-2	1.68E-06	4.94E-07	3.72E-08	2.72E-09	1.34E-08	5.56E-08	8.95E-08	9.35E-09
Acrolein	107-02-8	<	7.82E-08	<	<	<	<	<	<
Acrylonitrile	107-13-1	<	<	<	<	<	<	<	4.94E-08
Allyl chloride	107-05-1	<	<	<	<	<	<	<	<
4-Aminobiphenyl	92-67-1	<	<	<	<	<	<	<	<
Aniline	62-53-3	<	9.44E-08	<	3.12E-07	<	7.23E-08	<	5.59E-09
o-Anisidine	90-04-0	<	<	<	<	<	<	<	<
Benzene	71-43-2	3.96E-08	4.54E-08	8.21E-08	8.30E-08	2.16E-07	<	6.62E-08	<
Benzidine	92-87-5	<	<	<	<	<	<	<	<
Benzotrichloride	98-07-7	<	<	<	<	<	<	<	<
Benzyl chloride	100-44-7	<	<	<	<	<	<	<	<
Biphenyl	92-52-4	<	1.78E-08	4.08E-08	3.93E-09	<	8.52E-09	<	<
Bis(2-ethylhexyl)phthalate	117-81-7	2.83E-08	7.34E-07	8.63E-08	<	1.66E-08	1.30E-07	2.42E-08	<
Bromoform	75-25-2	2.02E-07	<	<	<	<	<	<	<
Methyl bromide	74-83-9	<	<	<	<	<	<	<	<
1,3-Butadiene	106-99-0	7.09E-08	<	<	1.57E-07	<	<	3.39E-07	8.17E-08
Carbon disulfide	75-15-0	<	2.41E-06	<	1.44E-07	1.33E-07	2.78E-06	<	2.03E-05
Carbon tetrachloride	56-23-5	<	<	8.63E-08	<	<	<	<	<
Carbonyl sulfide	463-58-1	<	<	<	<	3.88E-07	1.16E-06	<	1.63E-05
2-Chloroacetophenone	532-27-4	<	<	<	<	<	<	<	<
Chlorobenzene	108-90-7	<	<	<	<	<	<	<	<
Chloroform	67-66-3	<	<	<	<	<	<	<	<
o-Cresol	95-48-7	<	<	6.26E-08	6.05E-10	9.39E-09	4.35E-09	<	<
Cumene	98-82-8	2.11E-09	1.29E-06	2.90E-09	1.21E-09	1.02E-09	8.77E-09	6.02E-08	7.00E-08
Dibenzofuran	132-64-9	<	<	2.48E-08	1.02E-09	<	2.40E-09	<	<
1,2-Dibromo-3-chloropropane	96-12-8	<	<	<	<	<	<	<	<
Dibutylphthalate	84-74-2	5.80E-08	<	3.98E-08	<	<	1.09E-08	<	5.41E-09
1,4-Dichlorobenzene	106-46-7	<	3.49E-08	<	<	<	<	<	<
3,3'-Dichlorobenzidine	91-94-1	<	<	<	<	<	<	<	<
Dichloroethyl ether	111-44-4	<	<	<	<	<	<	<	<
3,3'-Dimethoxybenzidine	119-90-4	<	<	<	<	<	<	<	<
Dimethylaminoazobenzene	60-11-7	<	<	<	<	<	<	<	<
N,N-Dimethylaniline	121-69-7	<	<	<	<	<	<	<	<
3,3'-Dimethylbenzidine	119-93-7	<	<	<	<	<	<	<	<
Dimethylphthalate	131-11-3	<	<	1.14E-08	1.13E-09	<	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	<	<	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<	<	<	<
1,4-Dioxane	123-91-1	<	<	<	<	<	<	<	<
Epichlorohydrin	106-89-8	<	<	<	<	<	<	<	<
Ethyl acrylate	140-88-5	<	<	<	<	<	<	<	<
Ethyl benzene	100-41-4	<	1.57E-07	1.55E-07	8.46E-08	8.57E-08	1.76E-07	3.14E-08	8.02E-08
Ethyl chloride	75-00-3	<	<	<	<	<	<	<	<
Ethylene dibromide	106-93-4	<	<	<	<	<	<	<	<
Ethylene dichloride	107-06-2	<	1.22E-07	<	<	<	<	<	<
Ethylidene dichloride	75-34-3	<	<	<	<	<	<	<	<
Hexachlorobenzene	118-74-1	<	<	6.74E-09	<	<	<	<	<
Hexachlorobutadiene	87-68-3	<	<	<	<	<	<	<	<
Hexachlorocyclopentadiene	77-47-4	<	<	<	<	<	<	<	<
Hexachloroethane	67-72-1	<	<	<	<	<	<	<	<
Hexane	110-54-3	5.98E-06	5.59E-07	1.15E-06	1.13E-06	4.29E-06	1.08E-06	7.82E-06	9.26E-07
Hydroquinone	123-31-9	<	3.73E-08	<	5.87E-07	1.90E-05	<	<	<
Isophorone	78-59-1	<	1.30E-07	<	4.30E-08	<	<	<	<
Methyl chloride	74-87-3	<	2.18E-08	<	2.16E-08	<	2.36E-07	<	2.71E-08

only appears for cmpd 5 Footnote

SORT

6-7-99 1:22pm 59KB
for web - saved as Excel 97[illegible]?

4.12-7. Calender Emission Factors
(All EFs in Lbs/Lb Rubber Processed)

Analyte Name	CAS #	Cmpd #1	Cmpd #2	Cmpd #3	Cmpd #4	Cmpd #5	Cmpd #6	Cmpd #7	Cmpd #8
Methyl chloroform	71-55-6	<	**3.89E-08**	2.31E-07	3.07E-08	1.33E-07	<	<	1.94E-08
Methyl ethyl ketone	78-93-3	4.29E-06	**2.61E-07**	6.53E-07	1.98E-06	1.11E-06	3.19E-07	1.02E-06	3.68E-07
Methyl isobutyl ketone	108-10-1	<	**6.42E-07**	9.10E-06	1.08E-05	<	2.22E-05	<	9.20E-08
Methyl tert butyl ether	1634-04-4	<	<	<	<	<	2.36E-07	<	<
4,4-Methylene bis(2-chloroaniline)	101-14-4	<	<	<	<	<	<	<	<
Methylene chloride	75-09-2	7.98E-07	**4.71E-08**	2.80E-05	1.35E-06	3.03E-07	1.80E-06	8.26E-07	3.49E-07
4,4'-Methylenedianiline	101-77-9	<	<	<	<	<	<	<	<
Naphthalene	91-20-3	1.81E-08	**1.21E-07**	2.24E-07	1.25E-08	1.82E-07	3.70E-08	3.13E-08	1.97E-08
Nitrobenzene	98-95-3	<	<	<	<	<	<	<	<
4-Nitrobiphenyl	92-93-3	<	**2.04E-09**	<	<	<	<	<	<
4-Nitrophenol	100-02-7	<	<	<	<	<	<	<	<
N-Nitrosodimethylamine	62-75-9	<	<	<	<	<	<	<	<
N-Nitrosomorpholine	59-89-2	<	<	<	<	<	<	<	<
Pentachloronitrobenzene	82-68-8	<	<	<	<	<	<	<	<
Pentachlorophenol	87-86-5	<	<	<	<	<	<	<	<
Phenol	108-95-2	5.23E-08	**1.49E-07**	2.01E-07	1.07E-08	5.52E-07	3.21E-08	1.74E-08	2.31E-08
p-Phenylenediamine	106-50-3	<	<	<	<	<	<	<	<
Propionaldehyde	123-38-6	<	<	<	<	<	<	<	<
Propylene dichloride	78-87-5	<	<	<	<	<	<	<	<
Propylene oxide	75-56-9	<	<	<	<	<	<	<	<
Styrene	100-42-5	<	**4.86E-07**	<	3.22E-08	<	3.08E-06	<	2.99E-08
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<	<	<	<
Tetrachloroethylene	127-18-4	<	<	7.00E-08	4.78E-08	<	7.36E-08	<	5.62E-08
Toluene	108-88-3	1.20E-06	**3.92E-06**	1.53E-06	4.34E-07	1.26E-06	3.95E-07	7.63E-07	9.55E-07
o-Toluidine	95-53-4	<	<	<	<	<	1.62E-07	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<	<	<
Trichloroethylene	79-01-6	<	<	<	<	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<	<	<	<
Trifluralin	1582-09-8	<	<	<	<	<	<	<	<
2,2,4-Trimethylpentane	540-84-1	6.49E-08	**2.69E-07**	2.08E-07	6.96E-08	7.47E-08	1.15E-07	1.53E-07	1.78E-07
Vinyl acetate	108-05-4	<	<	<	<	1.70E-06	<	<	<
Vinyl chloride	75-01-4	<	<	<	<	<	<	<	<
Vinylidene chloride	75-35-4	<	<	<	3.97E-07	<	<	<	7.26E-08
o-Xylene	95-47-6	6.96E-08	**2.84E-07**	2.32E-07	2.74E-07	1.10E-07	6.90E-07	5.61E-06	1.12E-07
m-Xylene + p-Xylene		1.90E-07	**2.86E-07**	5.15E-07	3.73E-07	2.98E-07	4.52E-07	1.05E-05	3.15E-07
	NOTES:	Emission factors for all compounds except 2 and 12 were extrapolated.							
		Warm-up mill for the calender is not included in this emission factor.							
		"<" indicates that the analyte was below the limit of detection for all 3 test runs.							

a. - acet ef for cmpd #5 may include some isobutane due to (?)

4.12-7. Calender Emission Factors
(All EFs in Lbs/Lb Rubber Processed)

Analyte Name	CAS #	Cmpd #9	Cmpd #10	Cmpd #11	Cmpd #12	Cmpd #13	Cmpd #14	Cmpd #15	Cmpd #16
Total Method 25A Organics		2.52E-05	2.52E-04	2.84E-05	4.62E-06	1.97E-04	1.98E-04	8.12E-06	7.06E-05
Total Speciated Organics		4.16E-05	2.04E-04	2.55E-05	4.47E-06	1.11E-04	1.10E-04	4.44E-05	2.20E-05
Total Organic HAPs		1.11E-05	8.70E-05	8.28E-06	2.81E-06	1.16E-05	3.07E-05	4.03E-05	3.41E-06
Total Other HAPs									
Acetaldehyde	75-07-0	<	<	<	<	<	<	3.71E-07	<
Acetaldehyde + Isobutane									
Acetonitrile	75-05-8	<	<	<	<	<	<	<	<
Acetophenone	98-86-2	1.07E-06	6.14E-08	1.66E-07	1.17E-09	3.78E-08	1.23E-08	7.97E-09	8.03E-09
Acrolein	107-02-8	<	<	<	<	5.15E-07	5.99E-07	<	<
Acrylonitrile	107-13-1	<	<	<	<	6.91E-07	8.51E-06	<	<
Allyl chloride	107-05-1	<	<	<	<	<	<	<	<
4-Aminobiphenyl	92-67-1	<	<	<	1.27E-09	<	<	<	<
Aniline	62-53-3	3.72E-09	3.42E-09	1.73E-08	9.64E-09	<	<	<	<
o-Anisidine	90-04-0	<	<	<	<	<	<	<	<
Benzene	71-43-2	3.55E-08	<	<	1.33E-09	4.79E-07	3.80E-07	1.26E-08	1.89E-08
Benzidine	92-87-5	<	<	<	<	<	<	1.31E-08	<
Benzotrichloride	98-07-7	<	<	<	<	<	<	<	<
Benzyl chloride	100-44-7	<	<	<	<	<	<	<	<
Biphenyl	92-52-4	<	<	<	8.88E-10	<	8.96E-10	<	<
Bis(2-ethylhexyl)phthalate	117-81-7	5.12E-09	<	1.95E-07	9.35E-10	5.36E-07	<	3.33E-08	2.57E-08
Bromoform	75-25-2	<	<	<	<	<	<	<	<
Methyl bromide	74-83-9	<	<	<	<	<	<	<	<
1,3-Butadiene	106-99-0	1.23E-07	<	2.77E-07	<	8.14E-08	1.74E-07	4.47E-08	<
Carbon disulfide	75-15-0	4.83E-07	7.43E-05	6.27E-06	2.61E-06	6.03E-07	3.09E-06	1.11E-07	3.27E-08
Carbon tetrachloride	56-23-5	<	<	<	<	<	<	3.39E-05	<
Carbonyl sulfide	463-58-1	8.32E-07	<	<	4.19E-08	4.25E-07	8.20E-06	1.98E-06	<
2-Chloroacetophenone	532-27-4	<	3.96E-10	<	<	<	<	<	<
Chlorobenzene	108-90-7	<	<	<	<	<	<	<	<
Chloroform	67-66-3	<	<	<	<	<	1.78E-08	4.72E-07	8.92E-09
o-Cresol	95-48-7	<	<	<	1.86E-10	<	<	<	<
Cumene	98-82-8	2.30E-06	6.39E-07	1.94E-09	7.05E-10	7.15E-08	<	2.12E-09	<
Dibenzofuran	132-64-9	<	<	<	1.95E-10	<	1.75E-09	5.37E-10	<
1,2-Dibromo-3-chloropropane	96-12-8	<	<	<	<	<	<	<	<
Dibutylphthalate	84-74-2	9.52E-10	1.07E-08	<	2.62E-10	2.42E-07	6.49E-09	<	2.67E-09
1,4-Dichlorobenzene	106-46-7	<	<	<	<	<	<	<	<
3,3'-Dichlorobenzidine	91-94-1	<	<	<	<	<	<	<	<
Dichloroethyl ether	111-44-4	<	<	<	<	<	<	<	<
3,3'-Dimethoxybenzidine	119-90-4	<	<	<	<	<	<	<	<
Dimethylaminoazobenzene	60-11-7	<	<	<	<	<	<	1.19E-08	<
N,N-Dimethylaniline	121-69-7	<	<	<	<	<	<	<	<
3,3'-Dimethylbenzidine	119-93-7	<	<	<	<	<	<	<	<
Dimethylphthalate	131-11-3	<	<	<	<	<	2.18E-09	1.58E-09	2.26E-09
2,4-Dinitrophenol	51-28-5	<	<	<	<	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<	<	<	<
1,4-Dioxane	123-91-1	<	<	<	<	<	<	<	<
Epichlorohydrin	106-89-8	<	<	<	<	<	<	<	<
Ethyl acrylate	140-88-5	<	<	<	<	<	<	<	<
Ethyl benzene	100-41-4	5.34E-08	<	4.94E-08	2.06E-09	1.51E-07	4.44E-08	3.51E-08	<
Ethyl chloride	75-00-3	<	<	<	<	<	<	<	1.23E-06
Ethylene dibromide	106-93-4	<	<	<	<	<	<	<	<
Ethylene dichloride	107-06-2	<	<	<	<	<	<	<	<
Ethylidene dichloride	75-34-3	<	<	<	<	<	<	<	<
Hexachlorobenzene	118-74-1	<	<	<	<	<	<	<	<
Hexachlorobutadiene	87-68-3	<	<	<	<	<	<	<	<
Hexachlorocyclopentadiene	77-47-4	<	<	<	<	<	<	<	<
Hexachloroethane	67-72-1	<	<	<	<	<	<	8.93E-07	<
Hexane	110-54-3	2.33E-06	1.20E-06	2.06E-07	3.83E-08	1.48E-06	4.92E-07	5.71E-07	1.32E-06
Hydroquinone	123-31-9	<	<	<	<	<	<	<	<
Isophorone	78-59-1	<	<	<	<	<	<	<	<
Methyl chloride	74-87-3	2.30E-08	6.73E-08	<	<	4.66E-08	2.62E-08	7.42E-08	1.04E-08

4.12-7. Calender Emission Factors

(All EFs in Lbs/Lb Rubber Processed)

Analyte Name	CAS #	Cmpd #9	Cmpd #10	Cmpd #11	Cmpd #12	Cmpd #13	Cmpd #14	Cmpd #15	Cmpd #16
Methyl chloroform	71-55-6	5.29E-08	9.73E-08	<	<	3.86E-08	2.62E-08	1.33E-08	1.27E-08
Methyl ethyl ketone	78-93-3	3.57E-07	8.58E-07	6.27E-08	<	2.33E-07	2.24E-07	6.36E-08	2.87E-08
Methyl isobutyl ketone	108-10-1	8.97E-08	3.01E-07	4.92E-08	<	7.16E-08	5.99E-07	3.55E-08	6.26E-08
Methyl tert butyl ether	1634-04-4	<	<	<	<	<	<	<	<
4,4-Methylene bis(2-chloroaniline)	101-14-4	<	<	<	<	<	<	<	<
Methylene chloride	75-09-2	5.06E-07	6.56E-06	3.62E-07	3.25E-08	1.61E-07	1.22E-06	5.09E-07	3.63E-07
4,4'-Methylenedianiline	101-77-9	<	<	<	<	<	<	<	<
Naphthalene	91-20-3	2.02E-08	5.93E-09	6.43E-09	2.21E-09	8.29E-09	<	2.01E-08	8.16E-09
Nitrobenzene	98-95-3	<	<	1.46E-08	<	<	<	<	<
4-Nitrobiphenyl	92-93-3	<	<	<	<	<	<	<	<
4-Nitrophenol	100-02-7	<	<	<	<	<	<	<	<
N-Nitrosodimethylamine	62-75-9	<	<	<	<	<	<	<	<
N-Nitrosomorpholine	59-89-2	<	<	<	<	<	<	<	<
Pentachloronitrobenzene	82-68-8	<	<	<	<	<	<	<	<
Pentachlorophenol	87-86-5	<	<	<	<	3.28E-09	<	<	<
Phenol	108-95-2	4.31E-08	8.74E-09	6.67E-09	<	3.04E-08	3.86E-08	1.95E-08	3.31E-08
p-Phenylenediamine	106-50-3	<	<	<	<	<	<	<	<
Propionaldehyde	123-38-6	<	<	<	<	2.41E-06	<	<	<
Propylene dichloride	78-87-5	<	<	<	<	<	<	<	<
Propylene oxide	75-56-9	<	<	<	<	<	5.05E-06	<	<
Styrene	100-42-5	1.18E-07	1.58E-07	3.64E-08	7.73E-10	3.92E-08	4.71E-08	<	<
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<	<	<	<
Tetrachloroethylene	127-18-4	8.17E-08	8.85E-08	1.75E-08	<	9.65E-08	1.03E-07	5.04E-07	<
Toluene	108-88-3	1.64E-06	1.34E-06	2.84E-07	5.73E-08	2.03E-06	1.13E-06	2.29E-07	1.27E-07
o-Toluidine	95-53-4	<	<	<	<	<	<	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<	<	<
Trichloroethylene	79-01-6	<	<	<	<	1.61E-07	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<	<	<	<
Trifluralin	1582-09-8	<	<	<	<	<	<	<	<
2,2,4-Trimethylpentane	540-84-1	2.80E-07	2.31E-07	5.32E-08	2.27E-09	1.72E-07	1.89E-07	3.46E-08	<
Vinyl acetate	108-05-4	<	<	<	<	<	<	<	<
Vinyl chloride	75-01-4	<	<	<	<	<	<	9.54E-09	<
Vinylidene chloride	75-35-4	1.38E-07	<	<	<	<	1.59E-07	1.01E-08	<
o-Xylene	95-47-6	1.21E-07	2.83E-07	9.63E-08	2.45E-09	2.57E-07	1.24E-07	5.85E-08	3.98E-08
m-Xylene + p-Xylene		3.49E-07	7.83E-07	1.09E-07	6.09E-09	5.77E-07	2.43E-07	2.22E-07	7.76E-08
	NOTES:	Emission factors for all compounds except 2 and 12 were extrapolated.							
		Warm-up mill for the calender is not included in this emission factor.							
		"<" indicates that the analyte was below the limit of detection for all 3 test runs.							

4.12-7. Calender Emission Factors
(All EFs in Lbs/Lb Rubber Processed)

Analyte Name	CAS #	Cmpd #17	Cmpd #18	Cmpd #19	Cmpd #20	Cmpd #21	Cmpd #22	Cmpd #23
Total Method 25A Organics		3.84E-04	5.62E-05	2.39E-05	6.50E-06	1.35E-04	1.06E-04	2.65E-05
Total Speciated Organics		2.17E-04	8.90E-05	1.44E-05	1.00E-05	9.71E-05	6.07E-05	2.57E-05
Total Organic HAPs		1.02E-04	3.38E-05	2.67E-06	4.83E-06	8.17E-06	2.16E-05	2.15E-05
Total Other HAPs								
Acetaldehyde	75-07-0	<	<	<	<	<	<	<
Acetaldehyde + Isobutane								
Acetonitrile	75-05-8	<	<	3.36E-07	<	<	<	<
Acetophenone	98-86-2	1.05E-08	4.15E-08	1.80E-08	1.16E-07	1.27E-08	2.12E-08	6.54E-09
Acrolein	107-02-8	<	<	<	<	1.65E-07	2.18E-07	<
Acrylonitrile	107-13-1	<	5.80E-07	<	<	<	<	<
Allyl chloride	107-05-1	<	<	<	<	<	<	<
4-Aminobiphenyl	92-67-1	<	<	<	<	<	<	<
Aniline	62-53-3	3.72E-07	1.20E-07	<	5.22E-09	<	3.40E-07	1.61E-07
o-Anisidine	90-04-0	<	<	<	<	<	<	<
Benzene	71-43-2	<	2.74E-08	1.03E-07	4.29E-08	<	6.43E-08	<
Benzidine	92-87-5	<	<	<	<	<	<	<
Benzotrichloride	98-07-7	<	<	<	<	<	<	<
Benzyl chloride	100-44-7	<	<	<	<	<	<	<
Biphenyl	92-52-4	<	<	<	<	<	7.08E-09	<
Bis(2-ethylhexyl)phthalate	117-81-7	1.74E-09	1.60E-08	9.48E-09	3.28E-08	9.53E-08	6.09E-09	4.88E-07
Bromoform	75-25-2	<	<	<	<	<	<	<
Methyl bromide	74-83-9	<	<	4.08E-08	<	<	<	<
1,3-Butadiene	106-99-0	<	1.31E-07	4.20E-08	<	<	9.47E-08	1.03E-07
Carbon disulfide	75-15-0	<	2.57E-05	<	1.88E-07	3.16E-08	6.93E-08	3.68E-07
Carbon tetrachloride	56-23-5	<	<	<	<	<	<	1.71E-07
Carbonyl sulfide	463-58-1	<	<	1.22E-07	1.14E-06	2.55E-07	<	2.09E-06
2-Chloroacetophenone	532-27-4	<	<	<	<	<	<	<
Chlorobenzene	108-90-7	<	<	<	<	<	<	<
Chloroform	67-66-3	<	<	<	<	1.25E-08	<	<
o-Cresol	95-48-7	<	<	<	7.35E-10	<	<	<
Cumene	98-82-8	6.84E-09	8.75E-08	7.66E-07	3.78E-09	2.03E-08	4.07E-08	1.44E-09
Dibenzofuran	132-64-9	<	<	<	6.98E-10	2.22E-10	<	3.85E-10
1,2-Dibromo-3-chloropropane	96-12-8	<	<	<	<	<	<	<
Dibutylphthalate	84-74-2	<	6.00E-08	2.11E-08	1.58E-08	2.07E-07	2.59E-08	6.37E-08
1,4-Dichlorobenzene	106-46-7	<	<	<	<	<	<	<
3,3'-Dichlorobenzidine	91-94-1	<	<	<	<	<	<	<
Dichloroethyl ether	111-44-4	<	<	<	<	<	<	<
3,3'-Dimethoxybenzidine	119-90-4	<	<	<	<	<	<	<
Dimethylaminoazobenzene	60-11-7	<	<	<	<	<	<	<
N,N-Dimethylaniline	121-69-7	<	<	<	<	<	<	<
3,3'-Dimethylbenzidine	119-93-7	<	<	<	<	<	<	<
Dimethylphthalate	131-11-3	<	<	<	<	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	1.17E-08	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<	<	<
1,4-Dioxane	123-91-1	<	<	<	<	<	<	<
Epichlorohydrin	106-89-8	<	<	<	<	<	<	<
Ethyl acrylate	140-88-5	3.43E-06	<	<	<	<	<	<
Ethyl benzene	100-41-4	<	2.01E-07	2.35E-08	5.75E-08	<	9.29E-08	<
Ethyl chloride	75-00-3	1.46E-07	<	<	3.07E-07	<	<	<
Ethylene dibromide	106-93-4	<	<	<	<	<	<	<
Ethylene dichloride	107-06-2	<	<	<	<	<	<	<
Ethylidene dichloride	75-34-3	<	<	<	<	<	<	<
Hexachlorobenzene	118-74-1	<	<	<	<	<	<	<
Hexachlorobutadiene	87-68-3	<	<	<	<	<	<	<
Hexachlorocyclopentadiene	77-47-4	<	<	<	<	<	<	<
Hexachloroethane	67-72-1	<	<	<	<	<	<	4.39E-09
Hexane	110-54-3	8.19E-05	2.92E-07	1.72E-07	3.52E-07	1.84E-07	5.62E-07	4.51E-07
Hydroquinone	123-31-9	<	<	<	<	<	<	<
Isophorone	78-59-1	<	<	<	<	2.85E-09	2.44E-07	<
Methyl chloride	74-87-3	6.43E-07	<	1.08E-07	2.43E-07	2.85E-07	2.77E-08	<

4.12-7. Calender Emission Factors

(All EFs in Lbs/Lb Rubber Processed)

Analyte Name	CAS #	Cmpd #17	Cmpd #18	Cmpd #19	Cmpd #20	Cmpd #21	Cmpd #22	Cmpd #23
Methyl chloroform	71-55-6	4.37E-08	<	8.27E-08	5.30E-07	7.57E-09	4.75E-08	<
Methyl ethyl ketone	78-93-3	7.54E-07	9.11E-07	4.57E-08	9.42E-08	3.43E-07	3.17E-06	<
Methyl isobutyl ketone	108-10-1	1.20E-07	3.31E-06	<	1.39E-07	2.00E-08	9.90E-06	<
Methyl tert butyl ether	1634-04-4	<	<	<	<	5.79E-06	<	<
4,4-Methylene bis(2-chloroaniline)	101-14-4	<	<	<	<	<	<	<
Methylene chloride	75-09-2	1.20E-05	6.30E-07	2.71E-07	7.44E-07	2.05E-07	7.33E-07	7.94E-07
4,4'-Methylenedianiline	101-77-9	<	<	<	<	<	<	<
Naphthalene	91-20-3	2.91E-08	2.40E-08	8.92E-09	1.24E-08	9.06E-09	4.00E-08	2.30E-08
Nitrobenzene	98-95-3	<	<	<	<	<	<	<
4-Nitrobiphenyl	92-93-3	<	<	<	<	<	<	<
4-Nitrophenol	100-02-7	<	<	7.18E-09	<	<	<	<
N-Nitrosodimethylamine	62-75-9	<	<	<	<	<	<	<
N-Nitrosomorpholine	59-89-2	<	<	<	<	<	<	<
Pentachloronitrobenzene	82-68-8	<	<	<	<	<	<	<
Pentachlorophenol	87-86-5	<	<	9.07E-09	<	<	<	<
Phenol	108-95-2	9.21E-07	4.08E-08	<	1.34E-08	6.78E-09	4.98E-07	9.04E-09
p-Phenylenediamine	106-50-3	<	<	<	<	<	<	<
Propionaldehyde	123-38-6	<	<	<	<	<	<	<
Propylene dichloride	78-87-5	<	<	<	<	<	<	<
Propylene oxide	75-56-9	<	<	<	<	<	<	<
Styrene	100-42-5	<	3.95E-08	<	<	4.58E-08	1.07E-06	<
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<	<	<
Tetrachloroethylene	127-18-4	<	5.55E-08	2.04E-08	5.50E-08	<	1.39E-06	<
Toluene	108-88-3	7.51E-07	4.99E-07	3.14E-07	3.45E-07	1.00E-07	1.79E-06	1.67E-05
o-Toluidine	95-53-4	<	<	<	<	<	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<	<
Trichloroethylene	79-01-6	<	<	<	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<	<	<
Trifluralin	1582-09-8	<	<	<	<	<	<	<
2,2,4-Trimethylpentane	540-84-1	<	5.41E-08	3.31E-08	5.00E-08	1.53E-07	5.76E-07	<
Vinyl acetate	108-05-4	<	<	<	<	<	<	<
Vinyl chloride	75-01-4	<	<	<	<	<	<	<
Vinylidene chloride	75-35-4	<	6.38E-08	<	<	<	<	<
o-Xylene	95-47-6	3.69E-07	2.65E-07	3.49E-08	9.03E-08	1.16E-07	2.62E-07	<
m-Xylene + p-Xylene		3.45E-07	6.40E-07	7.29E-08	2.44E-07	1.03E-07	3.06E-07	8.54E-08
	NOTES:	Emission factors for all compounds except 2 and 12 were extrapolated.						
		Warm-up mill for the calender is not included in this emission factor.						
		"<" indicates that the analyte was below the limit of detection for all 3 test runs.						

Table 4.12-7. CALENDER EFs

Analyte Name	CAS #	Interpolated Cmpd #1 lb/lb rubber	Cmpd #2 lb/lb rubber	Interpolated Cmpd #3 lb/lb rubber	Interpolated Cmpd #4 lb/lb rubber	Interpolated Cmpd #5 lb/lb rubber	Interpolated Cmpd #6 lb/lb rubber	Interpolated Cmpd #7 lb/lb rubber
Total Method 25A Organics		5.33e-05	5.59e-05	1.17e-04	3.35e-05	1.86e-04	3.34e-05	1.05e-04
Total Speciated Organics		7.37e-05	7.66e-05	1.29e-04	7.71e-05	8.97e-05	1.43e-04	1.29e-04
Total Organic HAPs		3.05e-05	1.27e-05	8.55e-05	3.68e-05	6.07e-05	7.07e-05	6.08e-05
Total HAPs		3.05e-05	1.27e-05	8.55e-05	3.68e-05	6.07e-05	7.07e-05	6.08e-05
1,1,1-Trichloroethane	71-55-6	<	3.89e-08	2.31e-07	3.07e-08	1.33e-07	<	<
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<	<
1,1-Dichloroethane	75-34-3	<	<	<	<	<	<	<
1,1-Dichloroethene	75-35-4	<	<	<	3.97e-07	<	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	<	<	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<	<	<	<	<
1,2-Dibromoethane	106-93-4	<	<	<	<	<	<	<
1,2-Dichloroethane	107-06-2	<	1.22e-07	<	<	<	<	<
1,2-Dichloropropane	78-87-5	<	<	<	<	<	<	<
1,3-Butadiene	106-99-0	7.09e-08	<	<	1.57e-07	<	<	3.39e-07
1,4-Dichlorobenzene	106-46-7	<	3.49e-08	<	<	<	<	<
1,4-Dioxane	123-91-1	<	<	<	<	<	<	<
1,4-Phenylenediamine	106-50-3	<	<	<	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	<	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<	<	<
2-Butanone	78-93-3	4.29e-06	2.61e-07	6.53e-07	1.98e-06	1.11e-06	3.19e-07	1.02e-06
2-Chloroacetophenone	532-27-4	<	<	<	<	<	<	<
2-Methylphenol	95-48-7	<	<	6.26e-08	6.05e-10	9.39e-09	4.35e-09	<
3,3'-Dichlorobenzidine	91-94-1	<	<	<	<	<	<	<
3,3'-Dimethoxybenzidine	119-90-4	<	<	<	<	<	<	<

WP version of this table.
- Replaced 6-7-99 by cal_5-99.xls

Table 4.12-7. CALENDER

Analyte Name	CAS #	Interpolated Cmpd #1 lb/lb rubber	Cmpd #2 lb/lb rubber	Interpolated Cmpd #3 lb/lb rubber	Interpolated Cmpd #4 lb/lb rubber	Interpolated Cmpd #5 lb/lb rubber	Interpolated Cmpd #6 lb/lb rubber	Interpolated Cmpd #7 lb/lb rubber
3,3'-Dimethylbenzidine	119-93-7	<	<	<	<	<	<	<
4,4'-Methylenedianiline	101-77-9	<	<	<	<	<	<	<
4-Aminobiphenyl	92-67-1	<	<	<	<	<	<	<
4-Methyl-2-pentanone	108-10-1	<	6.42e-07	9.10e-06	1.08e-05	<	2.22e-05	<
4-Nitrobiphenyl	92-93-3	<	2.04e-09	<	<	<	<	<
4-Nitrophenol	100-02-7	<	<	<	<	<	<	<
a,a,a-Trichlorotoluene	98-07-7	<	<	<	<	<	<	<
Acetaldehyde	75-07-0	5.04e-07	<	<	<	<	<	<
Acetaldehyde + Isobutane		<	<	<	<	4.44e-07	<	<
Acetonitrile	75-05-8	<	<	<	<	<	<	<
Acetophenone	98-86-2	1.68e-06	4.94e-07	3.72e-08	2.72e-09	1.34e-08	5.56e-08	8.95e-08
Acrolein	107-02-8	<	7.82e-08	<	<	<	<	<
Acrylonitrile	107-13-1	<	<	<	<	<	<	<
Allyl Chloride	107-05-1	<	<	<	<	<	<	<
Aniline	62-53-3	<	9.44e-08	<	3.12e-07	<	7.23e-08	<
Benzene	71-43-2	3.96e-08	4.54e-08	8.21e-08	8.30e-08	2.16e-07	<	6.62e-08
Benzidine	92-87-5	<	<	<	<	<	<	<
Benzyl Chloride	100-44-7	<	<	<	<	<	<	<
Biphenyl	92-52-4	<	1.78e-08	4.08e-08	3.93e-09	<	8.52e-09	<
bis(2-Chloroethyl)ether	111-44-4	<	<	<	<	<	<	<
bis(2-Ethylhexyl)phthalate	117-81-7	2.83e-08	7.34e-07	8.63e-08	<	1.66e-08	1.30e-07	2.42e-08
Bromoform	75-25-2	2.02e-07	<	<	<	<	<	<
Bromomethane	74-83-9	<	<	<	<	<	<	<
Carbon Disulfide	75-15-0	<	2.41e-06	<	1.44e-07	1.33e-07	2.78e-06	<
Carbon Tetrachloride	56-23-5	<	<	8.63e-08	<	<	<	<
Carbonyl Sulfide	463-58-1	<	<	<	<	3.88e-07	1.16e-06	<
Chlorobenzene	108-90-7	<	<	<	<	<	<	<

Table 4.12-7. CALENDER

Analyte Name	CAS #	Interpolated Cmpd #1 lb/lb rubber	Cmpd #2 lb/lb rubber	Interpolated Cmpd #3 lb/lb rubber	Interpolated Cmpd #4 lb/lb rubber	Interpolated Cmpd #5 lb/lb rubber	Interpolated Cmpd #6 lb/lb rubber	Interpolated Cmpd #7 lb/lb rubber
Chloroethane	75-00-3	<	<	<	<	<	<	<
Chloroform	67-66-3	<	<	<	<	<	<	<
Chloromethane	74-87-3	<	2.18e-08	<	2.16e-08	<	2.36e-07	<
Cumene	98-82-8	2.11e-09	1.29e-06	2.90e-09	1.21e-09	1.02e-09	8.77e-09	6.02e-08
Di-n-butylphthalate	84-74-2	5.80e-08	<	3.98e-08	<	<	1.09e-08	<
Dibenzofuran	132-64-9	<	<	2.48e-08	1.02e-09	<	2.40e-09	<
Dimethylaminoazobenzene	60-11-7	<	<	<	<	<	<	<
Dimethylphthalate	131-11-3	<	<	1.14e-08	1.13e-09	<	<	<
Epichlorohydrin	106-89-8	<	<	<	<	<	<	<
Ethyl Acrylate	140-88-5	<	<	<	<	<	<	<
Ethylbenzene	100-41-4	<	1.57e-07	1.55e-07	8.46e-08	8.57e-08	1.76e-07	3.14e-06
Hexachlorobenzene	118-74-1	<	<	6.74e-09	<	<	<	<
Hexachlorobutadiene	87-68-3	<	<	<	<	<	<	<
Hexachlorocyclopentadiene	77-47-4	<	<	<	<	<	<	<
Hexachloroethane	67-72-1	<	<	<	<	<	<	<
Hexane	110-54-3	5.98e-06	5.59e-07	1.15e-06	1.13e-06	4.29e-06	1.08e-06	7.82e-06
Hydroquinone	123-31-9	<	3.73e-08	<	5.87e-07	1.90e-05	<	<
Isooctane	540-84-1	6.49e-08	2.69e-07	2.08e-07	6.96e-08	7.47e-08	1.15e-07	1.53e-07
Isophorone	78-59-1	<	1.30e-07	<	4.30e-08	<	<	<
m-Xylene + p-Xylene		1.90e-07	2.86e-07	5.15e-07	3.73e-07	2.98e-07	4.52e-07	1.05e-05
Methylene bis-chloroaniline	101-14-4	<	<	<	<	<	<	<
Methylene Chloride	75-09-2	7.98e-07	4.71e-08	2.80e-05	1.35e-06	3.03e-07	1.80e-06	8.26e-07
N,N-Dimethylaniline	121-69-7	<	<	<	<	<	<	<
N-Nitrosodimethylamine	62-75-9	<	<	<	<	<	<	<
N-Nitrosomorpholine	59-89-2	<	<	<	<	<	<	<
Naphthalene	91-20-3	1.81e-08	1.21e-07	2.24e-07	1.25e-08	1.82e-07	3.70e-08	3.13e-08
Nitrobenzene	98-95-3	<	<	<	<	<	<	<

Table 4.12-7. CALENDER

Analyte Name	CAS #	Interpolated Cmpd #1 lb/lb rubber	Cmpd #2 lb/lb rubber	Interpolated Cmpd #3 lb/lb rubber	Interpolated Cmpd #4 lb/lb rubber	Interpolated Cmpd #5 lb/lb rubber	Interpolated Cmpd #6 lb/lb rubber	Interpolated Cmpd #7 lb/lb rubber
o-Anisidine	90-04-0	<	<	<	<	<	<	<
o-Toluidine	95-53-4	<	<	<	<	<	1.62e-07	<
o-Xylene	95-47-6	6.96e-08	2.84e-07	2.32e-07	2.74e-07	1.10e-07	6.90e-07	5.61e-06
Pentachloronitrobenzene	82-68-8	<	<	<	<	<	<	<
Pentachlorophenol	87-86-5	<	<	<	<	<	<	<
Phenol	108-95-2	5.23e-08	1.49e-07	2.01e-07	1.07e-08	5.52e-07	3.21e-08	1.74e-08
Propanal	123-38-6	<	<	<	<	<	<	<
Propylene Oxide	75-56-9	<	<	<	<	<	<	<
Styrene	100-42-5	<	4.86e-07	<	3.22e-08	<	3.08e-06	<
t-Butyl Methyl Ether	1634-04-4	<	<	<	<	<	2.36e-07	<
Tetrachloroethene	127-18-4	<	<	7.00e-08	4.78e-08	<	7.36e-08	<
Toluene	108-88-3	1.20e-06	3.92e-06	1.53e-06	4.34e-07	1.26e-06	3.95e-07	7.63e-07
Trichloroethene	79-01-6	<	<	<	<	<	<	<
Trifluralin	1582-09-8	<	<	<	<	<	<	<
Vinyl Acetate	108-05-4	<	<	<	<	1.70e-06	<	<
Vinyl Chloride	75-01-4	<	<	<	<	<	<	<

Table 4.12-7. CALENDER

Analyte Name	CAS #	Interpolated Cmpd #8 lb/lb rubber	Interpolated Cmpd #9 lb/lb rubber	Interpolated Cmpd #10 lb/lb rubber	Interpolated Cmpd #11 lb/lb rubber	Cmpd #12 lb/lb rubber	Interpolated Cmpd #13 lb/lb rubber
Total Method 25A Organics		1.27e-05	2.52e-05	2.52e-04	2.84e-05	4.62e-06	1.97e-04
Total Speciated Organics		1.07e-04	8.32e-05	4.08e-04	5.10e-05	4.47e-06	2.22e-04
Total Organic HAPs		8.09e-05	2.21e-05	1.74e-04	1.66e-05	2.81e-06	2.33e-05
Total HAPs		8.09e-05	2.21e-05	1.74e-04	1.66e-05	2.81e-06	2.33e-05
1,1,1-Trichloroethane	71-55-6	1.94e-08	5.29e-08	9.73e-08	<	<	3.86e-08
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<
1,1-Dichloroethane	75-34-3	<	<	<	<	<	<
1,1-Dichloroethene	75-35-4	7.26e-08	1.38e-07	<	<	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	<	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<	<	<	<
1,2-Dibromoethane	106-93-4	<	<	<	<	<	<
1,2-Dichloroethane	107-06-2	<	<	<	<	<	<
1,2-Dichloropropane	78-87-5	<	<	<	<	<	<
1,3-Butadiene	106-99-0	8.17e-08	1.23e-07	<	2.77e-07	<	8.14e-08
1,4-Dichlorobenzene	106-46-7	<	<	<	<	<	<
1,4-Dioxane	123-91-1	<	<	<	<	<	<
1,4-Phenylenediamine	106-50-3	<	<	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<	<
2-Butanone	78-93-3	3.68e-07	3.57e-07	8.58e-07	6.27e-08	<	2.33e-07
2-Chloroacetophenone	532-27-4	<	<	3.96e-10	<	<	<
2-Methylphenol	95-48-7	<	<	<	<	1.86e-10	<

Table 4.12-7. CALENDER

Analyte Name	CAS #	Interpolated Cmpd #8 lb/lb rubber	Interpolated Cmpd #9 lb/lb rubber	Interpolated Cmpd #10 lb/lb rubber	Interpolated Cmpd #11 lb/lb rubber	Cmpd #12 lb/lb rubber	Interpolated Cmpd #13 lb/lb rubber
3,3'-Dichlorobenzidine	91-94-1	<	<	<	<	<	<
3,3'-Dimethoxybenzidine	119-90-4	<	<	<	<	<	<
3,3'-Dimethylbenzidine	119-93-7	<	<	<	<	<	<
4,4'-Methylenedianiline	101-77-9	<	<	<	<	<	<
4-Aminobiphenyl	92-67-1	<	<	<	<	1.27e-09	<
4-Methyl-2-pentanone	108-10-1	9.20e-08	8.97e-08	3.01e-07	4.92e-08	<	7.16e-08
4-Nitrobiphenyl	92-93-3	<	<	<	<	<	<
4-Nitrophenol	100-02-7	<	<	<	<	<	<
a,a,a-Trichlorotoluene	98-07-7	<	<	<	<	<	<
Acetaldehyde	75-07-0	<	<	<	<	<	<
Acetaldehyde + Isobutane		<	<	<	<	<	<
Acetonitrile	75-05-8	<	<	<	<	<	<
Acetophenone	98-86-2	9.35e-09	1.07e-06	6.14e-08	1.66e-07	1.17e-09	3.78e-08
Acrolein	107-02-8	<	<	<	<	<	5.15e-07
Acrylonitrile	107-13-1	4.94e-08	<	<	<	<	6.91e-07
Allyl Chloride	107-05-1	<	<	<	<	<	<
Aniline	62-53-3	5.59e-09	3.72e-09	3.42e-09	1.73e-08	9.64e-09	<
Benzene	71-43-2	<	3.55e-08	<	<	1.33e-09	4.79e-07
Benzidine	92-87-5	<	<	<	<	<	<
Benzyl Chloride	100-44-7	<	<	<	<	<	<
Biphenyl	92-52-4	<	<	<	<	8.88e-10	<
bis(2-Chloroethyl)ether	111-44-4	<	<	<	<	<	<
bis(2-Ethylhexyl)phthalate	117-81-7	<	5.12e-09	<	1.95e-07	9.35e-10	5.36e-07
Bromoform	75-25-2	<	<	<	<	<	<
Bromomethane	74-83-9	<	<	<	<	<	<

Table 4.12-7. CALENDER

Analyte Name	CAS #	Interpolated Cmpd #8 lb/lb rubber	Interpolated Cmpd #9 lb/lb rubber	Interpolated Cmpd #10 lb/lb rubber	Interpolated Cmpd #11 lb/lb rubber	Cmpd #12 lb/lb rubber	Interpolated Cmpd #13 lb/lb rubber
Carbon Disulfide	75-15-0	2.03e-05	4.83e-07	7.43e-05	6.27e-06	2.61e-06	6.03e-07
Carbon Tetrachloride	56-23-5	<	<	<	<	<	<
Carbonyl Sulfide	463-58-1	1.63e-05	8.32e-07	<	<	4.19e-08	4.25e-07
Chlorobenzene	108-90-7	<	<	<	<	<	<
Chloroethane	75-00-3	<	<	<	<	<	<
Chloroform	67-66-3	<	<	<	<	<	<
Chloromethane	74-87-3	2.71e-08	2.30e-08	6.73e-08	<	<	4.66e-08
Cumene	98-82-8	7.00e-08	2.30e-06	6.39e-07	1.94e-09	7.05e-10	7.15e-08
Di-n-butylphthalate	84-74-2	5.41e-09	9.52e-10	1.07e-08	<	2.62e-10	2.42e-07
Dibenzofuran	132-64-9	<	<	<	<	1.95e-10	<
Dimethylaminoazobenzene	60-11-7	<	<	<	<	<	<
Dimethylphthalate	131-11-3	<	<	<	<	<	<
Epichlorohydrin	106-89-8	<	<	<	<	<	<
Ethyl Acrylate	140-88-5	<	<	<	<	<	<
Ethylbenzene	100-41-4	8.02e-08	5.34e-08	<	4.94e-08	2.06e-09	1.51e-07
Hexachlorobenzene	118-74-1	<	<	<	<	<	<
Hexachlorobutadiene	87-68-3	<	<	<	<	<	<
Hexachlorocyclopentadiene	77-47-4	<	<	<	<	<	<
Hexachloroethane	67-72-1	<	<	<	<	<	<
Hexane	110-54-3	9.26e-07	2.33e-06	1.20e-06	2.06e-07	3.83e-08	1.48e-06
Hydroquinone	123-31-9	<	<	<	<	<	<
Isooctane	540-84-1	1.78e-07	2.80e-07	2.31e-07	5.32e-08	2.27e-09	1.72e-07
Isophorone	78-59-1	<	<	<	<	<	<
m-Xylene + p-Xylene		3.15e-07	3.49e-07	7.83e-07	1.09e-07	6.09e-09	5.77e-07
Methylene bis-chloroaniline	101-14-4	<	<	<	<	<	<

Table 4.12-7. CALENDER

Analyte Name	CAS #	Interpolated Cmpd #8 lb/lb rubber	Interpolated Cmpd #9 lb/lb rubber	Interpolated Cmpd #10 lb/lb rubber	Interpolated Cmpd #11 lb/lb rubber	Cmpd #12 lb/lb rubber	Interpolated Cmpd #13 lb/lb rubber
Methylene Chloride	75-09-2	3.49e-07	5.06e-07	6.56e-06	3.62e-07	3.25e-08	1.61e-07
N,N-Dimethylaniline	121-69-7	<	<	<	<	<	<
N-Nitrosodimethylamine	62-75-9	<	<	<	<	<	<
N-Nitrosomorpholine	59-89-2	<	<	<	<	<	<
Naphthalene	91-20-3	1.97e-08	2.02e-08	5.93e-09	6.43e-09	2.21e-09	8.29e-09
Nitrobenzene	98-95-3	<	<	<	1.46e-08	<	<
o-Anisidine	90-04-0	<	<	<	<	<	<
o-Toluidine	95-53-4	<	<	<	<	<	<
o-Xylene	95-47-6	1.12e-07	1.21e-07	2.83e-07	9.63e-08	2.45e-09	2.57e-07
Pentachloronitrobenzene	82-68-8	<	<	<	<	<	<
Pentachlorophenol	87-86-5	<	<	<	<	<	3.28e-09
Phenol	108-95-2	2.31e-08	4.31e-08	8.74e-09	6.67e-09	<	3.04e-08
Propanal	123-38-6	<	<	<	<	<	2.41e-06
Propylene Oxide	75-56-9	<	<	<	<	<	<
Styrene	100-42-5	2.99e-08	1.18e-07	1.58e-07	3.64e-08	7.73e-10	3.92e-08
t-Butyl Methyl Ether	1634-04-4	<	<	<	<	<	<
Tetrachloroethene	127-18-4	5.62e-08	8.17e-08	8.85e-08	1.75e-08	<	9.65e-08
Toluene	108-88-3	9.55e-07	1.64e-06	1.34e-06	2.84e-07	5.73e-08	2.03e-06
Trichloroethene	79-01-6	<	<	<	<	<	1.61e-07
Trifluralin	1582-09-8	<	<	<	<	<	<
Vinyl Acetate	108-05-4	<	<	<	<	<	<
Vinyl Chloride	75-01-4	<	<	<	<	<	<

Table 4.12-7. CALENDER

Analyte Name	CAS #	Interpolated Cmpd #14 lb/lb rubber	Interpolated Cmpd #15 lb/lb rubber	Interpolated Cmpd #16 lb/lb rubber	Interpolated Cmpd #17 lb/lb rubber	Interpolated Cmpd #18 lb/lb rubber	Interpolated Cmpd #19 lb/lb rubber	Interpolated Cmpd #20 lb/lb rubber
Total Method 25A Organics		1.98e-04	8.12e-06	7.06e-05	3.84e-04	5.62e-05	2.39e-05	6.50e-06
Total Speciated Organics		2.20e-04	8.88e-05	4.41e-05	4.33e-04	1.78e-04	2.87e-05	2.00e-05
Total Organic HAPs		6.14e-05	8.06e-05	6.82e-06	2.04e-04	6.76e-05	5.35e-06	9.66e-06
Total HAPs		6.14e-05	8.06e-05	6.82e-06	2.04e-04	6.76e-05	5.35e-06	9.66e-06
1,1,1-Trichloroethane	71-55-6	2.62e-08	1.33e-08	1.27e-08	4.37e-08	0.00e+00	8.27e-08	5.30e-07
1,1,2,2-Tetrachloroethane	79-34-5	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
1,1,2-Trichloroethane	79-00-5	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
1,1-Dichloroethane	75-34-3	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
1,1-Dichloroethene	75-35-4	1.59e-07	1.01e-08	0.00e+00	0.00e+00	6.38e-08	0.00e+00	0.00e+00
1,2,4-Trichlorobenzene	120-82-1	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
1,2-Dibromo-3-Chloropropane	96-12-8	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
1,2-Dibromoethane	106-93-4	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
1,2-Dichloroethane	107-06-2	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
1,2-Dichloropropane	78-87-5	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
1,3-Butadiene	106-99-0	1.74e-07	4.47e-08	0.00e+00	0.00e+00	1.31e-07	4.20e-08	0.00e+00
1,4-Dichlorobenzene	106-46-7	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
1,4-Dioxane	123-91-1	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
1,4-Phenylenediamine	106-50-3	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
2,4,5-Trichlorophenol	95-95-4	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
2,4,6-Trichlorophenol	88-06-2	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
2,4-Dinitrophenol	51-28-5	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	1.17e-08	0.00e+00
2,4-Dinitrotoluene	121-14-2	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
2-Butanone	78-93-3	2.24e-07	6.36e-08	2.87e-08	7.54e-07	9.11e-07	4.57e-08	9.42e-08
2-Chloroacetophenone	532-27-4	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
2-Methylphenol	95-48-7	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	7.35e-10

Table 4.12-7. CALENDER

Analyte Name	CAS #	Interpolated Cmpd #14 lb/lb rubber	Interpolated Cmpd #15 lb/lb rubber	Interpolated Cmpd #16 lb/lb rubber	Interpolated Cmpd #17 lb/lb rubber	Interpolated Cmpd #18 lb/lb rubber	Interpolated Cmpd #19 lb/lb rubber	Interpolated Cmpd #20 lb/lb rubber
3,3'-Dichlorobenzidine	91-94-1	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
3,3'-Dimethoxybenzidine	119-90-4	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
3,3'-Dimethylbenzidine	119-93-7	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
4,4'-Methylenedianiline	101-77-9	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
4-Aminobiphenyl	92-67-1	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
4-Methyl-2-pentanone	108-10-1	5.99e-07	3.55e-08	6.26e-08	1.20e-07	3.31e-06	0.00e+00	1.39e-07
4-Nitrobiphenyl	92-93-3	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
4-Nitrophenol	100-02-7	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	7.18e-09	0.00e+00
a,a,a-Trichlorotoluene	98-07-7	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Acetaldehyde	75-07-0	0.00e+00	3.71e-07	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Acetaldehyde + Isobutane		0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Acetonitrile	75-05-8	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	3.36e-07	0.00e+00
Acetophenone	98-86-2	1.23e-08	7.97e-09	8.03e-09	1.05e-08	4.15e-08	1.80e-08	1.16e-07
Acrolein	107-02-8	5.99e-07	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Acrylonitrile	107-13-1	8.51e-06	0.00e+00	0.00e+00	0.00e+00	5.80e-07	0.00e+00	0.00e+00
Allyl Chloride	107-05-1	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Aniline	62-53-3	0.00e+00	0.00e+00	0.00e+00	3.72e-07	1.20e-07	0.00e+00	5.22e-09
Benzene	71-43-2	3.80e-07	1.26e-08	1.89e-08	0.00e+00	2.74e-08	1.03e-07	4.29e-08
Benzidine	92-87-5	0.00e+00	1.31e-08	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Benzyl Chloride	100-44-7	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Biphenyl	92-52-4	8.96e-10	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
bis(2-Chloroethyl)ether	111-44-4	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
bis(2-Ethylhexyl)phthalate	117-81-7	0.00e+00	3.33e-08	2.57e-08	1.74e-09	1.60e-08	9.48e-09	3.29e-08
Bromoform	75-25-2	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Bromomethane	74-83-9	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	4.08e-08	0.00e+00

Table 4.12-7. CALENDER

Analyte Name	CAS #	Interpolated Cmpd #14 lb/lb rubber	Interpolated Cmpd #15 lb/lb rubber	Interpolated Cmpd #16 lb/lb rubber	Interpolated Cmpd #17 lb/lb rubber	Interpolated Cmpd #18 lb/lb rubber	Interpolated Cmpd #19 lb/lb rubber	Interpolated Cmpd #20 lb/lb rubber
Carbon Disulfide	75-15-0	3.09e-06	1.11e-07	3.27e-08	0.00e+00	2.57e-05	0.00e+00	1.88e-07
Carbon Tetrachloride	56-23-5	0.00e+00	3.39e-05	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Carbonyl Sulfide	463-58-1	8.20e-06	1.98e-06	0.00e+00	0.00e+00	0.00e+00	1.22e-07	1.15e-06
Chlorobenzene	108-90-7	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Chloroethane	75-00-3	0.00e+00	0.00e+00	1.23e-06	1.46e-07	0.00e+00	0.00e+00	3.07e-07
Chloroform	67-66-3	1.78e-08	4.72e-07	8.92e-09	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Chloromethane	74-87-3	2.62e-08	7.42e-08	1.04e-08	6.43e-07	0.00e+00	1.08e-07	2.43e-07
Cumene	98-82-8	0.00e+00	2.12e-09	0.00e+00	6.84e-09	8.75e-08	7.66e-07	3.78e-09
Di-n-butylphthalate	84-74-2	6.49e-09	0.00e+00	2.67e-09	0.00e+00	6.00e-08	2.11e-08	1.58e-08
Dibenzofuran	132-64-9	1.75e-09	5.37e-10	0.00e+00	0.00e+00	0.00e+00	0.00e+00	6.98e-10
Dimethylaminoazobenzene	60-11-7	0.00e+00	1.19e-08	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Dimethylphthalate	131-11-3	2.18e-09	1.58e-09	2.26e-09	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Epichlorohydrin	106-89-8	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Ethyl Acrylate	140-88-5	0.00e+00	0.00e+00	0.00e+00	3.43e-06	0.00e+00	0.00e+00	0.00e+00
Ethylbenzene	100-41-4	4.44e-08	3.51e-08	0.00e+00	0.00e+00	2.01e-07	2.35e-08	5.75e-08
Hexachlorobenzene	118-74-1	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Hexachlorobutadiene	87-68-3	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Hexachlorocyclopentadiene	77-47-4	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Hexachloroethane	67-72-1	0.00e+00	8.93e-07	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Hexane	110-54-3	4.92e-07	5.71e-07	1.32e-06	8.19e-05	2.92e-07	1.72e-07	3.52e-07
Hydroquinone	123-31-9	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Isooctane	540-84-1	1.89e-07	3.46e-08	0.00e+00	0.00e+00	5.41e-08	3.31e-08	5.00e-08
Isophorone	78-59-1	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
m-Xylene + p-Xylene		2.43e-07	2.22e-07	7.76e-08	3.45e-07	6.40e-07	7.29e-08	2.44e-07
Methylene bis-chloroaniline	101-14-4	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00

Table 4.12-7. CALENDER

Analyte Name	CAS #	Interpolated Cmpd #14 lb/lb rubber	Interpolated Cmpd #15 lb/lb rubber	Interpolated Cmpd #16 lb/lb rubber	Interpolated Cmpd #17 lb/lb rubber	Interpolated Cmpd #18 lb/lb rubber	Interpolated Cmpd #19 lb/lb rubber	Interpolated Cmpd #20 lb/lb rubber
Methylene Chloride	75-09-2	1.22e-06	5.09e-07	3.63e-07	1.20e-05	6.30e-07	2.71e-07	7.44e-07
N,N-Dimethylaniline	121-69-7	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
N-Nitrosodimethylamine	62-75-9	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
N-Nitrosomorpholine	59-89-2	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Naphthalene	91-20-3	0.00e+00	2.01e-08	8.16e-09	2.91e-08	2.40e-08	8.92e-09	1.24e-08
Nitrobenzene	98-95-3	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
o-Anisidine	90-04-0	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
o-Toluidine	95-53-4	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
o-Xylene	95-47-6	1.24e-07	5.85e-08	3.98e-08	3.69e-07	2.65e-07	3.49e-08	9.03e-08
Pentachloronitrobenzene	82-68-8	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Pentachlorophenol	87-86-5	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	9.07e-09	0.00e+00
Phenol	108-95-2	3.86e-08	1.95e-08	3.31e-08	9.21e-07	4.08e-08	0.00e+00	1.34e-08
Propanal	123-38-6	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Propylene Oxide	75-56-9	5.05e-06	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Styrene	100-42-5	4.71e-08	0.00e+00	0.00e+00	0.00e+00	3.95e-08	0.00e+00	0.00e+00
t-Butyl Methyl Ether	1634-04-4	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Tetrachloroethene	127-18-4	1.03e-07	5.04e-07	0.00e+00	0.00e+00	5.55e-08	2.04e-08	5.50e-08
Toluene	108-88-3	1.13e-06	2.29e-07	1.27e-07	7.51e-07	4.99e-07	3.14e-07	3.45e-07
Trichloroethene	79-01-6	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Trifluralin	1582-09-8	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Vinyl Acetate	108-05-4	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00
Vinyl Chloride	75-01-4	0.00e+00	9.54e-09	0.00e+00	0.00e+00	0.00e+00	0.00e+00	0.00e+00

Table 4.12-7. CALENDER

Analyte Name	CAS #	Interpolated Cmpd #21 lb/lb rubber	Interpolated Cmpd #22 lb/lb rubber	Interpolated Cmpd #23 lb/lb rubber
Total Method 25A organics		1.35e-04	1.06e-04	2.65e-05
Total Speciated Organics		1.94e-04	1.21e-04	5.14e-05
Total Organic HAPs		1.63e-05	4.32e-05	4.31e-05
Total HAPs		1.63e-05	4.32e-05	4.31e-05
1,1,1-Trichloroethane	71-55-6	7.57e-09	4.75e-08	<
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<
1,1-Dichloroethane	75-34-3	<	<	<
1,1-Dichloroethene	75-35-4	<	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<
1,2-Dibromoethane	106-93-4	<	<	<
1,2-Dichloroethane	107-06-2	<	<	<
1,2-Dichloropropane	78-87-5	<	<	<
1,3-Butadiene	106-99-0	<	9.47e-08	1.03e-07
1,4-Dichlorobenzene	106-46-7	<	<	<
1,4-Dioxane	123-91-1	<	<	<
1,4-Phenylenediamine	106-50-3	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<
2-Butanone	78-93-3	3.43e-07	3.17e-06	<
2-Chloroacetophenone	532-27-4	<	<	<
2-Methylphenol	95-48-7	<	<	<

Table 4.12-7. CALENDER

Analyte Name	CAS #	Interpolated Cmpd #21 lb/lb rubber	Interpolated Cmpd #22 lb/lb rubber	Interpolated Cmpd #23 lb/lb rubber
3,3'-Dichlorobenzidine	91-94-1	<	<	<
3,3'-Dimethoxybenzidine	119-90-4	<	<	<
3,3'-Dimethylbenzidine	119-93-7	<	<	<
4,4'-Methylenedianiline	101-77-9	<	<	<
4-Aminobiphenyl	92-67-1	<	<	<
4-Methyl-2-pentanone	108-10-1	2.00e-08	9.90e-06	<
4-Nitrobiphenyl	92-93-3	<	<	<
4-Nitrophenol	100-02-7	<	<	<
a,a,a-Trichlorotoluene	98-07-7	<	<	<
Acetaldehyde	75-07-0	<	<	<
Acetaldehyde + Isobutane		<	<	<
Acetonitrile	75-05-8	<	<	<
Acetophenone	98-86-2	1.27e-08	2.12e-08	6.54e-09
Acrolein	107-02-8	1.65e-07	2.18e-07	<
Acrylonitrile	107-13-1	<	<	<
Allyl Chloride	107-05-1	<	<	<
Aniline	62-53-3	<	3.40e-07	1.61e-07
Benzene	71-43-2	<	6.43e-08	<
Benzidine	92-87-5	<	<	<
Benzyl Chloride	100-44-7	<	<	<
Biphenyl	92-52-4	<	7.08e-09	<
bis(2-Chloroethyl)ether	111-44-4	<	<	<
bis(2-Ethylhexyl)phthalate	117-81-7	9.53e-08	6.09e-09	4.88e-07
Bromoform	75-25-2	<	<	<
Bromomethane	74-83-9	<	<	<

Table 4.12-7. CALENDER

Analyte Name	CAS #	Interpolated Cmpd #21 lb/lb rubber	Interpolated Cmpd #22 lb/lb rubber	Interpolated Cmpd #23 lb/lb rubber
Carbon Disulfide	75-15-0	3.16e-08	6.93e-08	3.68e-07
Carbon Tetrachloride	56-23-5	<	<	1.71e-07
Carbonyl Sulfide	463-58-1	2.55e-07	<	2.09e-06
Chlorobenzene	108-90-7	<	<	<
Chloroethane	75-00-3	<	<	<
Chloroform	67-66-3	1.25e-08	<	<
Chloromethane	74-87-3	2.85e-07	2.77e-08	<
Cumene	98-82-8	2.03e-08	4.07e-08	1.44e-09
Di-n-butylphthalate	84-74-2	2.07e-07	2.59e-08	6.37e-08
Dibenzofuran	132-64-9	2.22e-10	<	3.85e-10
Dimethylaminoazobenzene	60-11-7	<	<	<
Dimethylphthalate	131-11-3	<	<	<
Epichlorohydrin	106-89-8	<	<	<
Ethyl Acrylate	140-88-5	<	<	<
Ethylbenzene	100-41-4	<	9.29e-08	<
Hexachlorobenzene	118-74-1	<	<	<
Hexachlorobutadiene	87-68-3	<	<	<
Hexachlorocyclopentadiene	77-47-4	<	<	<
Hexachloroethane	67-72-1	<	<	4.39e-09
Hexane	110-54-3	1.84e-07	5.62e-07	4.51e-07
Hydroquinone	123-31-9	<	<	<
Isooctane	540-84-1	1.53e-07	5.76e-07	<
Isophorone	78-59-1	2.85e-09	2.44e-07	<
m-Xylene + p-Xylene		1.03e-07	3.06e-07	8.54e-08
Methylene bis-chloroaniline	101-14-4	<	<	<

Table 4.12-7. CALENDER

Analyte Name	CAS #	Interpolated Cmpd #21 lb/lb rubber	Interpolated Cmpd #22 lb/lb rubber	Interpolated Cmpd #23 lb/lb rubber
Methylene Chloride	75-09-2	2.05e-07	7.33e-07	7.94e-07
N,N-Dimethylaniline	121-69-7	<	<	<
N-Nitrosodimethylamine	62-75-9	<	<	<
N-Nitrosomorpholine	59-89-2	<	<	<
Naphthalene	91-20-3	9.06e-09	4.00e-08	2.30e-08
Nitrobenzene	98-95-3	<	<	<
o-Anisidine	90-04-0	<	<	<
o-Toluidine	95-53-4	<	<	<
o-Xylene	95-47-6	1.16e-07	2.62e-07	<
Pentachloronitrobenzene	82-68-8	<	<	<
Pentachlorophenol	87-86-5	<	<	<
Phenol	108-95-2	6.78e-09	4.98e-07	9.04e-09
Propanal	123-38-6	<	<	<
Propylene Oxide	75-56-9	<	<	<
Styrene	100-42-5	4.58e-08	1.07e-06	<
t-Butyl Methyl Ether	1634-04-4	5.79e-06	<	<
Tetrachloroethene	127-18-4	<	1.39e-06	<
Toluene	108-88-3	1.00e-07	1.79e-06	1.67e-05
Trichloroethene	79-01-6	<	<	<
Trifluralin	1582-09-8	<	<	<
Vinyl Acetate	108-05-4	<	<	<
Vinyl Chloride	75-01-4	<	<	<

values are ½ of WPD values due to ~~old~~ ~~assumptions~~ ~~???~~ error

4.12-7

= spec. org. > M25A

5/4/99

non-VOC

Calender

HAP Emission Factor Summary

(All in lb/lb rubber)

Drop shading

Analyte Name	CAS #	Interpolated Cmpd #1 lb/lb rubber	Cmpd #2 lb/lb rubber	Interpolated Cmpd #3 lb/lb rubber	Interpolated Cmpd #4 lb/lb rubber	Interpolated Cmpd #5 lb/lb rubber	Interpolated Cmpd #6 lb/lb rubber	Interpolated Cmpd #7 lb/lb rubber	Interpolated Cmpd #8 lb/lb rubber	Interpolated Cmpd #9 lb/lb rubber
Total VOC M25A footnotes		5.33E-05	5.59E-05	1.17E-04	3.35E-05	1.86E-04	3.34E-05	1.05E-04	1.27E-05	2.52E-05
Total Speciated Organics		3.68E-05	7.66E-05	6.47E-05	3.85E-05	4.48E-05	7.14E-05	6.45E-05	5.35E-05	4.16E-05
Total Organic HAPs sums		1.52E-05	1.27E-05	4.28E-05	1.84E-05	3.03E-05	3.53E-05	3.04E-05	4.05E-05	1.11E-05
Total HAPs what else?		1.52E-05	1.27E-05	4.28E-05	1.84E-05	3.03E-05	3.53E-05	3.04E-05	4.05E-05	1.11E-05
1,1,1-Trichloroethane Methyl chloroform	71-55-6	0.00E+00	3.89E-08	2.31E-07	3.07E-08	1.33E-07	0.00E+00	0.00E+00	1.94E-08	5.29E-08
1,1,2,2-Tetrachloroethane	79-34-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1,2-Trichloroethane	79-00-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1-Dichloroethane Ethylidene dichloride	75-34-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1-Dichloroethene Vinylidene chloride	75-35-4	0.00E+00	0.00E+00	0.00E+00	3.97E-07	0.00E+00	0.00E+00	0.00E+00	7.26E-08	1.38E-07
1,2,4-Trichlorobenzene	120-82-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2-Dibromo-3-Chloropropane	96-12-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2-Dibromoethane Ethylene dibromide	106-93-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2-Dichloroethane Ethylene dichloride	107-06-2	0.00E+00	1.22E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2-Dichloropropane Propylene dichloride	78-87-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-Butadiene	106-99-0	7.09E-08	0.00E+00	0.00E+00	1.57E-07	0.00E+00	0.00E+00	3.39E-07	8.17E-08	1.23E-07
1,4-Dichlorobenzene	106-46-7	0.00E+00	3.49E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,4-Dioxane	123-91-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,4-Phenylenediamine	106-50-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4,5-Trichlorophenol NOT IN TIRE CURE	95-95-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4,6-Trichlorophenol	88-06-2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4-Dinitrophenol	51-28-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4-Dinitrotoluene	121-14-2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2-Butanone Methyl Ethyl Ketone	78-93-3	4.29E-06	2.61E-07	6.53E-07	1.98E-06	1.11E-06	3.19E-07	1.02E-06	3.68E-07	3.57E-07
2-Chloroacetophenone	532-27-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2-Methylphenol o-cresol	95-48-7	0.00E+00	0.00E+00	6.26E-08	6.05E-10	9.39E-09	4.35E-09	0.00E+00	0.00E+00	0.00E+00
3,3'-Dichlorobenzidine	91-94-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3,3'-Dimethoxybenzidine NOT IN TIRE CURE	119-90-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3,3'-Dimethylbenzidine	119-93-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4,4'-Methylenedianiline	101-77-9	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4-Aminobiphenyl	92-67-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4-Methyl-2-pentanone methyl isobutyl Ketone	108-10-1	0.00E+00	6.42E-07	9.10E-06	1.08E-05	0.00E+00	2.22E-05	0.00E+00	9.20E-08	8.97E-08
4-Nitrobiphenyl	92-93-3	0.00E+00	2.04E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4-Nitrophenol NOT IN TIRE CURE	100-02-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
a,a,a-Trichlorotoluene Benzotrichloride	98-07-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	75-07-0	5.04E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde + Isobutane footnote		0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.44E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetonitrile	75-05-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetophenone	98-86-2	1.68E-06	4.94E-07	3.72E-08	2.72E-09	1.34E-08	5.56E-08	8.95E-08	9.35E-09	1.07E-06
Acrolein	107-02-8	0.00E+00	7.82E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acrylonitrile	107-13-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.94E-08	0.00E+00
Allyl Chloride	107-05-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aniline	62-53-3	0.00E+00	9.44E-08	0.00E+00	3.12E-07	0.00E+00	7.23E-08	0.00E+00	5.59E-09	3.72E-09
Benzene	71-43-2	3.96E-08	4.54E-08	8.21E-08	8.30E-08	2.16E-07	0.00E+00	6.62E-08	0.00E+00	3.55E-08
Benzidine < not in TIRE CURE	92-87-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzyl Chloride	100-44-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biphenyl	92-52-4	0.00E+00	1.78E-08	4.08E-08	3.93E-09	0.00E+00	8.52E-09	0.00E+00	0.00E+00	0.00E+00
bis(2-Chloroethyl)ether Dichloroethyl ether	111-44-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
bis(2-Ethylhexyl)phthalate	117-81-7	2.83E-08	7.34E-07	8.63E-08	0.00E+00	1.66E-08	1.30E-07	2.42E-08	0.00E+00	5.12E-09
Bromoform	75-25-2	2.02E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bromomethane Methyl Bromide	74-83-9	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon Disulfide	75-15-0	0.00E+00	2.41E-06	0.00E+00	1.44E-07	1.33E-07	2.78E-06	0.00E+00	2.03E-05	4.83E-07
Carbon Tetrachloride	56-23-5	0.00E+00	0.00E+00	8.63E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbonyl Sulfide	463-58-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.88E-07	1.16E-06	0.00E+00	1.63E-05	8.32E-07
Chlorobenzene	108-90-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chloroethane Ethyl Chloride	75-00-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chloroform	67-66-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chloromethane Methyl chloride	74-87-3	0.00E+00	2.18E-08	0.00E+00	2.16E-08	0.00E+00	2.36E-07	0.00E+00	2.71E-08	2.30E-08
Cumene	98-82-8	2.11E-09	1.29E-06	2.90E-09	1.21E-09	1.02E-09	8.77E-09	6.02E-08	7.00E-08	2.30E-06

4.12-77-92

Calender
HAP Emission Factor Summary

Analyte Name	CAS #	Interpolated Cmpd #1 lb/lb rubber	Cmpd #2 lb/lb rubber	Interpolated Cmpd #3 lb/lb rubber	Interpolated Cmpd #4 lb/lb rubber	Interpolated Cmpd #5 lb/lb rubber	Interpolated Cmpd #6 lb/lb rubber	Interpolated Cmpd #7 lb/lb rubber	Interpolated Cmpd #8 lb/lb rubber	Interpolated Cmpd #9 lb/lb rubber
Di-n-butylphthalate	84-74-2	5.80E-08	0.00E+00	3.98E-08	0.00E+00	0.00E+00	1.09E-08	0.00E+00	5.41E-09	9.52E-10
Dibenzofuran	132-64-9	0.00E+00	0.00E+00	2.48E-08	1.02E-09	0.00E+00	2.40E-09	0.00E+00	0.00E+00	0.00E+00
Dimethylaminoazobenzene < NOT IN TIRE	60-11-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dimethylphthalate	131-11-3	0.00E+00	0.00E+00	1.14E-08	1.13E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Epichlorohydrin	106-89-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethyl Acrylate < NOT IN TIRE	140-88-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethylbenzene	100-41-4	0.00E+00	1.57E-07	1.55E-07	8.46E-08	8.57E-08	1.76E-07	3.14E-06	8.02E-08	5.34E-08
Hexachlorobenzene < not in TIRE	118-74-1	0.00E+00	0.00E+00	6.74E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hexachlorobutadiene	87-68-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hexachlorocyclopentadiene } NOT IN	77-47-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hexachloroethane	67-72-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hexane	110-54-3	5.98E-06	5.59E-07	1.15E-06	1.13E-06	4.29E-06	1.08E-06	7.82E-06	9.26E-07	2.33E-06
Hydroquinone — NOT IN	123-31-9	0.00E+00	3.73E-08	0.00E+00	5.87E-07	1.90E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
① Isooctane 2,2,4-trimethylpentane	540-84-1	6.49E-08	2.69E-07	2.08E-07	6.96E-08	7.47E-08	1.15E-07	1.53E-07	1.78E-07	2.80E-07
Isophorone	78-59-1	0.00E+00	1.30E-07	0.00E+00	4.30E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
m-Xylene + p-Xylene footnote fill in ?		1.90E-07	2.86E-07	5.15E-07	3.73E-07	2.98E-07	4.52E-07	1.05E-05	3.15E-07	3.49E-07
4,4 Methylene bis(chloroaniline)	101-14-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methylene Chloride	75-09-2	7.98E-07	4.71E-08	2.80E-05	1.35E-06	3.03E-07	1.80E-06	8.26E-07	3.49E-07	5.06E-07
N,N-Dimethylaniline] NOT IN	121-69-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
N-Nitrosodimethylamine	62-75-9	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
N-Nitrosomorpholine	59-89-2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Naphthalene	91-20-3	1.81E-08	1.21E-07	2.24E-07	1.25E-08	1.82E-07	3.70E-08	3.13E-08	1.97E-08	2.02E-08
Nitrobenzene] NOT IN	98-95-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
o-Anisidine	90-04-0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
o-Toluidine	95-53-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.62E-07	0.00E+00	0.00E+00	0.00E+00
o-Xylene	95-47-6	6.96E-08	2.84E-07	2.32E-07	2.74E-07	1.10E-07	6.90E-07	5.61E-06	1.12E-07	1.21E-07
Pentachloronitrobenzene] NOT IN	82-68-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pentachlorophenol	87-86-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	108-95-2	5.23E-08	1.49E-07	2.01E-07	1.07E-08	5.52E-07	3.21E-08	1.74E-08	2.31E-08	4.31E-08
Propanal Propionaldehyde	123-38-6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Propylene Oxide	75-56-9	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Styrene	100-42-5	0.00E+00	4.86E-07	0.00E+00	3.22E-08	0.00E+00	3.08E-06	0.00E+00	2.99E-08	1.18E-07
t-Butyl Methyl Ether Methyl tert-butyl ether	1634-04-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.36E-07	0.00E+00	0.00E+00	0.00E+00
Tetrachloroethene Tetrachloroethylene	127-18-4	0.00E+00	0.00E+00	7.00E-08	4.78E-08	0.00E+00	7.36E-08	0.00E+00	5.62E-08	8.17E-08
Toluene	108-88-3	1.20E-06	3.92E-06	1.53E-06	4.34E-07	1.26E-06	3.95E-07	7.63E-07	9.55E-07	1.64E-06
Trichloroethene Trichloroethylene	79-01-6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trifluralin	1582-09-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Vinyl Acetate	108-05-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Vinyl Chloride	75-01-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Notes - warmup mill not included in ef.

All except 2 & 12 were extrapolated

These are the only 2 that are Not changed - they were done correctly

(nothing other than organics tested?)

① Total HAPS = Total organic HAPS = SUM of everything in table

② #2 & #12 added correctly → but all interpolated cmpds had SUM = sum + 2, even though indiv. cmpds were done OK

③ Total spec. organics - we don't have these values on table

Calender
HAP Emission Factor Summary

Analyte Name	CAS #	Interpolated Cmpd #10 lb/lb rubber	Interpolated Cmpd #11 lb/lb rubber	Cmpd #12 lb/lb rubber	Interpolated Cmpd #13 lb/lb rubber	Interpolated Cmpd #14 lb/lb rubber	Interpolated Cmpd #15 lb/lb rubber	Interpolated Cmpd #16 lb/lb rubber	Interpolated Cmpd #17 lb/lb rubber	Interpolated Cmpd #18 lb/lb rubber
Total VOC		2.52E-04	2.84E-05	4.62E-06	1.97E-04	1.98E-04	8.12E-06	7.06E-05	3.84E-04	5.62E-05
Total Speciated Organics		2.04E-04	2.55E-05	4.47E-06	1.11E-04	1.10E-04	4.44E-05	2.20E-05	2.17E-04	8.90E-05
Total Organic HAPs		8.70E-05	8.28E-06	2.81E-06	1.16E-05	3.07E-05	4.03E-05	3.41E-06	1.02E-04	3.38E-05
Total HAPs		8.70E-05	8.28E-06	2.81E-06	1.16E-05	3.07E-05	4.03E-05	3.41E-06	1.02E-04	3.38E-05
1,1,1-Trichloroethane	71-55-6	9.73E-08	0.00E+00	0.00E+00	3.86E-08	2.62E-08	1.33E-08	1.27E-08	4.37E-08	0.00E+00
1,1,2,2-Tetrachloroethane	79-34-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1,2-Trichloroethane	79-00-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1-Dichloroethane	75-34-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1-Dichloroethene	75-35-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E-07	1.01E-08	0.00E+00	0.00E+00	6.38E-08
1,2,4-Trichlorobenzene	120-82-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2-Dibromo-3-Chloropropane	96-12-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2-Dibromoethane	106-93-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2-Dichloroethane	107-06-2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2-Dichloropropane	78-87-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-Butadiene	106-99-0	0.00E+00	2.77E-07	0.00E+00	8.14E-08	1.74E-07	4.47E-08	0.00E+00	0.00E+00	1.31E-07
1,4-Dichlorobenzene	106-46-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,4-Dioxane	123-91-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,4-Phenylenediamine	106-50-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4,5-Trichlorophenol	95-95-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4,6-Trichlorophenol	88-06-2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4-Dinitrophenol	51-28-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4-Dinitrotoluene	121-14-2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2-Butanone	78-93-3	8.58E-07	6.27E-08	0.00E+00	2.33E-07	2.24E-07	6.36E-08	2.87E-08	7.54E-07	9.11E-07
2-Chloroacetophenone	532-27-4	3.96E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2-Methylphenol	95-48-7	0.00E+00	0.00E+00	1.86E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3,3'-Dichlorobenzidine	91-94-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3,3'-Dimethoxybenzidine	119-90-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3,3'-Dimethylbenzidine	119-93-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4,4'-Methylenedianiline	101-77-9	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4-Aminobiphenyl	92-67-1	0.00E+00	0.00E+00	1.27E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4-Methyl-2-pentanone	108-10-1	3.01E-07	4.92E-08	0.00E+00	7.16E-08	5.99E-07	3.55E-08	6.26E-08	1.20E-07	3.31E-06
4-Nitrobiphenyl	92-93-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4-Nitrophenol	100-02-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
a,a,a-Trichlorotoluene	98-07-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	75-07-0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.71E-07	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde + Isobutane		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetonitrile	75-05-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetophenone	98-86-2	6.14E-08	1.66E-07	1.17E-09	3.78E-08	1.23E-08	7.97E-09	8.03E-09	1.05E-08	4.15E-08
Acrolein	107-02-8	0.00E+00	0.00E+00	0.00E+00	5.15E-07	5.99E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acrylonitrile	107-13-1	0.00E+00	0.00E+00	0.00E+00	6.91E-07	8.51E-06	0.00E+00	0.00E+00	0.00E+00	5.80E-07
Allyl Chloride	107-05-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aniline	62-53-3	3.42E-09	1.73E-08	9.64E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.72E-07	1.20E-07
Benzene	71-43-2	0.00E+00	0.00E+00	1.33E-09	4.79E-07	3.80E-07	1.26E-08	1.89E-08	0.00E+00	2.74E-08
Benzidine	92-87-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.31E-08	0.00E+00	0.00E+00	0.00E+00
Benzyl Chloride	100-44-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biphenyl	92-52-4	0.00E+00	0.00E+00	8.88E-10	0.00E+00	8.96E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00
bis(2-Chloroethyl)ether	111-44-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
bis(2-Ethylhexyl)phthalate	117-81-7	0.00E+00	1.95E-07	9.35E-10	5.36E-07	0.00E+00	3.33E-08	2.57E-08	1.74E-09	1.60E-08
Bromoform	75-25-2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bromomethane	74-83-9	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon Disulfide	75-15-0	7.43E-05	6.27E-06	2.61E-06	6.03E-07	3.09E-06	1.11E-07	3.27E-08	0.00E+00	2.57E-05
Carbon Tetrachloride	56-23-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.39E-05	0.00E+00	0.00E+00	0.00E+00
Carbonyl Sulfide	463-58-1	0.00E+00	0.00E+00	4.19E-08	4.25E-07	8.20E-06	1.98E-06	0.00E+00	0.00E+00	0.00E+00
Chlorobenzene	108-90-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chloroethane	75-00-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-06	1.46E-07	0.00E+00
Chloroform	67-66-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.78E-08	4.72E-07	8.92E-09	0.00E+00	0.00E+00
Chloromethane	74-87-3	6.73E-08	0.00E+00	0.00E+00	4.66E-08	2.62E-08	7.42E-08	1.04E-08	6.43E-07	0.00E+00
Cumene	98-82-8	6.39E-07	1.94E-09	7.05E-10	7.15E-08	0.00E+00	2.12E-09	0.00E+00	6.84E-09	8.75E-08

Calender
HAP Emission Factor Summary

Analyte Name	CAS #	Interpolated Cmpd #10 lb/lb rubber	Interpolated Cmpd #11 lb/lb rubber	Cmpd #12 lb/lb rubber	Interpolated Cmpd #13 lb/lb rubber	Interpolated Cmpd #14 lb/lb rubber	Interpolated Cmpd #15 lb/lb rubber	Interpolated Cmpd #16 lb/lb rubber	Interpolated Cmpd #17 lb/lb rubber	Interpolated Cmpd #18 lb/lb rubber
Di-n-butylphthalate	84-74-2	1.07E-08	0.00E+00	2.62E-10	2.42E-07	6.49E-09	0.00E+00	2.67E-09	0.00E+00	6.00E-08
Dibenzofuran	132-64-9	0.00E+00	0.00E+00	1.95E-10	0.00E+00	1.75E-09	5.37E-10	0.00E+00	0.00E+00	0.00E+00
Dimethylaminoazobenzene	60-11-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.19E-08	0.00E+00	0.00E+00	0.00E+00
Dimethylphthalate	131-11-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.18E-09	1.58E-09	2.26E-09	0.00E+00	0.00E+00
Epichlorohydrin	106-89-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethyl Acrylate	140-88-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E-06	0.00E+00
Ethylbenzene	100-41-4	0.00E+00	4.94E-08	2.06E-09	1.51E-07	4.44E-08	3.51E-08	0.00E+00	0.00E+00	2.01E-07
Hexachlorobenzene	118-74-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hexachlorobutadiene	87-68-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hexachlorocyclopentadiene	77-47-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hexachloroethane	67-72-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.93E-07	0.00E+00	0.00E+00	0.00E+00
Hexane	110-54-3	1.20E-06	2.06E-07	3.83E-08	1.48E-06	4.92E-07	5.71E-07	1.32E-06	8.19E-05	2.92E-07
Hydroquinone	123-31-9	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Isooctane	540-84-1	2.31E-07	5.32E-08	2.27E-09	1.72E-07	1.89E-07	3.46E-08	0.00E+00	0.00E+00	5.41E-08
Isophorone	78-59-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
m-Xylene + p-Xylene		7.83E-07	1.09E-07	6.09E-09	5.77E-07	2.43E-07	2.22E-07	7.76E-08	3.45E-07	6.40E-07
Methylene bis-chloroaniline	101-14-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methylene Chloride	75-09-2	6.56E-06	3.62E-07	3.25E-08	1.61E-07	1.22E-06	5.09E-07	3.63E-07	1.20E-05	6.30E-07
N,N-Dimethylaniline	121-69-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
N-Nitrosodimethylamine	62-75-9	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
N-Nitrosomorpholine	59-89-2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Naphthalene	91-20-3	5.93E-09	6.43E-09	2.21E-09	8.29E-09	0.00E+00	2.01E-08	8.16E-09	2.91E-08	2.40E-08
Nitrobenzene	98-95-3	0.00E+00	1.46E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
o-Anisidine	90-04-0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
o-Toluidine	95-53-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
o-Xylene	95-47-6	2.83E-07	9.63E-08	2.45E-09	2.57E-07	1.24E-07	5.85E-08	3.98E-08	3.69E-07	2.65E-07
Pentachloronitrobenzene	82-68-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pentachlorophenol	87-86-5	0.00E+00	0.00E+00	0.00E+00	3.28E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol	108-95-2	8.74E-09	6.67E-09	0.00E+00	3.04E-08	3.86E-08	1.95E-08	3.31E-08	9.21E-07	4.08E-08
Propanal	123-38-6	0.00E+00	0.00E+00	0.00E+00	2.41E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Propylene Oxide	75-56-9	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.05E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Styrene	100-42-5	1.58E-07	3.64E-08	7.73E-10	3.92E-08	4.71E-08	0.00E+00	0.00E+00	0.00E+00	3.95E-08
t-Butyl Methyl Ether	1634-04-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tetrachloroethene	127-18-4	8.85E-08	1.75E-08	0.00E+00	9.65E-08	1.03E-07	5.04E-07	0.00E+00	0.00E+00	5.55E-08
Toluene	108-88-3	1.34E-06	2.84E-07	5.73E-08	2.03E-06	1.13E-06	2.29E-07	1.27E-07	7.51E-07	4.99E-07
Trichloroethene	79-01-6	0.00E+00	0.00E+00	0.00E+00	1.61E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trifluralin	1582-09-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Vinyl Acetate	108-05-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Vinyl Chloride	75-01-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.54E-09	0.00E+00	0.00E+00	0.00E+00

Calender
HAP Emission Factor Summary

Not in WPD should we show this ?

Analyte Name	CAS #	Interpolated Cmpd #19 lb/lb rubber	Interpolated Cmpd #20 lb/lb rubber	Interpolated Cmpd #21 lb/lb rubber	Interpolated Cmpd #22 lb/lb rubber	Interpolated Cmpd #23 lb/lb rubber	Mean lb/lb rubber	Max lb/lb rubber
Total VOC		2.39E-05	6.50E-06	1.35E-04	1.06E-04	2.65E-05	~~9.22E-05~~	~~3.84E-04~~
Total Speciated Organics		1.44E-05	1.00E-05	9.71E-05	6.07E-05	2.57E-05		
Total Organic HAPs		2.67E-06	4.83E-06	8.17E-06	2.16E-05	2.15E-05		
Total HAPs		2.67E-06	4.83E-06	8.17E-06	2.16E-05	2.15E-05	2.69E-5	3.62E-4
1,1,1-Trichloroethane	71-55-6	8.27E-08	5.30E-07	7.57E-09	4.75E-08	0.00E+00	6.11E-08	5.30E-07
1,1,2,2-Tetrachloroethane	79-34-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1,2-Trichloroethane	79-00-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1-Dichloroethane	75-34-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1-Dichloroethene	75-35-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.65E-08	3.97E-07
1,2,4-Trichlorobenzene	120-82-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2-Dibromo-3-Chloropropane	96-12-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2-Dibromoethane	106-93-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2-Dichloroethane	107-06-2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.32E-09	1.22E-07
1,2-Dichloropropane	78-87-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-Butadiene	106-99-0	4.20E-08	0.00E+00	0.00E+00	9.47E-08	1.03E-07	7.47E-08	3.39E-07
1,4-Dichlorobenzene	106-46-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.52E-09	3.49E-08
1,4-Dioxane	123-91-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,4-Phenylenediamine	106-50-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4,5-Trichlorophenol	95-95-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4,6-Trichlorophenol	88-06-2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4-Dinitrophenol	51-28-5	1.17E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.10E-10	1.17E-08
2,4-Dinitrotoluene	121-14-2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2-Butanone	78-93-3	4.57E-08	9.42E-08	3.43E-07	3.17E-06	0.00E+00	7.45E-07	4.29E-06
2-Chloroacetophenone	532-27-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.72E-11	3.96E-10
2-Methylphenol	95-48-7	0.00E+00	7.35E-10	0.00E+00	0.00E+00	0.00E+00	3.39E-09	6.26E-08
3,3'-Dichlorobenzidine	91-94-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3,3'-Dimethoxybenzidine	119-90-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3,3'-Dimethylbenzidine	119-93-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4,4'-Methylenedianiline	101-77-9	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4-Aminobiphenyl	92-67-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E-11	1.27E-09
4-Methyl-2-pentanone	108-10-1	0.00E+00	1.39E-07	2.00E-08	9.90E-06	0.00E+00	2.50E-06	2.22E-05
4-Nitrobiphenyl	92-93-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.89E-11	2.04E-09
4-Nitrophenol	100-02-7	7.18E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.12E-10	7.18E-09
a,a,a-Trichlorotoluene	98-07-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	75-07-0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.81E-08	5.04E-07
Acetaldehyde + Isobutane		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.93E-08	4.44E-07
Acetonitrile	75-05-8	3.36E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E-08	3.36E-07
Acetophenone	98-86-2	1.80E-08	1.16E-07	1.27E-08	2.12E-08	6.54E-09	1.73E-07	1.68E-06
Acrolein	107-02-8	0.00E+00	0.00E+00	1.65E-07	2.18E-07	0.00E+00	6.84E-08	5.99E-07
Acrylonitrile	107-13-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.27E-07	8.51E-06
Allyl Chloride	107-05-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aniline	62-53-3	0.00E+00	5.22E-09	0.00E+00	3.40E-07	1.61E-07	6.59E-08	3.72E-07
Benzene	71-43-2	1.03E-07	4.29E-08	0.00E+00	6.43E-08	0.00E+00	7.38E-08	4.79E-07
Benzidine	92-87-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.68E-10	1.31E-08
Benzyl Chloride	100-44-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biphenyl	92-52-4	0.00E+00	0.00E+00	0.00E+00	7.08E-09	0.00E+00	3.48E-09	4.08E-08
bis(2-Chloroethyl)ether	111-44-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
bis(2-Ethylhexyl)phthalate	117-81-7	9.48E-09	3.28E-08	9.53E-08	6.09E-09	4.88E-07	1.07E-07	7.34E-07
Bromoform	75-25-2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.77E-09	2.02E-07
Bromomethane	74-83-9	4.08E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.77E-09	4.08E-08
Carbon Disulfide	75-15-0	0.00E+00	1.88E-07	3.16E-08	6.93E-08	3.68E-07	6.07E-06	7.43E-05
Carbon Tetrachloride	56-23-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E-07	1.49E-06	3.39E-05
Carbonyl Sulfide	463-58-1	1.22E-07	1.14E-06	2.55E-07	0.00E+00	2.09E-06	1.43E-06	1.63E-05
Chlorobenzene	108-90-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chloroethane	75-00-3	0.00E+00	3.07E-07	0.00E+00	0.00E+00	0.00E+00	7.33E-08	1.23E-06
Chloroform	67-66-3	0.00E+00	0.00E+00	1.25E-08	0.00E+00	0.00E+00	2.22E-08	4.72E-07
Chloromethane	74-87-3	1.08E-07	2.43E-07	2.85E-07	2.77E-08	0.00E+00	8.09E-08	6.43E-07
Cumene	98-82-8	7.66E-07	3.78E-09	2.03E-08	4.07E-08	1.44E-09	2.34E-07	2.30E-06

Calender
HAP Emission Factor Summary

Analyte Name	CAS #	Interpolated Cmpd #19 lb/lb rubber	Interpolated Cmpd #20 lb/lb rubber	Interpolated Cmpd #21 lb/lb rubber	Interpolated Cmpd #22 lb/lb rubber	Interpolated Cmpd #23 lb/lb rubber	Mean lb/lb rubber	Max lb/lb rubber
Di-n-butylphthalate	84-74-2	2.11E-08	1.58E-08	2.07E-07	2.59E-08	6.37E-08	3.35E-08	2.42E-07
Dibenzofuran	132-64-9	0.00E+00	6.98E-10	2.22E-10	0.00E+00	3.85E-10	1.39E-09	2.48E-08
Dimethylaminoazobenzene	60-11-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.16E-10	1.19E-08
Dimethylphthalate	131-11-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.07E-10	1.14E-08
Epichlorohydrin	106-89-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethyl Acrylate	140-88-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.49E-07	3.43E-06
Ethylbenzene	100-41-4	2.35E-08	5.75E-08	0.00E+00	9.29E-08	0.00E+00	1.99E-07	3.14E-06
Hexachlorobenzene	118-74-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.93E-10	6.74E-09
Hexachlorobutadiene	87-68-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hexachlorocyclopentadiene	77-47-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hexachloroethane	67-72-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.39E-09	3.90E-08	8.93E-07
Hexane	110-54-3	1.72E-07	3.52E-07	1.84E-07	5.62E-07	4.51E-07	4.98E-06	8.19E-05
Hydroquinone	123-31-9	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.55E-07	1.90E-05
Isooctane	540-84-1	3.31E-08	5.00E-08	1.53E-07	5.76E-07	0.00E+00	1.29E-07	5.76E-07
Isophorone	78-59-1	0.00E+00	0.00E+00	2.85E-09	2.44E-07	0.00E+00	1.83E-08	2.44E-07
m-Xylene + p-Xylene		7.29E-08	2.44E-07	1.03E-07	3.06E-07	8.54E-08	7.41E-07	1.05E-05
Methylene bis-chloroaniline	101-14-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methylene Chloride	75-09-2	2.71E-07	7.44E-07	2.05E-07	7.33E-07	7.94E-07	2.55E-06	2.80E-05
N,N-Dimethylaniline	121-69-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
N-Nitrosodimethylamine	62-75-9	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
N-Nitrosomorpholine	59-89-2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Naphthalene	91-20-3	8.92E-09	1.24E-08	9.06E-09	4.00E-08	2.30E-08	3.75E-08	2.24E-07
Nitrobenzene	98-95-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.36E-10	1.46E-08
o-Anisidine	90-04-0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
o-Toluidine	95-53-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.04E-09	1.62E-07
o-Xylene	95-47-6	3.49E-08	9.03E-08	1.16E-07	2.62E-07	0.00E+00	4.13E-07	5.61E-06
Pentachloronitrobenzene	82-68-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pentachlorophenol	87-86-5	9.07E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.37E-10	9.07E-09
Phenol	108-95-2	0.00E+00	1.34E-08	6.78E-09	4.98E-07	9.04E-09	1.18E-07	9.21E-07
Propanal	123-38-6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-07	2.41E-06
Propylene Oxide	75-56-9	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.20E-07	5.05E-06
Styrene	100-42-5	0.00E+00	0.00E+00	4.58E-08	1.07E-06	0.00E+00	2.26E-07	3.08E-06
t-Butyl Methyl Ether	1634-04-4	0.00E+00	0.00E+00	5.79E-06	0.00E+00	0.00E+00	2.62E-07	5.79E-06
Tetrachloroethene	127-18-4	2.04E-08	5.50E-08	0.00E+00	1.39E-06	0.00E+00	1.15E-07	1.39E-06
Toluene	108-88-3	3.14E-07	3.45E-07	1.00E-07	1.79E-06	1.67E-05	1.64E-06	1.67E-05
Trichloroethene	79-01-6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.99E-09	1.61E-07
Trifluralin	1582-09-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Vinyl Acetate	108-05-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.40E-08	1.70E-06
Vinyl Chloride	75-01-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.15E-10	9.54E-09

4012-92

4.12-7. Calender Emission Factors

(All EFs in Lbs/Lb Rubber Processed)

Analyte Name	CAS #	Cmpd #1	Cmpd #2	Cmpd #3	Cmpd #4	Cmpd #5	Cmpd #6	Cmpd #7	Cmpd #8
Dimethylaminoazobenzene	60-11-7	<	<	<	<	<	<	<	<
Dimethylphthalate	131-11-3	<	<	1.14E-08	1.13E-09	<	<	<	<
Epichlorohydrin	106-89-8	<	<	<	<	<	<	<	<
Ethyl Acrylate	140-88-5	<	<	<	<	<	<	<	<
Ethyl benzene	100-41-4	<	**1.57E-07**	1.55E-07	8.46E-08	8.57E-08	1.76E-07	3.14E-06	8.02E-08
Hexachlorobenzene	118-74-1	<	<	6.74E-09	<	<	<	<	<
Hexachlorobutadiene	87-68-3	<	<	<	<	<	<	<	<
Hexachlorocyclopentadiene	77-47-4	<	<	<	<	<	<	<	<
Hexachloroethane	67-72-1	<	<	<	<	<	<	<	<
Hexane	110-54-3	5.98E-06	**5.59E-07**	1.15E-06	1.13E-06	4.29E-06	1.08E-06	7.82E-06	9.26E-07
Hydroquinone	123-31-9	<	**3.73E-08**	<	5.87E-07	1.90E-05	<	<	<
2,2,4-Trimethylpentane	540-84-1	6.49E-08	**2.69E-07**	2.08E-07	6.96E-08	7.47E-08	1.15E-07	1.53E-07	1.78E-07
Isophorone	78-59-1	<	**1.30E-07**	<	4.30E-08	<	<	<	<
m-Xylene + p-Xylene		1.90E-07	**2.86E-07**	5.15E-07	3.73E-07	2.98E-07	4.52E-07	1.05E-05	3.15E-07
4,4-Methylene bis(2-chloroaniline)	101-14-4	<	<	<	<	<	<	<	<
Methylene Chloride	75-09-2	7.98E-07	**4.71E-08**	2.80E-05	1.35E-06	3.03E-07	1.80E-06	8.26E-07	3.49E-07
N,N-Dimethylaniline	121-69-7	<	<	<	<	<	<	<	<
N-Nitrosodimethylamine	62-75-9	<	<	<	<	<	<	<	<
N-Nitrosomorpholine	59-89-2	<	<	<	<	<	<	<	<
Naphthalene	91-20-3	1.81E-08	**1.21E-07**	2.24E-07	1.25E-08	1.82E-07	3.70E-08	3.13E-08	1.97E-08
Nitrobenzene	98-95-3	<	<	<	<	<	<	<	<
o-Anisidine	90-04-0	<	<	<	<	<	<	<	<
o-Toluidine	95-53-4	<	<	<	<	<	1.62E-07	<	<
o-Xylene	95-47-6	6.96E-08	**2.84E-07**	2.32E-07	2.74E-07	1.10E-07	6.90E-07	5.61E-06	1.12E-07
Pentachloronitrobenzene	82-68-8	<	<	<	<	<	<	<	<
Pentachlorophenol	87-86-5	<	<	<	<	<	<	<	<
Phenol	108-95-2	5.23E-08	**1.49E-07**	2.01E-07	1.07E-08	5.52E-07	3.21E-08	1.74E-08	2.31E-08
Propionaldehyde	123-38-6	<	<	<	<	<	<	<	<
Propylene Oxide	75-56-9	<	<	<	<	<	<	<	<
Styrene	100-42-5	<	**4.86E-07**	<	3.22E-08	<	3.08E-06	<	2.99E-08
Methyl tert butyl ether	1634-04-4	<	<	<	<	<	2.36E-07	<	<
Tetrachloroethylene	127-18-4	<	<	7.00E-08	4.78E-08	<	7.36E-08	<	5.62E-08
Toluene	108-88-3	1.20E-06	**3.92E-06**	1.53E-06	4.34E-07	1.26E-06	3.95E-07	7.63E-07	9.55E-07
Trichloroethylene	79-01-6	<	<	<	<	<	<	<	<
Trifluralin	1582-09-8	<	<	<	<	<	<	<	<
Vinyl Acetate	108-05-4	<	<	<	<	1.70E-06	<	<	<
Vinyl Chloride	75-01-4	<	<	<	<	<	<	<	<
NOTES:	Emission factors for all compounds except 2 and 12 were extrapolated. From what?								
	Warm-up mill for the calender is not included in this emission factor.								
	"<" indicates that the analyte was below the limit of detection for all 3 test runs.								

ONLY ORGANIC HAPS TESTED - METALS NOT EXPECTED

See pp -- for cmpds < & NOT ALL THOSE TESTED

see pp -- for synonyms

see pp -- for test methods, terms, etc. < spec org = (cmpds not listed)

4.12-11. Tire Cure Emission Factors

(All EFs in Lbs/Lb Rubber Processed)

No ... ?

Analyte Name	CAS #	Tire A	Tire B	Tire C	Tire D	Tire E	Tire F	Tire G	Tire H	Tire I
Total Method 25A Organics		3.37E-04	2.50E-04	1.46E-04	2.83E-04	1.65E-04	1.80E-04	2.07E-04	2.59E-04	1.86E-04
Total Speciated Organics		1.39E-04	1.46E-04	8.44E-05	1.53E-04	1.55E-04	2.04E-04	1.93E-04	2.91E-04	1.73E-04
Total Organic HAPs		7.95E-05	6.12E-05	2.76E-05	9.10E-05	9.53E-05	8.59E-05	7.42E-05	1.49E-04	7.42E-05
Total Other HAPs ← ?										
Acetonitrile	75-05-8	<	<	<	<	<	<	<	<	<
Acetophenone	98-86-2	7.50E-08	1.60E-07	8.96E-08	1.32E-07	7.05E-08	1.08E-07	1.21E-07	1.31E-07	1.22E-07
Acrolein	107-02-8	<	<	3.86E-07	<	<	<	<	<	<
Acrylonitrile	107-13-1	<	<	<	<	<	<	<	<	<
Allyl Chloride	107-05-1	<	<	<	<	<	<	<	<	<
Aniline	62-53-3	1.76E-06	2.56E-06	5.74E-07	5.70E-06	7.40E-07	4.36E-06	6.99E-07	3.36E-07	7.57E-06
Benzene	71-43-2	1.98E-07	<	2.32E-07	2.03E-07	4.26E-07	3.61E-07	5.38E-07	4.70E-07	4.91E-07
Benzyl chloride	100-44-7	<	<	<	<	<	4.42E-08	<	<	<
Biphenyl	92-52-4	9.53E-08	6.98E-08	4.93E-08	4.03E-08	4.43E-08	<	6.97E-08	4.81E-08	<
Bis(2-Ethylhexyl)phthalate	117-81-7	1.14E-07	1.60E-06	1.36E-07	2.39E-08	<	<	<	2.10E-08	3.98E-08
Bromoform	75-25-2	<	<	<	<	<	<	<	<	<
1,3-Butadiene	106-99-0	<	<	<	<	<	<	<	<	<
Carbon Disulfide	75-15-0	2.56E-05	8.98E-06	2.75E-06	7.19E-07	7.71E-06	4.92E-07	6.05E-06	6.81E-06	2.06E-06
Carbon tetrachloride	56-23-5	<	<	<	<	<	<	<	<	<
Carbonyl sulfide	463-58-1	1.09E-06	<	<	<	<	<	<	<	<
2-Chloroacetophenone	532-27-4	<	<	<	<	3.83E-09	<	<	<	<
Chlorobenzene	108-90-7	<	<	<	<	<	<	<	<	<
Chloroform	67-66-3	<	<	<	<	<	<	6.60E-08	<	<
o-Cresol	95-48-7	1.08E-08	1.39E-08	5.98E-09	<	<	<	7.52E-09	1.95E-08	<
Cumene	98-82-8	1.21E-07	2.02E-07	<	3.34E-07	4.52E-07	<	2.92E-07	6.81E-07	2.06E-07
Dibenzofuran	132-64-9	1.16E-08	1.26E-08	9.54E-09	6.60E-09	3.94E-09	<	6.32E-09	7.25E-09	7.31E-09
1,2-Dibromo-3-chloropropane	96-12-8	<	<	<	4.11E-07	<	<	<	<	<
Dibutylphthalate	84-74-2	2.07E-07	6.42E-07	6.26E-07	1.86E-07	3.14E-07	9.49E-07	1.74E-07	3.76E-07	8.72E-08
1,4-Dichlorobenzene	106-46-7	4.98E-09	6.15E-09	5.63E-09	<	<	6.79E-07	5.61E-08	6.49E-10	8.61E-09
Dimethylphthalate	131-11-3	5.64E-09	2.66E-08	2.22E-08	9.08E-09	5.28E-08	4.06E-09	2.20E-07	1.51E-08	1.38E-08
1,4-Dioxane	123-91-1	<	<	<	<	<	<	<	<	<
Epichlorohydrin	106-89-8	<	<	<	<	<	<	<	<	<
Ethyl benzene	100-41-4	5.28E-06	3.07E-06	9.24E-07	1.18E-05	1.28E-05	1.03E-05	6.73E-06	2.11E-05	7.12E-06
Ethyl chloride	75-00-3	<	<	<	<	<	<	<	<	<
Ethylene dibromide	106-93-4	<	<	<	<	<	<	<	<	<
Ethylene dichloride	107-06-2	<	<	<	<	<	<	<	<	<
Ethylidene dichloride	75-34-3	<	<	<	<	<	7.96E-08	<	<	<
Hexachlorobutadiene	87-68-3	<	<	<	4.11E-07	<	<	<	<	<
Hexane	110-54-3	4.75E-07	1.07E-06	2.46E-07	8.48E-07	3.19E-06	3.04E-06	6.73E-06	7.98E-06	3.44E-06
Isophorone	78-59-1	<	<	2.29E-08	9.08E-09	6.18E-08	4.37E-09	<	<	<
Methyl bromide	74-83-9	1.14E-07	<	<	6.94E-08	<	<	<	<	<
Methyl chloride	74-87-3	9.77E-08	<	7.48E-08	8.73E-08	<	4.92E-08	1.03E-07	9.16E-08	6.63E-08
Methyl chloroform	71-55-6	7.92E-08	<	1.48E-07	<	4.26E-07	1.19E-07	1.32E-07	1.64E-07	1.30E-07
Methyl ethyl ketone	78-93-3	3.96E-07	4.41E-07	4.08E-07	8.73E-07	1.04E-06	1.55E-06	6.05E-07	1.64E-06	7.61E-07
Methyl isobutyl ketone	108-10-1	1.40E-05	1.95E-05	9.51E-06	1.23E-05	9.84E-06	9.60E-06	1.28E-05	1.62E-05	8.84E-06
Methyl tert butyl ether	1634-04-4	<	<	<	<	<	3.04E-07	<	<	<
Methylene chloride	75-09-2	9.77E-07	9.30E-07	1.94E-06	7.45E-06	4.79E-06	5.62E-06	1.01E-06	2.82E-06	3.68E-06
Naphthalene	91-20-3	6.93E-08	7.82E-08	1.50E-07	2.83E-07	2.31E-07	<	1.26E-07	2.47E-07	1.44E-07
Phenol	108-95-2	7.79E-08	5.07E-07	2.21E-07	<	2.16E-07	1.30E-07	5.88E-07	5.86E-07	4.32E-07
Propylene dichloride	78-87-5	<	<	<	<	<	<	<	<	<
Propylene oxide	75-56-9	<	<	<	<	<	<	<	<	<
Styrene	100-42-5	3.96E-07	3.09E-07	2.95E-07	2.83E-07	9.67E-07	3.98E-06	7.85E-07	3.05E-07	8.10E-07
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	2.06E-07	<	<	<	<	<
Tetrachloroethylene	127-18-4	7.66E-08	<	<	<	7.98E-08	2.13E-07	8.97E-08	1.17E-07	<
Toluene	108-88-3	6.60E-06	7.41E-06	2.69E-06	1.23E-05	1.30E-05	1.22E-05	1.08E-05	2.58E-05	1.06E-05
o-Toluidine	95-53-4	1.82E-07	2.88E-07	1.55E-08	<	1.09E-08	7.21E-09	1.30E-07	2.28E-08	<
1,2,4-Trichlorobenzene	120-82-1	<	7.76E-09	<	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<	<	<	<
Trichloroethylene	79-01-6	<	<	<	<	<	<	<	<	1.10E-07
Vinyl acetate	108-05-4	<	<	<	<	<	<	<	<	<
Vinyl chloride	75-01-4	<	<	<	<	<	<	<	<	<
Vinylidene chloride	75-35-4	<	<	<	<	<	5.85E-07	<	<	<
o-Xylene	95-47-6	4.23E-06	2.24E-06	1.05E-06	7.96E-06	9.67E-06	7.73E-06	5.38E-06	1.13E-05	5.89E-06
m-Xylene + p-Xylene		1.72E-05	1.10E-05	5.03E-06	2.83E-05	2.93E-05	2.34E-05	2.00E-05	5.17E-05	2.16E-05

NOTES: Tire A, D and F are original equipment, tires E, G and H are high performance and tires B, C and I are replacement tires.

1,1,1-Trichloroethane for Tire F is average from the other tires tested due to suspected mold release presence not normally used.

tir_5_99.xls
6-7-99 3:18pm 29KB
for web - saved as Excel '97 ...?

4.12-7. Calender Emission Factors

(All EFs in Lbs/Lb Rubber Processed)

need Footnote? BOLD = non-interpolated?

Analyte Name	CAS #	Cmpd #1	Cmpd #2	Cmpd #3	Cmpd #4	Cmpd #5	Cmpd #6	Cmpd #7	Cmpd #8
Total Method 25A Organics		5.33E-05	**5.59E-05**	1.17E-04	3.35E-05	1.86E-04	3.34E-05	1.05E-04	1.27E-05
Total Speciated Organics		3.68E-05	**7.66E-05**	6.47E-05	3.85E-05	4.48E-05	7.14E-05	6.45E-05	5.35E-05
Total Organic HAPs		1.52E-05	**1.27E-05**	4.28E-05	1.84E-05	3.03E-05	3.53E-05	3.04E-05	4.05E-05
Total Other HAPs									
Acetaldehyde	75-07-0	5.04E-07	<	<	<		<	<	<
Acetaldehyde + Isobutane						4.44E-07			
Acetonitrile	75-05-8	<	<	<	<	<	<	<	<
Acetophenone	98-86-2	1.68E-06	**4.94E-07**	3.72E-08	2.72E-09	1.34E-08	5.56E-08	8.95E-08	9.35E-09
Acrolein	107-02-8	<	**7.82E-08**	<	<	<	<	<	<
Acrylonitrile	107-13-1	<	<	<	<	<	<	<	4.94E-08
Allyl chloride	107-05-1	<	<	<	<	<	<	<	<
4-Aminobiphenyl	92-67-1	<	<	<	<	<	<	<	<
Aniline	62-53-3	<	**9.44E-08**	<	3.12E-07	<	7.23E-08	<	5.59E-09
o-Anisidine	90-04-0	<	<	<	<	<	<	<	<
Benzene	71-43-2	3.96E-08	**4.54E-08**	8.21E-08	8.30E-08	2.16E-07	<	6.62E-08	<
Benzidine	92-87-5	<	<	<	<	<	<	<	<
Benzotrichloride	98-07-7	<	<	<	<	<	<	<	<
Benzyl chloride	100-44-7	<	<	<	<	<	<	<	<
Biphenyl	92-52-4	<	**1.78E-08**	4.08E-08	3.93E-09	<	8.52E-09	<	<
Bis(2-ethylhexyl)phthalate	117-81-7	2.83E-08	**7.34E-07**	8.63E-08	<	1.66E-08	1.30E-07	2.42E-08	<
Bromoform	75-25-2	2.02E-07	<	<	<	<	<	<	<
Methyl bromide	74-83-9	<	<	<	<	<	<	<	<
1,3-Butadiene	106-99-0	7.09E-08	<	<	1.57E-07	<	<	3.39E-07	8.17E-08
Carbon disulfide	75-15-0	<	**2.41E-06**	<	1.44E-07	1.33E-07	2.78E-06	<	2.03E-05
Carbon tetrachloride	56-23-5	<	<	8.63E-08	<	<	<	<	<
Carbonyl sulfide	463-58-1	<	<	<	<	3.88E-07	1.16E-06	<	1.63E-05
2-Chloroacetophenone	532-27-4	<	<	<	<	<	<	<	<
Chlorobenzene	108-90-7	<	<	<	<	<	<	<	<
Chloroform	67-66-3	<	<	<	<	<	<	<	<
o-Cresol	95-48-7	<	<	6.26E-08	6.05E-10	9.39E-09	4.35E-09	<	<
Cumene	98-82-8	2.11E-09	**1.29E-06**	2.90E-09	1.21E-09	1.02E-09	8.77E-09	6.02E-08	7.00E-08
Dibenzofuran	132-64-9	<	<	2.48E-08	1.02E-09	<	2.40E-09	<	<
1,2-Dibromo-3-chloropropane	96-12-8	<	<	<	<	<	<	<	<
Dibutylphthalate	84-74-2	5.80E-08	<	3.98E-08	<	<	1.09E-08	<	5.41E-09
1,4-Dichlorobenzene	106-46-7	<	**3.49E-08**	<	<	<	<	<	<
3,3'-Dichlorobenzidine	91-94-1	<	<	<	<	<	<	<	<
Dichloroethyl ether	111-44-4	<	<	<	<	<	<	<	<
3,3'-Dimethoxybenzidine	119-90-4	<	<	<	<	<	<	<	<
Dimethylaminoazobenzene	60-11-7	<	<	<	<	<	<	<	<
N,N-Dimethylaniline	121-69-7	<	<	<	<	<	<	<	<
3,3'-Dimethylbenzidine	119-93-7	<	<	<	<	<	<	<	<
Dimethylphthalate	131-11-3	<	<	1.14E-08	1.13E-09	<	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	<	<	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<	<	<	<
1,4-Dioxane	123-91-1	<	<	<	<	<	<	<	<
Epichlorohydrin	106-89-8	<	<	<	<	<	<	<	<
Ethyl acrylate	140-88-5	<	<	<	<	<	<	<	<
Ethyl benzene	100-41-4	<	**1.57E-07**	1.55E-07	8.46E-08	8.57E-08	1.76E-07	3.14E-06	8.02E-08
Ethyl chloride	75-00-3	<	<	<	<	<	<	<	<
Ethylene dibromide	106-93-4	<	<	<	<	<	<	<	<
Ethylene dichloride	107-06-2	<	**1.22E-07**	<	<	<	<	<	<
Ethylidene dichloride	75-34-3	<	<	<	<	<	<	<	<
Hexachlorobenzene	118-74-1	<	<	6.74E-09	<	<	<	<	<
Hexachlorobutadiene	87-68-3	<	<	<	<	<	<	<	<
Hexachlorocyclopentadiene	77-47-4	<	<	<	<	<	<	<	<
Hexachloroethane	67-72-1	<	<	<	<	<	<	<	<
Hexane	110-54-3	5.98E-06	**5.59E-07**	1.15E-06	1.13E-06	4.29E-06	1.08E-06	7.82E-06	9.26E-07
Hydroquinone	123-31-9	<	**3.73E-08**	<	5.87E-07	1.90E-05	<	<	<
Isophorone	78-59-1	<	**1.30E-07**	<	4.30E-08	<	<	<	<
Methyl chloride	74-87-3	<	**2.18E-08**	<	2.16E-08	<	2.36E-07	<	2.71E-08

4.12-7. Calender Emission Factors

(All EFs in Lbs/Lb Rubber Processed)

Analyte Name	CAS #	Cmpd #1	Cmpd #2	Cmpd #3	Cmpd #4	Cmpd #5	Cmpd #6	Cmpd #7	Cmpd #8
Methyl chloroform	71-55-6	<	**3.89E-08**	2.31E-07	3.07E-08	1.33E-07	<	<	1.94E-08
Methyl ethyl ketone	78-93-3	4.29E-06	**2.61E-07**	6.53E-07	1.98E-06	1.11E-06	3.19E-07	1.02E-06	3.68E-07
Methyl isobutyl ketone	108-10-1	<	**6.42E-07**	9.10E-06	1.08E-05	<	2.22E-05	<	9.20E-08
Methyl tert butyl ether	1634-04-4	<	**<**	<	<	<	2.36E-07	<	<
4,4-Methylene bis(2-chloroaniline)	101-14-4	<	**<**	<	<	<	<	<	<
Methylene chloride	75-09-2	7.98E-07	**4.71E-08**	2.80E-05	1.35E-06	3.03E-07	1.80E-06	8.26E-07	3.49E-07
4,4'-Methylenedianiline	101-77-9	<	**<**	<	<	<	<	<	<
Naphthalene	91-20-3	1.81E-08	**1.21E-07**	2.24E-07	1.25E-08	1.82E-07	3.70E-08	3.13E-08	1.97E-08
Nitrobenzene	98-95-3	<	**<**	<	<	<	<	<	<
4-Nitrobiphenyl	92-93-3	<	**2.04E-09**	<	<	<	<	<	<
4-Nitrophenol	100-02-7	<	**<**	<	<	<	<	<	<
N-Nitrosodimethylamine	62-75-9	<	**<**	<	<	<	<	<	<
N-Nitrosomorpholine	59-89-2	<	**<**	<	<	<	<	<	<
Pentachloronitrobenzene	82-68-8	<	**<**	<	<	<	<	<	<
Pentachlorophenol	87-86-5	<	**<**	<	<	<	<	<	<
Phenol	108-95-2	5.23E-08	**1.49E-07**	2.01E-07	1.07E-08	5.52E-07	3.21E-08	1.74E-08	2.31E-08
p-Phenylenediamine	106-50-3	<	**<**	<	<	<	<	<	<
Propionaldehyde	123-38-6	<	**<**	<	<	<	<	<	<
Propylene dichloride	78-87-5	<	**<**	<	<	<	<	<	<
Propylene oxide	75-56-9	<	**<**	<	<	<	<	<	<
Styrene	100-42-5	<	**4.86E-07**	<	3.22E-08	<	3.08E-06	<	2.99E-08
1,1,2,2-Tetrachloroethane	79-34-5	<	**<**	<	<	<	<	<	<
Tetrachloroethylene	127-18-4	<	**<**	7.00E-08	4.78E-08	<	7.36E-08	<	5.62E-08
Toluene	108-88-3	1.20E-06	**3.92E-06**	1.53E-06	4.34E-07	1.26E-06	3.95E-07	7.63E-07	9.55E-07
o-Toluidine	95-53-4	<	**<**	<	<	<	1.62E-07	<	<
1,2,4-Trichlorobenzene	120-82-1	<	**<**	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	**<**	<	<	<	<	<	<
Trichloroethylene	79-01-6	<	**<**	<	<	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	**<**	<	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	**<**	<	<	<	<	<	<
Trifluralin	1582-09-8	<	**<**	<	<	<	<	<	<
2,2,4-Trimethylpentane	540-84-1	6.49E-08	**2.69E-07**	2.08E-07	6.96E-08	7.47E-08	1.15E-07	1.53E-07	1.78E-07
Vinyl acetate	108-05-4	<	**<**	<	<	1.70E-06	<	<	<
Vinyl chloride	75-01-4	<	**<**	<	<	<	<	<	<
Vinylidene chloride	75-35-4	<	**<**	<	3.97E-07	<	<	<	7.26E-08
o-Xylene	95-47-6	6.96E-08	**2.84E-07**	2.32E-07	2.74E-07	1.10E-07	6.90E-07	5.61E-06	1.12E-07
m-Xylene + p-Xylene		1.90E-07	**2.86E-07**	5.15E-07	3.73E-07	2.98E-07	4.52E-07	1.05E-05	3.15E-07
	NOTES:	Emission factors for all compounds except 2 and 12 were extrapolated.							
		Warm-up mill for the calender is not included in this emission factor. ← why not?							
		"<" indicates that the analyte was below the limit of detection for all 3 test runs.							

4.12-7. Calender Emission Factors

(All EFs in Lbs/Lb Rubber Processed)

Analyte Name	CAS #	Cmpd #9	Cmpd #10	Cmpd #11	Cmpd #12	Cmpd #13	Cmpd #14	Cmpd #15	Cmpd #16
Total Method 25A Organics		2.52E-05	2.52E-04	2.84E-05	**4.62E-06**	1.97E-04	1.98E-04	8.12E-06	7.06E-05
Total Speciated Organics		4.16E-05	2.04E-04	2.55E-05	**4.47E-06**	1.11E-04	1.10E-04	4.44E-05	2.20E-05
Total Organic HAPs		1.11E-05	8.70E-05	8.28E-06	**2.81E-06**	1.16E-05	3.07E-05	4.03E-05	3.41E-06
Total Other HAPs									
Acetaldehyde	75-07-0	<	<	<	<	<	<	3.71E-07	<
Acetaldehyde + Isobutane									
Acetonitrile	75-05-8	<	<	<	<	<	<	<	<
Acetophenone	98-86-2	1.07E-06	6.14E-08	1.66E-07	**1.17E-09**	3.78E-08	1.23E-08	7.97E-09	8.03E-09
Acrolein	107-02-8	<	<	<	<	5.15E-07	5.99E-07	<	<
Acrylonitrile	107-13-1	<	<	<	<	6.91E-07	8.51E-06	<	<
Allyl chloride	107-05-1	<	<	<	<	<	<	<	<
4-Aminobiphenyl	92-67-1	<	<	<	**1.27E-09**	<	<	<	<
Aniline	62-53-3	3.72E-09	3.42E-09	1.73E-08	**9.64E-09**	<	<	<	<
o-Anisidine	90-04-0	<	<	<	<	<	<	<	<
Benzene	71-43-2	3.55E-08	<	<	**1.33E-09**	4.79E-07	3.80E-07	1.26E-08	1.89E-08
Benzidine	92-87-5	<	<	<	<	<	<	1.31E-08	<
Benzotrichloride	98-07-7	<	<	<	<	<	<	<	<
Benzyl chloride	100-44-7	<	<	<	<	<	<	<	<
Biphenyl	92-52-4	<	<	<	**8.88E-10**	<	8.96E-10	<	<
Bis(2-ethylhexyl)phthalate	117-81-7	5.12E-09	<	1.95E-07	**9.35E-10**	5.36E-07	<	3.33E-08	2.57E-08
Bromoform	75-25-2	<	<	<	<	<	<	<	<
Methyl bromide	74-83-9	<	<	<	<	<	<	<	<
1,3-Butadiene	106-99-0	1.23E-07	<	2.77E-07	<	8.14E-08	1.74E-07	4.47E-08	<
Carbon disulfide	75-15-0	4.83E-07	7.43E-05	6.27E-06	**2.61E-06**	6.03E-07	3.09E-06	1.11E-07	3.27E-08
Carbon tetrachloride	56-23-5	<	<	<	<	<	<	3.39E-05	<
Carbonyl sulfide	463-58-1	8.32E-07	<	<	**4.19E-08**	4.25E-07	8.20E-06	1.98E-06	<
2-Chloroacetophenone	532-27-4	<	3.96E-10	<	<	<	<	<	<
Chlorobenzene	108-90-7	<	<	<	<	<	<	<	<
Chloroform	67-66-3	<	<	<	<	<	1.78E-08	4.72E-07	8.92E-09
o-Cresol	95-48-7	<	<	<	**1.86E-10**	<	<	<	<
Cumene	98-82-8	2.30E-06	6.39E-07	1.94E-09	**7.05E-10**	7.15E-08	<	2.12E-09	<
Dibenzofuran	132-64-9	<	<	<	**1.95E-10**	<	1.75E-09	5.37E-10	<
1,2-Dibromo-3-chloropropane	96-12-8	<	<	<	<	<	<	<	<
Dibutylphthalate	84-74-2	9.52E-10	1.07E-08	<	**2.62E-10**	2.42E-07	6.49E-09	<	2.67E-09
1,4-Dichlorobenzene	106-46-7	<	<	<	<	<	<	<	<
3,3'-Dichlorobenzidine	91-94-1	<	<	<	<	<	<	<	<
Dichloroethyl ether	111-44-4	<	<	<	<	<	<	<	<
3,3'-Dimethoxybenzidine	119-90-4	<	<	<	<	<	<	<	<
Dimethylaminoazobenzene	60-11-7	<	<	<	<	<	<	1.19E-08	<
N,N-Dimethylaniline	121-69-7	<	<	<	<	<	<	<	<
3,3'-Dimethylbenzidine	119-93-7	<	<	<	<	<	<	<	<
Dimethylphthalate	131-11-3	<	<	<	<	<	2.18E-09	1.58E-09	2.26E-09
2,4-Dinitrophenol	51-28-5	<	<	<	<	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<	<	<	<
1,4-Dioxane	123-91-1	<	<	<	<	<	<	<	<
Epichlorohydrin	106-89-8	<	<	<	<	<	<	<	<
Ethyl acrylate	140-88-5	<	<	<	<	<	<	<	<
Ethyl benzene	100-41-4	5.34E-08	<	4.94E-08	**2.06E-09**	1.51E-07	4.44E-08	3.51E-08	<
Ethyl chloride	75-00-3	<	<	<	<	<	<	<	1.23E-06
Ethylene dibromide	106-93-4	<	<	<	<	<	<	<	<
Ethylene dichloride	107-06-2	<	<	<	<	<	<	<	<
Ethylidene dichloride	75-34-3	<	<	<	<	<	<	<	<
Hexachlorobenzene	118-74-1	<	<	<	<	<	<	<	<
Hexachlorobutadiene	87-68-3	<	<	<	<	<	<	<	<
Hexachlorocyclopentadiene	77-47-4	<	<	<	<	<	<	<	<
Hexachloroethane	67-72-1	<	<	<	<	<	<	8.93E-07	<
Hexane	110-54-3	2.33E-06	1.20E-06	2.06E-07	**3.83E-08**	1.48E-06	4.92E-07	5.71E-07	1.32E-06
Hydroquinone	123-31-9	<	<	<	<	<	<	<	<
Isophorone	78-59-1	<	<	<	<	<	<	<	<
Methyl chloride	74-87-3	2.30E-08	6.73E-08	<	<	4.66E-08	2.62E-08	7.42E-08	1.04E-08

4.12-7. Calender Emission Factors

(All EFs in Lbs/Lb Rubber Processed)

Analyte Name	CAS #	Cmpd #9	Cmpd #10	Cmpd #11	Cmpd #12	Cmpd #13	Cmpd #14	Cmpd #15	Cmpd #16
Methyl chloroform	71-55-6	5.29E-08	9.73E-08	<	<	3.86E-08	2.62E-08	1.33E-08	1.27E-08
Methyl ethyl ketone	78-93-3	3.57E-07	8.58E-07	6.27E-08	<	2.33E-07	2.24E-07	6.36E-08	2.87E-08
Methyl isobutyl ketone	108-10-1	8.97E-08	3.01E-07	4.92E-08	<	7.16E-08	5.99E-07	3.55E-08	6.26E-08
Methyl tert butyl ether	1634-04-4	<	<	<	<	<	<	<	<
4,4-Methylene bis(2-chloroaniline)	101-14-4	<	<	<	<	<	<	<	<
Methylene chloride	75-09-2	5.06E-07	6.56E-06	3.62E-07	**3.25E-08**	1.61E-07	1.22E-06	5.09E-07	3.63E-07
4,4'-Methylenedianiline	101-77-9	<	<	<	<	<	<	<	<
Naphthalene	91-20-3	2.02E-08	5.93E-09	6.43E-09	**2.21E-09**	8.29E-09	<	2.01E-08	8.16E-09
Nitrobenzene	98-95-3	<	<	1.46E-08	<	<	<	<	<
4-Nitrobiphenyl	92-93-3	<	<	<	<	<	<	<	<
4-Nitrophenol	100-02-7	<	<	<	<	<	<	<	<
N-Nitrosodimethylamine	62-75-9	<	<	<	<	<	<	<	<
N-Nitrosomorpholine	59-89-2	<	<	<	<	<	<	<	<
Pentachloronitrobenzene	82-68-8	<	<	<	<	<	<	<	<
Pentachlorophenol	87-86-5	<	<	<	<	3.28E-09	<	<	<
Phenol	108-95-2	4.31E-08	8.74E-09	6.67E-09	<	3.04E-08	3.86E-08	1.95E-08	3.31E-08
p-Phenylenediamine	106-50-3	<	<	<	<	<	<	<	<
Propionaldehyde	123-38-6	<	<	<	<	2.41E-06	<	<	<
Propylene dichloride	78-87-5	<	<	<	<	<	<	<	<
Propylene oxide	75-56-9	<	<	<	<	<	5.05E-06	<	<
Styrene	100-42-5	1.18E-07	1.58E-07	3.64E-08	**7.73E-10**	3.92E-08	4.71E-08	<	<
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<	<	<	<
Tetrachloroethylene	127-18-4	8.17E-08	8.85E-08	1.75E-08	<	9.65E-08	1.03E-07	5.04E-07	<
Toluene	108-88-3	1.64E-06	1.34E-06	2.84E-07	**5.73E-08**	2.03E-06	1.13E-06	2.29E-07	1.27E-07
o-Toluidine	95-53-4	<	<	<	<	<	<	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<	<	<
Trichloroethylene	79-01-6	<	<	<	<	1.61E-07	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<	<	<	<
Trifluralin	1582-09-8	<	<	<	<	<	<	<	<
2,2,4-Trimethylpentane	540-84-1	2.80E-07	2.31E-07	5.32E-08	**2.27E-09**	1.72E-07	1.89E-07	3.46E-08	<
Vinyl acetate	108-05-4	<	<	<	<	<	<	<	<
Vinyl chloride	75-01-4	<	<	<	<	<	<	9.54E-09	<
Vinylidene chloride	75-35-4	1.38E-07	<	<	<	<	1.59E-07	1.01E-08	<
o-Xylene	95-47-6	1.21E-07	2.83E-07	9.63E-08	**2.45E-09**	2.57E-07	1.24E-07	5.85E-08	3.98E-08
m-Xylene + p-Xylene		3.49E-07	7.83E-07	1.09E-07	**6.09E-09**	5.77E-07	2.43E-07	2.22E-07	7.76E-08
	NOTES:	Emission factors for all compounds except 2 and 12 were extrapolated.							
		Warm-up mill for the calender is not included in this emission factor.							
		"<" indicates that the analyte was below the limit of detection for all 3 test runs.							

4.12-7. Calender Emission Factors

(All EFs in Lbs/Lb Rubber Processed)

Analyte Name	CAS #	Cmpd #17	Cmpd #18	Cmpd #19	Cmpd #20	Cmpd #21	Cmpd #22	Cmpd #23
Total Method 25A Organics		3.84E-04	5.62E-05	2.39E-05	6.50E-06	1.35E-04	1.06E-04	2.65E-05
Total Speciated Organics		2.17E-04	8.90E-05	1.44E-05	1.00E-05	9.71E-05	6.07E-05	2.57E-05
Total Organic HAPs		1.02E-04	3.38E-05	2.67E-06	4.83E-06	8.17E-06	2.16E-05	2.15E-05
Total Other HAPs								
Acetaldehyde	75-07-0	<	<	<	<	<	<	<
Acetaldehyde + Isobutane								
Acetonitrile	75-05-8	<	<	3.36E-07	<	<	<	<
Acetophenone	98-86-2	1.05E-08	4.15E-08	1.80E-08	1.16E-07	1.27E-08	2.12E-08	6.54E-09
Acrolein	107-02-8	<	<	<	<	1.65E-07	2.18E-07	<
Acrylonitrile	107-13-1	<	5.80E-07	<	<	<	<	<
Allyl chloride	107-05-1	<	<	<	<	<	<	<
4-Aminobiphenyl	92-67-1	<	<	<	<	<	<	<
Aniline	62-53-3	3.72E-07	1.20E-07	<	5.22E-09	<	3.40E-07	1.61E-07
o-Anisidine	90-04-0	<	<	<	<	<	<	<
Benzene	71-43-2	<	2.74E-08	1.03E-07	4.29E-08	<	6.43E-08	<
Benzidine	92-87-5	<	<	<	<	<	<	<
Benzotrichloride	98-07-7	<	<	<	<	<	<	<
Benzyl chloride	100-44-7	<	<	<	<	<	<	<
Biphenyl	92-52-4	<	<	<	<	<	7.08E-09	<
Bis(2-ethylhexyl)phthalate	117-81-7	1.74E-09	1.60E-08	9.48E-09	3.28E-08	9.53E-08	6.09E-09	4.88E-07
Bromoform	75-25-2	<	<	<	<	<	<	<
Methyl bromide	74-83-9	<	<	4.08E-08	<	<	<	<
1,3-Butadiene	106-99-0	<	1.31E-07	4.20E-08	<	<	9.47E-08	1.03E-07
Carbon disulfide	75-15-0	<	2.57E-05	<	1.88E-07	3.16E-08	6.93E-08	3.68E-07
Carbon tetrachloride	56-23-5	<	<	<	<	<	<	1.71E-07
Carbonyl sulfide	463-58-1	<	<	1.22E-07	1.14E-06	2.55E-07	<	2.09E-06
2-Chloroacetophenone	532-27-4	<	<	<	<	<	<	<
Chlorobenzene	108-90-7	<	<	<	<	<	<	<
Chloroform	67-66-3	<	<	<	<	1.25E-08	<	<
o-Cresol	95-48-7	<	<	<	7.35E-10	<	<	<
Cumene	98-82-8	6.84E-09	8.75E-08	7.66E-07	3.78E-09	2.03E-08	4.07E-08	1.44E-09
Dibenzofuran	132-64-9	<	<	<	6.98E-10	2.22E-10	<	3.85E-10
1,2-Dibromo-3-chloropropane	96-12-8	<	<	<	<	<	<	<
Dibutylphthalate	84-74-2	<	6.00E-08	2.11E-08	1.58E-08	2.07E-07	2.59E-08	6.37E-08
1,4-Dichlorobenzene	106-46-7	<	<	<	<	<	<	<
3,3'-Dichlorobenzidine	91-94-1	<	<	<	<	<	<	<
Dichloroethyl ether	111-44-4	<	<	<	<	<	<	<
3,3'-Dimethoxybenzidine	119-90-4	<	<	<	<	<	<	<
Dimethylaminoazobenzene	60-11-7	<	<	<	<	<	<	<
N,N-Dimethylaniline	121-69-7	<	<	<	<	<	<	<
3,3'-Dimethylbenzidine	119-93-7	<	<	<	<	<	<	<
Dimethylphthalate	131-11-3	<	<	<	<	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	1.17E-08	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<	<	<
1,4-Dioxane	123-91-1	<	<	<	<	<	<	<
Epichlorohydrin	106-89-8	<	<	<	<	<	<	<
Ethyl acrylate	140-88-5	3.43E-06	<	<	<	<	<	<
Ethyl benzene	100-41-4	<	2.01E-07	2.35E-08	5.75E-08	<	9.29E-08	<
Ethyl chloride	75-00-3	1.46E-07	<	<	3.07E-07	<	<	<
Ethylene dibromide	106-93-4	<	<	<	<	<	<	<
Ethylene dichloride	107-06-2	<	<	<	<	<	<	<
Ethylidene dichloride	75-34-3	<	<	<	<	<	<	<
Hexachlorobenzene	118-74-1	<	<	<	<	<	<	<
Hexachlorobutadiene	87-68-3	<	<	<	<	<	<	<
Hexachlorocyclopentadiene	77-47-4	<	<	<	<	<	<	<
Hexachloroethane	67-72-1	<	<	<	<	<	<	4.39E-09
Hexane	110-54-3	8.19E-05	2.92E-07	1.72E-07	3.52E-07	1.84E-07	5.62E-07	4.51E-07
Hydroquinone	123-31-9	<	<	<	<	<	<	<
Isophorone	78-59-1	<	<	<	<	2.85E-09	2.44E-07	<
Methyl chloride	74-87-3	6.43E-07	<	1.08E-07	2.43E-07	2.85E-07	2.77E-08	<

4.12-7. Calender Emission Factors

(All EFs in Lbs/Lb Rubber Processed)

Analyte Name	CAS #	Cmpd #17	Cmpd #18	Cmpd #19	Cmpd #20	Cmpd #21	Cmpd #22	Cmpd #23
Methyl chloroform	71-55-6	4.37E-08	<	8.27E-08	5.30E-07	7.57E-09	4.75E-08	<
Methyl ethyl ketone	78-93-3	7.54E-07	9.11E-07	4.57E-08	9.42E-08	3.43E-07	3.17E-06	<
Methyl isobutyl ketone	108-10-1	1.20E-07	3.31E-06	<	1.39E-07	2.00E-08	9.90E-06	<
Methyl tert butyl ether	1634-04-4	<	<	<	<	5.79E-06	<	<
4,4-Methylene bis(2-chloroaniline)	101-14-4	<	<	<	<	<	<	<
Methylene chloride	75-09-2	1.20E-05	6.30E-07	2.71E-07	7.44E-07	2.05E-07	7.33E-07	7.94E-07
4,4'-Methylenedianiline	101-77-9	<	<	<	<	<	<	<
Naphthalene	91-20-3	2.91E-08	2.40E-08	8.92E-09	1.24E-08	9.06E-09	4.00E-08	2.30E-08
Nitrobenzene	98-95-3	<	<	<	<	<	<	<
4-Nitrobiphenyl	92-93-3	<	<	<	<	<	<	<
4-Nitrophenol	100-02-7	<	<	7.18E-09	<	<	<	<
N-Nitrosodimethylamine	62-75-9	<	<	<	<	<	<	<
N-Nitrosomorpholine	59-89-2	<	<	<	<	<	<	<
Pentachloronitrobenzene	82-68-8	<	<	<	<	<	<	<
Pentachlorophenol	87-86-5	<	<	9.07E-09	<	<	<	<
Phenol	108-95-2	9.21E-07	4.08E-08	<	1.34E-08	6.78E-09	4.98E-07	9.04E-09
p-Phenylenediamine	106-50-3	<	<	<	<	<	<	<
Propionaldehyde	123-38-6	<	<	<	<	<	<	<
Propylene dichloride	78-87-5	<	<	<	<	<	<	<
Propylene oxide	75-56-9	<	<	<	<	<	<	<
Styrene	100-42-5	<	3.95E-08	<	<	4.58E-08	1.07E-06	<
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<	<	<
Tetrachloroethylene	127-18-4	<	5.55E-08	2.04E-08	5.50E-08	<	1.39E-06	<
Toluene	108-88-3	7.51E-07	4.99E-07	3.14E-07	3.45E-07	1.00E-07	1.79E-06	1.67E-05
o-Toluidine	95-53-4	<	<	<	<	<	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<	<
Trichloroethylene	79-01-6	<	<	<	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<	<	<
Trifluralin	1582-09-8	<	<	<	<	<	<	<
2,2,4-Trimethylpentane	540-84-1	<	5.41E-08	3.31E-08	5.00E-08	1.53E-07	5.76E-07	<
Vinyl acetate	108-05-4	<	<	<	<	<	<	<
Vinyl chloride	75-01-4	<	<	<	<	<	<	<
Vinylidene chloride	75-35-4	<	6.38E-08	<	<	<	<	<
o-Xylene	95-47-6	3.69E-07	2.65E-07	3.49E-08	9.03E-08	1.16E-07	2.62E-07	<
m-Xylene + p-Xylene		3.45E-07	6.40E-07	7.29E-08	2.44E-07	1.03E-07	3.06E-07	8.54E-08
	NOTES:	Emission factors for all compounds except 2 and 12 were extrapolated.						
		Warm-up mill for the calender is not included in this emission factor.						
		"<" indicates that the analyte was below the limit of detection for all 3 test runs.						

= name changed to CAA

= sort by

= no capital

Table 4.12-11. TIRE CURE EMISSION FACTORS

these #5 (tire A) all increase by 16.57%

(mult than by 1.1657) to get updated #5

Analyte Name	CAS #	Tire A lb/lb rubber	Tire B lb/lb rubber	Tire C lb/lb rubber	Tire D lb/lb rubber	Tire E lb/lb rubber	Tire F lb/lb rubber
Total Method 25A Organics		2.90e-04	2.13e-04	1.21e-04	2.43e-04	1.44e-04	1.56e-04
Total Speciated Organics		1.19e-04	1.24e-04	7.00e-05	1.32e-04	1.36e-04	1.76e-04
Total Organic HAPs		6.82e-05	5.20e-05	2.29e-05	7.83e-05	8.32e-05	7.42e-05
Total HAPs		6.82e-05	5.20e-05	2.29e-05	7.83e-05	8.32e-05	7.42e-05
1,1,1-Trichloroethane Methyl chl	71-55-6	6.80e-08	<	1.23e-07	<	3.71e-07	1.03e-07
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	1.77e-07	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<
1,1-Dichloroethane Ethylidene di	75-34-3	<	<	<	<	<	6.88e-08
1,1-Dichloroethene Vinylidene ch	75-35-4	<	<	<	<	<	5.06e-07
1,2,4-Trichlorobenzene	120-82-1	<	6.60e-09	<	<	<	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<	3.53e-07	<	<
1,2-Dibromoethane Ethylene di	106-93-4	<	<	<	<	<	<
1,2-Dichloroethane Ethylene di	107-06-2	<	<	<	<	<	<
1,2-Dichloropropane Propylene di	78-87-5	<	<	<	<	<	<
1,3-Butadiene	106-99-0	<	<	<	<	<	<
1,4-Dichlorobenzene	106-46-7	4.27e-09	5.23e-09	4.67e-09	<	<	5.87e-07
1,4-Dioxane	123-91-1	<	<	<	<	<	<
2-Butanone Methyl ethyl Ket	78-93-3	3.40e-07	3.75e-07	3.38e-07	7.51e-07	9.06e-07	1.33e-06
2-Chloroacetophenone	532-27-4	<	<	<	<	3.35e-09	<
2-Methylphenol o-Cresol	95-48-7	9.30e-09	1.18e-08	4.96e-09	<	<	<
4-Methyl-2-Pentanone Methyl isobutyl	108-10-1	1.20e-05	1.66e-05	7.90e-06	1.06e-05	8.59e-06	8.29e-06
Acetonitrile	75-05-8	<	<	<	<	<	<
Acetophenone	98-86-2	6.43e-08	1.27e-07	7.44e-08	1.14e-07	6.16e-08	9.32e-08

because they were orig. divided by wt. of ~~tire~~; but should have been divided by wt. of rubber in the tire.

so ~~16.5~~ tire is 1-16.57% rubber? (for Tire A)

other tires range from 14.5 to 20.5

Avg. of 16.7% increase

WP version of this table.
-Replaced 6-7-99 by tir_5.99.xls

Table 4.12-11. TIRE CURE EMISSION FACTORS

Analyte Name	CAS #	Tire A lb/lb rubber	Tire B lb/lb rubber	Tire C lb/lb rubber	Tire D lb/lb rubber	Tire E lb/lb rubber	Tire F lb/lb rubber
Acrolein	107-02-8	<	<	3.19e-07	<	<	<
Acrylonitrile	107-13-1	<	<	<	<	<	<
Allyl Chloride	107-05-1	<	<	<	<	<	<
Aniline	62-53-3	1.51e-06	2.18e-06	4.77e-07	4.91e-06	6.46e-07	3.76e-06
Benzene	71-43-2	1.70e-07	<	1.93e-07	1.75e-07	3.71e-07	3.03e-07
Benzyl Chloride	100-44-7	<	<	<	<	<	3.82e-08
Biphenyl	92-52-4	8.18e-08	5.93e-08	4.09e-08	3.47e-08	3.87e-08	<
bis(2-Ethylhexyl)phthalate	117-81-7	9.77e-08	1.36e-06	1.13e-07	2.06e-08	<	<
Bromoform	75-25-2	<	<	<	<	<	<
Bromomethane Methyl bromide	74-83-9	9.74e-08	<	<	5.97e-08	<	<
Carbon Disulfide	75-15-0	2.20e-05	7.64e-06	2.28e-06	6.19e-07	6.73e-06	4.25e-07
Carbon Tetrachloride	56-23-5	<	<	<	<	<	<
Carbonyl Sulfide	463-58-1	9.34e-07	<	<	<	<	<
Chlorobenzene	108-90-7	<	<	<	<	<	<
Chloroethane Ethyl chloride	75-00-3	<	<	<	<	<	<
Chloroform	67-66-3	<	<	<	<	<	<
Chloromethane Methyl chloride	74-87-3	8.38e-08	<	6.20e-08	7.51e-08	<	4.25e-08
Cumene	98-82-8	1.04e-07	1.71e-07	<	2.87e-07	3.95e-07	<
Di-n-butylphthalate	84-74-2	1.77e-07	5.46e-07	5.20e-07	1.60e-07	2.74e-07	8.20e-07
Dibenzofuran	132-64-9	9.96e-09	1.07e-08	7.92e-09	5.68e-09	3.44e-09	<
Dimethylphthalate	131-11-3	4.84e-09	2.26e-08	1.85e-08	7.81e-09	4.61e-08	3.51e-09
Epichlorohydrin	106-89-8	<	<	<	<	<	<
Ethylbenzene	100-41-4	4.53e-06	2.61e-06	7.67e-07	1.02e-05	1.11e-05	8.90e-06

SP

Table 4.12-11. TIRE CURE EMISSION FACTORS

Analyte Name	CAS #	Tire A lb/lb rubber	Tire B lb/lb rubber	Tire C lb/lb rubber	Tire D lb/lb rubber	Tire E lb/lb rubber	Tire F lb/lb rubber
Hexachlorobutadiene	87-68-3	<	<	<	3.53e-07	<	<
Hexane	110-54-3	4.08e-07	9.11e-07	2.04e-07	7.29e-07	2.79e-06	2.63e-06
Isophorone	78-59-1	<	<	1.90e-08	7.81e-09	5.39e-08	3.77e-09
m-Xylene + p-Xylene		1.47e-05	9.38e-06	4.17e-06	2.43e-05	2.55e-05	2.02e-05
Methylene Chloride	75-09-2	8.38e-07	7.90e-07	1.61e-06	6.41e-06	4.18e-06	4.85e-06
Naphthalene	91-20-3	5.95e-08	6.65e-08	1.24e-07	2.43e-07	2.02e-07	<
o-Toluidine	95-53-4	1.57e-07	2.45e-07	1.28e-08	<	9.48e-09	6.23e-09
o-Xylene	95-47-6	3.63e-06	1.90e-06	8.69e-07	6.85e-06	8.36e-06	6.67e-06
Phenol	108-95-2	6.68e-08	4.31e-07	1.84e-07	<	1.89e-07	1.12e-07
Propylene Oxide	75-56-9	<	<	<	<	<	<
Styrene	100-42-5	3.40e-07	2.63e-07	2.45e-07	2.43e-07	8.36e-07	3.44e-06
t-Butyl Methyl Ether *Methyl tert*	1634-04-4	<	<	<	<	<	2.63e-07
Tetrachloroethene *Tetrachloroethylene*	127-18-4	6.57e-08	<	<	<	6.97e-08	1.84e-07
Toluene	108-88-3	5.67e-06	6.30e-06	2.23e-06	1.06e-05	1.14e-05	1.05e-05
Trichloroethene *Trichloroethylene*	79-01-6	<	<	<	<	<	<
Vinyl Acetate	108-05-4	<	<	<	<	<	<
Vinyl Chloride	75-01-4	<	<	<	<	<	<

Tire A, D and F are original equipment, tires E, G and H are high performance and tires B, C and I are replacement tires.

1,1,1-Trichloroethane for Tire F is not included in the Total HAPs or in the statistical summary due to its suspected presence from mold release agents.

Table 4.12-11. TIRE CURE EMISSION FACTORS

Analyte Name	CAS #	Tire G lb/lb rubber	Tire H lb/lb rubber	Tire I lb/lb rubber
Total Method 25A Organics		1.80e-04	2.23e-04	1.58e-04
Total Speciated Organics		1.68e-04	2.50e-04	1.47e-04
Total Organic HAPs		6.45e-05	1.28e-04	6.30e-05
Total HAPs		6.45e-05	1.28e-04	6.30e-05
1,1,1-Trichloroethane	71-55-6	1.15e-07	1.41e-07	1.10e-07
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<
1,1-Dichloroethane	75-34-3	<	<	<
1,1-Dichloroethene	75-35-4	<	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<
1,2-Dibromoethane	106-93-4	<	<	<
1,2-Dichloroethane	107-06-2	<	<	<
1,2-Dichloropropane	78-87-5	<	<	<
1,3-Butadiene	106-99-0	<	<	<
1,4-Dichlorobenzene	106-46-7	4.87e-08	5.58e-10	7.31e-09
1,4-Dioxane	123-91-1	<	<	<
2-Butanone	78-93-3	5.26e-07	1.41e-06	6.46e-07
2-Chloroacetophenone	532-27-4	<	<	<
2-Methylphenol	95-48-7	6.53e-09	1.67e-08	<
4-Methyl-2-Pentanone	108-10-1	1.11e-05	1.39e-05	7.50e-06
Acetonitrile	75-05-8	<	<	<
Acetophenone	98-86-2	1.05e-07	1.13e-07	1.04e-07

TIRE CURE
HAPS EMISSION FACTOR SUMMARY

Analyte Name	CAS #	Tire G lb/lb rubber	Tire H lb/lb rubber	Tire I lb/lb rubber
Acrolein	107-02-8	<	<	<
Acrylonitrile	107-13-1	<	<	<
Allyl Chloride	107-05-1	<	<	<
Aniline	62-53-3	6.07e-07	2.89e-07	6.43e-06
Benzene	71-43-2	4.68e-07	4.04e-07	4.17e-07
Benzyl Chloride	100-44-7	<	<	<
Biphenyl	92-52-4	6.06e-08	4.14e-08	<
bis(2-Ethylhexyl)phthalate	117-81-7	<	1.80e-08	3.38e-08
Bromoform	75-25-2	<	<	<
Bromomethane	74-83-9	<	<	<
Carbon Disulfide	75-15-0	5.26e-06	5.86e-06	1.75e-06
Carbon Tetrachloride	56-23-5	<	<	<
Carbonyl Sulfide	463-58-1	<	<	<
Chlorobenzene	108-90-7	<	<	<
Chloroethane	75-00-3	<	<	<
Chloroform	67-66-3	5.65e-08	<	<
Chloromethane	74-87-3	8.96e-08	7.88e-08	5.63e-08
Cumene	98-82-8	2.53e-07	5.86e-07	1.75e-07
Di-n-butylphthalate	84-74-2	1.52e-07	3.24e-07	7.41e-08
Dibenzofuran	132-64-9	5.49e-09	6.23e-09	6.20e-09
Dimethylphthalate	131-11-3	1.91e-07	1.30e-08	1.18e-08
Epichlorohydrin	106-89-8	<	<	<
Ethylbenzene	100-41-4	5.85e-06	1.82e-05	6.04e-06

TIRE CURE
HAPS EMISSION FACTOR SUMMARY

Analyte Name	CAS #	Tire G lb/lb rubber	Tire H lb/lb rubber	Tire I lb/lb rubber
Hexachlorobutadiene	87-68-3	<	<	<
Hexane	110-54-3	5.85e-06	6.87e-06	2.92e-06
Isophorone	78-59-1	<	<	<
m-Xylene + p-Xylene		1.73e-05	4.44e-05	1.83e-05
Methylene Chloride	75-09-2	8.77e-07	2.42e-06	3.13e-06
Naphthalene	91-20-3	1.10e-07	2.12e-07	1.22e-07
o-Toluidine	95-53-4	1.13e-07	1.96e-08	<
o-Xylene	95-47-6	4.68e-06	9.69e-06	5.00e-06
Phenol	108-95-2	5.11e-07	5.04e-07	3.67e-07
Propylene Oxide	75-56-9	<	<	<
Styrene	100-42-5	6.82e-07	2.63e-07	6.88e-07
t-Butyl Methyl Ether	1634-04-4	<	<	<
Tetrachloroethene	127-18-4	7.79e-08	1.01e-07	<
Toluene	108-88-3	9.35e-06	2.22e-05	8.96e-06
Trichloroethene	79-01-6	<	<	9.38e-08
Vinyl Acetate	108-05-4	<	<	<
Vinyl Chloride	75-01-4	<	<	<

Tire A, D and F are original equipment, tires E, G and H are high performance and tires B, C and I are replacement tires.

1,1,1-Trichloroethane for Tire F is not included in the Total HAPs or in the statistical summary due to its suspected presence from mold release agents. — ?

Note
on HAPs is
different
Why wouldn't
it get included ??

4.12-11. Tire Cure Emission Factors

(All EFs in Lbs/Lb Rubber Processed)

Analyte Name	CAS #	Tire A	Tire B	Tire C	Tire D	Tire E	Tire F	Tire G	Tire H	Tire I
Total Method 25A Organics		3.37E-04	2.50E-04	1.46E-04	2.83E-04	1.65E-04	1.80E-04	2.07E-04	2.59E-04	1.86E-04
Total Speciated Organics		1.39E-04	1.46E-04	8.44E-05	1.53E-04	1.55E-04	2.04E-04	1.93E-04	2.91E-04	1.73E-04
Total Organic HAPs		7.95E-05	6.12E-05	2.76E-05	9.10E-05	9.53E-05	8.59E-05	7.42E-05	1.49E-04	7.42E-05
Total Other HAPs										
Acetonitrile	75-05-8	<	<	<	<	<	<	<	<	<
Acetophenone	98-86-2	7.50E-08	1.50E-07	8.96E-08	1.32E-07	7.05E-08	1.08E-07	1.21E-07	1.31E-07	1.22E-07
Acrolein	107-02-8	<	<	3.85E-07	<	<	<	<	<	<
Acrylonitrile	107-13-1	<	<	<	<	<	<	<	<	<
Allyl Chloride	107-05-1	<	<	<	<	<	<	<	<	<
Aniline	62-53-3	1.76E-06	2.56E-06	5.74E-07	5.70E-06	7.40E-07	4.36E-06	6.99E-07	3.36E-07	7.57E-06
Benzene	71-43-2	1.98E-07	<	2.32E-07	2.03E-07	4.26E-07	3.51E-07	5.38E-07	4.70E-07	4.91E-07
Benzyl chloride	100-44-7	<	<	<	<	<	4.42E-08	<	<	<
Biphenyl	92-52-4	9.53E-08	6.98E-08	4.93E-08	4.03E-08	4.43E-08	<	6.97E-08	4.81E-08	<
bis(2-Ethylhexyl)phthalate	117-81-7	1.14E-07	1.60E-06	1.36E-07	2.39E-08	<	<	<	2.10E-08	3.98E-08
Bromoform	75-25-2	<	<	<	<	<	<	<	<	<
1,3-Butadiene	106-99-0	<	<	<	<	<	<	<	<	<
Carbon Disulfide	75-15-0	2.56E-05	8.98E-06	2.75E-06	7.19E-07	7.71E-06	4.92E-07	6.05E-06	6.81E-06	2.06E-06
Carbon tetrachloride	56-23-5	<	<	<	<	<	<	<	<	<
Carbonyl sulfide	463-58-1	1.09E-06	<	<	<	<	<	<	<	<
2-Chloroacetophenone	532-27-4	<	<	<	<	3.83E-09	<	<	<	<
Chlorobenzene	108-90-7	<	<	<	<	<	<	<	<	<
Chloroform	67-66-3	<	<	<	<	<	<	6.50E-08	<	<
o-Cresol	95-48-7	1.08E-08	1.39E-08	5.98E-09	<	<	<	7.52E-09	1.95E-08	<
Cumene	98-82-8	1.21E-07	2.02E-07	<	3.34E-07	4.52E-07	<	2.92E-07	6.81E-07	2.06E-07
Dibenzofuran	132-64-9	1.16E-08	1.26E-08	9.54E-09	6.60E-09	3.94E-09	<	6.32E-09	7.25E-09	7.31E-09
1,2-Dibromo-3-chloropropane	96-12-8	<	<	<	4.11E-07	<	<	<	<	<
Dibutylphthalate	84-74-2	2.07E-07	6.42E-07	6.26E-07	1.86E-07	3.14E-07	9.49E-07	1.74E-07	3.76E-07	8.72E-08
1,4-Dichlorobenzene	106-46-7	4.98E-09	6.15E-09	5.63E-09	<	<	6.79E-07	5.61E-08	6.49E-10	8.61E-09
Dimethylphthalate	131-11-3	5.64E-09	2.66E-08	2.22E-08	9.08E-09	5.28E-08	4.06E-09	2.20E-07	1.51E-08	1.38E-08
1,4-Dioxane	123-91-1	<	<	<	<	<	<	<	<	<
Epichlorohydrin	106-89-8	<	<	<	<	<	<	<	<	<
Ethyl benzene	100-41-4	5.28E-06	3.07E-06	9.24E-07	1.18E-05	1.28E-05	1.03E-05	6.73E-06	2.11E-05	7.12E-06
Ethyl chloride	75-00-3	<	<	<	<	<	<	<	<	<
Ethylene dibromide	106-93-4	<	<	<	<	<	<	<	<	<
Ethylene dichloride	107-06-2	<	<	<	<	<	<	<	<	<
Ethylidene dichloride	75-34-3	<	<	<	<	<	7.96E-08	<	<	<
Hexachlorobutadiene	87-68-3	<	<	<	4.11E-07	<	<	<	<	<
Hexane	110-54-3	4.75E-07	1.07E-06	2.46E-07	8.48E-07	3.19E-06	3.04E-06	6.73E-06	7.98E-06	3.44E-06
Isophorone	78-59-1	<	<	2.29E-08	9.08E-09	6.18E-08	4.37E-09	<	<	<
Methyl bromide	74-83-9	1.14E-07	<	<	6.94E-08	<	<	<	<	<
Methyl chloride	74-87-3	9.77E-08	<	7.48E-08	8.73E-08	<	4.92E-08	1.03E-07	9.16E-08	6.63E-08
Methyl chloroform	71-55-6	7.92E-08	<	1.48E-07	<	4.26E-07	1.19E-07	1.32E-07	1.64E-07	1.30E-07
Methyl ethyl ketone	78-93-3	3.96E-07	4.41E-07	4.08E-07	8.73E-07	1.04E-06	1.55E-06	6.05E-07	1.64E-06	7.61E-07
Methyl isobutyl ketone	108-10-1	1.40E-05	1.95E-05	9.51E-06	1.23E-05	9.84E-06	9.60E-06	1.28E-05	1.62E-05	8.84E-06
Methyl tert butyl ether	1634-04-4	<	<	<	<	<	3.04E-07	<	<	<
Methylene chloride	75-09-2	9.77E-07	9.30E-07	1.94E-06	7.45E-06	4.79E-06	5.62E-06	1.01E-06	2.82E-06	3.68E-06
Naphthalene	91-20-3	6.93E-08	7.82E-08	1.50E-07	2.83E-07	2.31E-07	<	1.26E-07	2.47E-07	1.44E-07
Phenol	108-95-2	7.79E-08	5.07E-07	2.21E-07	<	2.16E-07	1.30E-07	5.88E-07	5.86E-07	4.32E-07
Propylene dichloride	78-87-5	<	<	<	<	<	<	<	<	<
Propylene oxide	75-56-9	<	<	<	<	<	<	<	<	<
Styrene	100-42-5	3.96E-07	3.09E-07	2.95E-07	2.83E-07	9.57E-07	3.98E-06	7.85E-07	3.05E-07	8.10E-07
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	2.06E-07	<	<	<	<	<
Tetrachloroethylene	127-18-4	7.66E-08	<	<	<	7.98E-08	2.13E-07	8.97E-08	1.17E-07	<
Toluene	108-88-3	6.60E-06	7.41E-06	2.69E-06	1.23E-05	1.30E-05	1.22E-05	1.08E-05	2.58E-05	1.06E-05
o-Toluidine	95-53-4	1.82E-07	2.88E-07	1.55E-08	<	1.09E-08	7.21E-09	1.30E-07	2.28E-08	<
1,2,4-Trichlorobenzene	120-82-1	<	7.76E-09	<	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<	<	<	<
Trichloroethylene	79-01-6	<	<	<	<	<	<	<	<	1.10E-07
Vinyl acetate	108-05-4	<	<	<	<	<	<	<	<	<
Vinyl chloride	75-01-4	<	<	<	<	<	<	<	<	<
Vinylidene chloride	75-35-4	<	<	<	<	<	5.85E-07	<	<	<
o-Xylene	95-47-6	4.23E-06	2.24E-06	1.05E-06	7.96E-06	9.57E-06	7.73E-06	5.38E-06	1.13E-05	5.89E-06
m-Xylene + p-Xylene		1.72E-05	1.10E-05	5.03E-06	2.83E-05	2.93E-05	2.34E-05	2.00E-05	5.17E-05	2.16E-05

NOTES: Tire A, D and F are original equipment, tires E, G and H are high performance and tires B, C and I are replacement tires.
1,1,1-Trichloroethane for Tire F is average from the other tires tested due to suspected mold release presence not normally used.

How did I get 12 #s?

Table 4.12-11

updated 1/11/99 by rjd

See Notes

Tire Cure
HAPS Emission Factor Summary

Avg. = 16.7

		+16.5%	+17.6%	+20.5%	+16.2%	+14.5%	+15.8%	+15.1	+16.3	+17.8%	
Analyte Name	**CAS #**	**Tire A lb/lb rubber**	**Tire B lb/lb rubber**	**Tire C lb/lb rubber**	**Tire D lb/lb rubber**	**Tire E lb/lb rubber**	**Tire F lb/lb rubber**	**Tire G lb/lb rubber**	**Tire H lb/lb rubber**	**Tire I lb/lb rubber**	
Total VOC		3.37E-04	2.50E-04	1.46E-04	2.83E-04	1.65E-04	1.80E-04	2.07E-04	2.59E-04	1.86E-04	
Total Speciated Organics		1.39E-04	1.46E-04	8.44E-05	1.53E-04	1.55E-04	2.04E-04	1.93E-04	2.91E-04	1.73E-04	
Total Organic HAPs		7.95E-05	6.12E-05	2.76E-05	9.10E-05	9.53E-05	8.59E-05	7.42E-05	1.49E-04	7.42E-05	
Total HAPs		7.95E-05	6.12E-05	2.76E-05	9.10E-05	9.53E-05	8.59E-05	7.42E-05	1.49E-04	7.42E-05	
1,1,1-Trichloroethane	71-55-6	7.92E-08	0.00E+00	1.48E-07	0.00E+00	4.26E-07	1.19E-07	1.32E-07	1.64E-07	1.30E-07	
1,1,2,2-Tetrachloroethane	79-34-5	0.00E+00	0.00E+00	0.00E+00	2.06E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
1,1,2-Trichloroethane	79-00-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	< OUT NONE
1,1-Dichloroethane	75-34-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.96E-08	0.00E+00	0.00E+00	0.00E+00	
1,1-Dichloroethene	75-35-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.85E-07	0.00E+00	0.00E+00	0.00E+00	
1,2,4-Trichlorobenzene	120-82-1	0.00E+00	7.76E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
1,2-Dibromo-3-Chloropropane	96-12-8	0.00E+00	0.00E+00	0.00E+00	4.11E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
1,2-Dibromoethane	106-93-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	< NONE
1,2-dichloroethane	107-06-2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	< NONE
1,2-Dichloropropane	78-87-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	< NONE
1,3-Butadiene	106-99-0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	< NONE
1,4-Dichlorobenzene	106-46-7	4.98E-09	6.15E-09	5.63E-09	0.00E+00	0.00E+00	6.79E-07	5.61E-08	6.49E-10	8.61E-09	
1,4-Dioxane < 5 compounds!	123-91-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	< NONE
2-Butanone	78-93-3	3.96E-07	4.41E-07	4.08E-07	8.73E-07	1.04E-06	1.55E-06	6.05E-07	1.64E-06	7.61E-07	
2-Chloroacetophenone	532-27-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.83E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
2-Methylphenol < 5 compounds?	95-48-7	1.08E-08	1.39E-08	5.98E-09	0.00E+00	0.00E+00	0.00E+00	7.52E-09	1.95E-08	0.00E+00	
4-Methyl-2-Pentanone	108-10-1	1.40E-05	1.95E-05	9.51E-06	1.23E-05	9.84E-06	9.60E-06	1.28E-05	1.62E-05	8.84E-06	
Acetonitrile < 5 compounds	75-05-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	< NONE
Acetophenone	98-86-2	7.50E-08	1.50E-07	8.96E-08	1.32E-07	7.05E-08	1.08E-07	1.21E-07	1.31E-07	1.22E-07	
Acrolein	107-02-8	0.00E+00	0.00E+00	3.85E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Acrylonitrile	107-13-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	< NONE
Allyl Chloride	107-05-1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	< NONE
Aniline	62-53-3	1.76E-06	2.56E-06	5.74E-07	5.70E-06	7.40E-07	4.36E-06	6.99E-07	3.36E-07	7.57E-06	
Benzene < 1 cmpd	71-43-2	1.98E-07	0.00E+00	2.32E-07	2.03E-07	4.26E-07	3.51E-07	5.38E-07	4.70E-07	4.91E-07	
Benzyl Chloride	100-44-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.42E-08	0.00E+00	0.00E+00	0.00E+00	
Biphenyl < 1 cmpd	92-52-4	9.53E-08	6.98E-08	4.93E-08	4.03E-08	4.43E-08	0.00E+00	6.97E-08	4.81E-08	0.00E+00	
bis(2-Ethylhexyl)phthalate	117-81-7	1.14E-07	1.60E-06	1.36E-07	2.39E-08	0.00E+00	0.00E+00	0.00E+00	2.10E-08	3.98E-08	
Bromoform	75-25-2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	< NONE
Bromomethane	74-83-9	1.14E-07	0.00E+00	0.00E+00	6.94E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Carbon Disulfide	75-15-0	2.56E-05	8.98E-06	2.75E-06	7.19E-07	7.71E-06	4.92E-07	6.05E-06	6.81E-06	2.06E-06	
Carbon Tetrachloride	56-23-5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	< NONE
Carbonyl Sulfide	463-58-1	1.09E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Chlorobenzene	108-90-7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	< NONE
Chloroethane	75-00-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	< NONE
Chloroform	67-66-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.50E-08	0.00E+00	0.00E+00	
Chloromethane	74-87-3	9.77E-08	0.00E+00	7.48E-08	8.73E-08	0.00E+00	4.92E-08	1.03E-07	9.16E-08	6.63E-08	
Cumene	98-82-8	1.21E-07	2.02E-07	0.00E+00	3.34E-07	4.52E-07	0.00E+00	2.92E-07	6.81E-07	2.06E-07	

4.12-152 to 154

Tire Cure
HAPS Emission Factor Summary

Analyte Name	CAS #	Tire A lb/lb rubber	Tire B lb/lb rubber	Tire C lb/lb rubber	Tire D lb/lb rubber	Tire E lb/lb rubber	Tire F lb/lb rubber	Tire G lb/lb rubber	Tire H lb/lb rubber	Tire I lb/lb rubber	
Di-n-butylphthalate	84-74-2	2.07E-07	6.42E-07	6.26E-07	1.86E-07	3.14E-07	9.49E-07	1.74E-07	3.76E-07	8.72E-08	
Dibenzofuran	132-64-9	1.16E-08	1.26E-08	9.54E-09	6.60E-09	3.94E-09	0.00E+00	6.32E-09	7.25E-09	7.31E-09	
Dimethylphthalate <1 cmpd	131-11-3	5.64E-09	2.66E-08	2.22E-08	9.08E-09	5.28E-08	4.06E-09	2.20E-07	1.51E-08	1.38E-08	
Epichlorohydrin	106-89-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	< NONE
Ethylbenzene <1 cmpd	100-41-4	5.28E-06	3.07E-06	9.24E-07	1.18E-05	1.28E-05	1.03E-05	6.73E-06	2.11E-05	7.12E-06	
Hexachlorobutadiene <1 cmpd	87-68-3	0.00E+00	0.00E+00	0.00E+00	4.11E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Hexane <2 cmpds	110-54-3	4.75E-07	1.07E-06	2.46E-07	8.48E-07	3.19E-06	3.04E-06	6.73E-06	7.98E-06	3.44E-06	
Isophorone <2 cmpds	78-59-1	0.00E+00	0.00E+00	2.29E-08	9.08E-09	6.18E-08	4.37E-09	0.00E+00	0.00E+00	0.00E+00	
m-Xylene + p-Xylene		1.72E-05	1.10E-05	5.03E-06	2.83E-05	2.93E-05	2.34E-05	2.00E-05	5.17E-05	2.16E-05	
Methylene Chloride <3 cmpds	75-09-2	9.77E-07	9.30E-07	1.94E-06	7.45E-06	4.79E-06	5.62E-06	1.01E-06	2.82E-06	3.68E-06	
Naphthalene	91-20-3	6.93E-08	7.82E-08	1.50E-07	2.83E-07	2.31E-07	0.00E+00	1.26E-07	2.47E-07	1.44E-07	
o-Toluidine <2 cmpds	95-53-4	1.82E-07	2.88E-07	1.55E-08	0.00E+00	1.09E-08	7.21E-09	1.30E-07	2.28E-08	0.00E+00	
o-Xylene <2 cmpds	95-47-6	4.23E-06	2.24E-06	1.05E-06	7.96E-06	9.57E-06	7.73E-06	5.38E-06	1.13E-05	5.89E-06	
Phenol	108-95-2	7.79E-08	5.07E-07	2.21E-07	0.00E+00	2.16E-07	1.30E-07	5.88E-07	5.86E-07	4.32E-07	
Propylene Oxide <1 cmpd	75-56-9	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	< NONE
Styrene	100-42-5	3.96E-07	3.09E-07	2.95E-07	2.83E-07	9.57E-07	3.98E-06	7.85E-07	3.05E-07	8.10E-07	
t-Butyl Methyl Ether	1634-04-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.04E-07	0.00E+00	0.00E+00	0.00E+00	
Tetrachloroethene	127-18-4	7.66E-08	0.00E+00	0.00E+00	0.00E+00	7.98E-08	2.13E-07	8.97E-08	1.17E-07	0.00E+00	
Toluene	108-88-3	6.60E-06	7.41E-06	2.69E-06	1.23E-05	1.30E-05	1.22E-05	1.08E-05	2.58E-05	1.06E-05	
Trichloroethene <1 cmpd	79-01-6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-07	
Vinyl Acetate	108-05-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	< NONE
Vinyl Chloride	75-01-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	< NONE

22 on this page

17 NONES

Notes below

4.12 ~~157~~ 155 to 157

4.12-12. Grinding Operations

UNCONTROLLED Emission Factors

(EFs in Lbs/Lb Rubber Removed, except Retread Buffing in Lbs/Lb Rubber Processed)

Analyte Name	CAS #	Belt Grinding	Retread Carcass Grinding	Retread Buffing *	Sidewall/ Whitewall Grinding
Total Method 25A Organics		1.78E-03	5.21E-04	2.43E-04	1.59E-02
Total Speciated Organics		2.66E-03	2.54E-03	6.36E-04	1.10E-02
Total Organic HAPs		2.15E-03	1.37E-04	1.33E-05	1.12E-03
Total Metal HAPs		1.34E-05	6.35E-06	6.44E-08	3.72E-05
Total HAPs		2.17E-03	1.43E-04	1.33E-05	1.16E-03
Total Particulate Matter		2.26E-04	5.45E-01	9.09E-07	1.96E-04
Acetaldehyde	75-07-0	1.53E-05	<	<	<
Acetonitrile	75-05-8	<	<	<	<
Acetophenone	98-86-2	1.77E-05	7.13E-07	1.89E-08	3.37E-06
Acrolein	107-02-8	6.44E-06	1.68E-06	4.70E-07	<
Acrylonitrile	107-13-1	<	<	<	<
Allyl chloride	107-05-1	<	<	<	<
4-Aminobiphenyl	92-67-1	<	<	<	<
Aniline	62-53-3	<	1.97E-05	6.66E-08	4.05E-04
o-Anisidine	90-04-0	<	<	<	<
Benzene	71-43-2	<	4.13E-06	9.96E-06	1.33E-05
Benzidine	92-87-5	<	<	<	<
Benzotrichloride	98-07-7	<	<	<	<
Benzyl chloride	100-44-7	<	<	<	<
Biphenyl	92-52-4	<	<	6.63E-09	<
Bis(2-Ethylhexyl)phthalate	117-81-7	5.30E-05	7.94E-06	1.99E-08	2.76E-05
Bromoform	75-25-2	<	<	<	<
1,3-Butadiene	106-99-0	2.41E-05	2.65E-05	4.39E-08	2.40E-05
Carbon disulfide	75-15-0	3.03E-04	2.58E-06	6.77E-07	1.90E-05
Carbon tetrachloride	56-23-5	<	<	<	<
Carbonyl sulfide	463-58-1	7.14E-06	8.70E-06	<	<
2-Chloroacetophenone	532-27-4	<	<	<	<
Chlorobenzene	108-90-7	<	<	<	<
Chloroform	67-66-3	<	<	<	<
Chloroprene	126-99-8	8.16E-05	<	<	<
o-Cresol	95-48-7	<	<	3.91E-09	<
Cumene	98-82-8	<	<	<	1.13E-06
Dibenzofuran	132-64-9	<	1.59E-07	<	<
1,2-Dibromo-3-chloropropane	96-12-8	<	<	<	<
Dibutylphthalate	84-74-2	3.31E-06	2.24E-06	3.87E-08	2.54E-06
1,4-Dichlorobenzene	106-46-7	<	<	6.77E-09	<
3,3-Dichlorobenzidine	91-94-1	<	<	<	<
Dichloroethyl ether	111-44-4	<	<	<	<
3,3-Dimethoxybenzidine	119-90-4	<	<	<	<
Dimethyl aminoazobenzene	60-11-7	<	<	<	<
3,3'-Dimethyl benzidine	119-93-7	<	<	<	<
N,N-Dimethylaniline	121-69-7	<	<	<	<
Dimethylphthalate	131-11-3	<	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<
1,4-Dioxane	123-91-1	<	<	<	<
Epichlorohydrin	106-89-8	<	<	<	<
Ethyl benzene	100-41-4	<	<	<	5.70E-05
Ethyl chloride	75-00-3	<	<	<	<
Ethylene dibromide	106-93-4	<	<	<	<
Ethylene dichloride	107-06-2	<	<	<	<
Ethylidene dichloride	75-34-3	<	<	<	<
Hexachlorobenzene	118-74-1	<	<	<	<
Hexachlorobutadiene	87-68-3	<	<	<	<
Hexachlorocyclopentadiene	77-47-4	<	<	<	<
Hexachloroethane	67-72-1	<	<	<	<
Hexane	110-54-3	4.18E-05	1.60E-05	<	1.24E-04
Hydroquinone	123-31-9	<	<	<	<

4.12-12. Grinding Operations
Emission Factors

(EFs in Lbs/Lb Rubber Removed, except Retread Buffing in Lbs/Lb Rubber Processed)

Analyte Name	CAS #	Belt Grinding	Retread Carcass Grinding	Retread Buffing *	Sidewall/ Whitewall Grinding
Isophorone	78-59-1	<	<	6.46E-09	<
Methyl bromide	74-83-9	<	<	<	<
Methyl chloride	74-87-3	<	<	7.12E-09	<
Methyl chloroform	71-55-6	<	3.58E-07	2.19E-08	<
Methyl ethyl ketone	78-93-3	6.22E-06	5.13E-07	1.51E-08	2.97E-05
Methyl isobutyl ketone	108-10-1	<	1.92E-05	8.44E-07	<
Methyl tert butyl ether	1634-04-4	<	<	<	<
4,4-Methylene bis(2-chloroaniline)	101-14-4	<	<	<	<
Methylene chloride	75-09-2	4.98E-05	2.50E-07	1.67E-07	2.76E-05
4,4'-Methylenedianiline	101-77-9	<	<	<	<
Naphthalene	91-20-3	4.02E-06	5.81E-07	2.11E-08	3.81E-06
Nitrobenzene	98-95-3	<	<	<	<
4-Nitrobiphenyl	92-93-3	3.80E-07	<	<	<
4-Nitrophenol	100-02-7	<	<	<	<
N-Nitrosodimethylamine	62-75-9	<	<	<	<
N-Nitrosomorpholine	59-89-2	<	<	<	<
Pentachloronitrobenzene	82-68-8	<	<	<	<
Pentachlorophenol	87-86-5	<	<	<	<
Phenol	108-95-2	8.88E-06	1.66E-06	3.04E-07	1.57E-05
p-Phenylenediamine	106-50-3	<	<	<	<
Propylene dichloride	78-87-5	<	<	<	<
Propylene oxide	75-56-9	3.06E-05	<	<	<
Styrene	100-42-5	<	<	9.86E-08	1.69E-05
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<
Tetrachloroethylene	127-18-4	1.39E-04	<	7.58E-09	<
Toluene	108-88-3	1.35E-03	6.30E-06	3.82E-07	1.86E-04
o-Toluidine	95-53-4	<	2.55E-06	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<
Trichloroethylene	79-01-6	<	1.95E-06	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<
Trifluralin	1582-09-8	<	<	<	<
2,2,4-Trimethylpentane	540-84-1	<	1.09E-05	<	1.15E-04
Vinyl acetate	108-05-4	<	<	<	<
Vinyl chloride	75-01-4	<	<	<	<
Vinylidene chloride	75-35-4	<	<	<	<
o-Xylene	95-47-6	5.40E-06	<	4.17E-08	1.86E-05
m-Xylene + p-Xylene		8.51E-06	2.23E-06	5.36E-08	3.18E-05
Cadmium Compounds		1.40E-07	8.58E-07	<	7.38E-07
Chromium Compounds		2.58E-06	1.44E-06	3.79E-08	1.34E-05
Cobalt Compounds		<	<	8.74E-09	<
Lead Compounds		1.59E-06	2.02E-06	<	1.55E-05
Nickel Compounds		9.13E-06	2.03E-06	1.78E-08	7.51E-06

NOTES: reverse order to match table

* Sidewall, carcass, and belt grinding are reported in pounds emitted per pound of rubber removed or ~~ground-off. Retread~~ buffing is reported in pounds emitted per pound of rubber processed.

redo order

Particulate Matter Control:
- Sidewall by cyclone - 91.9% X1.0 = .0082 = 8.2E-3 vs. 1.86E-4
- Carcass by cyclone - 97.8% X1.0 = .0022 = 2.2E-3 vs. 5.45E-1
- Belt by cyclone and ESP - 99.97% X1.0 = .0003 = 3XE-4 vs. 2.26E-4
- Retread by cyclone and baghouse - 97.9% = ~~.0021 = 2.1E-3 vs.~~

Buffing?

For uncontrolled PM emissions sidewall, carcass or belt use a factor of 1.0 lb emitted per pound of rubber removed.

~~Table 4.12-12 Grinding Opers Grind, WD~~

~~4 cols → 2nd col. is "carcass"~~

~~Change VOC & TOT values~~

~~Output in Xcel format – same as tire curing & calendering~~

~~re-do totals~~

6-8-7-9 – fix to tire curing & calendering

e-mail/List-serve note:

< previous

- changes to 2 pols
- " " totals (note M25A arg.)
- revisions @ TRC – sect. being finalized
- Tony's HCB ? → updates coming
- table of name/CAS fixes
- expect VOC to replace M25A? < & PM footnote errors < pt. #'s as before

---

- were orig. grinding tests on truck tires, as re-do @ Michelin was? Different formulations?
- Figure out notes on PM control efficiency
  - cyclone inlet or cyclone outlet data more approp?
- decision on "VOC" vs. "M25A" (← overall project)

Not

Table 4.12-12. GRINDING OPERATIONS EMISSION FACTORS

Retread grinding buffing

Analyte Name	CAS #	Belt lb/lb rubber removed	Carcass lb/lb rubber removed	Retread lb/lb rubber processed	Sidewall / Whitewall lb/lb rubber removed
Total Method 25A Organics		1.78e-03	5.21e-04	2.43e-04	1.59e-02
Total Speciated Organics		2.66e-03	~~1.63e-02~~	6.36e-04	1.10e-02
Total Organic HAPs		2.15e-03	~~1.39e-02~~	1.33e-05	1.12e-03
Total Metal HAPs		1.34e-05	6.35e-06	6.44e-08	3.72e-05
Total HAPs		2.17e-03	~~1.39e-02~~	1.33e-05	1.16e-03
Total Particulate Matter		2.26e-04	5.45e-01	9.09e-07	1.96e-04
1,1,1-Trichloroethane	71-55-6	<	3.58e-07	2.19e-08	<
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<
1,1-Dichloroethane	75-34-3	<	<	<	<
1,1-Dichloroethene	75-35-4	<	<	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<	<
1,2-Dibromoethane	106-93-4	<	<	<	<
1,2-Dichloroethane	107-06-2	<	<	<	<
1,2-Dichloropropane	78-87-5	<	<	<	<
1,3-Butadiene	106-99-0	2.41e-05	2.65e-05	4.39e-08	2.40e-05
1,4-Dichlorobenzene	106-46-7	<	<	6.77e-09	<
1,4-Dioxane	123-91-1	<	<	<	<
1,4-Phenylenediamine	106-50-3	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<
2-Butanone	78-93-3	6.22e-06	5.13e-07	1.51e-08	2.97e-05

Table 4.12-12. GRINDING OPERATIONS EMISSION FACTORS

Analyte Name	CAS #	Belt lb/lb rubber removed	Carcass lb/lb rubber removed	Retread lb/lb rubber processed	Sidewall / Whitewall lb/lb rubber removed
2-Chloro-1,3-Butadiene	126-99-8	8.16e-05	<	<	<
2-Chloroacetophenone	532-27-4	<	<	<	<
2-Methylphenol	95-48-7	<	<	3.91e-09	<
3,3'-Dichlorobenzidine	91-94-1	<	<	<	<
3,3'-Dimethoxybenzidine	119-90-4	<	<	<	<
3,3'-Dimethylbenzidine	119-93-7	<	<	<	<
4,4'-Methylenedianiline	101-77-9	<	<	<	<
4-Aminobiphenyl	92-67-1	<	<	<	<
4-Methyl-2-pentanone	108-10-1	<	1.92e-05	8.44e-07	<
4-Nitrobiphenyl	92-93-3	3.80e-07	<	<	<
4-Nitrophenol	100-02-7	<	<	<	<
a,a,a-Trichlorotoluene	98-07-7	<	<	<	<
Acetaldehyde	75-07-0	1.53e-05	<	<	<
Acetonitrile	75-05-8	<	<	<	<
Acetophenone	98-86-2	1.77e-05	7.13e-07	1.89e-08	3.37e-06
Acrolein	107-02-8	6.44e-06	1.68e-06	4.70e-07	<
Acrylonitrile	107-13-1	<	<	<	<
Allyl Chloride	107-05-1	<	<	<	<
Aniline	62-53-3	<	1.97e-05	6.66e-08	4.05e-04
Benzene	71-43-2	<	4.13e-06	9.96e-06	1.33e-05
Benzidine	92-87-5	<	<	<	<
Benzyl Chloride	100-44-7	<	<	<	<
Biphenyl	92-52-4	<	<	6.63e-09	<
bis(2-Chloroethyl)ether	111-44-4	<	<	<	<
bis(2-Ethylhexyl)phthalate	117-81-7	5.30e-05	7.94e-06	1.99e-08	2.76e-05

Table 4.12-12. GRINDING OPERATIONS EMISSION FACTORS

Analyte Name	CAS #	Belt lb/lb rubber removed	Carcass lb/lb rubber removed	Retread lb/lb rubber processed	Sidewall / Whitewall lb/lb rubber removed
Bromoform	75-25-2	<	<	<	<
Bromomethane	74-83-9	<	<	<	<
Cadmium (Cd) Compounds		1.40e-07	8.58e-07	<	7.38e-07
Carbon Disulfide	75-15-0	3.03e-04	2.58e-06	6.77e-07	1.90e-05
Carbon Tetrachloride	56-23-5	<	<	<	<
Carbonyl Sulfide	463-58-1	7.14e-06	8.70e-06	<	<
Chlorobenzene	108-90-7	<	<	<	<
Chloroethane	75-00-3	<	<	<	<
Chloroform	67-66-3	<	<	<	<
Chloromethane	74-87-3	<	<	7.12e-09	<
Chromium (Cr) Compounds		2.58e-06	1.44e-06	3.79e-08	1.34e-05
Cobalt (Co) Compounds		<	<	8.74e-09	<
Cumene	98-82-8	<	<	<	1.13e-06
Di-n-butylphthalate	84-74-2	3.31e-06	2.24e-06	3.87e-08	2.54e-06
Dibenzofuran	132-64-9	<	1.59e-07	<	<
Dimethylaminoazobenzene	60-11-7	<	<	<	<
Dimethylphthalate	131-11-3	<	<	<	<
Epichlorohydrin	106-89-8	<	<	<	<
Ethylbenzene	100-41-4	<	<	<	5.70e-05
Hexachlorobenzene	118-74-1	<	<	<	<
Hexachlorobutadiene	87-68-3	<	<	<	<
Hexachlorocyclopentadiene	77-47-4	<	<	<	<
Hexachloroethane	67-72-1	<	<	<	<
Hexane	110-54-3	4.18e-05	1.60e-05	<	1.24e-04
Hydroquinone	123-31-9	<	<	<	<

per 1/99 test by Trigon e Tricholin SC

Table 4.12-12. GRINDING OPERATIONS EMISSION FACTORS

Analyte Name	CAS #	Belt lb/lb rubber removed	Carcass lb/lb rubber removed	Retread lb/lb rubber processed	Sidewall / Whitewall lb/lb rubber removed
Isooctane	540-84-1	<	1.09e-05	<	1.15e-04
Isophorone	78-59-1	<	<	6.46e-09	<
Lead (Pb) Compounds		1.59e-06	2.02e-06	<	1.55e-05
m-Xylene + p-Xylene		8.51e-06	2.23e-06	5.36e-08	3.18e-05
Methylene bis-chloroaniline	101-14-4	<	<	<	<
Methylene Chloride	75-09-2	4.98e-05	2.5e-7 ~~4.19e-03~~	1.67e-07	2.76e-05
N,N-Dimethylaniline	121-69-7	<	<	<	<
N-Nitrosodimethylamine	62-75-9	<	<	<	<
N-Nitrosomorpholine	59-89-2	<	<	<	<
Naphthalene	91-20-3	4.02e-06	5.81e-07	2.11e-08	3.81e-06
Nickel (Ni) Compounds		9.13e-06	2.03e-06	1.78e-08	7.51e-06
Nitrobenzene	98-95-3	<	<	<	<
o-Anisidine	90-04-0	<	<	<	<
o-Toluidine	95-53-4	<	2.55e-06	<	<
o-Xylene	95-47-6	5.40e-06	<	4.17e-08	1.86e-05
Pentachloronitrobenzene	82-68-8	<	<	<	<
Pentachlorophenol	87-86-5	<	<	<	<
Phenol	108-95-2	8.88e-06	1.66e-06	3.04e-07	1.57e-05
Propylene Oxide	75-56-9	3.06e-05	<	<	<
Styrene	100-42-5	<	<	9.86e-08	1.69e-05
t-Butyl Methyl Ether	1634-04-4	<	<	<	<
Tetrachloroethene	127-18-4	1.39e-04	<	7.58e-09	<
Toluene	108-88-3	1.35e-03	6.3 e-6 ~~9.59e-03~~	3.82e-07	1.86e-04
Trichloroethene	79-01-6	<	1.95e-06	<	<
Trifluralin	1582-09-8	<	<	<	<

Table 4.12-12. GRINDING OPERATIONS EMISSION FACTORS

Analyte Name	CAS #	Belt lb/lb rubber removed	Carcass lb/lb rubber removed	Retread lb/lb rubber processed	Sidewall / Whitewall lb/lb rubber removed
Vinyl Acetate	108-05-4	<	<	<	<
Vinyl Chloride	75-01-4	<	<	<	<

Sidewall, carcass, and belt grinding are reported in pounds emitted per pound of rubber removed or ground-off.

Retread buffing is reported in pounds emitted per pound of rubber processed.

Particulate Matter Control:
- Sidewall by cyclone - 91.9%
- Carcass by cyclone - 97.8%
- Belt by cyclone and ESP - 99.97%
- Retread by cyclone and baghouse - 97.9%

For uncontrolled PM emissions sidewall, carcass or belt use a factor of 1.0 lb emitted per pound of rubber removed.

4.12-12. Grinding Operations
Emission Factors

(EFs in Lbs/Lb Rubber Removed, except Retread Buffing in Lbs/Lb Rubber Processed)

Analyte Name	CAS #	Belt Grinding	Retread Carcass Grinding	Retread Buffing *	Sidewall/ Whitewall Grinding
Isophorone	78-59-1	<	<	6.46E-09	<
Methyl bromide	74-83-9	<	<	<	<
Methyl chloride	74-87-3	<	<	7.12E-09	<
Methyl chloroform	71-55-6	<	3.58E-07	2.19E-08	<
Methyl ethyl ketone	78-93-3	6.22E-06	5.13E-07	1.51E-08	2.97E-05
Methyl isobutyl ketone	108-10-1	<	1.92E-05	8.44E-07	<
Methyl tert butyl ether	1634-04-4	<	<	<	<
4,4-Methylene bis(2-chloroaniline)	101-14-4	<	<	<	<
Methylene chloride	75-09-2	4.98E-05	2.50E-07	1.67E-07	2.76E-05
4,4'-Methylenedianiline	101-77-9	<	<	<	<
Naphthalene	91-20-3	4.02E-06	5.81E-07	2.11E-08	3.81E-06
Nitrobenzene	98-95-3	<	<	<	<
4-Nitrobiphenyl	92-93-3	3.80E-07	<	<	<
4-Nitrophenol	100-02-7	<	<	<	<
N-Nitrosodimethylamine	62-75-9	<	<	<	<
N-Nitrosomorpholine	59-89-2	<	<	<	<
Pentachloronitrobenzene	82-68-8	<	<	<	<
Pentachlorophenol	87-86-5	<	<	<	<
Phenol	108-95-2	8.88E-06	1.66E-06	3.04E-07	1.57E-05
p-Phenylenediamine	106-50-3	<	<	<	<
Propylene dichloride	78-87-5	<	<	<	<
Propylene oxide	75-56-9	3.06E-05	<	<	<
Styrene	100-42-5	<	<	9.86E-08	1.69E-05
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<
Tetrachloroethylene	127-18-4	1.39E-04	<	7.58E-09	<
Toluene	108-88-3	1.35E-03	6.30E-06	3.82E-07	1.86E-04
o-Toluidine	95-53-4	<	2.55E-06	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<
Trichloroethylene	79-01-6	<	1.95E-06	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<
Trifluralin	1582-09-8	<	<	<	<
2,2,4-Trimethylpentane	540-84-1	<	1.09E-05	<	1.15E-04
Vinyl acetate	108-05-4	<	<	<	<
Vinyl chloride	75-01-4	<	<	<	<
Vinylidene chloride	75-35-4	<	<	<	<
o-Xylene	95-47-6	5.40E-06	<	4.17E-08	1.86E-05
m-Xylene + p-Xylene		8.51E-06	2.23E-06	5.36E-08	3.18E-05
Cadmium Compounds		1.40E-07	8.58E-07	<	7.38E-07
Chromium Compounds		2.58E-06	1.44E-06	3.79E-08	1.34E-05
Cobalt Compounds		<	<	8.74E-09	<
Lead Compounds		1.59E-06	2.02E-06	<	1.55E-05
Nickel Compounds		9.13E-06	2.03E-06	1.78E-08	7.51E-06

NOTES:

* Sidewall, carcass, and belt grinding are reported in pounds emitted per pound of rubber removed or ground-off. Retread buffing is reported in pounds emitted per pound of rubber processed.

because what?

(control level?)

Particulate Matter Control:

Sidewall by cyclone - 91.9%
Carcass by cyclone - 97.8%
Belt by cyclone and ESP - 99.97%
Retread by cyclone and baghouse - 97.9%

For uncontrolled PM emissions sidewall, carcass or belt use a factor of 1.0 lb emitted per pound of rubber removed.

4.12-12. Grinding Operations
Emission Factors

(EFs in Lbs/Lb Rubber Removed, except Retread Buffing in Lbs/Lb Rubber Processed)

Analyte Name	CAS #	Belt Grinding	Retread Carcass Grinding	Retread Buffing	Sidewall/ Whitewall Grinding
Hexachloroethane	67-72-1	<	<	<	<
Hexane	110-54-3	4.18E-05	1.60E-05	<	1.24E-04
Hydroquinone	123-31-9	<	<	<	<
Isophorone	78-59-1	<	<	6.46E-09	<
Lead Compounds		1.59E-06	2.02E-06	<	1.55E-05
Methyl bromide	74-83-9	<	<	<	<
Methyl chloride	74-87-3	<	<	7.12E-09	<
Methyl chloroform	71-55-6	<	3.58E-07	2.19E-08	<
Methyl ethyl ketone	78-93-3	6.22E-06	5.13E-07	1.51E-08	2.97E-05
Methyl isobutyl ketone	108-10-1	<	1.92E-05	8.44E-07	<
Methyl tert butyl ether	1634-04-4	<	<	<	<
4,4-Methylene bis(2-chloroaniline)	101-14-4	<	<	<	<
Methylene chloride	75-09-2	4.98E-05	2.5E-7 ~~4.19E-03~~	1.67E-07	2.76E-05
4,4'-Methylenedianiline	101-77-9	<	<	<	<
Naphthalene	91-20-3	4.02E-06	5.81E-07	2.11E-08	3.81E-06
Nickel Compounds		9.13E-06	2.03E-06	1.78E-08	7.51E-06
Nitrobenzene	98-95-3	<	<	<	<
4-Nitrobiphenyl	92-93-3	3.80E-07	<	<	<
4-Nitrophenol	100-02-7	<	<	<	<
N-Nitrosodimethylamine	62-75-9	<	<	<	<
N-Nitrosomorpholine	59-89-2	<	<	<	<
Pentachloronitrobenzene	82-68-8	<	<	<	<
Pentachlorophenol	87-86-5	<	<	<	<
Phenol	108-95-2	8.88E-06	1.66E-06	3.04E-07	1.57E-05
p-Phenylenediamine	106-50-3	<	<	<	<
Propylene dichloride	78-87-5	<	<	<	<
Propylene oxide	75-56-9	3.06E-05	<	<	<
Styrene	100-42-5	<	<	9.86E-08	1.69E-05
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<
Tetrachloroethylene	127-18-4	1.39E-04	<	7.58E-09	<
Toluene	108-88-3	1.35E-03	6.3E-6 ~~9.59E-03~~	3.82E-07	1.86E-04
o-Toluidine	95-53-4	<	2.55E-06	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<
Trichloroethylene	79-01-6	<	1.95E-06	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<
Trifluralin	1582-09-8	<	<	<	<
2,2,4-Trimethylpentane	540-84-1	<	1.09E-05	<	1.15E-04
Vinyl acetate	108-05-4	<	<	<	<
Vinyl chloride	75-01-4	<	<	<	<
Vinylidene chloride	75-35-4	<	<	<	<
m-Xylene + p-Xylene		8.51E-06	2.23E-06	5.36E-08	3.18E-05
o-Xylene	95-47-6	5.40E-06	<	4.17E-08	1.86E-05

NOTES:

Sidewall, carcass, and belt grinding are reported in pounds emitted per pound of rubber removed or ground-off. Retread buffing is reported in pounds emitted per pound of rubber processed.

Particulate Matter Control:
- Sidewall by cyclone - 91.9% .091
- Carcass by cyclone - 97.8% .022
- Belt by cyclone and ESP - 99.97% .0003
- Retread by cyclone and baghouse - 97.9%

For uncontrolled PM emissions sidewall, carcass or belt use a factor of 1.0 lb emitted per pound of rubber removed.

4.12-12. Grinding Operations
Emission Factors

(EFs in Lbs/Lb Rubber Removed, except Retread Buffing in Lbs/Lb Rubber Processed)

Analyte Name	CAS #	Belt Grinding	Retread Carcass Grinding	Retread Buffing	Sidewall/ Whitewall Grinding
Total Method 25A Organics		1.78E-03	5.21E-04	2.43E-04	1.59E-02
Total Speciated Organics		2.66E-03	1.63E-02	6.36E-04	1.10E-02
Total Organic HAPs		2.15E-03	1.39E-02	1.33E-05	1.12E-03
Total Metal HAPs		1.34E-05	6.35E-06	6.44E-08	3.72E-05
Total HAPs		2.17E-03	1.39E-02	1.33E-05	1.16E-03
Total Particulate Matter		2.26E-04	5.45E-01	9.09E-07	1.96E-04
Acetaldehyde	75-07-0	1.53E-05	<	<	<
Acetonitrile	75-05-8	<	<	<	<
Acetophenone	98-86-2	1.77E-05	7.13E-07	1.89E-08	3.37E-06
Acrolein	107-02-8	6.44E-06	1.68E-06	4.70E-07	<
Acrylonitrile	107-13-1	<	<	<	<
Allyl chloride	107-05-1	<	<	<	<
4-Aminobiphenyl	92-67-1	<	<	<	<
Aniline	62-53-3	<	1.97E-05	6.66E-08	4.05E-04
o-Anisidine	90-04-0	<	<	<	<
Benzene	71-43-2	<	4.13E-06	9.96E-06	1.33E-05
Benzidine	92-87-5	<	<	<	<
Benzotrichloride	98-07-7	<	<	<	<
Benzyl chloride	100-44-7	<	<	<	<
Biphenyl	92-52-4	<	<	6.63E-09	<
Bis(2-Ethylhexyl)phthalate	117-81-7	5.30E-05	7.94E-06	1.99E-08	2.76E-05
Bromoform	75-25-2	<	<	<	<
1,3-Butadiene	106-99-0	2.41E-05	2.65E-05	4.39E-08	2.40E-05
Cadmium Compounds		1.40E-07	8.58E-07	<	7.38E-07
Carbon disulfide	75-15-0	3.03E-04	2.58E-06	6.77E-07	1.90E-05
Carbon tetrachloride	56-23-5	<	<	<	<
Carbonyl sulfide	463-58-1	7.14E-06	8.70E-06	<	<
2-Chloroacetophenone	532-27-4	<	<	<	<
Chlorobenzene	108-90-7	<	<	<	<
Chloroform	67-66-3	<	<	<	<
Chloroprene	126-99-8	8.16E-05	<	<	<
Chromium Compounds		2.58E-06	1.44E-06	3.79E-08	1.34E-05
Cobalt Compounds		<	<	8.74E-09	<
o-Cresol	95-48-7	<	<	3.91E-09	<
Cumene	98-82-8	<	<	<	1.13E-06
Dibenzofuran	132-64-9	<	1.59E-07	<	<
1,2-Dibromo-3-chloropropane	96-12-8	<	<	<	<
Dibutylphthalate	84-74-2	3.31E-06	2.24E-06	3.87E-08	2.54E-06
1,4-Dichlorobenzene	106-46-7	<	<	6.77E-09	<
3,3-Dichlorobenzidine	91-94-1	<	<	<	<
Dichloroethyl ether	111-44-4	<	<	<	<
3,3-Dimethoxybenzidine	119-90-4	<	<	<	<
3,3-Dimethyl benzidine	119-93-7	<	<	<	<
Dimethylaminoazobenzene	60-11-7	<	<	<	<
N,N-Dimethylaniline	121-69-7	<	<	<	<
Dimethylphthalate	131-11-3	<	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<
1,4-Dioxane	123-91-1	<	<	<	<
Epichlorohydrin	106-89-8	<	<	<	<
Ethyl benzene	100-41-4	<	<	<	5.70E-05
Ethyl chloride	75-00-3	<	<	<	<
Ethylene dibromide	106-93-4	<	<	<	<
Ethylene dichloride	107-06-2	<	<	<	<
Ethylidene dichloride	75-34-3	<	<	<	<
Hexachlorobenzene	118-74-1	<	<	<	<
Hexachlorobutadiene	87-68-3	<	<	<	<
Hexachlorocyclopentadiene	77-47-4	<	<	<	<

	10/16 reentered F.4-1 BELT	F.2-1 CARCASS	10/16 processed F.6-1 BUFFING	F.3-1 SIDEWALL
PM-AP42	2.26 E-4	5.45E-1	9.09 E-07	1.96 E-4
PM-V014	1.19 E+00	5.45E-1	9.48 E-3	1.23 E+00
VOC-AP42	1.78 E-3	5.21E-4	2.43 E-4	1.59 E-2
VOC-V014	1.79 E-3	5.18 E-4	2.4 E-4	1.57 E-2
SPEC-AP42				
SPEC-V014				
Metals-AP42				
" -V014				

TRC vs. RMA Averaging Comparison

From Table H.1-2 Calender 1 Speciated Semivolatiles Table, TRC Vol. #4 (1/95):

	Compound #12			
	Run 1 lb/lb rubber	Run 2 lb/lb rubber	Run 3 lb/lb rubber	Average lb/lb rubber
Hydroquinone	< 5.16E-11	< 7.01E-11	< 7.24E-11	< 6.47E-11

From Table H.2-2 Calender 2 Speciated Semivolatiles Table, TRC Vol. #4 (1/95):

	Compound #2			
	Run 1 lb/lb rubber	Run 2 lb/lb rubber	Run 3 lb/lb rubber	Average lb/lb rubber
Hydroquinone	< 7.75E-09	< 5.14E-09	1.06E-07	< 3.95E-08

In the above cases, TRC used a straight arithmetic average to determine the average lb/lb rubber emission factor.

The revised RMA emission factor values found in Table 4.12-7. Calender found in the current draft version of AP-42 were calculated as follows:

For Compound #12 - Hydroquinone:

The RMA value would be 0 (zero) or simply "<" because all replicate values were below detection limit.[1]

For Compound #2 - Hydroquinone:

The RMA value would be calculated as follows, since not all results were below detection:

$$(7.75E\text{-}09/2 + 5.14E\text{-}09/2 + 1.06E\text{-}07)/3 = 3.748E\text{-}08 \text{ lb/lb rubber}$$

The current value in AP-42 is 3.73E-08. The slight variation is due to rounding. The AP-42 factor was generated from the RMA database. The RMA database values for Compound#2 are as follows:

$$(7.75E\text{-}9/2 + 5.137E\text{-}9/2 + 1.0556E\text{-}07)/3 = 3.733E\text{-}08 \text{ lb/lb rubber.}$$

Which is the value found in AP-42.

RMA/AP-42 Emission Factor - Interpolation of Unknowns

Because not all-chemical compounds could be analyzed for during the initial testing program it was necessary to derive a methodology to interpolate emission factors for unknowns. The method involves the ratioing know compounds and using this ratio to estimate unknowns.

Ratios were setup in the following manner, using mixing as the key point of comparison. Mixing is the only process for which all rubber compounds and all chemical analytes were tested. To calculate an unknown the following methodologies were used:

VOC Interpolation – Milling Example:

Step 1 – Calculate ratio of (Known Process/MixingValue) for tested compounds

Compounds #2, #3, #4 and #12 were tested for during Milling Trials with the following results. These values were then divided by the comparable mixing factors for the same compounds.

	Cmpd #2	Cmpd #3	Cmpd #4	Cmpd #12
VOC (lb/lb rubber) – Milling	1.10E-04	1.13E-04	8.37E-05	4.97E-07
VOC (lb/lb rubber) - Mixing	3.91E-05	1.36E-04	3.88E-05	1.54E-05
Ratio (milling/mixing)	2.813	0.831	2.157	0.032

<This is a wide range

Step 2 – Calculate average ratio when multiple compounds are compared the final ratio is calculated by averaging.

$$(2.813 + 0.831 + 2.157 + 0.032)/4 = 1.458$$

Step 3 – Use ratio from Step 2 to calculate interpolated values by multiplying known compound from mixing by ratio to determine unknown.

To Calculate VOC emission factor for Milling, the following calculation is used:

Milling/Mixing Ratio for VOC = 1.458 from Step 2.

Mixing VOC value for Compound #1 = 6.17E-05 from Table 4.12-4. Internal Mixing & Milling.

$$6.17E\text{-}05 \times 1.458 = 8.99E\text{-}05 \text{ lb/lb rubber}$$

This is the value found in AP-42 Table 4.12-5 Milling for VOC for Compound #1.

The same procedure would be used for interpolating other Milling VOC factors for untested rubber compounds. To develop factors for other untested processes and rubber compounds one would develop a new ratio for the given process (i.e., extruding/mixing, calendering/mixing, platen press/mixing, etc.) as noted in Steps 1-3.

Interpolation – Speciated Organics:

The same method as noted in the VOC example is used with the following adjustments.

When evaluating individual speciated compounds the ratio is setup using the Total Speciated Organics value instead of the individual compound result. This is a more conservative approach then working with individual compound ratios.

Step 1 – Calculate ratio of (Known Process/MixingValue) for tested compounds

Compounds #2, #3, #4 and #12 were tested for during Milling Trials with the following results. These values were then divided by the comparable mixing factors for the same compounds.

	Cmpd #2	Cmpd #3	Cmpd #4	Cmpd #12
Total Speciated Organics (lb/lb rubber) – Milling	3.48E-05	4.31E-04	5.04E-05	9.31E-07
Total Speciated Organics (lb/lb rubber) - Mixing	5.53E-05	8.92E-04	5.31E-05	6.69E-05
Ratio (milling/mixing)	0.6293	0.483	0.949	0.014

Step 2 – Calculate average ratio when multiple compounds are compared the final ratio is calculated by averaging.

$$(0.6293 + 0.483 + 0.949 + 0.014)/4 = 0.519$$

Step 3 – Use ratio from Step 2 to calculate interpolated values by multiplying known compound from mixing by ratio to determine unknown.

To calculate a speciated (i.e., 1,3-Butadiene) emission factor for Milling, the following calculation is used:

Milling/Mixing Ratio for Speciated Organics = 0.519 from Step 2.

Mixing 1,3-Butadiene value for Compound #1 = 9.78E-08 from Table 4.12-4. Internal Mixing & Milling.

$$9.78\text{E-}08 \times 0.519 = 5.07\text{E-}08 \text{ lb/lb rubber}$$

This is the value found in AP-42 Table 4.12-5 Milling for Compound #1 1,3- Butadiene.

Interpolation for particulate matter is done in the same way as noted in the previous two examples.

(reported)

Process	Subprocess	Rubber / Tire	Replicate #	Sample Time	Sample Volum	Sample Volume Uni
Internal Mixing and Milling	Small Mixer 2	3	1	0	79.476	dscf
Internal Mixing and Milling	Small Mixer 2	4	1	0	84.237	dscf
Internal Mixing and Milling	Small Mixer 2	5	1	0	61.45	dscf
Internal Mixing and Milling	Small Mixer 2	6	1	0	77.704	dscf
Internal Mixing and Milling	Small Mixer 2	7	1	0	87.505	dscf
Internal Mixing and Milling	Small Mixer 2	8	1	0	78.976	dscf
Internal Mixing and Milling	Small Mixer 2	9	1	0	89.584	dscf
Internal Mixing and Milling	Control Device	Inlet	1	120	94.974	dscf
Internal Mixing and Milling	Control Device	Inlet	2	130	95.877	dscf
Internal Mixing and Milling	Control Device	Inlet	3	120	93.248	dscf
Internal Mixing and Milling	Control Device	Outlet	1	120	79.484	dscf
Internal Mixing and Milling	Control Device	Outlet	2	130	80.662	dscf
Internal Mixing and Milling	Control Device	Outlet	3	120	79.155	dscf
Internal Mixing and Milling	Large Mixer 1	22	1	0	47.799	dscf
Internal Mixing and Milling	Large Mixer 1	4	1	0	30.443	dscf
Internal Mixing and Milling	Large Mixer 1	4	2	0	29.79	dscf
Internal Mixing and Milling	Large Mixer 1	9	1	0	83.993	dscf
Internal Mixing and Milling	Small Mixer 1	22	1	0	111.56	dscf
Internal Mixing and Milling	Small Mixer 1	4	1	0	95.201	dscf
Internal Mixing and Milling	Small Mixer 1	9	1	0	81.694	dscf
Internal Mixing and Milling	Small Mixer 2	1	1	0	64.55	dscf
Internal Mixing and Milling	Small Mixer 2	10	1	0	86.881	dscf
Internal Mixing and Milling	Small Mixer 2	11	1	0	46.434	dscf
Internal Mixing and Milling	Small Mixer 2	12	1	0	84.294	dscf
Internal Mixing and Milling	Small Mixer 2	13	1	0	72.637	dscf
Internal Mixing and Milling	Small Mixer 2	14	1	0	77.386	dscf
Internal Mixing and Milling	Small Mixer 2	15	1	0	66.244	dscf
Internal Mixing and Milling	Small Mixer 2	16	1	0	49.766	dscf
Internal Mixing and Milling	Small Mixer 2	17	1	0	71.23	dscf
Internal Mixing and Milling	Small Mixer 2	18	1	0	62.527	dscf
Internal Mixing and Milling	Small Mixer 2	19	1	0	64.153	dscf
Internal Mixing and Milling	Small Mixer 2	2	1	0	90.53	dscf
Internal Mixing and Milling	Small Mixer 2	20	1	0	95.265	dscf

Process	Subprocess	Rubber / Tire	Sample Flowra	Process Rate	Measured Proc	Tire % Rubber
Internal Mixing and Milling	Small Mixer 2	3	25	2.91	0	0
Internal Mixing and Milling	Small Mixer 2	4	23	6.93	0	0
Internal Mixing and Milling	Small Mixer 2	5	22	8.08	0	0
Internal Mixing and Milling	Small Mixer 2	6	23	4.5	0	0
Internal Mixing and Milling	Small Mixer 2	7	23	3.63	0	0
Internal Mixing and Milling	Small Mixer 2	8	23	6.45	0	0
Internal Mixing and Milling	Small Mixer 2	9	23	5.43	0	0
Internal Mixing and Milling	Control Device	Inlet	6915	7240	14480	0
Internal Mixing and Milling	Control Device	Inlet	6864	9381.6923077	20327	0
Internal Mixing and Milling	Control Device	Inlet	6760	9053.6585366	18560	0
Internal Mixing and Milling	Control Device	Outlet	7736	7240	14480	0
Internal Mixing and Milling	Control Device	Outlet	7843	9381.6923077	20327	0
Internal Mixing and Milling	Control Device	Outlet	7806	9053.6585366	18560	0
Internal Mixing and Milling	Large Mixer 1	22	799	507.69	0	0
Internal Mixing and Milling	Large Mixer 1	4	957	216.64	0	0
Internal Mixing and Milling	Large Mixer 1	4	908	216.64	0	0
Internal Mixing and Milling	Large Mixer 1	9	754	343.52	0	0
Internal Mixing and Milling	Small Mixer 1	22	23.82	10.99	0	0
Internal Mixing and Milling	Small Mixer 1	4	23.72	9.54	0	0
Internal Mixing and Milling	Small Mixer 1	9	23.73	8.75	0	0
Internal Mixing and Milling	Small Mixer 2	1	22	7.11	0	0
Internal Mixing and Milling	Small Mixer 2	10	23	7.06	0	0
Internal Mixing and Milling	Small Mixer 2	11	23	13.96	0	0
Internal Mixing and Milling	Small Mixer 2	12	23	8.2	0	0
Internal Mixing and Milling	Small Mixer 2	13	23	7.77	0	0
Internal Mixing and Milling	Small Mixer 2	14	24	6.97	0	0
Internal Mixing and Milling	Small Mixer 2	15	22	11.27	0	0
Internal Mixing and Milling	Small Mixer 2	16	26	18.6	0	0
Internal Mixing and Milling	Small Mixer 2	17	23	7.29	0	0
Internal Mixing and Milling	Small Mixer 2	18	23	7.54	0	0
Internal Mixing and Milling	Small Mixer 2	19	24	11.35	0	0
Internal Mixing and Milling	Small Mixer 2	2	26	5.94	0	0
Internal Mixing and Milling	Small Mixer 2	20	25	6.85	0	0

Process	Subprocess	Rubber / Tire	Analyte Group	Analyte Name	CAS #
~~Internal Mixing and Milling~~	~~Small Mixer 2~~	~~3~~	~~Semivolatiles~~	~~4-Nitroaniline~~	100-01-
Internal Mixing and Milling	Small Mixer 2	4	Semivolatiles	4-Nitroaniline	100-01-
~~Internal Mixing and Milling~~	~~Small Mixer 2~~	~~5~~	~~Semivolatiles~~	~~4-Nitroaniline~~	100-01-
Internal Mixing and Milling	Small Mixer 2	6	Semivolatiles	4-Nitroaniline	100-01-
Internal Mixing and Milling	Small Mixer 2	7	Semivolatiles	4-Nitroaniline	100-01-
Internal Mixing and Milling	Small Mixer 2	8	Semivolatiles	4-Nitroaniline	100-01-
Internal Mixing and Milling	Small Mixer 2	9	Semivolatiles	4-Nitroaniline	100-01-
Internal Mixing and Milling	Control Device	Inlet	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Control Device	Inlet	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Control Device	Inlet	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Control Device	Outlet	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Control Device	Outlet	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Control Device	Outlet	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Large Mixer 1	22	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Large Mixer 1	4	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Large Mixer 1	4	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Large Mixer 1	9	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Small Mixer 1	22	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Small Mixer 1	4	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Small Mixer 1	9	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Small Mixer 2	1	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Small Mixer 2	10	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Small Mixer 2	11	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Small Mixer 2	12	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Small Mixer 2	13	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Small Mixer 2	14	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Small Mixer 2	15	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Small Mixer 2	16	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Small Mixer 2	17	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Small Mixer 2	18	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Small Mixer 2	19	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Small Mixer 2	2	Semivolatiles	4-Nitrophenol	100-02-
Internal Mixing and Milling	Small Mixer 2	20	Semivolatiles	4-Nitrophenol	100-02-

Process	Subprocess	Rubber / Tire	HAP	O3 Precursor	TIC	DL Flag
Internal Mixing and Milling	Small Mixer 2	3				Y
Internal Mixing and Milling	Small Mixer 2	4				Y
Internal Mixing and Milling	Small Mixer 2	5				Y
Internal Mixing and Milling	Small Mixer 2	6				Y
Internal Mixing and Milling	Small Mixer 2	7				Y
Internal Mixing and Milling	Small Mixer 2	8				Y
Internal Mixing and Milling	Small Mixer 2	9				Y
Internal Mixing and Milling	Control Device	Inlet	Y			Y
Internal Mixing and Milling	Control Device	Inlet	Y			Y
Internal Mixing and Milling	Control Device	Inlet	Y			Y
Internal Mixing and Milling	Control Device	Outlet	Y			Y
Internal Mixing and Milling	Control Device	Outlet	Y			Y
Internal Mixing and Milling	Control Device	Outlet	Y			Y
Internal Mixing and Milling	Large Mixer 1	22	Y			Y
Internal Mixing and Milling	Large Mixer 1	4	Y			Y
Internal Mixing and Milling	Large Mixer 1	4	Y			Y
Internal Mixing and Milling	Large Mixer 1	9	Y			Y
Internal Mixing and Milling	Small Mixer 1	22	Y			Y
Internal Mixing and Milling	Small Mixer 1	4	Y			Y
Internal Mixing and Milling	Small Mixer 1	9	Y			Y
Internal Mixing and Milling	Small Mixer 2	1	Y			Y
Internal Mixing and Milling	Small Mixer 2	10	Y			Y
Internal Mixing and Milling	Small Mixer 2	11	Y			Y
Internal Mixing and Milling	Small Mixer 2	12	Y			Y
Internal Mixing and Milling	Small Mixer 2	13	Y			Y
Internal Mixing and Milling	Small Mixer 2	14	Y			Y
Internal Mixing and Milling	Small Mixer 2	15	Y			Y
Internal Mixing and Milling	Small Mixer 2	16	Y			Y
Internal Mixing and Milling	Small Mixer 2	17	Y			Y
Internal Mixing and Milling	Small Mixer 2	18	Y			Y
Internal Mixing and Milling	Small Mixer 2	19	Y			N
Internal Mixing and Milling	Small Mixer 2	2	Y			Y
Internal Mixing and Milling	Small Mixer 2	20	Y			Y

Process	Subprocess	Rubber / Tire	Analyte Concentration	Analyte Concentration Units	lbs/hr
Internal Mixing and Milling	Small Mixer 2	3	0.950789820215064	µg/m³	8.904147E-08
Internal Mixing and Milling	Small Mixer 2	4	0.620391122732881	µg/m³	5.345166E-08
Internal Mixing and Milling	Small Mixer 2	5	1.22969848252909	µg/m³	1.013419E-07
Internal Mixing and Milling	Small Mixer 2	6	0.708904892447131	µg/m³	6.107783E-08
Internal Mixing and Milling	Small Mixer 2	7	0.823197512200271	µg/m³	7.092505E-08
Internal Mixing and Milling	Small Mixer 2	8	0.527586439762291	µg/m³	4.545579E-08
Internal Mixing and Milling	Small Mixer 2	9	0.469054451813934	µg/m³	4.041279E-08
Internal Mixing and Milling	Control Device	Inlet	2.18614693120294	µg/m³	5.662905E-05
Internal Mixing and Milling	Control Device	Inlet	12.9970255557541	µg/m³	0.0003341866
Internal Mixing and Milling	Control Device	Inlet	10.6180614527956	µg/m³	0.0002688807
Internal Mixing and Milling	Control Device	Outlet	2.68771002343648	µg/m³	7.78873E-05
Internal Mixing and Milling	Control Device	Outlet	1.58907498080502	µg/m³	4.668683E-05
Internal Mixing and Milling	Control Device	Outlet	1.62378969675103	µg/m³	4.748168E-05
Internal Mixing and Milling	Large Mixer 1	22	3.35385121996855	µg/m³	1.003826E-05
Internal Mixing and Milling	Large Mixer 1	4	3.93204972671906	µg/m³	1.409609E-05
Internal Mixing and Milling	Large Mixer 1	4	4.62275476357099	µg/m³	1.572369E-05
Internal Mixing and Milling	Large Mixer 1	9	1.59752349553477	µg/m³	4.51218E-06
Internal Mixing and Milling	Small Mixer 1	22	1.32937508735893	µg/m³	1.186198E-07
Internal Mixing and Milling	Small Mixer 1	4	1.43170171561484	µg/m³	1.272140E-07
Internal Mixing and Milling	Small Mixer 1	9	1.64680268202175	µg/m³	1.463885E-07
Internal Mixing and Milling	Small Mixer 2	1	2.15529502378483	µg/m³	1.776222E-07
Internal Mixing and Milling	Small Mixer 2	10	1.62164144644369	µg/m³	1.397174E-07
Internal Mixing and Milling	Small Mixer 2	11	2.63876143747191	µg/m³	2.273504E-07
Internal Mixing and Milling	Small Mixer 2	12	1.30277818327272	µg/m³	1.122448E-07
Internal Mixing and Milling	Small Mixer 2	13	1.57990950900574	µg/m³	1.361218E-07
Internal Mixing and Milling	Small Mixer 2	14	1.47382824175412	µg/m³	1.325031E-07
Internal Mixing and Milling	Small Mixer 2	15	1.43387892799672	µg/m³	1.181688E-07
Internal Mixing and Milling	Small Mixer 2	16	2.25632230022948	µg/m³	2.197568E-07
Internal Mixing and Milling	Small Mixer 2	17	3.30650847774893	µg/m³	2.848822E-07
Internal Mixing and Milling	Small Mixer 2	18	1.76195070170364	µg/m³	1.518061E-07
Internal Mixing and Milling	Small Mixer 2	19	1.24944066889527	µg/m³	1.123297E-07
Internal Mixing and Milling	Small Mixer 2	2	1.33395241206679	µg/m³	1.299216E-07
Internal Mixing and Milling	Small Mixer 2	20	1.78286498470962	µg/m³	1.669653E-07

Process	Subprocess	Rubber / Tire	lbs/lb processed	Notes
Internal Mixing and Milling	Small Mixer 2	3	3.0598442152E-08	
Internal Mixing and Milling	Small Mixer 2	4	7.7130820133E-09	
Internal Mixing and Milling	Small Mixer 2	5	1.2542315760E-08	
Internal Mixing and Milling	Small Mixer 2	6	1.3572850605E-08	
Internal Mixing and Milling	Small Mixer 2	7	1.9538581613E-08	
Internal Mixing and Milling	Small Mixer 2	8	7.0474096864E-09	
Internal Mixing and Milling	Small Mixer 2	9	7.4425033995E-09	
Internal Mixing and Milling	Control Device	Inlet	7.8216925118E-09	
Internal Mixing and Milling	Control Device	Inlet	3.5621141742E-08	
Internal Mixing and Milling	Control Device	Inlet	2.9698573716E-08	
Internal Mixing and Milling	Control Device	Outlet	1.0757914265E-08	
Internal Mixing and Milling	Control Device	Outlet	4.9763760671E-09	
Internal Mixing and Milling	Control Device	Outlet	5.2444746504E-09	
Internal Mixing and Milling	Large Mixer 1	22	1.9772415863E-08	
Internal Mixing and Milling	Large Mixer 1	4	6.5066892404E-08	
Internal Mixing and Milling	Large Mixer 1	4	7.2579810398E-08	
Internal Mixing and Milling	Large Mixer 1	9	1.3135129113E-08	
Internal Mixing and Milling	Small Mixer 1	22	1.0793427372E-08	
Internal Mixing and Milling	Small Mixer 1	4	1.3334803747E-08	
Internal Mixing and Milling	Small Mixer 1	9	1.6730118761E-08	
Internal Mixing and Milling	Small Mixer 2	1	2.4982021589E-08	
Internal Mixing and Milling	Small Mixer 2	10	1.9789997697E-08	
Internal Mixing and Milling	Small Mixer 2	11	1.6285845840E-08	
Internal Mixing and Milling	Small Mixer 2	12	1.3688385697E-08	
Internal Mixing and Milling	Small Mixer 2	13	1.7518898774E-08	
Internal Mixing and Milling	Small Mixer 2	14	1.9010481241E-08	
Internal Mixing and Milling	Small Mixer 2	15	1.0485255565E-08	
Internal Mixing and Milling	Small Mixer 2	16	1.1814879933E-08	
Internal Mixing and Milling	Small Mixer 2	17	3.9078485244E-08	
Internal Mixing and Milling	Small Mixer 2	18	2.0133441453E-08	
Internal Mixing and Milling	Small Mixer 2	19	9.8968910922E-09	
Internal Mixing and Milling	Small Mixer 2	2	2.1872328136E-08	
Internal Mixing and Milling	Small Mixer 2	20	2.43744972E-08	

from Vol I

from Interpolation table

Table 1-1. Summary of Results--Showing Relative Contribution by Process on an Overall Average Basis-- (lb Pollutant/lb Rubber)[1,2]

Process	# Compounds or Components Tested	Total VOC as Methane	Total Speciated Volatiles	Total Speciated Semivolatiles	Total Metals	Total Sulfur	Total Amines	Total Particulate Matter
Mixing/Milling	26 23	1.01E-04	8.28E-05	2.86E-06	1.90E-05	6.25E-06	n/a	2.86E-04
Internal Mixer Control	1	7.75E-06	4.30E-05	1.64E-06	2.23E-04	2.47E-07	n/a	2.62E-03
Extrusion	4 4	1.39E-05	2.63E-05	9.10E-06	1.06E-05	2.79E-08	n/a	1.44E-05
Tire Curing	10	2.26E-04	1.50E-04	1.31E-05	n/a	5.36E-06	4.27E-08	n/a
Platen Press Curing	11 ? 17	6.14E-04	2.41E-03	1.13E-04	n/a	2.14E-04	n/a	n/a
Hot Air Oven Curing	3 3	2.16E-04	1.46E-03	6.65E-04	n/a	1.14E-03	n/a	n/a
Autoclave Curing[3]	10 11	1.50E-04	6.38E-04	2.48E-04	n/a	2.98E-04	1.01E-08	n/a
Warmup Mill - Eng. Prod.	1 4	1.71E-06	9.31E-07	7.02E-09	n/a	1.42E-07	n/a	n/a
Warmup Mill - Tires	3	1.02E-04	1.94E-05	2.32E-05	n/a	5.81E-07	n/a	n/a
Calendering - Eng. Prod.	1 ?	4.67E-06	4.14E-06	3.09E-08	n/a	2.04E-06	n/a	n/a
Tire Calendering	2 2	5.31E-05	6.89E-05	3.51E-06	n/a	1.53E-06	n/a	n/a
Sidewall Grinding[4]	3	1.57E-02	9.90E-03	5.31E-04	2.07E-02	0.00E-0	n/a	1.25E-01
Tire Carcass Grinding[4]	3	5.18E-04	1.57E-02	6.25E-04	1.38E-02	9.99E-06	n/a	5.45E-01
Retread Buffing[4]	3	2.40E-04	9.96E-06	9.99E-06	9.51E-05	9.04E-07	n/a	9.48E-03
Belt Grinding[4]	3	1.79E-03	2.46E-03	1.35E-04	4.79E-02	2.12E-02	n/a	1.19E+00

Note: These are averages of pollutant categories and are only provided to appraise the reader of the relative contribution of each process to facility emissions. These are not to be used in the development of emissions inventories.

[1]Sidewall grinding, tire carcass grinding, and belt grinding factors are lb pollutant/lb rubber removed. All other factors are lb pollutant/lb rubber processed.

[2]Table 2-3 details the test methods used for each process.

[3]Emission factors are for noncontact steam systems and include the water phase concentrations.

[4]Process includes a control device(s). However, factors provided in this table are before control, indicating the process' potential to emit.

n/a =

table 2-1 on pg. 8 of vol 3 is similar

Table 2-2. Test Matrix of Processes and Chemical Analyses

	Banbury Mixing (Internal)	Extruder	Warmup Mill	Calender	Tire Press	Autoclave	Platen Press	Oven Cure	Grinding
Total Volatile Organic Compounds	X	X	X	X	X	X	X	X	X
Speciated Volatiles	X	X	X	X	X	X	X	X	X
Volatile Ozone Precursors	X	X	X	X	X	X	X	X	X
Sulfur Compounds	X	X	X	X	X	X	X	X	X
Speciated Semivolatiles	X	X	X	X	X	X	X	X	X
Amines					X	X		~~vol 3~~	
Total Speciated Volatiles by FTIR		X			X			~~vol 3~~ X	(a)
Particulate Matter	X	X							X
Metals	X	X							X

(a) FTIR at one grinding facility.

2 cols in vol 3

POM in vol 3

#Cmpds

checks:

biggest org HAPs

biggest metals

26	4	4/3	3! 1? 2	10?	10 or 11	11 or 17?	3	4 types x3 each
OK early change	early changed	OK	changed	wt boots		bad	bad	bad
small, large, pilot	3.5 barrel?	lab & full	full scale	large lab	full scale	lab scale	lab scale	full scale

toluene & MC for carcass grinding

similar to Table 2-2 in vol 3

Table 2-3. Sampling and Analytical Methods Summary			
	Parameters	**Sampling Method**	**Analytical Methods**
1	Total Volatile Organic Compounds	M25A	M25A/FID
2	Speciated Volatiles	TO-14 (a) Grab Sample	TO-14/GC-MS M 8240
3	Volatile Ozone Precursors	TO-14	TO-14/GC-FID
4	Sulfur Compounds	TO-14	GC/FPD
5	Speciated Semivolatiles	M 0010 Grab Sample (b)	M 8270 M 8270
6	Particulate Matter	M5	Gravimetric
7	Metals	M0012	M 6010, 7000
8	Amines	Midget Impinger Sampling Train	GC
9	Total Speciated Volatiles by FTIR	Extractive	FTIR

POM ?

(a) Grab sample for autoclave water trap.
(b) Grab/composite sample for autoclave water trap.

In addition to the sampling conducted at each process emission vent, numerous sampling runs were conducted to quantify background concentrations of target pollutants present in the atmosphere where the sampling was conducted. These background tests were conducted since most of the emissions testing was performed in process areas containing several air pollutant emitting processes. The necessity of background emissions testing was determined by the team leader for each test program based upon field observations. These field observations included assessing the presence of visible emissions, odors, and plant activities which could bias the test data such as maintenance painting. Quantifiable background concentrations were subtracted from the sample concentrations for that day to provide more accurate emission results from the processes.

Laboratory and field blank samples were also collected for each sampling method to recognize and quantify contamination of any sampling media. The results of these blank sample runs were compared with the process sample runs to identify emission results which may be biased. If quantifiable pollutant concentrations were found in the sample blanks, these concentrations were subtracted from the specific test results associated the blank sample. Sample results which were found to have values less than or equal to background or blank sample concentrations were assumed to be equal to zero.

Table 4-1. Generic Rubber Formulations/Products		
Compound	**Category**	**Description**
1	Tire Inner Liner	Brominated IIR/Natural Rubber
2	Tire Ply Coat	Natural Rubber/Synthetic Rubber
3	Tire Belt Coat	Natural Rubber
4	Tire Base/Sidewall	Natural Rubber/Polybutadiene Rubber
5	Tire Apex	Natural Rubber
6	Tire Tread	Styrene Butadiene Rubber/Polybutadiene Rubber
7	Tire Bladder	Butyl Rubber/Neoprene Rubber
8	EPDM 1 unextruded	EPDM Sulfur Cure
9	EPDM 2 extruded	Peroxide Cure
10	EPDM 3	Non-black EPDM Sulfur Cure
11	CRW	Polychloroprene W Type
12	CRG	Polychloroprene G Type
13	Paracryl OZO	Nitrile Rubber/PVC
14	Paracryl BLT	Nitrile Rubber
15	Hypalon	CSM
16	Fluoroelastomer	FKM
17	AEM	Vamac
18	Hydrogenated Nitrile	HNBR
19	Silicone	VMQ
20	Acrylate Rubber	ACM
21	Chlorinated Polyethylene	CPE
22	Emulsion SBR	SBR 1502
23	Epichlorohydrin	ECO
24	Oil-Extended SBR*	SBR 1712
25	Emulsion SBR*	SBR 1500
26	Solution SBR*	Duradene 707

*Compounds 24, 25, and 26. Were mixes of polymer only, without fillers or cure system.

Calculation of Emission Factors for Methylene Chloride and Toluene Based on Air Testing Results (1/28/99)

from 40 min data

2.37E-05 lb/hr Emissions methylene chloride (*test data*)

/ 96.2 lbs/~~hr~~ test-hr Rubber ground from tire (*process test data*)

2.5E-07 ~~lb~~/lb methylene chloride per pound of rubber ground

$\boxed{2.3E\text{-}7;\ 2.8E\text{-}7;\ 2.3E\text{-}7}$

from 40 min data

6.03E-04 lb/hr Emissions toluene (*test data*)

/ 96.2 lbs/~~hr~~ test-hr Rubber ground from tire (*process test scenario*)

6.3E-06 ~~lb~~/lb toluene emission per pound of rubber ground

$\boxed{7.4E\text{-}6;\ 5.8E\text{-}6;\ 5.5E\text{-}6}$

T.O.C. → 0.10 lb/hr, as C

AP42 Re-Test for Tire Carcasses Grinding (28 Jan 99)

For Pollutants Methylene Chloride and Toluene

Test Process Information:

		Truck Tire Brandname	Tire Weight Before Grinding (lbs/tire)	Tire Weight After Grinding (lbs/tire)	Tire Weight Ground Off (lbs/tire)	
Test #1						
	1.	Goodyear	108.3	95.5	12.8	
	2.	Goodyear	105.7	88	17.7	
	3.	Firestone	105	95.9	9.1	
	4.	Goodyear	109.7	97	12.7	
	5.	Michelin	92.8	81.9	10.9	
	6.	Michelin	98.5	84	14.5	
	7.	Goodyear	93.5	84.2	9.3	
	8	Michelin	95.8	83.2	12.6	
				Total Removed	99.6	÷8 = 12.45
				Average per Tire	12.5	
Test #2						
	1.	Kumho	110.95	103.3	7.65	
	2.	Dunlop	113.7	97.85	15.85	
	3.	Goodyear	109.4	95.5	13.9	
	4.	Yokohama	109.9	100.9	9	
	5.	Dunlop	97.85	87.15	10.7	
	6.	Goodyear	110	97.2	12.8	
	7.	Michelin	101.7	92.9	8.8	
	8.	Michelin	93.6	80.7	12.9	
				Total Removed	91.6	÷8 = 11.45
				Average per Tire	11.5	
Between Test		Goodyear	112.45	102.2	10.25	
		Kelly	107.3	94.5	12.8	
Test #3						
	1.	Michelin	108.8	94.5	14.3	
	2.	Michelin	98.9	87.8	11.1	
	3.	Hankook	123.5	109.9	13.6	
	4.	Michelin	103.6	94	9.6	
	5.	Dunlop	105.9	94	11.9	
	6.	Bridgeston	104.5	91.3	13.2	
	7.	Goodyear	108.6	96.1	12.5	
	8	General	104.9	93.8	11.1	
				Total Removed	97.3	÷8 = 12.16
				Average per Tire	12.2	

Average Rubber Removed per Test 96.2 ✓

Average Rubber Removed per Tire 12.02 ✓

tol = 7.4e-4 lbs/hr = 7.4e-6 lb/lb
mc = 2.3e-5 lb/hr = 2.3e-7 lb/lb

tol = 5.3e-4 lbs/hr = 5.8e-6 lb/lb
mc = 2.6e-5 lb/hr = 2.8e-7 lb/lb

tol = 5.4e-4 lbs/hr = 5.5e-6 lb/lb
mc = 2.2e-5 lbs/hr = 2.3e-7 lb/lb

Test Tire Scale Information

Manufacturer:	Measurement Systems International
Model #:	Challenger2, Model 3360
Digital Readout:	in 0.1 lbs increments

Calibration Company:	Greenville Scale Co., Inc.
Technician:	Anders
Last Calibration Date:	11/2/98
Next Calibration Due:	2/2/99

2 tires - Keep 9
grinding

TIRES

polymers

PROCESS	EQUIPT TESTED	1	2	3	4	5	6	7	8	9	9a	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
		RUBBER FORMULATION #																										
Internal Mixing&Milling	sm mixer 1 (2 lb lab?)				#		?			#														#				
Banbury Mixer (closed)	sm mixer 2 (2 lb lab?)		1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	lrg mixer 1(200 lb ~~pilot?~~)				#		#			#														#				
	lrg w/torit (500 lb prod?)					3																						
Milling	mill#1(?) -production													3														
	mill#2(?) -lab scale		1	1	1																							
Extruder	3.5" barrel (2.5-to=prod)				#		#			#														#				
Calendar	cal #1(?) - production		3	(pg 1-5 indicates 2+1 ~~tests~~ formulations)																								
	cal#2(?) - batch (prod)													3												done 3X		
Platen Press Curing	at TRC-Lowell - lab	✓	1✓	1✓		✓3		1✓		1		✓	3✓	✓	1	1✓		1✓	1✓		1	1✓		1	1✓			
Autoclave Curing	full scale				#	#	#		#	#	#		#				#			#			#	#				
Hot Air Cure	lab-scale ✓					#1			#1															#1				

thruput basis

~~17,16,10,11?~~

		A	B	C	D	E	F	G	H	I
		TIRE DESIGNATION								
Tire Cure	9 tires, 3 types - Prod 28 lab cuts - Lab	1	1	1	1	1	1	1	1	1

A D F = OEM
E G H = hiper.
B C I = repl.

Grinding - Belt	full scale	3 runs
Grinding - Carcass		3 runs
Grinding - Retread		3 runs
Grinding - Sidewall/Whitewall		3 runs
Grinding - Force		only observed?

PROCESS	EQUIPT TESTED	tvoc	spec	semi	sulf	amines	PM	Metals
		TEST METHODS						
Internal Mixing&Milling	sm mixer 1 (2 lb lab?) sm mixer 2 (2 lb lab?) lrg mixer 1(200 lb pilot?) lrg w/torit (500 lb prod?)							
Milling	mill#1(?) -production mill#2(?) -lab scale							
Extruder	3.5"							
Calendar	cal #1(?) - production cal#2(?) - batch							
Platen Press Curing	at TRC-Lowell							
Autoclave Curing								
Hot Air Cure	lab-scale							
Tire Cure	9 tires, 3 types 28 lab cuts							
Grinding								

FTIR

FTIR

Check list: Leak chks

Flow rates
concentrations
field sheets
calibrations
process rate

Lab analyses
Calcs
Access
4 vol report

ID #5; data is same

check vol & data tables beforehand

CALCS are correct

Look for background subtractions

& enclosure velocities

& process data every 15 min.

11-12-99 POLL_NAMES in RMA order. From Grinding, plus where noted
all tire cure (table 4.12-11) and Calender (table 4.12-7) checked and listed.

original RMA name	CAS	RMA	same?	Analyte Name (CAA exact)
1,1,1-Trichloroethane	71-55-6	1	N	Methyl chloroform
1,1,2,2-Tetrachloroethane	79-34-5	2		1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane	79-00-5	3		1,1,2-Trichloroethane
1,1-Dichloroethane	75-34-3	4	N	Ethylidene dichloride
1,1-Dichloroethene	75-35-4	5	N	Vinylidene chloride
1,2,4-Trichlorobenzene	120-82-1	6		1,2,4-Trichlorobenzene
1,2-Dibromo-3-Chloropropane	96-12-8	7	n	1,2-Dibromo-3-chloropropane
1,2-Dibromoethane	106-93-4	8	N	Ethylene dibromide
1,2-Dichloroethane	107-06-2	9	N	Ethylene dichloride
1,2-Dichloropropane	78-87-5	10	N	Propylene dichloride
1,3-Butadiene	106-99-0	11		1,3-Butadiene
1,4-Dichlorobenzene	106-46-7	12		1,4-Dichlorobenzene
1,4-Dioxane	123-91-1	13		1,4-Dioxane
1,4-Phenylenediamine	106-50-3	14	n	p-Phenylenediamine
2,4,5-Trichlorophenol	95-95-4	15		2,4,5-Trichlorophenol
2,4,6-Trichlorophenol	88-06-2	16		2,4,6-Trichlorophenol
2,4-Dinitrophenol	51-28-5	17		2,4-Dinitrophenol
2,4-Dinitrotoluene	121-14-2	18		2,4-Dinitrotoluene
2-Butanone	78-93-3	19	N	Methyl ethyl ketone
2-Chloro-1,3-Butadiene	126-99-8	20	N	Chloroprene
2-Chloroacetophenone	532-27-4	21		2-Chloroacetophenone
2-Methylphenol	95-48-7	22	N	o-Cresol
3,3'-Dichlorobenzidine	91-94-1	23	n	3,3-Dichlorobenzidine
3,3'-Dimethoxybenzidine	119-90-4	24	n	3,3-Dimethoxybenzidine
3,3'-Dimethylbenzidine	119-93-7	25	n	3,3'-Dimethyl benzidine
4,4'-Methylenedianiline	101-77-9	26		4,4'-Methylenedianiline
4-Aminobiphenyl	92-67-1	27		4-Aminobiphenyl
4-Methyl-2-pentanone	108-10-1	28	N	Methyl isobutyl ketone
4-Nitrobiphenyl	92-93-3	29		4-Nitrobiphenyl
4-Nitrophenol	100-02-7	30		4-Nitrophenol
a,a,a-Trichlorotoluene	98-07-7	31	N	Benzotrichloride
Acetaldehyde	75-07-0	32		Acetaldehyde
Acetonitrile	75-05-8	33		Acetonitrile
Acetophenone	98-86-2	34		Acetophenone
Acrolein	107-02-8	35		Acrolein
Acrylonitrile	107-13-1	36		Acrylonitrile
Allyl Chloride	107-05-1	37	n	Allyl chloride
Aniline	62-53-3	38		Aniline
Benzene	71-43-2	39		Benzene
Benzidine	92-87-5	40		Benzidine
Benzyl Chloride	100-44-7	41	n	Benzyl chloride
Biphenyl	92-52-4	42		Biphenyl
bis(2-Chloroethyl)ether	111-44-4	43	N	Dichloroethyl ether
bis(2-Ethylhexyl)phthalate	117-81-7	44	n	Bis(2-Ethylhexyl)phthalate
Bromoform	75-25-2	45		Bromoform
Bromomethane	74-83-9	46	N	Methyl bromide
Cadmium (Cd) Compounds		47	n	Cadmium Compounds
Carbon Disulfide	75-15-0	48	n	Carbon disulfide

Carbon Tetrachloride	56-23-5	49	n	Carbon tetrachloride
Carbonyl Sulfide	463-58-1	50		Carbonyl sulfide
Chlorobenzene	108-90-7	51		Chlorobenzene
Chloroethane	75-00-3	52	N	Ethyl chloride
Chloroform	67-66-3	53		Chloroform
Chloromethane	74-87-3	54	N	Methyl chloride
Chromium (Cr) Compounds		55	n	Chromium Compounds
Cobalt (Co) Compounds		56	n	Cobalt Compounds
Cumene	98-82-8	57		Cumene
Di-n-butylphthalate	84-74-2	58	n	Dibutylphthalate
Dibenzofuran	132-64-9	59		Dibenzofuran
Dimethylaminoazobenzene	60-11-7	60	n	Dimethyl aminoazobenzene
Dimethylphthalate	131-11-3	61		Dimethylphthalate
Epichlorohydrin	106-89-8	62		Epichlorohydrin
Ethyl Acrylate	140-88-5	63	n	Ethyl acrylate
Ethylbenzene	100-41-4	64	n	Ethyl benzene
Hexachlorobenzene	118-74-1	65		Hexachlorobenzene
Hexachlorobutadiene	87-68-3	66		Hexachlorobutadiene
Hexachlorocyclopentadiene	77-47-4	67		Hexachlorocyclopentadiene
Hexachloroethane	67-72-1	68		Hexachloroethane
Hexane	110-54-3	69		Hexane
Hydroquinone	123-31-9	70		Hydroquinone
Isooctane	540-84-1	71	N	2,2,4-Trimethylpentane
Isophorone	78-59-1	72		Isophorone
Lead (Pb) Compounds		73	n	Lead Compounds
m-Xylene + p-Xylene		74		m-Xylene + p-Xylene
Methylene bis-chloroaniline	101-14-4	75	n	4,4-Methylene bis(2-chloroaniline)
Methylene Chloride	75-09-2	76	n	Methylene chloride
N,N-Dimethylaniline	121-69-7	77		N,N-Dimethylaniline
N-Nitrosodimethylamine	62-75-9	78		N-Nitrosodimethylamine
N-Nitrosomorpholine	59-89-2	79		N-Nitrosomorpholine
Naphthalene	91-20-3	80		Naphthalene
Nickel (Ni) Compounds		81	n	Nickel Compounds
Nitrobenzene	98-95-3	82		Nitrobenzene
o-Anisidine	90-04-0	83		o-Anisidine
o-Toluidine	95-53-4	84		o-Toluidine
o-Xylene	95-47-6	85		o-Xylene
Pentachloronitrobenzene	82-68-8	86		Pentachloronitrobenzene
Pentachlorophenol	87-86-5	87		Pentachlorophenol
Phenol	108-95-2	88		Phenol
Propanal	123-38-6	89	N	Propionaldehyde
Propylene Oxide	75-56-9	90	n	Propylene oxide
Styrene	100-42-5	91		Styrene
t-Butyl Methyl Ether	1634-04-4	92	N	Methyl tert butyl ether
Tetrachloroethene	127-18-4	93	N	Tetrachloroethylene
Toluene	108-88-3	94		Toluene
Trichloroethene	79-01-6	95	N	Trichloroethylene
Trifluralin	1582-09-8	96		Trifluralin
Vinyl Acetate	108-05-4	97	n	Vinyl acetate
Vinyl Chloride	75-01-4	98	n	Vinyl chloride

PROCESS	EQUIPT TESTED	RUBBER FORMULATION # 1	2	3	4	5	6	7	8	9	9a	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Internal Mixing&Milling	sm mixer 1 (2 lb lab?)				#		?			#														#				
	sm mixer 2 (2 lb lab?)		1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	lrg mixer 1(200 lb pilot?)				#		#			#														#				
	lrg w/torit (500 lb prod?)					3																						
Milling	mill#1(?) -production													3														
	mill#2(?) -lab scale		1	1	1																							
Extruder	3.5"				#		#			#														#				
Calendar	cal #1(?) - production		3	(pg 1-5 indicates 2+1 tests)																								
	cal#2(?) - batch													3														
Platen Press Curing	at TRC-Lowell		1.	1		3		1		1		1	3	1	1	1		1	1		1	1		1	1			
Autoclave Curing					#	#	#		#	#	#		#				#			#			#	#				
Hot Air Cure	lab-scale					#			#															#				

		TIRE DESIGNATION A	B	C	D	E	F	G	H	I
Tire Cure	9 tires, 3 types 28 lab cuts	1	1	1	1	1	1	1	1	1
Grinding - Belt		3 runs								
Grinding - Carcass		3 runs								
Grinding - Retread		3 runs								
Grinding - Sidewall/Whitewall		3 runs								
Grinding - Force		only observed?								

PROCESS	EQUIPT TESTED	TEST METHODS tvoc	spec	semi	sulf	amines	PM	Metals
Internal Mixing&Milling	sm mixer 1 (2 lb lab?)							
	sm mixer 2 (2 lb lab?)							
	lrg mixer 1(200 lb pilot?)							
	lrg w/torit (500 lb prod?)							
Milling	mill#1(?) -production							
	mill#2(?) -lab scale							
Extruder	3.5"							
Calendar	cal #1(?) - production							
	cal#2(?) - batch							
Platen Press Curing	at TRC-Lowell							
Autoclave Curing								
Hot Air Cure	lab-scale							
Tire Cure	9 tires, 3 types 28 lab cuts							
Grinding								

	Equipt	Pollutant	vol/:	Cmpd #	match?	AP-42 EF value	AP-42 table#	Vol. 4 EF value
1	autoclave	toluene		4		1.3E-005	4.12-9	*************
2	calendar	carbonyl sulfide		12	y	*************	4.12-7	
3	grinding	carbon disulfide		retread		*************	4.12-12	*************
4	extruder	acetophenone		9	y	*************	4.12-6	
5	extruder	4-methyl-2-pentanone		22	y	*************	4.12-6	*************
6	hot air cure	2-butanone		5	y	*************	4.12-10	
7	hot air cure	carbon disulfide		22		*************	4.12-10	*************
8	hot air cure	acetophenone		8		*************	4.12-10	*************
9	calendar	hydroquinone		2		*************	4.12-7	*************
10	calendar	hydroquinone		12		*************	4.12-7	*************
11	calendar	4-nitrobiphenyl		2		*************	4.12-7	*************
12	platen press	dibenzofuran		1	y	*************	4.12-8	
13	platen press	hexane		2	y	*************	4.12-8	
14	platen press	cumene		14		*************	4.12-8	*************
15	internal mixing &	m+p-xylene		17	y	*************	?	
16	internal mixing &	toluene		23	y	*************	?	
17	milling	benzene		4	y	*************	4.12-5	
18	milling	ethylbenzene		12	y	*************	4.12-5	
19	milling	naphthalene		3	y	*************	4.12-5	
20	tire cure	2-methylphenol		tire A		*************	4.12-11	*************
21	tire cure	tetrachloroethane		tire H		*************	4.12-5	*************
22	autoclave	4-methyl-2-pentanone		6		*************	4.12-9	*************
23	extruder	nickel cmpds	mtl	6	y	*************	4.12-6	
24	grinding	propylene oxide		belt		*************	4.12-12	?
25	tire cure/tire pre	dimethylphthalate		tire F		*************	?	*************
26	internal mixing &	1,3-butadiene		7	y	*************	4.12-4	

Vol. 4 table#	Vol. 2 EF value	Vol. 2 table#	Vol. 2 Notes	NON-MATCH SOURCE
3-6A	**************	D.1-5 thru D.1-8	sum of 4 pieces	AP42
			mean of 3 runs	
3-9	**************	F.1-4	mean of 3 runs	ALL 3
			mean of 3 runs	
	**************		mean of 3 runs	
			1 value?	
3-8	**************	J.1-4	1 value?	VOL 2
3-8	**************	J.1-2	1 value?	VOL 2
3-4A	**************	H.2-2	mean of 3 runs	AP42
3-4	**************	H.1-2	mean of 3 runs	AP42
3-4	**************	H.1-2	mean of 3 runs	AP42
			1 value?	
			1 value?	
3-7	**************	E.1-3	1 value?	VOL 2
			1 value?	
			1 value?	
			1 value?	
			1 value?	
			1 value?	
3-5A	**************	C.1-2	1 value?	AP42
3-5A	**************	C.1-2	1 value?	ALL 3
3-6	**************	D.1-5 thru D.1-8	sum of 4 pieces	ALL 3
			mean of 3 runs	
3-9	**************		mean of 3 runs	ALL 3
3-5	**************		1 value?	VOL 4
			1 value?	

1. copy WPD by multiple columns to XLS template (CALENDAR)
2. check alignment of cts & names across 4 copies
3. copy-PASTE SPECIAL- VALUES only into template area
4. clean out units from each column heading
5. clean up "interpolated from col. headings, & make real values BOLD
6. insert Line for "Total other HAPs" - subtract, delete total HAPs line

save as

rename WPDs as "old ..."
check SUMS → "TOTAL HAPS" = everything in TABLE (i.e. - no non-HAPS reported in table, may have been speciated)
re-title, re-footnote, re-page
Final 03/02
but will have to re-do AT VERY END
& Non-Detects (<) count as ZERO towards SUMS

set print breaks
set footnotes
[insert 7 COLUMNS
Attach Pill names
sort
change sht name

3/3/02 - PLATEN PRESS - Footnote CONTENT & Format - issues
" - EXTRUDER
" - AUTOCLAVE - which are interpolated - Footnote ≠ Col. Headings

3/09/02 - Hoover - footnote says 5 of 22 meas. col headings say 5 (8) of 22 (Lotus agrees)
! 3/09/02 - Milling - the order of biphenyl/benzyl chloride was switched in the LAST 2 of 4 WPDs
3/09/02 - Mixing (Internal Mixing & Milling) - No info on what CMPDS were ~~extrapolated~~ ALL MEAS?

ONLY 1 of 8 has values: Biphenyl
compd ~~#2~~
Interpolated

called WARMUP MILL in Lotus tables → Lotus shows entry for BENZYL

N-Nitrosomorpholine	59-89-2	79		N-Nitrosomorpholine	Nitrosomorpholine	
Naphthalene	91-20-3	80		Naphthalene	Naphthalene	
Nickel (Ni) Compounds		81	n	Nickel Compounds	zNickel Compounds	
Nitrobenzene	98-95-3	82		Nitrobenzene	Nitrobenzene	
o-Anisidine	90-04-0	83		o-Anisidine	Anisidine	
o-Toluidine	95-53-4	84		o-Toluidine	Toluidine	
o-Xylene	95-47-6	85		o-Xylene	Xylene1	< p-xylene, fr. hot air cure
Pentachloronitrobenzene	82-68-8	86		Pentachloronitrobenzene	Pentachloronitrobenzene	
Pentachlorophenol	87-86-5	87		Pentachlorophenol	Pentachlorophenol	
Phenol	108-95-2	88		Phenol	Phenol	
Propanal	123-38-6	89	N	Propionaldehyde	Propionaldehyde	from Calendering table 4.12-7
Propylene Oxide	75-56-9	90	n	Propylene oxide	Propylene oxide	
Styrene	100-42-5	91		Styrene	Styrene	< substituted Quinoline - fr. hot air cure
t-Butyl Methyl Ether	1634-04-4	92	N	Methyl tert butyl ether	Methyl tert butyl ether	
Tetrachloroethene	127-18-4	93	N	Tetrachloroethylene	Tetrachloroethylene	
Toluene	108-88-3	94		Toluene	Toluene	
Trichloroethene	79-01-6	95	N	Trichloroethylene	Trichloroethylene	
Trifluralin	1582-09-8	96		Trifluralin	Trifluralin	
Vinyl Acetate	108-05-4	97	n	Vinyl acetate	Vinyl acetate	
Vinyl Chloride	75-01-4	98	n	Vinyl chloride	Vinyl chloride	< vinyl bromide - from [illegible]

3/3/02
platen press-EF table:
doesn't have - CADMIUM
chromium
cobalt
Ethyl Acrylate
Lead Compounds
Nickel Compounds
Propanal

Extruder EF table:
doesn't have -
Chloroprene
Cadmium
Lead Compounds

Autoclave EF table:
doesn't have:
cadmium
chromium
cobalt
Lead
Nickel

3/9/02
Hot Air Cure EF table
doesn't have: 1,2 epoxybutane
Chloroprene
acetaldehyde isobutane
nickel
Cadmium
chromium
cobalt
iodomethane
Pb Compounds
methyl ~~methacrylate~~
vinyl bromide

3/9/02 Milling EF table
doesn't have:
epoxybutane
chloroprene
cadmium
chromium
cobalt
iodomethane
Lead
m-xylene
methyl methacrylate
Nickel cmpds
p-xylene
substit. quinoline
vinyl bromide

3/9/02
MIXING:
epoxybutane
chloroprene
cobalt
iodomethane
m-xylene
methyl methacrylate
p-xylene
subs. quinoline
vinyl bromide

11-12-99 POLL_NAMES in RMA order. From Grinding, plus where noted
all tire cure (table 4.12-11) and Calender (table 4.12-7) checked and listed.

original RMA name	CAS	RMA	same?	Analyte Name (CAA exact)	CAA sort name	CAA errors poll from grinding unless noted
1,1,1-Trichloroethane	71-55-6	1	N	Methyl chloroform	Methyl chloroform	
1,1,2,2-Tetrachloroethane	79-34-5	2		1,1,2,2-Tetrachloroethane	Tetrachloroethane	
1,1,2-Trichloroethane	79-00-5	3		1,1,2-Trichloroethane	Trichloroethane	
1,1-Dichloroethane	75-34-3	4	N	Ethylidene dichloride	Ethylidene dichloride	
1,1-Dichloroethene	75-35-4	5	N	Vinylidene chloride	Vinylidene chloride	
1,2,4-Trichlorobenzene	120-82-1	6		1,2,4-Trichlorobenzene	Trichlorobenzene	
1,2-Dibromo-3-Chloropropane	96-12-8	7	n	1,2-Dibromo-3-chloropropane	Dibromo-3-chloropropane	
1,2-Dibromoethane	106-93-4	8	N	Ethylene dibromide	Ethylene dibromide	
1,2-Dichloroethane	107-06-2	9	N	Ethylene dichloride	Ethylene dichloride	
1,2-Dichloropropane	78-87-5	10	N	Propylene dichloride	Propylene dichloride	< 1,2-Epoxybutane from Autoclave
1,3-Butadiene	106-99-0	11		1,3-Butadiene	Butadiene	
1,4-Dichlorobenzene	106-46-7	12		1,4-Dichlorobenzene	Dichlorobenzene	
1,4-Dioxane	123-91-1	13		1,4-Dioxane	Dioxane	
1,4-Phenylenediamine	106-50-3	14	n	p-Phenylenediamine	Phenylenediamine	
2,4,5-Trichlorophenol	95-95-4	15		2,4,5-Trichlorophenol	Trichlorophenol	
2,4,6-Trichlorophenol	88-06-2	16		2,4,6-Trichlorophenol	Trichlorophenol	
2,4-Dinitrophenol	51-28-5	17		2,4-Dinitrophenol	Dinitrophenol	
2,4-Dinitrotoluene	121-14-2	18		2,4-Dinitrotoluene	Dinitrotoluene	
2-Butanone	78-93-3	19	N	Methyl ethyl ketone	Methyl ethyl ketone	
2-Chloro-1,3-Butadiene	126-99-8	20	N	Chloroprene	Chloroprene	
2-Chloroacetophenone	532-27-4	21		2-Chloroacetophenone	Chloroacetophenone	
2-Methylphenol	95-48-7	22	N	o-Cresol	Cresol	
3,3'-Dichlorobenzidine	91-94-1	23	n	3,3-Dichlorobenzidine	Dichlorobenzidine	CAA spelling has "e" rather than "i", 3rd letter from end
3,3'-Dimethoxybenzidine	119-90-4	24	n	3,3-Dimethoxybenzidine	Dimethoxybenzidine	
3,3'-Dimethylbenzidine	119-93-7	25	n	3,3'-Dimethyl benzidine	Dimethyl benzidine	
4,4'-Methylenedianiline	101-77-9	26		4,4'-Methylenedianiline	Methylenedianiline	
4-Aminobiphenyl	92-67-1	27		4-Aminobiphenyl	Aminobiphenyl	
4-Methyl-2-pentanone	108-10-1	28	N	Methyl isobutyl ketone	Methyl isobutyl ketone	
4-Nitrobiphenyl	92-93-3	29		4-Nitrobiphenyl	Nitrobiphenyl	
4-Nitrophenol	100-02-7	30		4-Nitrophenol	Nitrophenol	
a,a,a-Trichlorotoluene	98-07-7	31	N	Benzotrichloride	Benzotrichloride	
Acetaldehyde	75-07-0	32		Acetaldehyde	Acetaldehyde	
Acetonitrile <	75-05-8	33		Acetonitrile	Acetonitrile	< acet + isobutane - from Ex Mix 2-3-03
Acetophenone	98-86-2	34		Acetophenone	Acetophenone	
Acrolein	107-02-8	35		Acrolein	Acrolein	
Acrylonitrile	107-13-1	36		Acrylonitrile	Acrylonitrile	
Allyl Chloride	107-05-1	37	n	Allyl chloride	Allyl chloride	
Aniline	62-53-3	38		Aniline	Aniline	
Benzene	71-43-2	39		Benzene	Benzene	
Benzidine	92-87-5	40		Benzidine	Benzidine	
Benzyl Chloride	100-44-7	41	n	Benzyl chloride	Benzyl chloride	
Biphenyl	92-52-4	42		Biphenyl	Biphenyl	
bis(2-Chloroethyl)ether	111-44-4	43	N	Dichloroethyl ether	Dichloroethyl ether	
bis(2-Ethylhexyl)phthalate	117-81-7	44	n	Bis(2-Ethylhexyl)phthalate	Bis(2-Ethylhexyl)phthalate	
Bromoform	75-25-2	45		Bromoform	Bromoform	
Bromomethane	74-83-9	46	N	Methyl bromide	Methyl bromide	
Cadmium (Cd) Compounds		47	n	Cadmium Compounds	zCadmium Compounds	
Carbon Disulfide	75-15-0	48	n	Carbon disulfide	Carbon disulfide	
Carbon Tetrachloride	56-23-5	49	n	Carbon tetrachloride	Carbon tetrachloride	
Carbonyl Sulfide	463-58-1	50		Carbonyl sulfide	Carbonyl sulfide	
Chlorobenzene	108-90-7	51		Chlorobenzene	Chlorobenzene	
Chloroethane	75-00-3	52	N	Ethyl chloride	Ethyl chloride	
Chloroform	67-66-3	53		Chloroform	Chloroform	
Chloromethane	74-87-3	54	N	Methyl chloride	Methyl chloride	
Chromium (Cr) Compounds		55	n	Chromium Compounds	zChromium Compounds	
Cobalt (Co) Compounds		56	n	Cobalt Compounds	zCobalt Compounds	
Cumene	98-82-8	57		Cumene	Cumene	
Di-n-butylphthalate	84-74-2	58	n	Dibutylphthalate	Dibutylphthalate	
Dibenzofuran	132-64-9	59		Dibenzofuran	Dibenzofuran	CAA has "s" on end
Dimethylaminoazobenzene	60-11-7	60	n	Dimethyl aminoazobenzene	Dimethyl aminoazobenzene	
Dimethylphthalate	131-11-3	61		Dimethylphthalate	Dimethylphthalate	
Epichlorohydrin	106-89-8	62		Epichlorohydrin	Epichlorohydrin	
Ethyl Acrylate	140-88-5	63	n	Ethyl acrylate	Ethyl acrylate	from Calendering table 4.12-7
Ethylbenzene	100-41-4	64	n	Ethyl benzene	Ethyl benzene	
Hexachlorobenzene	118-74-1	65		Hexachlorobenzene	Hexachlorobenzene	
Hexachlorobutadiene	87-68-3	66		Hexachlorobutadiene	Hexachlorobutadiene	
Hexachlorocyclopentadiene	77-47-4	67		Hexachlorocyclopentadiene	Hexachlorocyclopentadiene	
Hexachloroethane	67-72-1	68		Hexachloroethane	Hexachloroethane	
Hexane	110-54-3	69		Hexane	Hexane	
Hydroquinone	123-31-9	70		Hydroquinone	Hydroquinone	< iodomethane from Autoclave
Isooctane	540-84-1	71	N	2,2,4-Trimethylpentane	Trimethylpentane	
Isophorone	78-59-1	72		Isophorone	Isophorone	
Lead (Pb) Compounds		73	n	Lead Compounds	zLead Compounds	< m-xylene - from Hot Air C.
m-Xylene + p-Xylene		74		m-Xylene + p-Xylene	Xylene2 + p-Xylene	CAA has separate or mixed isomers
Methylene bis-chloroaniline	101-14-4	75	n	4,4-Methylene bis(2-chloroanilin	Methylene bis(2-chloroaniline)	~ methyl methacrylate from Autoclave
Methylene Chloride	75-09-2	76	n	Methylene chloride	Methylene chloride	
N,N-Dimethylaniline	121-69-7	77		N,N-Dimethylaniline	Dimethylaniline	CAA preferred does not match CAS - use CAA synonym
N-Nitrosodimethylamine	62-75-9	78		N-Nitrosodimethylamine	Nitrosodimethylamine	

Print File List
12/15/97 1:58pm
C:\RMA

Total Files: 38 ~ 31 Tables
Total Bytes: 5,820,434

vol2.1	61,384	06/25/96 7:55am	AP-42 SECTION 4.12 d04s12A.WPD
vol1.4	12,267	02/13/9610:09am	=d04s12B.WPD ?
vol1.3	32,807	02/13/96 9:56am	BACKGROUND REPORT
vol1.2a	4,665	02/26/97 4:09pm	put these 4 together
vol1.2	60,335	06/24/96 2:32pm	in one WPD 140K
vol1.1	28,382	06/24/96 2:56pm	
tirecur2.wpd	104,846	09/26/96 4:18pm	5D 4.12-11
tirecur1.wpd	84,833	09/26/96 4:19pm	
rma_call	3,636	03/21/97 2:18pm	
platen4.wpd	266,335	09/26/9612:52pm	4.12-8
platen3.wpd	327,999	09/26/96 4:26pm	5A
platen2.wpd	228,205	09/26/96 4:25pm	
platen1.wpd	260,171	09/26/96 4:22pm	
mix4.wpd	128,129	11/04/96 9:48am	4.12-4 1 4.12-3 Internal Mixing & Milling
mix3.wpd	160,400	11/04/96 9:46am	
mix2.wpd	154,164	11/04/96 9:44am	
mix1.wpd	163,599	11/04/96 9:42am	
milling4.wpd	150,767	09/26/96 1:27pm	4.12-5 2
milling3.wpd	150,897	09/24/96 1:17pm	
milling2.wpd	166,429	09/24/96 1:24pm	
milling1.wpd	155,715	09/24/96 1:23pm	
hotair4.wpd	199,579	09/26/96 9:43am	4.12-10
hotair3.wpd	338,953	09/26/96 9:29am	5C
hotair2.wpd	335,319	09/25/96 4:29pm	
hotair1.wpd	123,424	09/25/96 4:29pm	
grind.wpd	119,642	09/26/96 3:25pm	6 4.12-12
extrud4.wpd	121,451	11/04/9610:10am	4.12-6
extrud3.wpd	152,033	11/04/9610:08am	3
extrud2.wpd	141,074	11/04/9610:07am	
extrud1.wpd	129,959	11/04/9610:05am	
calend4.wpd	147,747	09/24/96 2:13pm	4.12-7
calend3.wpd	208,224	09/24/96 1:26pm	4
calend2.wpd	202,145	09/24/96 1:29pm	
calend1.wpd	217,100	09/24/96 1:30pm	
autoclv4.wpd	169,658	09/24/96 1:33pm	4.12-9
autoclv3.wpd	146,261	09/24/96 1:31pm	5B
autoclv2.wpd	198,401	09/24/96 1:34pm	
autoclv1.wpd	163,499	09/24/96 1:35pm	

4.12-4.xx
1 Table 2 spaces
2 drop NAP ... SUMMARY-ADDS
4 pg. #'s
5 replace $'s
3 replace VOC w/ method 25A organics
SAVE

31
A
B
TXT

please post the attached on web under draft sections under Review 4 section 4.12 1 Description = Manufacture of Rubber Products, Draft Section 1 comments Req. by Feb 27, 1998.

txt file under txt and save like 1.x

3/09/07 RR

LAST 4 cmpds - last of 4 wpds - Biphenyl & Benzyl chloride order switched

Benzyl Cl was never detected in 4 measured compounds

Footnotes: 2, 3, 4 & 12 measured
2, 1, 1, matches col. headings

NL

Table 4.12-5. MILLING EMISSION FACTORS

Analyte Name	CAS #	Interpolated Cmpd #1 lb/lb rubber	Cmpd #2 lb/lb rubber	Cmpd #3 lb/lb rubber	Cmpd #4 lb/lb rubber	Interpolated Cmpd #5 lb/lb rubber	Interpolated Cmpd #6 lb/lb rubber
Total Method 25A Organics		8.99e-05	1.10e-04	1.13e-04	8.37e-05	3.14e-04	5.64e-05
Total Speciated Organics		2.63e-05	3.48e-05	4.31e-05	5.04e-05	3.21e-05	5.10e-05
Total Organic HAPs		1.09e-05	6.39e-06	2.06e-05	1.59e-05	2.17e-05	2.53e-05
Total HAPs		1.09e-05	6.39e-06	2.06e-05	1.59e-05	2.17e-05	2.53e-05
1,1,1-Trichloroethane	71-55-6	<	3.32e-08	<	<	9.52e-08	<
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<
1,1-Dichloroethane	75-34-3	<	<	<	<	<	<
1,1-Dichloroethene	75-35-4	<	<	<	<	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	<	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<	<	<	<
1,2-Dibromoethane	106-93-4	<	<	<	<	<	<
1,2-Dichloroethane	107-06-2	<	4.06e-08	<	<	<	<
1,2-Dichloropropane	78-87-5	<	<	<	<	<	<
1,3-Butadiene	106-99-0	5.07e-08	<	<	<	<	<
1,4-Dichlorobenzene	106-46-7	<	<	<	<	7.90e-10	6.32e-10
1,4-Dioxane	123-91-1	<	<	<	<	<	<
1,4-Phenylenediamine	106-50-3	<	<	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<	<

MILLING
HAP EMISSION FACTOR SUMMARY

Analyte Name	CAS #	Interpolated Cmpd #20 lb/lb rubber	Interpolated Cmpd #21 lb/lb rubber	Interpolated Cmpd #22 lb/lb rubber	Interpolated Cmpd #23 lb/lb rubber
2-Butanone	78-93-3	6.73e-08	2.45e-07	2.27e-06	<
2-Chloroacetophenone	532-27-4	<	<	<	<
2-Methylphenol	95-48-7	5.26e-10	<	<	<
3,3'-Dichlorobenzidine	91-94-1	<	<	<	<
3,3'-Dimethoxybenzidine	119-90-4	<	<	<	<
3,3'-Dimethylbenzidine	119-93-7	<	<	<	<
4,4'-Methylenedianiline	101-77-9	<	<	<	<
4-Aminobiphenyl	92-67-1	<	<	<	<
4-Methyl-2-pentanone	108-10-1	9.92e-08	1.43e-08	7.08e-06	<
4-Nitrobiphenyl	92-93-3	<	<	<	<
4-Nitrophenol	100-02-7	<	<	<	<
a,a,a-Trichlorotoluene	98-07-7	<	<	<	<
Acetaldehyde	75-07-0	<	<	<	<
Acetaldehyde + Isobutane		<	<	<	<
Acetonitrile	75-05-8	<	<	<	<
Acetophenone	98-86-2	8.33e-08	9.11e-09	1.51e-08	4.68e-09
Acrolein	107-02-8	<	1.18e-07	1.56e-07	<
Acrylonitrile	107-13-1	<	<	<	<
Allyl Chloride	107-05-1	<	<	<	<
Aniline	62-53-3	3.73e-09	<	2.43e-07	1.15e-07
Benzene	71-43-2	3.07e-08	<	4.60e-08	<
Benzidine	92-87-5	<	<	<	<
Biphenyl	92-52-4	<	<	5.07e-09	<

MILLING
HAP EMISSION FACTOR SUMMARY

Analyte Name	CAS #	Interpolated Cmpd #20 lb/lb rubber	Interpolated Cmpd #21 lb/lb rubber	Interpolated Cmpd #22 lb/lb rubber	Interpolated Cmpd #23 lb/lb rubber
Benzyl Chloride	100-44-7	<	<	<	<
bis(2-Chloroethyl)ether	111-44-4	<	<	<	<
bis(2-Ethylhexyl)phthalate	117-81-7	2.35e-08	6.81e-08	4.36e-09	3.49e-07
Bromoform	75-25-2	<	<	<	<
Bromomethane	74-83-9	<	<	<	<
Carbon Disulfide	75-15-0	1.35e-07	2.26e-08	4.96e-08	2.63e-07
Carbon Tetrachloride	56-23-5	<	<	<	1.23e-07
Carbonyl Sulfide	463-58-1	8.19e-07	1.82e-07	<	1.49e-06
Chlorobenzene	108-90-7	<	<	<	<
Chloroethane	75-00-3	2.20e-07	<	<	<
Chloroform	67-66-3	<	8.92e-09	<	<
Chloromethane	74-87-3	1.74e-07	2.04e-07	1.98e-08	<
Cumene	98-82-8	2.71e-09	1.45e-08	2.91e-08	1.03e-09
Di-n-butylphthalate	84-74-2	1.13e-08	1.48e-07	1.85e-08	4.55e-08
Dibenzofuran	132-64-9	4.99e-10	1.59e-10	<	2.75e-10
Dimethylaminoazobenzene	60-11-7	<	<	<	<
Dimethylphthalate	131-11-3	<	<	<	<
Epichlorohydrin	106-89-8	<	<	<	<
Ethyl Acrylate	140-88-5	<	<	<	<
Ethylbenzene	100-41-4	4.11e-08	<	6.64e-08	<
Hexachlorobenzene	118-74-1	<	<	<	<
Hexachlorobutadiene	87-68-3	<	<	<	<
Hexachlorocyclopentadiene	77-47-4	<	<	<	<

RR 3/9/07 Footnotes & column headings NOT consistent on which compounds were measured; 5 & 22, or 5, 8 & 22

Table 4.12-10. HOT AIR CURE EMISSION FACTORS

Analyte Name	CAS #	Interpolated Cmpd #1 lb/lb rubber	Interpolated Cmpd #2 lb/lb rubber	Interpolated Cmpd #3 lb/lb rubber	Interpolated Cmpd #4 lb/lb rubber	Cmpd #5 lb/lb rubber	Interpolated Cmpd #6 lb/lb rubber
Total Method 25A Organics		3.46e-03	2.19e-03	7.62e-03	2.17e-03	9.37e-04	2.17e-03
Total Speciated Organics		1.25e-03	1.36e-03	2.20e-03	1.31e-03	7.50e-04	2.42e-03
Total HAPs		5.18e-04	3.28e-04	1.45e-03	6.25e-04	3.65e-05	1.20e-03
Total Organic HAPs		5.18e-04	3.28e-04	1.45e-03	6.25e-04	3.65e-05	1.20e-03
1,1,1-Trichloroethane	71-55-6	<	1.98e-06	7.85e-06	1.04e-06	1.12e-06	<
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<
1,1-Dichloroethane	75-34-3	<	<	<	<	<	<
1,1-Dichloroethene	75-35-4	<	<	<	1.35e-05	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	<	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<	<	<	<
1,2-Dibromoethane	106-93-4	<	<	<	<	<	<
1,2-Dichloroethane	107-06-2	<	<	<	<	<	<
1,2-Dichloropropane	78-87-5	<	<	<	<	<	<
1,3-Butadiene	106-99-0	2.41e-06	<	<	5.34e-06	<	<
1,4-Dichlorobenzene	106-46-7	<	<	<	<	<	<
1,4-Dioxane	123-91-1	<	<	<	<	<	<
1,4-Phenylenediamine	106-50-3	<	<	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<	<
2-Butanone	78-93-3	1.46e-04	3.92e-05	2.22e-05	6.74e-05	1.62e-06	1.08e-05
2-Chloroacetophenone	532-27-4	<	<	<	<	<	<

3/3/02 RR From Cmpd 10 → 18, the total organic HAPs Line is wrong needs to be moved over to right, so it's cmpd 11 → 19 Not

Table 4.12-8. PLATEN PRESS CURING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #1 lb/lb rubber	Cmpd #2 lb/lb rubber	Cmpd #3 lb/lb rubber	Interpolated Cmpd #4 lb/lb rubber	Cmpd #5 lb/lb rubber	Interpolated Cmpd #6 lb/lb rubber
Total Method 25A Organics		8.27e-04	4.04e-04	4.04e-03	1.18e-03	5.87e-04	1.18e-03
Total Speciated Organics		2.54e-04	9.19e-04	5.15e-04	1.04e-03	2.92e-04	1.92e-03
Total HAPs		2.99e-05	7.23e-04	1.57e-04	4.96e-04	8.36e-05	9.52e-04
Total Organic HAPs		2.99e-05	7.23e-04	1.57e-04	4.96e-04	8.36e-05	9.52e-04
1,1,1-Trichloroethane	71-55-6	3.54e-06	2.52e-06	3.15e-06	8.26e-07	3.80e-06	<
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<
1,1-Dichloroethane	75-34-3	<	<	<	<	<	<
1,1-Dichloroethene	75-35-4	<	<	<	1.07e-05	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	<	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<	<	<	<
1,2-Dibromoethane	106-93-4	<	<	<	<	<	<
1,2-Dichloroethane	107-06-2	<	<	<	<	<	<
1,2-Dichloropropane	78-87-5	<	<	<	<	<	<
1,3-Butadiene	106-99-0	<	1.20e-05	<	4.24e-06	5.84e-06	<
1,4-Dichlorobenzene	106-46-7	1.03e-07	7.63e-08	5.52e-08	<	<	<
1,4-Dioxane	123-91-1	<	<	<	<	<	<
1,4-Phenylenediamine	106-50-3	<	<	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<	<
2-Butanone	78-93-3	1.84e-06	2.77e-06	2.89e-06	5.35e-05	2.04e-06	8.61e-06
2-Chloro-1,3-Butadiene	126-99-8	<	<	<	<	<	<
2-Chloroacetophenone	532-27-4	<	<	<	<	<	<
2-Methylphenol	95-48-7	<	<	2.98e-08	1.63e-08	<	1.17e-07
3,3'-Dichlorobenzidine	91-94-1	<	<	<	<	<	<

Table 4.12-8. PLATEN PRESS CURING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #1 lb/lb rubber	Cmpd #2 lb/lb rubber	Cmpd #3 lb/lb rubber	Interpolated Cmpd #4 lb/lb rubber	Cmpd #5 lb/lb rubber	Interpolated Cmpd #6 lb/lb rubber
3,3'-Dimethoxybenzidine	119-90-4	<	<	<	<	<	<
3,3'-Dimethylbenzidine	119-93-7	<	<	<	<	<	<
4,4'-Methylenedianiline	101-77-9	<	<	<	<	<	<
4-Aminobiphenyl	92-67-1	<	<	<	<	<	<
4-Methyl-2-pentanone	108-10-1	<	<	1.16e-04	2.92e-04	<	5.99e-04
4-Nitrobiphenyl	92-93-3	<	<	<	<	<	<
4-Nitrophenol	100-02-7	<	<	<	<	<	<
a,a,a-Trichlorotoluene	98-07-7	<	<	<	<	<	<
Acetaldehyde	75-07-0	<	<	<	<	6.69e-06	<
Acetonitrile	75-05-8	<	<	<	<	5.47e-06	<
Acetophenone	98-86-2	5.09e-07	1.39e-06	4.25e-07	7.33e-08	<	1.50e-06
Acrolein	107-02-8	<	<	<	<	<	<
Acrylonitrile	107-13-1	<	<	<	<	<	<
Allyl Chloride	107-05-1	<	<	<	<	<	<
Aniline	62-53-3	<	4.16e-07	7.08e-07	8.40e-06	2.01e-06	1.95e-06
Benzene	71-43-2	1.08e-06	1.36e-06	1.18e-06	2.24e-06	<	<
Benzidine	92-87-5	<	<	<	<	4.53e-06	<
Benzyl Chloride	100-44-7	<	<	<	<	<	<
Biphenyl	92-52-4	<	<	1.40e-07	1.06e-07	3.06e-07	2.30e-07
bis(2-Chloroethyl)ether	111-44-4	<	<	<	<	<	<
bis(2-Ethylhexyl)phthalate	117-81-7	4.20e-06	2.48e-06	2.14e-06	<	3.83e-06	3.49e-06
Bromoform	75-25-2	<	<	<	<	<	<
Bromomethane	74-83-9	<	<	<	<	<	<
Carbon Disulfide	75-15-0	2.16e-06	5.35e-04	3.15e-06	3.89e-06	3.46e-06	7.49e-05
Carbon Tetrachloride	56-23-5	<	<	<	<	<	<
Carbonyl Sulfide	463-58-1	<	3.65e-05	<	<	<	3.11e-05
Chlorobenzene	108-90-7	<	<	<	<	<	<

Table 4.12-8. PLATEN PRESS CURING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #1 lb/lb rubber	Cmpd #2 lb/lb rubber	Cmpd #3 lb/lb rubber	Interpolated Cmpd #4 lb/lb rubber	Cmpd #5 lb/lb rubber	Interpolated Cmpd #6 lb/lb rubber
Chloroethane	75-00-3	<	<	<	<	<	<
Chloroform	67-66-3	<	<	<	<	<	<
Chloromethane	74-87-3	1.06e-06	<	7.87e-07	5.83e-07	<	6.36e-06
Cumene	98-82-8	3.64e-08	5.90e-08	5.96e-08	3.26e-08	9.03e-08	2.36e-07
Di-n-butylphthalate	84-74-2	5.47e-08	2.11e-06	3.01e-07	<	1.39e-07	2.93e-07
Dibenzofuran	132-64-9	6.38e-08	5.04e-08	1.54e-07	2.75e-08	<	6.46e-08
Dimethylaminoazobenzene	60-11-7	<	<	<	<	<	<
Dimethylphthalate	131-11-3	<	7.78e-08	<	3.06e-08	1.80e-07	<
Epichlorohydrin	106-89-8	<	<	<	<	<	<
Formaldehyde Ethylbenzene	100-41-4	<	<	<	2.28e-06	1.34e-06	4.75e-06
Hexachlorobenzene	118-74-1	<	<	<	<	<	<
Hexachlorobutadiene	87-68-3	<	<	<	<	<	<
Hexachlorocyclopentadiene	77-47-4	<	<	<	<	<	<
Hexachloroethane	67-72-1	<	<	<	<	<	<
Hexane	110-54-3	7.49e-06	1.03e-05	6.96e-06	3.05e-05	1.66e-05	2.91e-05
Hydroquinone	123-31-9	<	<	<	1.58e-05	<	<
Isooctane	540-84-1	<	<	<	1.88e-06	<	3.11e-06
Isophorone	78-59-1	<	<	<	1.16e-06	<	<
m-Xylene + p-Xylene		1.01e-06	1.91e-06	9.03e-06	1.01e-05	9.24e-06	1.22e-05
Methylene bis-chloroaniline	101-14-4	<	<	<	<	<	<
Footnote Methylene Chloride	75-09-2	1.61e-06	1.57e-06	1.57e-06	3.65e-05	1.67e-06	4.87e-05
N,N-Dimethylaniline	121-69-7	<	<	<	<	<	<
N-Nitrosodimethylamine	62-75-9	<	<	<	<	<	<
N-Nitrosomorpholine	59-89-2	<	<	<	<	<	<
Naphthalene	91-20-3	3.29e-07	4.59e-07	5.78e-07	3.38e-07	1.57e-06	9.98e-07
Nitrobenzene	98-95-3	<	<	<	<	<	<
o-Anisidine	90-04-0	<	<	<	<	<	<

Table 4.12-8. PLATEN PRESS CURING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #1 lb/lb rubber	Cmpd #2 lb/lb rubber	Cmpd #3 lb/lb rubber	Interpolated Cmpd #4 lb/lb rubber	Cmpd #5 lb/lb rubber	Interpolated Cmpd #6 lb/lb rubber
o-Toluidine	95-53-4	<	1.59e-06	<	<	<	4.36e-06
o-Xylene	95-47-6	<	<	<	7.38e-06	2.01e-06	1.86e-05
Pentachloronitrobenzene	82-68-8	<	<	<	<	<	<
Pentachlorophenol	87-86-5	<	<	<	<	<	<
Phenol	108-95-2	6.12e-07	5.37e-07	5.19e-07	2.87e-07	9.68e-07	8.66e-07
Propylene Oxide	75-56-9	<	1.04e-04	<	<	<	<
Styrene	100-42-5	<	<	<	8.69e-07	<	8.31e-05
t-Butyl Methyl Ether	1634-04-4	<	<	<	<	<	6.36e-06
Tetrachloroethene	127-18-4	<	<	5.35e-07	1.29e-06	<	1.98e-06
Toluene	108-88-3	4.23e-06	6.20e-06	6.03e-06	1.17e-05	1.18e-05	1.07e-05
Trichloroethene	79-01-6	<	<	<	<	<	<
Trifluralin	1582-09-8	<	<	<	<	<	<
Vinyl Acetate	108-05-4	<	<	<	<	<	<
Vinyl Chloride	75-01-4	<	<	<	<	<	<

Emission factors were extrapolated for compounds 4, 6, 8, 15, 18 and 21.

Compounds #1 and #7 were judged to be one of the most prodigious emitters of formaldehyde. Sampling was conducted using EPA method TO-11. Analysis was conducted using EPA method TO-11/HPLC. Due to the high reactivity and propensity of formaldehyde to become quickly bound up with other available chemicals formaldehyde emissions from other compounds and processes are judged to be insignificant. ?

Formaldehyde Concentration - lb/lb rubber
Compound #1 - 1.88E-06
Compound #7 - 1.23E-06

Methylene Chloride - Subsequent background testing at the lab indicated high background levels. Concentrations are reported at detection levels. ?

Δ = 9.05E-04

Δ = negative

Table 4.12-8. PLATEN PRESS CURING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #7 lb/lb rubber	Interpolated Cmpd #8 lb/lb rubber	Cmpd #9 lb/lb rubber	Cmpd #10 lb/lb rubber	Cmpd #11 lb/lb rubber	Cmpd #12 lb/lb rubber
Total Method 25A Organics		2.36e-04	4.49e-04	1.75e-03	8.66e-04	2.40e-04	6.66e-04
Total Speciated Organics		1.46e-04	1.44e-03	1.04e-03	1.63e-03	7.31e-04	9.76e-04
Total HAPs		4.85e-05	1.09e-03	5.05e-04	1.34e-03	4.35e-04	6.68e-04
Total Organic HAPs		4.85e-05	1.09e-03	5.05e-04	4.35e-04	6.68e-04	1.36e-03
1,1,1-Trichloroethane	71-55-6	4.19e-06	5.22e-07	4.20e-06	2.52e-06	<	3.03e-05
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<
1,1-Dichloroethane	75-34-3	<	<	<	<	<	<
1,1-Dichloroethene	75-35-4	<	1.96e-06	<	<	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	<	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<	<	<	<
1,2-Dibromoethane	106-93-4	<	<	<	<	<	<
1,2-Dichloroethane	107-06-2	<	<	<	<	<	<
1,2-Dichloropropane	78-87-5	<	<	<	<	<	<
1,3-Butadiene	106-99-0	9.42e-06	2.20e-06	7.53e-06	7.43e-06	<	<
1,4-Dichlorobenzene	106-46-7	5.42e-08	<	<	5.53e-08	<	5.78e-08
1,4-Dioxane	123-91-1	<	<	<	<	<	<
1,4-Phenylenediamine	106-50-3	<	<	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<	<
2-Butanone	78-93-3	<	9.92e-06	3.02e-06	<	<	1.18e-06

Table 4.12-8. PLATEN PRESS CURING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #13 lb/lb rubber	Cmpd #14 lb/lb rubber	Interpolated Cmpd #15 lb/lb rubber	Cmpd #16 lb/lb rubber	Cmpd #17 lb/lb rubber	Interpolated Cmpd #18 lb/lb rubber
Total Method 25A Organics		1.42e-03	5.30e-04	2.87e-04	8.08e-04	6.23e-03	1.98e-03
Total Speciated Organics		1.57e-03	1.33e-03	1.20e-03	3.49e-04	2.78e-03	2.40e-03
Total HAPs		1.36e-03	1.03e-03	1.09e-03	6.37e-05	1.06e-03	9.11e-04
Total Organic HAPs		1.03e-03	1.09e-03	6.37e-05	1.06e-03	9.11e-04	3.47e-04
1,1,1-Trichloroethane	71-55-6	3.56e-04	2.05e-06	3.57e-07	2.45e-06	1.51e-05	<
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<
1,1-Dichloroethane	75-34-3	<	<	<	<	<	<
1,1-Dichloroethene	75-35-4	<	<	2.72e-07	<	<	1.72e-06
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	1.66e-08	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<	<	<	<
1,2-Dibromoethane	106-93-4	<	<	<	<	<	<
1,2-Dichloroethane	107-06-2	<	<	<	<	<	<
1,2-Dichloropropane	78-87-5	<	<	<	<	<	<
1,3-Butadiene	106-99-0	<	2.17e-05	1.21e-06	<	<	3.52e-06
1,4-Dichlorobenzene	106-46-7	<	8.94e-08	<	9.15e-08	5.27e-08	<
1,4-Dioxane	123-91-1	<	<	<	<	<	<
1,4-Phenylenediamine	106-50-3	<	<	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<	<
2-Butanone	78-93-3	<	<	1.72e-06	1.20e-06	<	2.46e-05

Table 4.12-8. PLATEN PRESS CURING EMISSION FACTORS

Analyte Name	CAS #	Cmpd #19 lb/lb rubber	Cmpd #20 lb/lb rubber	Interpolated Cmpd #21 lb/lb rubber	Cmpd #22 lb/lb rubber	Cmpd #23 lb/lb rubber
Total Method 25A Organics		6.68e-03	6.13e-04	4.78e-03	4.78e-04	2.83e-04
Total Speciated Organics		3.29e-03	3.23e-04	2.62e-03	2.95e-04	2.30e-04
Total HAPs		3.47e-04	7.45e-05	2.20e-04	2.06e-04	7.26e-05
Total Organic HAPs		<	7.45e-05	2.20e-04	2.06e-04	7.26e-05
1,1,1-Trichloroethane	71-55-6	2.25e-06	3.34e-06	2.04e-07	4.51e-06	2.04e-06
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<
1,1-Dichloroethane	75-34-3	<	<	<	<	<
1,1-Dichloroethene	75-35-4	<	<	<	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<	<	<
1,2-Dibromoethane	106-93-4	<	<	<	<	<
1,2-Dichloroethane	107-06-2	<	<	<	<	<
1,2-Dichloropropane	78-87-5	<	<	<	<	<
1,3-Butadiene	106-99-0	1.00e-05	2.56e-05	<	<	6.77e-06
1,4-Dichlorobenzene	106-46-7	5.11e-08	9.11e-08	<	<	8.08e-08
1,4-Dioxane	123-91-1	<	<	<	<	<
1,4-Phenylenediamine	106-50-3	<	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<
2-Butanone	78-93-3	1.30e-05	1.76e-06	9.24e-06	<	1.30e-06

3/3/02 RR

Table 4.12-6. EXTRUDER EMISSION FACTORS

Analyte Name	CAS #	Interpolated Cmpd #1 lb/lb rubber	Interpolated Cmpd #2 lb/lb rubber	Interpolated Cmpd #3 lb/lb rubber	Cmpd #4 lb/lb rubber	Interpolated Cmpd #5 lb/lb rubber	Cmpd #6 lb/lb rubber
Total Method 25A Organics		1.48e-05	9.37e-06	3.25e-05	5.67e-06	5.15e-05	1.23e-05
Total Speciated Organics		2.72e-05	2.97e-05	4.78e-05	2.11e-05	3.31e-05	9.04e-05
Total Particulate Matter		2.12e-08	4.85e-08	1.08e-07	3.11e-08	1.12e-07	7.77e-09
Total Organic HAPs		1.13e-05	7.14e-06	3.16e-05	9.87e-06	2.24e-05	3.51e-05
Total Metal HAPs		5.00e-09	4.31e-10	9.52e-09	4.67e-07	3.20e-09	1.05e-07
Total HAPs		1.13e-05	7.14e-06	3.16e-05	1.03e-05	2.24e-05	3.52e-05
1,1,1-Trichloroethane	71-55-6	<	4.31e-08	1.71e-07	8.47e-08	9.84e-08	9.37e-08
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<
1,1-Dichloroethane	75-34-3	<	<	<	<	<	<
1,1-Dichloroethene	75-35-4	<	<	<	<	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	<	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<	<	<	<
1,2-Dibromoethane	106-93-4	<	<	<	<	<	<
1,2-Dichloroethane	107-06-2	<	<	<	<	<	<
1,2-Dichloropropane	78-87-5	<	<	<	<	<	<
1,3-Butadiene	106-99-0	5.24e-08	<	<	8.92e-08	<	5.06e-07
1,4-Dichlorobenzene	106-46-7	<	<	<	8.36e-09	<	<
1,4-Dioxane	123-91-1	<	<	<	<	<	<
1,4-Phenylenediamine	106-50-3	<	<	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<	<
2-Butanone	78-93-3	3.17e-06	8.52e-07	4.83e-07	1.34e-07	8.20e-07	1.17e-07

Table 4.12-6. EXTRUDER EMISSION FACTORS

Analyte Name	CAS #	Interpolated Cmpd #1 lb/lb rubber	Interpolated Cmpd #2 lb/lb rubber	Interpolated Cmpd #3 lb/lb rubber	Cmpd #4 lb/lb rubber	Interpolated Cmpd #5 lb/lb rubber	Cmpd #6 lb/lb rubber
2-Chloroacetophenone	532-27-4	<	<	<	6.48e-09	<	1.68e-09
2-Methylphenol	95-48-7	<	<	4.63e-08	<	6.94e-09	<
3,3'-Dichlorobenzidine	91-94-1	<	<	<	<	<	<
3,3'-Dimethoxybenzidine	119-90-4	<	<	<	<	<	<
3,3'-Dimethylbenzidine	119-93-7	<	<	<	<	<	<
4,4'-Methylenedianiline	101-77-9	<	<	<	<	<	<
4-Aminobiphenyl	92-67-1	<	<	<	<	<	<
4-Methyl-2-Pentanone	108-10-1	<	1.05e-07	6.73e-06	5.54e-06	<	2.66e-06
4-Nitrobiphenyl	92-93-3	<	<	<	<	<	<
4-Nitrophenol	100-02-7	<	<	<	<	<	<
a,a,a-Trichlorotoluene	98-07-7	<	<	<	<	<	<
Acetaldehyde	75-07-0	3.73e-07	<	<	<	<	<
Acetaldehyde + Isobutane		<	<	<	<	3.28e-07	<
Acetonitrile	75-05-8	<	<	<	1.09e-07	<	2.19e-07
Acetophenone	98-86-2	1.24e-06	1.14e-08	2.75e-08	3.65e-08	9.92e-09	3.32e-06
Acrolein	107-02-8	<	<	<	2.03e-07	<	3.10e-07
Acrylonitrile	107-13-1	<	<	<	<	<	<
Allyl Chloride	107-05-1	<	<	<	<	<	<
Aniline	62-53-3	<	2.57e-07	<	5.08e-07	<	2.19e-07
Benzene	71-43-2	2.93e-08	2.47e-08	6.07e-08	4.46e-08	1.60e-07	2.69e-07
Benzidine	92-87-5	<	<	<	<	<	<
Benzyl Chloride	100-44-7	<	<	<	<	<	<
Biphenyl	92-52-4	<	<	3.02e-08	4.65e-09	<	1.68e-08
bis(2-Chloroethyl)ether	111-44-4	<	<	<	<	<	<
bis(2-Ethylhexyl)phthalate	117-81-7	2.09e-08	1.61e-08	6.37e-08	1.94e-07	1.22e-08	1.13e-07

3/3/02 RR

2-3-02
Footnotes say non-interpolated cmpds = 4, 5, 6, 9, 11, 15, 21, & 22
BUT COLUMN HEADINGS SAYS #8 IS not BUT #15 IS NOT
(col headings same as Lotus file)

Table 4.12-9. AUTOCLAVE CURING EMISSION FACTORS

Analyte Name	CAS #	Interpolated Cmpd #1 lbs/lb Rubber	Interpolated Cmpd #2 lbs/lb Rubber	Interpolated Cmpd #3 lbs/lb Rubber	Cmpd #4 lbs/lb Rubber	Cmpd #5 lbs/lb Rubber	Cmpd #6 lbs/lb Rubber
Total Method 25A Organics		1.78e-04	1.13e-04	3.93e-04	1.49e-04	1.56e-04	1.29e-04
Total speciated organics		8.60e-04	9.36e-04	1.51e-03	2.33e-04	3.75e-04	3.00e-04
Total organic HAPs		3.56e-04	2.25e-04	9.98e-04	1.24e-04	1.81e-04	6.73e-05
Total HAPs other		3.56e-04	2.25e-04	9.98e-04	1.24e-04	1.81e-04	6.73e-05
1,1,1-Trichloroethane	71-55-6	<	1.36e-06	5.39e-06	<	<	<
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<
1,1-Dichloroethane	75-34-3	<	<	<	<	<	<
1,1-Dichloroethene	75-35-4	<	<	<	<	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	<	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<	<	<	<
1,2-Dibromoethane	106-93-4	<	<	<	<	<	<
1,2-Dichloroethane	107-06-2	<	<	<	<	<	<
1,2-Dichloropropane	78-87-5	<	<	<	<	<	<
1,2-Epoxybutane	106-88-7	<	<	<	<	<	<
1,3-Butadiene	106-99-0	1.65e-06	<	<	1.11e-06	2.88e-06	5.33e-07
1,4-Dichlorobenzene	106-46-7	<	<	4.84e-08	1.35e-08	1.21e-08	6.86e-09
1,4-Dioxane	123-91-1	<	<	<	<	<	<
1,4-Phenylenediamine	106-50-3	<	<	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<	<

Table 4.12-9. AUTOCLAVE CURING EMISSION FACTORS

Analyte Name	CAS #	Interpolated Cmpd #1 lbs/lb Rubber	Interpolated Cmpd #2 lbs/lb Rubber	Interpolated Cmpd #3 lbs/lb Rubber	Cmpd #4 lbs/lb Rubber	Cmpd #5 lbs/lb Rubber	Cmpd #6 lbs/lb Rubber
o-Anisidine	90-04-0	<	<	<	<	<	<
o-Toluidine	95-53-4	<	<	<	9.82e-08	<	5.37e-06
o-Xylene	95-47-6	1.62e-06	6.59e-06	5.41e-06	3.13e-06	3.87e-06	2.39e-06
Pentachloronitrobenzene	82-68-8	<	<	<	<	<	<
Pentachlorophenol	87-86-5	<	<	<	<	<	<
Phenol	108-95-2	1.22e-06	8.29e-07	4.69e-06	<	1.13e-07	<
Propanal	123-38-6	<	<	<	<	<	<
Propylene Oxide	75-56-9	<	<	<	<	<	<
Styrene	100-42-5	<	<	<	9.96e-07	4.99e-07	2.72e-06
t-Butyl Methyl Ether	1634-04-4	<	<	<	6.63e-09	1.24e-07	8.48e-09
Tetrachloroethene	127-18-4	<	6.94e-05	1.63e-06	<	<	<
Toluene	108-88-3	2.79e-05	3.49e-05	3.58e-05	1.30e-05	9.36e-06	5.01e-06
Trichloroethene	79-01-6	<	<	<	<	<	<
Trifluralin	1582-09-8	<	<	<	<	<	<
Vinyl Acetate	108-05-4	<	<	<	<	<	<
Vinyl Bromide	593-60-2	<	<	<	<	<	<
Vinyl Chloride	75-01-4	<	<	<	<	<	<

Factors include pollutants in steam blow-off (when depressurizing the vessel) and in the condensate produced during curing. For non-contact steam applications, the total values shall be used. For direct contact, steam curing, 17% of the emission factor is discharged in the condensate produced during curing and is not, therefore, released as an air emission.

Emission factors for all compounds except 4, 5, 6, 9, 11, 15, 21 and 22 were extrapolated.

Autoclave Organic Speciation Factors
~~From~~ Table 4-7b (p. 4-62 Vol. 1)
#4: 3.69% #5: 2.8% #6: 0.86%

Table 3-6A Autoclave Curing Emission Factor Summary (lb/lb rubber)
4: 2.08E-05 5: 1.56E-05 6: 7.09E-06

Table D.1-5 Autoclave Speciated Volatiles Summary

Vol. 2

Cooldown - Gas

mg/m3 ↓

Toluene #4: 4,326 #5: 3,230 #6: 1,369

lb/hr ↓

4: 1.64E-03 5: 1.05E-03 6: 5.23E-04

lb/lb rubber ↓

⟹ 4: 1.90E-05 5: 1.35E-05 6: 6.24E-06

Blowdown - Gas

lb/lb rubber

⟹ 4: 1.80E-06 5: 1.90E-06 6: 7.80E-07

Table D.1-7

Blowdown - Liquid

lb/lb rubber

⟹ 4: 9.56E-10 5: 1.17E-07 6: 5.08E-08

Table D1.8

Water Trap Liquid

4: 2.19E-08 5: 6.79E-08 6: 1.84E-08

Total 4: = 2.08E-05

÷4 = 5.21E-06

Table 4.12-7. CALENDER

Analyte Name	CAS #	Interpolated Cmpd #1 lb/lb rubber	Cmpd #2 lb/lb rubber	Interpolated Cmpd #3 lb/lb rubber	Interpolated Cmpd #4 lb/lb rubber	Interpolated Cmpd #5 lb/lb rubber	Interpolated Cmpd #6 lb/lb rubber	Interpolated Cmpd #7 lb/lb rubber
Total Method 25A Organics		5.33e-05	5.59e-05	1.17e-04	3.35e-05	1.86e-04	3.34e-05	1.05e-04
Total Speciated Organics		7.37e-05	7.66e-05	1.29e-04	7.71e-05	8.97e-05	1.43e-04	1.29e-04
Total Organic HAPs		3.05e-05	1.27e-05	8.55e-05	3.68e-05	6.07e-05	7.07e-05	6.08e-05
Total HAPs — Become "Total Other HAPs"		~~3.05e-05~~ blank	~~1.27e-05~~ blank	~~8.55e-05~~	~~3.68e-05~~	6.07e-05	7.07e-05	6.08e-05
1,1,1-Trichloroethane	71-55-6	<	3.89e-08	2.31e-07	3.07e-08	1.33e-07	<	<
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	<	<	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<	<
1,1-Dichloroethane	75-34-3	<	<	<	<	<	<	<
1,1-Dichloroethene	75-35-4	<	<	<	3.97e-07	<	<	<
1,2,4-Trichlorobenzene	120-82-1	<	<	<	<	<	<	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<	<	<	<	<
1,2-Dibromoethane	106-93-4	<	<	<	<	<	<	<
1,2-Dichloroethane	107-06-2	<	1.22e-07	<	<	<	<	<
1,2-Dichloropropane	78-87-5	<	<	<	<	<	<	<
1,3-Butadiene	106-99-0	7.09e-08	<	<	1.57e-07	<	<	3.39e-07
1,4-Dichlorobenzene	106-46-7	<	3.49e-08	<	<	<	<	<
1,4-Dioxane	123-91-1	<	<	<	<	<	<	<
1,4-Phenylenediamine	106-50-3	<	<	<	<	<	<	<
2,4,5-Trichlorophenol	95-95-4	<	<	<	<	<	<	<
2,4,6-Trichlorophenol	88-06-2	<	<	<	<	<	<	<
2,4-Dinitrophenol	51-28-5	<	<	<	<	<	<	<
2,4-Dinitrotoluene	121-14-2	<	<	<	<	<	<	<
2-Butanone	78-93-3	4.29e-06	2.61e-07	6.53e-07	1.98e-06	1.11e-06	3.19e-07	1.02e-06
2-Chloroacetophenone	532-27-4	<	<	<	<	<	<	<
2-Methylphenol	95-48-7	<	<	6.26e-08	6.05e-10	9.39e-09	4.35e-09	<
3,3'-Dichlorobenzidine	91-94-1	<	<	<	<	<	<	<

Do we want all 9, or reduce to 3?

Not a match from RMA

Table 4.12-11. TIRE CURE EMISSION FACTORS

Analyte Name	CAS #	Tire A lb/lb rubber	Tire B lb/lb rubber	Tire C lb/lb rubber	Tire D lb/lb rubber	Tire E lb/lb rubber	Tire F lb/lb rubber
Total Method 25A Organics		2.90e-04	2.13e-04	1.21e-04	2.43e-04	1.44e-04	1.56e-04
Total Speciated Organics		1.19e-04	1.24e-04	7.00e-05	1.32e-04	1.36e-04	1.76e-04
Total Organic HAPs		6.82e-05	5.20e-05	2.29e-05	7.83e-05	8.32e-05	7.42e-05
Total HAPs		6.82e-05	5.20e-05	2.29e-05	7.83e-05	8.32e-05	7.42e-05
1,1,1-Trichloroethane	71-55-6	6.80e-08	<	1.23e-07	<	3.71e-07	1.03e-07
1,1,2,2-Tetrachloroethane	79-34-5	<	<	<	1.77e-07	<	<
1,1,2-Trichloroethane	79-00-5	<	<	<	<	<	<
1,1-Dichloroethane	75-34-3	<	<	<	<	<	6.88e-08
1,1-Dichloroethene	75-35-4	<	<	<	<	<	5.06e-07
1,2,4-Trichlorobenzene	120-82-1	<	6.60e-09	<	<	<	<
1,2-Dibromo-3-Chloropropane	96-12-8	<	<	<	3.53e-07	<	<
1,2-Dibromoethane	106-93-4	<	<	<	<	<	<
1,2-Dichloroethane	107-06-2	<	<	<	<	<	<
1,2-Dichloropropane	78-87-5	<	<	<	<	<	<
1,3-Butadiene	106-99-0	<	<	<	<	<	<
1,4-Dichlorobenzene	106-46-7	4.27e-09	5.23e-09	4.67e-09	<	<	5.87e-07
1,4-Dioxane	123-91-1	<	<	<	<	<	<
2-Butanone	78-93-3	3.40e-07	3.75e-07	3.38e-07	7.51e-07	9.06e-07	1.33e-06
2-Chloroacetophenone	532-27-4	<	<	<	<	3.35e-09	<
2-Methylphenol	95-48-7	9.30e-09	1.18e-08	4.96e-09	<	<	<
4-Methyl-2-Pentanone	108-10-1	1.20e-05	1.66e-05	7.90e-06	1.06e-05	8.59e-06	8.29e-06
Acetonitrile	75-05-8	<	<	<	<	<	<
Acetophenone	98-86-2	6.43e-08	1.27e-07	7.44e-08	1.14e-07	6.16e-08	9.32e-08

c:\ZIPPER\ comoov. doc

RMA.

RUBBER MANUFACTURERS ASSOCIATION

March 31, 1998

Ron Ryan
U.S. Environmental Protection Agency
(MD-14)
RTP, NC 27711

Dear Ron:

The Rubber Manufacturers Association appreciates the opportunity to provide comments and conduct additional quality assurance on AP-42 Section 4-12, the emission factors for the rubber industry. As you know, this AP-42 section represents the culmination of many years' work to determine appropriate emission factors for the rubber industry.

The Rubber Manufacturers Association is the national trade association for the rubber products industry, and represents a $50 billion domestic manufacturing sector. RMA represents more than 100 companies that manufacture various rubber products, including tires, hoses, belts, seals, molded goods, and other finished rubber products. RMA member companies and their suppliers and customers operate in all 50 States. The industry employs nearly 650,000 workers.

RMA members have a direct interest in the development of this AP-42 section. These data will assist RMA member companies and other rubber manufacturing companies in Title V permit applications and other requirements. In addition, the emission factors will be of great use in EPA's development of MACT standards for various industrial processes common in the rubber industry.

The enclosed comments include three documents: (1) comments on the data tables from AP-42 Section 4.12; (2) a redline/strike through version of the background document for Section 4.12; and (3) a redline/strike through version of Section 4.12, the narrative portion of the AP-42. The comments on the data tables were compiled by RMA through a quality assurance review of the data, compared to the final RMA information. The redline/strike through versions of both the background document and the 4.12 narrative include language refinements and additional explanation in response to questions raised as the factors have been used by industry representatives and state agencies.

RMA appreciates the Agency's attention to this important project, and asks for expedited finalization of the AP-42 section for the rubber industry. Finalization of the AP-42 is critical for RMA member companies as they use the emission factors in Title V permit applications and

1400 K STREET, N.W., WASHINGTON, D.C. 20005 • TELEPHONE (202) 682-4800 • FAX (202) 682-4854

-4737

other state and federal requirements. As you work to finalize this AP-42 section, I encourage you to contact me at 202-682-4839 with any additional questions.

Sincerely,

Tracey J. Norberg

Enclosures

C:\ZIIIER\TABLECOM.DOC

Rubber Manufacturers Association
Comments on AP-42 Section 4.12 Data Tables
March 31, 1998

Milling (Table 4.12-5)

minimal

1. On page 4.12-41, the AP-42 document indicates that the emission factor for Naphthalene for Interpolated Cmpd 5 is 1.31E-07. The value should read 1.30E-07. The AP-42 document should be revised.

Extruder (Table 4.12-6)

all but one 10x larger

1. On page 4.12-58, the AP-42 document indicates that Total Metal HAPs emissions factors are 5.00E-09 for Cmpd 1, 4.31E-10 for Cmpd 2, 9.52E-09 for Cmpd 3, 4.67E-07 for Cmpd 4, and 3.20E-09 for Cmpd 5. The RMA data indicate that the emissions factors should be 5.18E-08; 5.20E-09; 9.32E-08; $\boxed{\text{4.63E-07;}}$ and 4.14E-08, respectively. The AP-42 document should be revised. minimal

all but one 10x larger

2. On page 4.12-60, the AP-42 document shows values for emission factors from Chromium (Cr) Compounds to be 1.96E-09 for Cmpd 1, 4.31E-10 for Cmpd 2, 3.65E-09 for Cmpd 3 and 1.68E-09 for Cmpd 5. The values should read $\boxed{\text{1.71E-09;}}$ 3.74E-09; 3.17E-08; and 1.46E-08, respectively. The AP-42 document should be revised. minimal

new efs

3. On page 4.12-60, values for Cadium (CAS# 744-43-9) were omitted. The emission factors for cadium should read: 5.01E-09 (Cmpd 1); 1.28E-09 (Cmpd 2); 3.76E-09 (Cmpd 3); "<" (Cmpd 4); 2.71E-09 (Cmpd 5); and "<" (Cmpd 6). The AP-42 document should be revised.

10x larger

4. On page 4.12-61, the AP-42 document indicates that the emissions factors for Nickel (Ni) Compounds are: 3.03E-09 (Cmpd 1); 5.88E-09 (Cmpd 3); and 1.53E-09 (Cmpd 5). These emissions factors should be revised to read: 2.64E-08; 5.10E-08; and 1.33E-08, respectively.

5. On page 4.12-61 of the AP-42 document, the emission factor for Phenol for Cmpd 1 2 should read 2.62E-08. The AP-42 document should be revised. what was it? ~~3.76x10~~ -8

2.63 in draft

new efs

6. On page 4.12-61 of the AP-42 document, the emission factors for Lead (Pb) Compounds have been omitted. The emission factors for lead should read: 3.40E-09 (Cmpd 1); 1.74E-10 (Cmpd 2); 6.67E-09 (Cmpd 3); "<" (Cmpd 4); 1.09E-08 (Cmpd 5); and "<" (Cmpd 6). The AP-42 document should be revised.

10x larger

7. On page 4.12-62 of the AP-42 document, the emission factors for Total Metal HAPs read: 7.57E-09 (Cmpd 7); 2.35E-09 (Cmpd 8); 2.45E-09 (Cmpd 10); and 1.72E-09 (Cmpd 12). The emission factors for Total Metal HAPs should read: 7.34E-08 (Cmpd

7); 2.09E-08 (Cmpd 8); 2.78E-08 (Cmpd 10); and 1.54E-08 (Cmpd 12). The AP-42 factors should be revised.

8. On page 4.12-64 of the AP-42 document, the emissions factors for Chromium (Cr) Compounds read: 7.57E-09 (Cmpd 7); 2.72E-10 (Cmpd 8); 9.63E-10 (Cmpd 10) and 3.97E-10 (Cmpd 12). The emission factors for Chromium Compounds should read: 6.58E-08 (Cmpd 7); 2.36E-09 (Cmpd 8); 8.37E-09 (Cmpd 10); and 3.45E-09 (Cmpd 12). The AP-42 document should be revised.

10X larger

9. On page 4.12-64, values for Cadium (CAS# 744-43-9) were omitted. The emission factors for cadium should read: 2.09E-09 (Cmpd 7);4.87E-10 (Cmpd 8); "<" (Cmpd 9); 2.19E-09 (Cmpd 10); 6.80E-10 (Cmpd 11); and 3.91E-10 (Cmpd 12). The AP-42 document should be revised.

new efs

10. On page 4.12-65, the AP-42 document indicates that the emissions factors for Nickel (Ni) Compounds are: 2.08E-09 (Cmpd 8); 1.48E-09 (Cmpd 10); and 1.32E-09 (Cmpd 12). The AP-42 emissions factors should be revised to read: 1.81E-08; 1.29E-08; and 1.15E-08, respectively.

10X larger

11. On page 4.12-65 of the AP-42 document, the emission factors for Lead (Pb) Compounds have been omitted. The emission factors for lead should read: 5.51E-09 (Cmpd 7); "<" (Cmpd 8); "<" (Cmpd 9); 4.37E-09 (Cmpd 10); 2.95E-10 (Cmpd 11); and "<" (Cmpd 12). The AP-42 document should be revised.

new efs

12. On page 4.12-67 of the AP-42 document, the emission factors for Total Metal HAPs read: 2.52E-09 (Cmpd 13); 2.50E-10 (Cmpd 14); 1.45E-09 (Cmpd 15); 5.11E-11 (Cmpd 16); 4.57E-09 (Cmpd 17); and 2.40E-09 (Cmpd 18). The emission factors for Total Metal HAPs should read: 2.60E-08 (Cmpd 13); 6.87E-09 (Cmpd 14); 1.36E-08 (Cmpd 15); 7.71E-10 (Cmpd 16); 4.11E-08 (Cmpd 17); and 2.16E-08 (Cmpd 18). The AP-42 document should be revised.

10X larger

new fs. 13. On page 4.12-67 of the AP-42 document, the AP-42 emission factor for 1,1,1-Trichloroethane for Cmpd 18 should be revised to read 2.50E-05 instead of "<".

14. On page 4.12-69, values for Cadium (CAS# 744-43-9) were omitted. The emission factors for cadium should read: 3.18E-10 (Cmpd 13); 1.81E-09 (Cmpd 14); 8.90E-10 (Cmpd 15); 3.27E-10 (Cmpd 16); 1.42E-09 (Cmpd 17); and 7.85E-10 (Cmpd 18). The AP-42 document should be revised.

new efs

15. On page 4.12-69 of the AP-42 document, the emissions factors for Chromium (Cr) Compounds read: 4.06E-10 (Cmpd 13); 2.50E-10 (Cmpd 14);.1.21E-10 (Cmpd 15); 5.11E-11 (Cmpd 16); and 2.59E-09 (Cmpd 17). The emission factors for Chromium Compounds should read: 3.53E-09 (Cmpd 13); 2.17E-09 (Cmpd 14); 1.05E-09 (Cmpd

10X larger

15); 4.44E-10 (Cmpd 16); and 2.25E-08 (Cmpd 17). The AP-42 document should be revised.

16. On page 4.12-70, the AP-42 document indicates that the emissions factors for Nickel (Ni) Compounds are: 2.11E-09 (Cmpd 13); 1.33E-09 (Cmpd 15); 1.98E-09 (Cmpd 17); and 2.40E-09 (Cmpd 18). These emissions factors should be revised to read: 1.83E-08; 1.15E-08; and 1.72E-08; 2.09E-09, respectively.

all but one 10X larger

minimal

17. On page 4.12-70 of the AP-42 document, the emission factors for Lead (Pb) Compounds have been omitted. The emission factors for lead should read: 3.80E-09 (Cmpd 13); 2.89E-09 (Cmpd 14); 1.22E-10 (Cmpd 15); "<" (Cmpd 16); "<" (Cmpd 17); and "<" (Cmpd 18). The AP-42 document should be revised.

new efs

18. On page 4.12-67 of the AP-42 document, the emission factors for Total Metal HAPs read: 1.63E-09 (Cmpd 19); 5.78E-10 (Cmpd 20); 6.63E-11 (Cmpd 21); 7.55E-07 (Cmpd 22); and 3.09E-09 (Cmpd 23). The emission factors for Total Metal HAPs should read: 1.55E-08 (Cmpd 19); 5.75E-09 (Cmpd 20); 9.13E-10 (Cmpd 21); 7.54E-07 (Cmpd 22); and 2.76E-08 (Cmpd 23). The AP-42 document should be revised.

all but one 10X larger

minimal

19. On page 4.12-74, values for Cadium (CAS# 744-43-9) were omitted. The emission factors for cadium should read: 3.24E-10 (Cmpd 19); 7.25E-10 (Cmpd 20); 3.36E-10 (Cmpd 21); "<" (Cmpd 22); and 5.56E-10 (Cmpd 23). The AP-42 document should be revised.

new efs

20. On page 4.12-74 of the AP-42 document, the emissions factors for Chromium (Cr) Compounds read: 5.78E-10 (Cmpd 20); 6.63E-11 (Cmpd 21); and 1.30E-09 (Cmpd 23). The emission factors for Chromium Compounds should read: 5.02E-09 (Cmpd 20); 5.76E-10 (Cmpd 21); and 1.13E-08 (Cmpd 23). The AP-42 document should be revised.

10X larger

21. On page 4.12-75, the AP-42 document indicates that the emissions factors for Nickel (Ni) Compounds are: 1.63E-09 (Cmpd 19) and 1.79E-09 (Cmpd 23). These emissions factors should be revised to read: 1.42E-08 and 1.56E-08, respectively.

10X larger

22. On page 4.12-75 of the AP-42 document, the emission factors for Lead (Pb) Compounds have been omitted. The emission factors for lead should read: 9.95E-10 (Cmpd 19); "<" (Cmpd 20); "<" (Cmpd 21); "<" (Cmpd 22); and 1.46E-10 (Cmpd 23). The AP-42 document should be revised.

new efs

Platen Press Curing (Table 4.12-8)

1. On page 4.12-93, the AP-42 document indicates that the emission factors for Cmpd 4 and Cmpd 6 for 1,4 Dichlorobenzene are ",". The RMA data has factors of 1.43E-08 and 2.38E-08, respectively for these compounds. The AP-42 factors should be revised.

new efs

2. On page 4.12-94 the AP-42 document indicates that the emission factor for Cmpd 3 for bis(2-Ethylhexyl)phthalate is 2.14E-06. The RMA data has a factor of 2.13E-06 for this compound. The AP-42 factor should be revised.

minimal

3. On page 4.12-95 the AP-42 document indicates that the emission factor for Cmpd 5 for Di-n-butylphthatate is 1.39E-07. The RMA data has a factor of 1.38E-07 for this compound. The AP-42 factor should be revised.

minimal

4. On page 4.12-97 the AP-42 document indicates that the emission factor of Cmpd 8 for 1,4 Dichlorobenzene is ",". The RMA data has a factor of 8.76E-08 for this compound. The AP-42 factor should be revised.

new ef

5. On page 4.12-98 the AP-42 document indicates that the emission factor for Cmpd 9 for Acetophenone is 4.40E-04. The RMA data has a factor of 4.39E-04 for this compound. The AP-42 factor should be revised.

minimal

6. On page 4.12-105 the AP-42 document indicates that the emission factor for Cmpd 15 for N-Nitrosodimethylamine is "<". The RMA data has a factor of 4.57E-08 for this compound. The AP-42 factor should be revised.

new ef

7. On page 4.12-108 the AP-42 document indicates that the emission factor for Cmpd 22 for bis(2-Ethylhexyl)phthalate is 2.67E-06. The RMA data shows a factor of 2.66E-06 for this compound. The AP-42 factor should be revised.

minimal

<u>Hot Air Curing</u> (Table 4.12-10)

1. Revise the heading of the table to read "Hot Air Curing."

minimal

<u>Tire Curing</u> (Table 4.12-11)

1. On page 4.12-152 the AP-42 document has an emission factor of Tire E for 2-Butanone of 0.96E-07. The RMA document has a factor of 0.95E-07. The AP-42 factor should be revised.

minimal

2. On page 4.12-157 the AP-42 document has the following note: "<u>1,1,1-Trichloroethane</u> for Tire F is <u>not included</u> in the Total HAPs or in the statistical summary due its suspected presence from mold release agents." This language should be changed to read; "1,1,1 Trichloroethane for Tire F is averaged from other tires tested due to suspected mold release presence not normally used."

explan.

3. Pages 4.12-156 and 157 of the AP-42 document do not identify the table in the same way as pages 4.12-152 - 155. The former identifies the table as "TIRE CURE HAPS EMISSION FACTOR SUMMARY" while the latter identifies the table as "Table 4.12-

minimal

11." The table identification on pages 4.12-156 and 157 should be revised to be consistent with pages 4.12-152 - 155.

RUBBER MANUFACTURERS ASSOCIATION
REDLINE/STRIKEOUT VERSION
MARCH 31, 1998

4.12 Manufacture of Rubber Products

4.12.1 General Process Description

Many of the rubber manufacturing facilities in the United States produce pneumatic tires for automobile, trucks, airplanes and farm machinery. However, **many** ~~the majority of~~ rubber manufacturing facilities produce other engineered rubber products. The processes involved in these industries are very similar. Differences basically consist of the raw rubber material (natural or synthetic) used, the chemical additives, and the type of curing employed. The following is a description of a generic rubber manufacturing facility applicable to both tire and other manufactured rubber products, except where noted.

The manufacturing of rubber products involves ~~several~~six principal processing steps (mixing, milling, extrusion, calendering, curing, and grinding), with ancillary steps in between. Initially, the raw rubber (natural or synthetic) is mixed with several additives which are chosen based upon the desired properties of the final product. The mixed rubber is often milled and transferred to an extruder where it can be combined with other rubbers. Many rubber products contain synthetic fabric or fibers for strengthening purposes. These fibers are typically coated with mixed rubber using a ~~calendering machine~~calender. The extruded rubber and rubber coated materials are then assembled into ~~its~~ **a** final shape and cured. Among the steps in the tire assembly process, described in more detail below, are bead building; cementing and marking; cutting and cooling; tire building; and green tire spraying. It is during the curing process that the rubber vulcanizes (crosslinks), producing the characteristic properties of finished rubber. Once the final product is cured, it is often ground to remove rough surfaces and/or to achieve symmetry.

Mixing consists of taking the raw rubber and mixing it with several chemical additives. These additives consist of ~~an accelerator~~accelerators (~~accelerates~~ **to initiate** the vulcanization **process** ~~rate~~), zinc oxides (assists in accelerating vulcanization), retarders (prevents premature vulcanization), antioxidants (prevents aging), softeners (facilitates processing of the rubber), carbon black or other fillers (reinforcing/strengthening agents), and inorganic or organic sulfur compounds (vulcanizing agent).

Mixing ~~is~~ typically is performed in an internal batch mixer. The internal mixer contains two rotors which shear the rubber mix against the wall of the vessel. Internal mixing is performed at elevated temperatures up to approximately ~~*330F*~~ 330°F.

Once mixed, the rubber is discharged from the mixer and processed into slab rubber or pellets. Rubber mixing typically occurs in two or more stages wherein the rubber is returned to the mixer and re-mixed with additional chemicals. The initial stage results in non-productive compounds, and the final stage results in productive compounds. It should also be noted that various rubber compounds produced at a particular facility can be exported to other facilities for use there.

Non-productive compounds consist of ~~the polymers~~raw rubber, process oils, reinforcing materials such as carbon black and/or ~~*silicia*~~ silica and the antioxidant/antiozonant protection system. These materials are ~~usually mixed together in two or more stages called non-productives which are~~ mixed at temperatures around ~~*330F*~~ 330°F. The final, "productive," stage involves mixing the rubber from the last non-productive stage ~~is then taken and~~with the activators, accelerators and sulfur curing agents ~~are mixed into it, making what is called the productive stage~~. This stage is mixed at a lower temperature (around ~~*230F*~~ 230°F) because the rubber compound will now scorch and cure at elevated temperatures.

The majority of rubber products produced in the United States are composed of one or more of 23 generic rubber compounds shown in Table 4.12-1. Emission~~s~~ factors were derived from the specific compound recipes shown in Table 4.12-2. Emissions from manufacturing aids such as solvents~~,~~ ~~adhesives~~ and ~~mold release compounds~~adhesives ARE NOT included in these emission factors.

Table 4.12-1

Index of Rubber Compounds

Compound #1:	Tire Inner Liner (BrIIR/NR)
Compound #2:	Tire Ply Coat (Natural Rubber/Synthetic Rubber)
Compound #3:	Tire Belt Coat (Natural Rubber)
Compound #4:	Tire Base/Sidewall (Natural Rubber/Polybutadiene Rubber)
Compound #5:	Tire Apex (Natural Rubber)
Compound #6:	Tire Tread (Styrene Butadiene Rubber/Polybutadiene Rubber)
Compound #7:	Tire Bladder (Butyl Rubber)
Compound #8:	EPDM 1 (EPDM Sulfur Cure)
Compound #9:	EPDM 2 (Peroxide Cure)
Compound #10:	EPDM 3 (Non-Black EPDM Sulfur Cure)
Compound #11:	CRW (Polychloroprene W Type)
Compound #12:	CRG (Polychloroprene G Type)
Compound #13:	Paracryl OZO (NBR/PVC)
Compound #14:	Paracryl BLT (NBR)
Compound #15:	Hypalon (CSM)
Compound #16:	Fluoroelastomer (FKM)
Compound #17:	AEM (Vamac)
Compound #18:	Hydrogenated Nitrile (HNBR)
Compound #19:	Silicone (VMQ)
Compound #20:	Acrylate Rubber (ACM)
Compound #21:	Chlorinated Polyethylene (CPE)
Compound #22:	Emulsion SBR (SBR 1502)
Compound #23:	Epichlorohydrin (ECO)

~~*Compound #24: Oil-Extended SBR (SBR 1712)*~~
~~*Compound #25: Emulsion SBR (SBR 1500)*~~
~~*Compound #26: Solution SBR (Duradene 707)*~~

Table 4.12-2

Rubber Compound Recipes

Compound #1: Tire Inner Liner (BrIIR/NR)

Recipe:	
Brominated IIR X-2	85.00
SMR 20 Natural Rubber	15.00
GPF Black	60.00
Stearic Acid	1.00
Paraffinic Medium Process Oil	15.00
Unreactive Phenol Formaldehyde Type Resin (Arofene 8318, SP1068)	5.00
Zinc Oxide	3.00
Sulfur	.50
MBTS	1.50
	186.00

Number of Passes/Temperature:
1 (NP Temperature: 320°F; Chlorobutyl or 290°F Bromobutyl)
2 (P) Temperature: 220°F

Compound #2: Tire Ply Coat (Natural Rubber/Synthetic Rubber)

Recipe:	
50472 Natural Rubber	
SMR-GP Natural Rubber	70.00
Duradene 707	30.00
N330	36.50
Sundex 790	20.00
Flectol H	
	1.50
Santoflex IP	2.30
Sunproof Super Wax	1.20
Zinc Oxide	5.00
Stearic Acid	1.00
Sulfur	2.30
CBS	.80
	170.60

Number of Passes/Temperature:
1 (NP) Temperature: 330°F
2 (P) Temperature: 220°F

Table 4.12-2 (cont.)

Rubber Compound Recipes

Compound #3: Tire Belt Coat (Natural Rubber)

Recipe:

#1RSS Natural Rubber	100.00
HAF Black (N330)	55.00
Aromatic Oil	5.00
N-(1,3 dimethylbutyl)-~~N-phenyl-P-pnenylene~~N-phenyl-P-phenylene diamine (Santoflex 13)	1.00
Zinc Oxide	10.00
Stearic Acid	2.00
n-tertiary-butyl-2-benzothiazole disulfide (Vanax NS)	.80
Sulfur	4.00
Cobalt Neodecanate (20.5% cobalt)	2.50
	180.30

Number of Passes/Temperatures:
1 (NP) Temperature: 330°F; add 1/2 black, add 1/2 oil
2 (NP) Temperature: 330°F, add remainder of black and oil
3 (remill) Temperature: 300°F
4 (P) Temperature: 220°F

Compound #4: Tire Base/Sidewall (Natural Rubber/Polybutadiene Rubber)

Non-Productive Recipe:

NR-SMR-5 CV	50.00
Taktene 1220	50.00
N330 Carbon Black	50.00
Zinc Oxide	1.50
Stearic Acid	2.00
Agerite Resin D	2.00
Vulkanox 4020	3.00
Vanwax H Special	3.00
Flexon 580 Oil	10.00
	171.50

Productive Recipe:

Non Productive	171.50
Zinc Oxide	1.50
Rubber Maker Sulfur	1.75
DPG	0.10
CBS	0.60
	175.45

Number of Passes/Temperatures:
1 (NP) Temperature: 330°F
2 (P) Temperature: 220°F

Table 4.12-2 (cont.)

Rubber Compound Recipes

Compound #5: Tire Apex (Natural Rubber)

Recipe:

TSR 20 Natural Rubber	100.00
HAF Black (N330)	80.00
Aromatic Oil	8.00
Stearic Acid	1.00
Resorcinol	3.00
Hexamethylenetetramine	3.00
Zinc Oxide	3.00
N-tertiary-butyl-2-benzothiazole disulfide (Vanax NS)	1.50
n-cyclohexythiop*h*thalimide (Santogard PVI)	.30
Sulfur	3.00
	202.80

1 (NP) Temperature: 330°F; add 60 parts black, add 6 parts oil
2 (NP) Temperature: 330°F; add Resorcinol, add 20 parts black, add 2 parts oil
3 (P) Temperature: 200°F; add Hexam

Compound #6: Tire Tread (Styrene Butadiene Rubber/Polybutadiene Rubber)

Non-Productive Recipe #1:

SBR 1712C	110.00
N299 Carbon Black	60.00
Taktene 1220	20.00
Zinc Oxide	1.50
Stearic Acid	3.00
Vulkanox 4020	2.00
Wingstay 100	2.00
Vanox H Special	2.50
Sundex 8125 Oil	20.00
	221.00

Non-Productive Recipe #2:

Non-Productive #1:	221.00
N299 Carbon Black	20.00
Sundex 8125 Oil	5.00
	246.00

Productive Recipe:

Non-Productive #2	246.00
Zinc Oxide	1.50
Rubber ~~Maker~~Makers Sulfur	1.60
TMTD	0.20
CBS	3.00
	252.30

Number of Passes/Temperatures:
1(NP) Temperature: 330°F; add 60 parts black, add 20 parts oil
2(NP) Temperature: 330°F; add 20 parts black, add 5 parts oil
3 (P) Temperature: 220°F

Table 4.12-2 (cont.)

Rubber Compound Recipes

Compound #7: Tire Bladder

Recipe:

BUTYL268	100.00
N330	55.00
Castor Oil	5.00
SP 1045 Resin	10.00
Zinc Oxide	5.00
Neoprene W	5.00
	180.00

Number of Passes/Temperatures:
NP 1 All Butyl, Castor Oil, Zinc Oxide, 45 phr N330, discharge approx 330°F/340°F
+Resin, 10 phr N330, discharge approx 270/280°F DO NOT EXCEED 290°F
PROD NP2 = neoprene, discharge approx 250F/260°F

Compound #8: EPDM 1 (EPDM Sulfur Cure)

Non-Productive Recipe:

Vistalon 7000	50.00
Vistalon 3777	87.50
N650 GPF-HS Black	115.00
N762 SRF-LM Black	115.00
Process Oil Type 104B (Sunpar 2280)	100.00
Zinc Oxide	5.00
Stearic Acid	1.00
	473.50

Productive Recipe:	
Non-Productive	473.50
Sulfur	0.50
TMTDS	3.00
ZDBDC	3.00
ZDMDC	3.00
DTDM	2.00
	485.00

Number of Passes/Temperatures
1 (NP) Temperature: 340°F; upside down mix, rubber then black and oil
2 (P) Temperature: 220°F

Table 4.12-2 (cont.)

Rubber Compound Recipes

Compound #9: EPDM 2 (Peroxide Cure)

Non-Productive Recipe:	
Royalene 502	100.00
N 762 Carbon Black	200.00
Sunpar 2280 Oil	85.00
Zinc Oxide	5.00
Stearic Acid	1.00
	391.00
Productive:	
Non-Productive	391.00
DICUP 40C	6.00
SARET 500 (on carrier/2 parts active)	2.56
	399.56

NP Temperature: 330°F
P Temperature: 240°F

Compound #10: EPDM 3 (Non-black EPDM Sulfur Cure)

Recipe:	
Vistalon 5600	50.00

Vistalon 3777	87.50
Hard Clay (Suprex)	180.00
Mistron Vapor Talc	100.00
Atomite Whiting	40.00
Process Oil Type 104B (Sunpar 2280)	60.00
Silane (A-1100)	1.50
Paraffin Wax	5.00
Zinc Oxide	5.00
Stearic Acid	1.00
Sulfur	1.50
Cupsac	0.50
TMTD	3.00
	535.00

Number of Passes/Temperatures:
1 (NP) Temperature: 330°F
2 (P) Temperature: 220°F, add Sulfur, Cupsac, and TMTDS

Table 4.12-2 (cont.)

Rubber Compound Recipes

Compound #11: CRW (Polychloroprene W Type)

Recipe:

Non Productive:	
Neoprene WRT	100.00
N 550	13.20
N 762	15.70
Agerite Staylite S	2.00
Sunproof Super Wax	2.00
Santoflex IP	1.00
Magnesium Oxide	4.00
Stearic Acid	0.50
PlastHall Doz	15.00
	153.40
Productive Recipe:	
Non-Productive	153.40
Zinc Oxide	5.00

TMTD	0.50
Dispersed Ethylene Thiourea	1.00
	159.90

Number of Passes/Temperatures:
1 pass at 240°F; add accelerator package at 200°F

Compound #12: CRG (Polychloroprene G Type)

Non-Productive Recipe:

Neoprene GN	100.00
SRF	50.00
Sundex 790	10.00
Octamine	2.00
Stearic Acid	1.00
Maglite D	4.00
	167.00

Productive Recipe:

Non-Productive	167.00
TMTM	0.50
Sulfur	1.00
DOTG	0.50
Zinc Oxide	5.00
	174.00

Number of Passes/Temperatures:
1 (NP) Temperatures: 240°F; add zinc oxide and ~~eureatives~~curatives late at 200°F
2 (P) Temperature: 200°F

Table 4.12-2 (cont.)

Rubber Compound Recipes

Compound #13: Paracryl OZO (NBR/PVC)

Recipe:

PARACRIL OZO	100.00
Zinc Oxide	5.00
OCTAMINE	2.00
Hard Clay	80.00
FEF (N-550) Black	20.00
Stearic Acid	1.00
MBTS	2.50

TUEX	1.50
ETHYLTUEX	1.50
DOP	15.00
KP-140	15.00
Spider Sulfur	0.20
	243.70

Number of Passes:
(NP) Temperature: 330°F
(P) Temperature: 220°F; add MBTS, TUEX, ETHYLTUEX, Spider Sulfur

Compound #14: Paracryl BLT (NBR)

Recipe:

PARACRIL BLT	100.00
Zinc Oxide	5.00
SRF (N-774) Black	100.00
TP-95	15.00
Paraplex G-25	5.00
AMINOX	1.50
Stearic Acid	1.00
ESEN	0.50
MONEX	1.50
Sulfur	0.75
	230.25

Number of Passes/Temperatures:
(NP) Temperature: 280°F
(P) Temperature: 220°F; add sulfur, MONEX, and possibly ESEN

Table 4.12-2 (cont.)

Rubber Compound Recipes

Compound #15: Hypalon (CSM)

Recipe:

Hypalon 40	100.00
CLS 4 PBD	3.00
Carbo wax 4000	3.00

PE 617A	3.00
Mag Lite D	5.00
PE 200	3.00
Whiting (Atomite)	100.00
N650	100.00
TOTM Oil	70.00
MBTS	1.00
Tetrone A	1.50
NBC	0.50
HVA-2	0.50
	390.50

Uses of Formulas/Temperatures:
Number of Passes:
1 (P) Temperature: 280°F

Compound #16: Fluoroelastomer (FKM)

Recipe:

Viton E60C	100.00
N990 Black	20.00
Calcium Hydroxide	6.00
Maglite D	3.00
	129.00

Compound #17: AEM (Vamac)

Recipe:

VAMAC*B-124 Masterbatch	124.00
ARMEEN 18D	.50
Stearic Acid	.20
SRF Carbon Black (N-774)	10.00
DIAK #1	4.00
DPG	4.00
	142.70

Table 4.12-2 (cont.)

Rubber Compound Recipes

Compound #18: Hydrogenated Nitrile (HNBR)

Non-Productive Recipe:	
HNBR Zetpol 2020	100.00
N650 Black	45.00
Flexone 7P	1.00
Agerite Resin D	1.00
ZMTI	1.00
Kadox 911 C	5.00
Stearic Acid	1.00
Trioctyl trimellitate (TOTM)	7.00
	161.00
Productive Recipe:	
Sulfur	0.50
MBTS	1.50
TMTD	1.50
MTD Monex	.50
	165.00

Number of Passes/Temperatures:
1 (NP) Temperature: 275°F
2 (P) Temperature: 210°F

Compound #19: Silicone (VMQ)

Recipe:	
Silicone Rubber	70.00
Silastic NPC-80 silicone rubber	30.00
5 Micron Min - U - Sil	68.00
Silastic HT - 1 modifier	0.80
Vulcanizing agent: Varox DBPH 50	1.00
	169.80

Compound #20: Acrylate Rubber (ACM)

Non-Productive Recipe:	
Hytemp AR71	100.00
Stearic Acid	1.00
N 550	65.00
	166.00
Productive Recipe:	
Non-Productive	166.00
Sodium Stearate	2.25
Potassium Stearate	0.75
Sulfur	0.30
	169.30

Number of Passes/Temperatures:
1 (NP) Temperature: 260°F
2 (P) Temperature: 220°F

Table 4.12-2 (cont.)

Rubber Compound Recipes

Compound #21: Chlorinated Polyethylene (CPE)

Recipe:
CM 0136

	100.00
Maglite D	10.00
N 774 Black	30.00
Sterling VH	35.00
DER 331 DLC	7.00
Agerite Resin D	0.20
TOTM Oil	35.00
Triallyl Isocyanurate Cure 5223 (provided by Gates)	2.90
Trigonox 17/40	10.00
	230.10

Number of Passes/Temperatures:
Single pass mixed to 240°F; add **Triallylisocyanurate**,
Triganox 17/40 at 200°F

Compound #22: Emulsion SBR (SBR 1502)

Non-Productive Recipe:

SBR 1502	100.00
N330 Carbon Black	58.50
Zinc Oxide	10.00
Stearic Acid	2.00
Agerite Resin D (Naugard Q)	2.00
Flexone 7P	1.00
Sunproof Super Wax	1.50
Sundex 790 Oil	7.00
	182.00

Productive Recipe:

Non-Productive	182.00
Rubber Makers Sulfur	2.00
TBBS	1.80
	185.80

Number of Passes/Temperatures:
Non-productive pass mixed to 330°F,
Second pass mixed to 220°F.

Table 4.12-2 (cont.)

Rubber Compound Recipes

Compound #23: Epichlorohydrin (ECO)

Recipe:

Hydrin 2000	100.00
N330 Carbon Black	50.00
Stearic Acid	1.00
Vulkanox MB-2/MG/C	1.00
Calcium Carbonate	5.00
Zisnet F-PT	1.00
Diphenylguanadine	0.50
Santogard PVI	0.50
	159.00

Number of Passes/Temperatures:
1 Pass at 240°F

~~***Compound #24: Oil - Extended SBR (SBR 1712) ****~~	~~***137.50***~~
~~***SBR 1712***~~	~~***137.50***~~
~~***Compound #25: Emulsion SBR (SBR 1500) ****~~	~~***100.00***~~
~~***SBR 1500***~~	~~***100.00***~~
~~***Compound #26: Solution SBR (Duradene 707) ****~~	~~***100.00***~~
~~***Duradene 708***~~	~~***100.00***~~

~~**** - Compounds 24, 25, and 26 were mixes of polymer only, with no fillers or cure system.***~~

Emissions of volatile organic compounds (VOCs) due to use of cements, solvent tackifiers, and release agents in rubber manufacturing are generally determined by either material balance, assuming a 100% loss to the atmosphere or, in some cases, by direct measurement. In cases where solvent emissions are determined by a mass balance calculation which assumes 100% loss at the time of application to the rubber substrate, there is a potential for double-counting a small percentage of the solvent emissions when using the emission factors to determine process volatile organic emissions. This situation is due to the partial absor***b***ption of some solvents into the rubber surface during manufacturing, and ~~***the***~~ subsequent volatilization during downstream processing or curing.

It is not possible to determine to what extent typical hydrocarbon solvent constituents reported in the emission factors may have resulted from use of solvents or adhesives upstream in the manufacturing process. Anecdotal evidence suggests that as much as ~~***five***~~ ***5%*** of the solvent applied to the surface of the rubber may migrate into the rubber and ~~***show up***~~ appear later in the process as a volatile emission. Caution should therefore be exercised when compiling a facility-wide VOC emission inventory which combines the use of process emission factors and mass balance calculations of solvent usage. ~~This~~Otherwise, this methodology will generally result in an ~~***a slight***~~ overstatement of the actual facility-wide VOC emissions.

~~Once the rubber is properly mixed~~Milling operations are conducted to form the rubber compounds into sheets or strips for introduction into calenders or extruders, ~~it can be extruded~~for warming up rubber for ease of handling and processing and to homogenize recycled rubber compounds for reuse in the process.–

In the mixing area rubber compound is discharged from the Banbury mixer into a drop mill, extruder or pelletizer which forms it into a long sheet of rubber compound. Additional mills may be located directly downstream from the Banbury drop mill to provide additional mixing or handling capability. From the mill(s) the hot, tacky rubber sheet is then passed through a water-based "anti-tack" solution which prevents the rubber sheets from sticking together as they cool to ambient temperature. The rubber sheets are placed directly onto a long conveyor belt (festoon) which, through the application of cool air or water, lowers their temperature. After cooling the rubber sheets are piled onto a storage pallet for transfer to the component preparation area.

Mills are also used to prepare rubber for introduction to calendering and extruding processes. In these cases the mills are used to heat the rubber compound in order to make the rubber stock more flexible for further handling and processing.

Mills are also used to homogenize recycled rubber compounds for reintroduction into the process.

Extrusion is often performed to combine several types of previously mixed rubber compounds. The extruder consists of a power-driven screw within a stationary cylinder. A die is attached to the head of the screw to produce the desired shape or cross section of the extruded rubber. ~~Extrusion can be performed with both warm or cold rubber feed.~~

Extruders may have multiple heads providing laminations of extruded shapes. Extruding heats the rubber and the rubber remains hot until it is cooled via air cooling or use of a water bath or spray conveyor where cooling takes place.

Extrusion can be performed with both warm or cold rubber feed. The extruder is jacketed to maintain the desired operating temperature.—

~~Calendering is often used in the rubber manufacturing industry to apply a rubber coat onto synthetic or steel fibers. These calenders employ either three or four rolls and are hollow to allow~~Extruders may be utilized in the mixing area, along with mills to shape mixed rubber compound for ~~heating or cooling~~further processing.

Calendering is often used in the rubber manufacturing industry to apply a rubber coat onto ~~synthetic~~a continuous textile or ~~steel fibers~~metal mest web. The ~~openings between the rolls can be adjusted to control the coating thickness. An example of calendering~~calender is ~~in the manufacturing of radial tires where synthetic fibers are rubber coated and subsequently combined with rubber stock to create~~ a ~~more durable product~~heavy-duty machine equipped with multiple rolls revolving in opposite directions. Calenders receive hot strips of rubber from mills and squeeze the rubber into reinforcing fibers of cloth or steel or cloth-like fiber matrices, thus forming thin sheets of rubber coated materials. Calenders are also used to produce non-reinforced, thickness controlled sheets of rubber called innerliner or gum strip. After calendering, the calendered stock is wound into a liner to prevent sticking on itself. The calendered material is next cut to desired width and/or length for use in tire building.

The function of the bead is to provide a proper seal between the tire and the wheel rim when a tire is mounted on the rim. Bead compounds produced in mixing are used to coat bead wires. Brass-plated bead wire is received on large spools. Bundles of wires are passed through an extrusion die and given a coating of rubber. The rubber coated wire is then wound into a hoop of specific diameter and thickness and sent to the tire-building machine. In some cases, a cement may be applied to the finished bead.

Cementing operations are used at various stages in the tire building process. For example, cements (adhesives) may be used to improve the adhesion of different components to each other during the tire building process. Traditionally cements have been used in the bead building process, applied to extruded tread stock (end cementing for cut treads and undertread cementing for retreads and certain other tread stocks) and at tire building machines. It is important to note that cement usage can vary significantly from facility to facility depending on the type of tire being manufactured and the process being utilized.

Marking inks are used at various stages of the process to aid in the identification of the components being managed. Typically marking inks are applied to extruded tread stocks to aid in the identification and handling of cured tires. Again, it is important to note that marking practices can vary significantly from facility to facility.

The various components manufactured in component preparation must be cut and cooled prior to introduction into tire building. Typically, the processing of the rubber compounds generates heat which causes an increase in rubber temperature. If this temperature is not controlled properly the compound may begin to cure prematurely, thus rendering it unusable.

Tire components from bead making, extrusion and calendering are moved to the component assembly area. The assembly of various tire components is referred to as tire building. The main mechanical component of the tire-building operation is the drum, which is a collapsible cylinder that can be turned and controlled by the tire builder.

The typical tire building process begins with the application of a thin layer of special calendered rubber compound, called the innerliner, to the drum. Next, plies are placed on the drum, one at a time. The cords (calendered stock - rayon, nylon, polyester and related fabrics coated with rubber) are laid in alternate direction in each successive ply. This step is followed by a process of setting the beads in place. The plies are turned up around the beads and incorporate the beads into the tire. Chafer (extruder) stock from extruding or calendering is added if needed. Belts (metal or fabric calendered stock), if any are then applied. Finally, the tread and sidewalls are added to complete the tire. The tire may be "stitched" under pressure to remove air from between the components and bind them together. Radial tire production involves limited use of cements and solvents. Cement usage during tire building will vary significantly from facility to facility.

The drum is then collapsed and the uncured (green) tire is transferred to the green tire spraying operation. In preparation for curing, the uncured green tire may be coated with a lubricant (green tire spray). The lubricating spray is either a solvent-based or a water-based silicone. The function of the green tire spray is to ensure the cured tire does not stick to the curing mold when being removed.

The final step in manufacturing of rubber products is vulcanizing (curing). There are three predominant vulcanizing processes: press mold curing, autoclave curing, and hot air curing. Press mold curing uses high temperature and pressure to cure the final product. The high pressure (600-10,000 psi) forces the rubber to conform to the shape of the mold. Press mold curing is used in tire and engineered products manufacturing.

Autoclave curing utilizes saturated steam at an elevated pressure to cure the rubber mix. Unlike press mold curing, the product is formed into its final shape prior to the curing process. Autoclave curing is ~~the predominant curing~~a common method in non-tire rubber manufacturing facilities.

Hot air curing entails passing uncured, ~~green~~ engineered products through a chamber with a heated atmosphere. Temperature and residence times may vary, depending on the product type and formulation. As with the autoclave curing, these products have already been formed into their final shape prior to undergoing the curing process.

Grinding is often performed to remove rough edges and other blemishes from the final product or in some cases to actually form and shape the product. The ground rubber is occasionally recycled and utilized as filler in some rubber manufacturing processes. In the tire manufacturing industry, grinding is performed to balance the tire and also to expose the white sidewall or lettering. Relative to the engineered products industry, grinding may actually be used to obtain the correct shape of the final product such as the final shaping of drive belts.

4.12.2 Equipment Scale Considerations

Emissions testing was performed on several sizes of similar process equipment. These size differences are the most profound on the sizes of internal mixers tested. Emissions tests were performed on internal mixers ranging from a two-pound laboratory mixer, to a 200-pound pilot scale system up to a 500-pound production mixer. On a pound ***of*** pollutant emitted per pound of rubber mixed basis, test data indicated that emissions were not dependent on mixer size. This is especially true for the volatiles and semivolatile emissions. There was some variability of metals emissions which is most likely the result of greater particulate losses into the ventilation system on the larger mixers during charging than ~~is experienced~~ on smaller scale equipment.

Since there ~~*were*~~ was no direct correlation to process equipment size and emissions, no scaling factors were developed for equipment size.

4.12.3 Emissions And Controls

The mechanically-created or externally-added heat present during the six ~~common~~principal processes (mixing, milling, extrusion, calendering, curing, and grinding) cause volatile organic ~~chemicals~~compounds (VOC~~S~~) and hazardous air pollutants (HAP~~S~~) to be emitted. Particulate matter is primarily emitted from the dry chemicals utilized in mixing and as a result of grinding.

Dust collectors (baghouses, fabric filters) are commonly used to control particulate matter emissions from mixing. Cyclone separators in combination with dust collectors or electrostatic precipitators are typically used in grinding applications.

4.12.4 Emission Factors

The following is common to each of the Emission Factors tables:

(1) Total VOCs were analyzed by EPA ***R***eference ***M***ethod 25A/FID.

(2) Total speciated organics were analyzed by EPA ***R***eference ***M***ethods TO-14/GC-MS (speciated volatiles), TO-14/GC-FID (volatile ozone precursors) and M8270 (semi-volatiles).

Note: Results from Method 25A and results from the total speciated organics reference methods are not directly comparable due to the inherent differences in the method of analysis.

(3) Total Organic HAP~~S~~ are hazardous air pollutants as defined by the Clean Air Act ***Amendments*** of 1990, Section 301 and were analyzed by EPA ***R***eference ***M***ethod TO-14/GC-MS and M8240 (*v*olatiles), M8270 (semi-volatiles), and TO-14/GC/FPD (*s*ulfur compounds).

(4) Total Metal HAP~~S~~ are hazardous air pollutants as defined by the Clean Air Act ***Amendments*** of 1990, Section 301 and were analyzed by EPA ***R***eference ***M***ethods M6010 and M7000 (metals).

(5) Total HAP~~S~~ are the sum of total organic HAP~~S~~ and total metal HAP~~S~~.

(6) Total Particulate Matter (PM) was analyzed by ***EPA R***eference ***M***ethod 5~~/Gravimetric~~.

(7) Target analytes which were not detected in any runs for a particular process and compound were not included in the tables. The assumption is that if a target analyte went undetected in any runs, there is a high probability that even if it was present, the low ~~non-~~detection limits indicate that its overall contribution is insignificant.

(8) ***Target analytes detected in one or more runs were averaged together. Target analytes that were not detected in a test run were assumed to have been present at a concentration of one-half the test detection limit for averaging purposes.***

(9) Metals were expected to be detected in the particulate matter emitted during rubber mixing but were not expected to be a significant emission in any other process. To confirm this assumption, the extruder emissions were analyzed for metals. Metals emitted proved to be so insignificant that they could be within the margin of error of the analytical procedure. Metal emissions were therefore considered to be insignificant in other processes.

A total of 31 files containing nine separate tables of emission factors comprise the remainder of this section. The nine tables have been broken up into multiple files in order to keep the file sizes workable. The tables were split so that all emission factors for a given rubber formulation are in one file. The contents of the remaining 31 files are shown in Table 4.12-3.

Table 4.12-3
Key to Emission Factor Tables and Files

Table # and Name	File Name	Rubber Compounds Incl.
4.12-4 Internal Mixing & Milling	MIX1.WPD	1 - 6
	MIX2.WPD	7 - 12
	MIX3.WPD	13 - 18
	MIX4.WPD	19 - 23
4.12-5 Milling	MILLING1.WPD	1 - 6
	MILLING2.WPD	7 - 13
	MILLING3.WPD	14 - 19
	MILLING4.WPD	20 - 23
4.12-6 Extruder	EXTRUD1.WPD	1 - 6
	EXTRUD2.WPD	7 - 12
	EXTRUD3.WPD	13 - 18
	EXTRUD4.WPD	19 - 23
4.12-7 Calender	CALEND1.WPD	1 - 7
	CALEND2.WPD	8 - 13
	CALEND3.WPD	14 - 20
	CALEND4.WPD	21 - 23
4.12-8 Platen Press Curing	PLATEN1.WPD	1 - 6
	PLATEN2.WPD	7 - 12
	PLATEN3.WPD	13 - 18
	PLATEN4.WPD	19 - 23
4.12-9 Autoclave Curing	AUTOCLV1.WPD	1 - 6
	AUTOCLV2.WPD	7 - 12
	AUTOCLV3.WPD	13 - 18
	AUTOCLV4.WPD	19 - 23
4.12-10 Hot Air ~~Cure~~Curing	HOTAIR1.WPD	1 - 6
	HOTAIR2.WPD	7 - 12
	HOTAIR3.WPD	13 - 18
	HOTAIR4.WPD	19 - 23
4.12-11 ***Tire Curing***	TIRECUR1.WPD	A - F
	TIRECUR2.WPD	G - I
4.12-12 Grinding Operations	GRIND.WPD	

C:\ZIPPER\NEW4512b.wpd

RUBBER MANUFACTURERS ASSOCIATION
REDLINE/STRIKEOUT VERSION
MARCH 31, 1998

EMISSION FACTOR BACKGROUND REPORT FOR AP-42 Section 4.12
Manufacture of Rubber Products

1. Introduction

1.1 Program Overview And Objectives

The Clean Air Act Amendments (CAAA) of 1990 contain a variety of new programs and approaches designed to reduce emissions of hazardous air pollutants (HAPs), improve urban air quality and to control the precursors of acid rain. The Environmental Protection Agency (EPA) and the state/local air agencies now have at their disposal an expanded authority base to meet the CAAA objectives including an expanded array of enforcement tools. As the CAAA implementation moves forward, industry will be faced with numerous complex and burdensome air compliance issues.

On July 21, 1992, EPA promulgated the Operating Permit Rule, which represents an expanded and very different approach to permitting air emission sources. The operating permit program commonly referred to as *Title V* is a national program which is now being implemented on a state by state (and in the case of California, county by county) basis. In other words, each state has been charged with developing and implementing its own federally enforceable operating permit program which meets or exceeds the CAAA requirements.

Title V now requires each facility which exceeds a major source threshold to secure a facility wide permit. The Title V program defines major source applicability on the basis of **potential to emit**. All facilities which have the **potential to emit** more than any of the following must secure a facility operating permit:

- 100 tons/year of a criteria pollutant except in ~~selected~~certain urban areas (non attainment areas) where the threshold can be as low as 10 tons/year

- 10 tons/year of a single HAP or 25 tons/year in aggregate of any listed HAPs

Title V requirements represent a significant departure from past state permitting programs which addressed some but not all sources at a facility on a process by process basis. Before the federal 1990 CAAA, fewer than 20 pollutants were federally regulated. Now there are in excess of 200 regulated pollutants ~~when~~without taking into account additional ~~state~~ air toxics requirements that may exist in some states.

To prepare a facility Title V permit, there are several tasks which must be completed. One such activity is the development of the plant emissions inventory which is the largest part of the permitting effort and also one of the areas where accuracy is critical. An inaccurate inventory can result in future compliance problems.

Producing an accurate inventory is contingent upon the availability of sound emissions data or emission factors for each process in a facility. These factors coupled with commonly archived process and production data are used to calculate emissions and produce the inventory.

Unfortunately, emission factors have not been established by EPA or the states for many industrial processes, including the rubber manufacturing industry. In the absence of established emissions factors or readily available emissions data, EPA and the states have typically adopted the fallback position of requiring emissions testing for each significant process within a facility, an endeavor which is expensive in addition to being very complex.

As a result of the lack of documented emissions factors for the industry, the Rubber Manufacturers Association (RMA), on behalf of its membership, embarked on a large project to address the emission factor issue. Specifically, the objectives of the project were as follows:

- Develop emission factors for the commonly used rubber manufacturing processes;

- Develop a consistent applications approach for developing plant-wide emissions inventories;

- Develop a standard protocol for estimating emissions related to future process changes;

- Provide background information for addressing Title V record keeping and compliance demonstration requirements;

- Provide support for addressing future enhanced monitoring requirements; and

- Provide information sufficient to address equipment scale differences.

An intense testing-based project was conducted which resulted in emission factors for the commonly used rubber compounds and processes. The results of the project and the emission factors now available are discussed ~~in the remainder of this report~~.below:

1.2 Emission Factor Project Definitions

The following is a brief list of key definitions which define pollutant categories measured in the test program, as well as terminologies which will assist the reader in interpreting the emission factor data provided in this volume.

(1) *Total Speciated Volatiles:* The sum of the target volatile organic compounds as well as those compounds tentatively identified during a mass spectral library search.

(2) *Total Speciated Semivolatiles:* The sum of the target semivolatile organic compounds as well as those compounds tentatively identified during a mass spectral library search.

(3) *TVOC:* Total volatile organic compounds measured as total hydrocarbons (THC) calibrated to a methane standard. Measurements were made on a continuous basis using a THC analyzer in accordance with EPA Reference Method 25A.

(4) *Total Metals:* The sum of the target analytes detected. The target analytes ~~are~~ were cadmium, chromium, copper, lead, magnesium, nickel and zinc.

(5) *Total Sulfur:* The sum of the target sulfur compounds detected during sample analysis using gas *chromatography/flame* photometric detection (GC/FPD).

(6) *Total Speciated Organics*, as used in the summary and speciation tables: The total speciated organic compounds measured in the test program, is the sum of the semivolatile and volatile emissions for a given rubber compound minus any duplicate compounds. Where ~~there is duplication of a chemical compound in the analyte list~~, *the same compound may have been measured by two different test methods*, the higher value was used to present a conservative emissions total. The other value was ignored and not included in the total.

(7) *Speciation Factors:* These are the fraction by weight, of a particular compound to the total for a specific pollutant category. For example, a speciation factor for benzene is determined by dividing the measured benzene emissions by the **Total Speciated Organic** compound emissions (**Total Speciated Organics** is defined above).

(8) *Volatile Organic Compounds (VOCs)* as defined for permitting requirements is based on the EPA definition cited in **40 CFR** 52.21:

Volatile Organic Compounds (VOC) means any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate which participates in atmospheric photochemical reactions. This includes any organic compound other than the following which have been determined to have negligible photochemical reactivity:

(a) Methane (CAS 74-82-8);
(b) Ethane (CAS 74-84-0);
(c) 1,1,1-Trichloroethane (CAS 71-55-6);
(d) Methylene Chloride (CAS 75-09-2);
(e) Trichlorofluoromethane (CAS 75-69-4);
(f) Dichlorodifluoromethane (CAS 75-71-8);
(g) Chlorodifluoromethane (CAS 75-45-6);
(h) Trifluoromethane (CAS 75-46-7);
(i) Trichlorotrifluoroethane (CAS 76-13-1);
(j) Dichlorotetrafluoroethane (CAS 76-14-2);
(k) Chloropentafluoroethane (CAS 76-15-3);
(l) Dichlorotrifluoroethane (CAS 306-83-2);

(m) Tetrafluoroethane (CAS 811-97-2);
(n) Dichlorofluoroethane (CAS 1717-00-6);
(o) Chlorodifluoroethane (CAS 75-68-3);
(p) Chlorotetrafluoroethane (CAS 2837-89-0);
(q) Pentafluoroethane (CAS 354-33-6);
(r) Tetrafluoroethane (CAS 359-35-3);
(s) Trifluoroethane (CAS 420-46-2);
(t) Difluoroethane (CAS 75-37-6);
(u) Perchloroethylene (CAS 127-18-4); and,
(v) the following ~~4~~ *four* classes of perfluorocarbon compounds:

(1) Cyclic, branched, or linear, completely fluorinated alkanes;
(2) Cyclic, branched, or linear, completely fluorinated ethers with no unsaturation;
(3) Cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturation; and
(4) Sulfur-containing perfluorocarbons with no unsaturations and with sulfur bonds only to carbon and fluorine.

1.3 Emission Factor Summary

Standardized rubber formulations based on published industry references such as The Vanderbilt Rubber Handbook, 13th Edition were used as the test compounds for the internal mixing/milling, platen press curing, extruder, autoclave, hot air curing, and ~~warmup mill~~milling tests. Data for the calendering, grinding, and tire **curing** processes were generated in actual manufacturing settings. For tire curing, actual tires from several of the participating companies were used to collect test data.

2. Emissions Factor Development Approach

2.1 Selection of Compounds and Target Pollutants

The initial step necessary in developing emission factors is to identify which pollutants are emitted to the atmosphere from the process. Previous investigations into the emissions from rubber manufacturing **showed** that the predominant emissions are low molecular weight organic compounds (C_6-C_8). However, the potential for heavier, less volatile organic compound emissions also exists due to the chemistry and the elevated temperatures of many of the processes. Particulate matter emissions can also be significant, especially during the mixing process when carbon black is added to the mix.

Title III of the 1990 CAAA lists 189 HAPs **(Since the original publication of the HAP list, caprolactam has been dropped.)**. Many of these are applicable to the rubber manufacturing industry. In addition, many states where rubber manufacturing facilities operate have developed their own ~~HAP~~air toxic lists. Since the Title V operating program will be administered by the individual states, there exists the possibility that facilities will need to conduct emission inventories for all of the HAPs in Title III as well as on the state ~~lists~~compounds. A comprehensive target test list was developed using all the chemicals from Title III, selected state air **toxics** ~~lists~~comounds, as well as the SARA 313 toxic ~~chemical list~~chemicals. Information presented in the tables includes only HAPs data.

The emissions from each process **may** ~~change depending upon the type of rubber used (natural or synthetic) and the specific additives (metal oxides, accelerators, retardants, antioxidants, softeners, fillers, and vulcanizing agents) in the mix. The emissions~~ vary ~~due to~~depending upon the ~~physical properties of the raw rubber~~type of rubber used (natural or synthetic), the specific additives (metal oxides, accelerators, retardants, antioxidants, softeners, fillers, and vulcanizing agents) in the mix, the physical characteristics of the processes, ~~chemical additives,~~ and the reaction chemistry of the processes.

The tire manufacturing industry principally uses natural rubber, styrene-butadiene (SBR) rubber, and polybutadiene rubber. Polybutadiene is often mixed with SBR to improve the abrasion and cracking resistance of the tire. For nontire rubber goods where oil resistance is a priority, rubbers such as polyacrylates, nitrile, neoprene, polyurethanes, epichlorohydrins, chlorosulfonated polyethylene, chlorinated polyethylene, and fluoroelastomers are used. Potential emissions from ~~these rubbers consist~~rubber consists of breakdown compounds such as the monomers used to create the rubber.

Accelerators ~~are added to the mix to speed up~~ **initiate** the vulcanization **process** ~~rate~~. Typical accelerators are metal oxides (zinc oxide, lead oxide, and magnesium oxide) and a large variety of organic accelerators. These organic accelerators are typically from the following classes of organic compounds: benzothiazoles, benzothiazolesulfonamides, dithiocarbamates, dithiophosphates, guanidines, thioureas, and thiurams.

Antioxidants help to prevent oxidation (aging) of the vulcanized product. Antioxidants are usually high molecular weight amine compounds such as dioctylated diphenylamine.

Retarders are used to prevent the premature vulcanization (scorching) of the rubber during processing. Retarders currently in use **consist mainly** of organic acids (salicyelic and benzoic acids), phthalic anhydride, and N-(cyclohexylthio)phthalimide. ~~Again, the~~The potential emissions consist of the retarders themselves along with their thermal breakdown components.

Softeners are used to increase the workability of the mix for lubrication during extrusion and molding**,** and~~,~~ to aid in the dispersion of fillers. The predominant softener used in the rubber industry is petroleum oil. The potential emission compounds from petroleum oil are extensive. The majority of the compounds would most likely be aromatic hydrocarbons of various sizes and types.

Fillers are added to the rubber mix for several reasons. ~~Fillers~~ **They** provide color but are mainly used to reinforce the final product. Fillers are fine particles which increase the abrasion resistance and tensile strength of the product. Carbon black is used as the primary filler in tire manufacturing. Rubber goods requiring a color other than black use numerous types of inorganic fillers. Due to the ~~extremely~~ fine particle size of fillers, ~~they~~rubber mixers are ~~easily emitted to the atmosphere during mixing~~typically equipped with particulate emission control equipment..

Sulfur compounds comprise the vast majority of vulcanizing agents currently used. Sulfur can be added as elemental sulfur or within inorganic or organic sulfur compounds. The presence of sulfur and the high temperatures involved in the processes ~~creates the possibility~~results in the possible emission of **that** ~~of~~sulfur compounds such as carbon disulfide ~~to~~ **can** be emitted.

Twenty-~~six~~ three rubber compounds/mixtures were studied in this program. ~~These included 4 specific 10 tire-related mixtures, of which one was specifically a tread mixture, and were and five were "sidewall mixtures", and seven rubbers associated with engineered products (non-tire) applications: 4 four styrene-butadiene rubbers (SBR), and 3 three ethylene-propylene-diene-mixture (EPDM) terpolymers. Thirteen other compounds/mixtures were also studied.~~

~~The target compounds for the emission factor development program were the entire list of the original 189 HAPs, in addition to total VOCs and other pollutants prevalent in typical rubber manufacturing processes.~~

2.2 Description of Sampling / Analytical Regimes

(NOTE: "Tables 2-2 and 2-3 are missing. It appears these table numbers need to be changed to 2-1 and 2-2")

The ten processes tested are summarized in *Table 2-1 (formerly called Table 2-2)* and the test methods employed are shown in *Table 2-2 (formerly called Table 2-3)*: tire press, oven ~~cure~~ **curing** of tire cuts, autoclave, extruder, internal mixers, grinding, platen press, calender, warmup mill, and oven ~~cure~~ **curing** of engineered products. Nine of the processes were tested *for total volatile organic compounds; speciated volatiles; volatile ozone precursors; sulfur compounds; and semivolatile organic* *compounds*. Two processes (tire press and autoclave) were tested for amines. Four processes (tire press, oven ~~cure~~ **curing** of tire cuts, extruder, and some grinding processes) were tested by Fourier transform infrared spectroscopy (FTIR). Three processes (extruder, internal mixers, and grinding) were tested for particulate matter and metals.

To ~~accurately~~ quantify the emissions from each process **accurately**, the emissions tests were conducted using enclosure methodologies to ensure that all emissions were captured. The design of each enclosure was based upon the criteria in EPA Method 204 for a total enclosure. The objective in using the enclosure approach was to collect and "concentrate" non-point source emissions from the individual process in a way that enclosure exhaust could be sampled.

A highly ventilated enclosure with rapid air turnover would not allow for adequate detection limits of the target parameters. **EPA's** criteria for enclosures ~~have been~~ **were** followed, as guidance. However, air velocities ~~have been~~ **were** varied to allow for optimal sampling conditions within the exhaust duct. Specific enclosure construction and exhaust details vary with the process, fugitive release rate, and target sampling parameters.

During each test run for all processes, all pertinent operating parameters were recorded. These parameters consisted of the quantity and **types** of materials being processed, processing and/or production rate, process temperature, and process pressure. ~~This~~ These data ~~was~~ were recorded at the start of each test run and at **15-minute** intervals thereafter until the completion of the test run.

The emissions test data, process data, and laboratory data acquired from the sampling program ~~was~~ **were** compiled and evaluated for each test run. Mass emission rates from each rubber type and each pollutant were calculated from the laboratory results and field test data. The mass emission rates were calculated utilizing the measured exhaust air flow rate and concentration of each target pollutant in the sample vent for each individual test run. All emission calculations were performed in accordance with the specific sampling methodologies utilized for this program.

In addition to the sampling conducted at each process emission vent, numerous sampling runs were conducted to quantify background concentrations of target pollutants present in the atmosphere where the sampling was conducted. These background tests were conducted since most of the emissions testing was performed in process areas containing several air pollutant emitting processes. The necessity of background emissions testing was determined by the team leader for each test program based upon field observations. These field observations included assessing the presence of visible emissions, odors, and plant activities which could bias the test **data,** such as maintenance painting. Quantifiable background concentrations were subtracted from the sample concentrations for that day to provide more accurate emission results from the processes.

Laboratory and field blank samples were also collected for each sampling method to recognize and quantify contamination of any sampling media. The results of these blank sample runs were compared with the process sample runs to identify emission results which ~~may be~~ **might have been** biased. If quantifiable pollutant concentrations were found in the sample blanks, these concentrations were subtracted from the specific test results associated with the blank sample. Sample results which were found to have values less than or equal to background or blank sample concentrations were assumed to be equal to ~~0~~ zero.

The emission sampling results and the process data were then correlated to quantify emissions on a basis of pounds of pollutant emitted per pound of rubber processed. For ~~3~~ three of the grinding operations (sidewall grinding, carcass grinding, and belt grinding), emissions were quantified on a pound of pollutant emitted per pound of rubber removed basis. For batch operations such as ~~the~~ internal ~~mixer~~mixing and autoclave curing, this was done by determining the total pounds of pollutant emitted and dividing by the total pounds of rubber processed. For continuous operations such as the extruder and calendering, this was performed by dividing the average hourly mass emission rate by the average hourly rubber processing rate. Results for ~~the tire press~~tire curing were developed on both a lb/lb tire and lb/lb rubber basis ~~due to~~ **to account for** the non-rubber components of the tires such as fabric and steel cords, wire beads, and belts.

In addition to the results of the compound specific sampling methods data, total organic compound emissions were determined using the data collected during the Method 25A continuous process monitoring. Average total organic concentrations were recorded for each ~~1~~ one-minute interval for each test run. An average value was then determined from the average of all **of** the ~~1~~ one-minute data points collected over the duration of each test. Background concentrations were quantified at the beginning of each test run to correct the final result. Mass emissions of total organics were then quantified for each run.

Concentration data ~~are~~were provided for every target analyte and every *tentatively-identified* compound. In each case where a particular compound was not detected, the detection limit ~~is~~was provided.

For sampling methods having more than ~~1~~ one target pollutant, the pollutant emissions were aggregated to provide total emissions by pollutant category. Total emissions were developed in this manner for metals, organics (including volatiles, ozone precursors, and semivolatiles), sulfur compounds, and in some cases, amines. Many of the target pollutants in these sampling methods were not present in the sample ~~exhaust~~ at quantifiable concentrations. Mass emission rates of these pollutants were calculated based upon their detection limit, as stated in the laboratory results, and their values were denoted with a "<" symbol prior to their stated emission value in the results tables. Emissions totals for detected compounds include emissions of all compounds which were detected in the sample by ~~the~~ chemical analysis.

2.3 Development of Final Factors

The results of the data analysis were assembled to develop pollutant and rubber *type-specific* emission factors for each process. This effort involved collecting and collating the results of several emission tests performed on similar processes at different facilities. Emission factors are reported as point estimates. The emission factors were developed based upon the aggregate emission totals in the data analysis discussed above.

For calculation of emission factors, emissions of all organic compounds were computed as the sum of ozone precursors, volatile organic compounds, and semivolatile organic compounds. For organic compounds which were detected by more than ~~1~~ one method, the higher concentration value was used.

Target analytes which were not detected in any runs for a particular process or compound were not included ~~on~~ in the tables. The assumption is that if a target analyte ~~went~~ was not-~~un~~detected in any runs, there is a high probability that even if it was present, the low ~~non-~~detection limits indicate its overall contribution is insignificant.

(Ed. NOTE: The above paragraph must be combined with the next paragraph, or edited or deleted)

Target analytes detected in one or more runs were averaged together. ~~with Target analytes at less than detect at the detection limit divided by two.~~ ~~*that were not detected in a test run were assumed to have been present at a concentration of one-half the test detection limit for averaging purposes.*~~ **If an analyte was not detected in all runs, then those runs in which it was not detected were counted at one-half of the analytical detection level for averaging purposes. If an analyte was not detected in any run, then the average was designated in Tables 4.12-4 through 4.12-12 as "ND".**

3. Description of Test Facilities

3.1 Processes Employing Generic Rubber Compounds

The following descriptions provide detail of the specific operations that were tested at specific locations.

3.1.1 Internal ~~Mixer/Drop Mill~~Mixing and Milling

Emissions during rubber mixing were evaluated from ~~4~~ *four* internal mixers at ~~3~~ *three* facilities during ~~this~~ *the test* program. For this report series, the mixers are designated as:

Large Banbury Mixer (F-80)	Large Mixer No. 1
Small Banbury Mixer (BR-1600)	Small Mixer No. 1
Small Banbury Mixer (BR-1600)	Small Mixer No. 2
Large Banbury ~~Mixer/Torit~~Mixer/ Control Device	Mixer Control Device

Emissions from Large Mixer No. 1 occurred at ~~2~~ *two* points in the process, during charging and mixing, and during drop milling. Batch sizes of 125 to 140 pounds per drop were mixed during the testing. Temperatures of the nonproductive runs were approximately **335°F** ~~335°F~~. The productive run temperatures were typically ~~220°F~~ *220°F* (~~240°F~~ *240°F* for ~~the~~ EPDM 2). The configuration of the unit tested allowed for sampling of the fume collector and duct system. The charging/mixing zone ~~is~~ was serviced by an 18-inch exhaust duct leading to a baghouse for control of emissions. Sampling was conducted in the round duct in an area with a suitable length of straight run. Emissions from the drop milling zone were handled similarly, being routed to a collector duct via a long rectangular duct.

The small internal mixers were similar in design and capacity. Emissions were sampled from a section of duct installed in a flexible exhaust hose. Sampling took place during charging and mixing. Batch sizes were typically 2 to 3 pounds for each drop with a fill of approximately 65 percent. Mixing temperatures were the same as with the larger units, and consistent with the recipes (~~335ºF~~ **335°F** for the non-productive and ~~220ºF~~ **220°F** for the productive drops). At the completion of ~~the~~ mixing, the rubber dropped into a tray drawer for transfer to the adjacent milling unit.

The milling units used with the small internal mixers were enclosed to contain pollutants released during operation. The enclosures were equipped with an outlet exhaust duct to facilitate sampling. Monitoring/sampling continued once the mixed rubber was placed inside the enclosures and continued throughout the milling process.

Control efficiencies of emissions from the control device serving the large ~~internal~~"Banbury" mixer were determined through the simultaneous sampling of inlet and outlet ducts of a ~~Torit~~ fabric filter control device. The sampling was conducted during ~~2~~ *two* modes of operation**:** charging/mixing and drop milling. Batch sizes of approximately 465 pounds per drop were mixed during the testing. Temperatures of these master batch nonproductive runs ranged from 315° to **330°F** ~~330ºF~~.

3.1.2 Extrusion

Evaluation of emissions during the rubber extrusion process was conducted on a 3.5-inch extruder. ~~The compounds extruded were mixed and provided by the Goodyear Tire and Rubber Company's St. Mary's, OH facility.~~ Two pallets each of ~~wigwagged~~ tread (Compound No. 6), sidewall (Compound No. 4), emulsion SBR (Compound No. 22), and peroxide-cure EPDM (Compound No. 9) *rubber* were provided. Optimum target melt temperatures were provided for each compound. These were as follows:

Tread -	255° - 275°F
Sidewall -	230° - 260°F
SBR 1502 -	255° - 275°F
EPDM 2 -	250° - 280°F

The extruder ~~consists~~consisted of a *power-driven* screw within a stationary cylinder. A die with a 1/8 x 3-inch extrusion slot was attached to the head of the screw to produce the desired cross section of the extruded rubber. During the testing, it became necessary to install additional screens behind the die plate to increase rubber back pressure and temperature. The rubber strips were fed manually into the hopper rollers.

~~There were 2 two~~ **Two** zones **were** sampled during operation of the extruder process. The extruder outlet, or head, was enclosed to permit capture of emissions throughout operation. The ~~small~~enclosure was equipped with an outlet exhaust duct from which sampling was conducted. ~~This was designated as Location A.~~ After extrusion, the product entered the cool-down zone, ~~designated as~~

~~Location B,~~ which was also enclosed to allow for sampling of pollutant emissions. Rubber temperatures were measured at the die head and at ~~2~~ *two* points of the cooldown zone.

3.1.3 Autoclave Curing

Autoclave curing utilizes saturated steam at an elevated pressure to cure the rubber mix and is the predominant curing method in nontire *(commonly referred to as "engineered products")* rubber manufacturing facilities. ~~(Ed. NOTE: Are locations A and B shown on a Figure? If not, drop this reference???)~~

~~**3.1.3 Autoclave Curing**~~

~~Autoclave curing utilizes saturated steam at an elevated pressure to cure the rubber mix and is the predominant curing method in nontire *(commonly referred to as "engineered products")* rubber manufacturing facilities.~~ The 11 rubber compounds selected for testing included compounds used primarily for engineered products, but also included compounds used in tire manufacturing. These compounds were provided by several manufacturers. The compounds selected and their designated compound numbers were as follows:

- Tire Base/Sidewall (#4)
- Tire Apex (#5)
- Tire Tread (#6)
- EPDM 1 (sulfur-cured) (#8)
- EPDM 2 (unextruded peroxide-cured) (#9)
- EPDM 2 (extruded peroxide-cured) (#9)
- CRW Neoprene (#11)
- Hypalon (#15)
- HNBR Hydrogenated Nitrile (#18)
- CPE Chlorinated Polyethylene (#21)
- Emulsion SBR (SBR 1502) (#22)

The curing tests were conducted using a steam-contact autoclave setup. A rack loaded with the desired quantity of rubber strips was loaded by electric winch into the autoclave chamber. Three batches of approximately 50 pounds each were loaded and cured for each rubber type. The autoclave was operated at ~~340°F~~ **340°F** and approximately 110 psig during each curing run.

Sampling of the autoclave emissions was conducted throughout the ~~3~~ *three* basic ~~modes~~phases of operation. Sampling was initiated during the curing phase with sampling of the water trap effluent, conducted during the blowdown phase, and continued through the cool-down phase.

The approach was to set up a total capture method whereby all steam and pollutant releases were sampled. The autoclave curing entailed sampling of the water trap condensate (during curing), the blowdown steam, and cooldown air emissions. All steam releases were vented through the 1-inch water trap or blowdown pipe into a series of condensing impingers and sorbent tubes kept under negative pressure by a metering pump. During curing, the water trap condensate was directed into sample containers and large impingers for volume determination. The blowdown pipe was connected to the condensing coils and the first of a series of large impingers. Steam and entrained pollutants were directed into the impingers for condensing and ~~gross~~ pollutant scrubbing through impingement. Remaining gaseous or entrained pollutants then passed through the sorbent traps for the collection of organic species. ~~We installed~~ A **control** valve *was installed* on the blowdown system to control the rate of steam release during the blowdown cycle.

Following completion of each autoclave run, the rack containing the cured rubber products was removed from the autoclave but kept within the temporary enclosure for sampling during the **cool-down** period.

3.1.4 Platen Press Curing

The platen press curing process is a general approach to pressure curing engineered ~~rubber~~ products in molds. Specific molds are used to form the desired engineered product at set pressures and curing temperatures. ~~Emissions from platen presses can be controlled using an exhaust hood and duct.~~ Most emissions occur during mold release, at the end of the curing cycle.

~~The platen press used in this program was manufactured by Pasadena Hydraulics, Inc. of Pasadena, CA. and provided for the test program by Goodyear Tire and Rubber Company.~~

~~Testing was conducted at *the* Lowell, MA facility of *TRC Environmental Corporation.* Emission rates were developed based on pounds of pollutant emitted per hour (lbs/hr) and pounds emitted per pound of rubber (lbs/lb rubber) cured.~~

During this program, 17 rubber compounds were cured at temperatures between 340° and 350°F and pressures of 30 tons for the first ~~3~~ three minutes and 20 tons for the second ~~3~~ three minutes. The rubber compounds were from batches mixed during testing of *Small* ~~internal~~ *Mixer No. 2*. The compounds cured and their designated numbers were as follows:

- Tire Inner Liner (#1)
- Tire Ply Coat (#2)
- Tire Belt Coat (#3)
- Tire Apex (#5)
- Tire Curing Bladder (#7)
- EPDM 2 (unextruded peroxide-cured) (#9)
- EPDM 3 (non-black sulfur-cured) (#10)
- CRW Neoprene (#11)
- CRG Neoprene (#12)
- Paracryl OZO (#13)
- Paracryl BLT (#14)
- Fluoroelastomer (#16)
- AEM (#17)
- Silicone (#19)
- Acrylate Rubber (#20)
- Emulsion SBR (SBR 1502) (#22)
- Epichlorohydrin (#23)

Nine samples of approximately 50 grams each were cured for each rubber type. Each 50-gram tab of rubber was placed directly onto the lower plate and pressed into a "pancake" *of* approximately **185-mm** diameter and *1-mm* thickness. The **cool-down** period lasted for 6 minutes when the cured samples were removed from the press and left inside the enclosure. Emissions were contained by an exhaust hood and flexible Tyvek sheeting, and exhausted by a single 5-inch duct and blower.

3.1.5 Hot Air ~~Oven~~ Curing

Hot air ~~oven~~ curing of engineered rubber products is used **for final curing of** ~~*to final-cure*~~ preformed products. Three rubber compounds were evaluated. One compound used in tire manufacturing (Tire Apex, Compound #5) and ~~2~~ two compounds typical of engineered ~~rubber~~ products manufacturing (sulfur-cured EPDM 1, Compound #8; and Emulsion SBR 1502, Compound #22) were ~~selected~~tested. To simulate the process for this program, a **lab-scale** system with enclosure was designed and set up to evaluate the emissions during curing and **cool-down**. The rubber compound samples were placed in the oven and allowed to reach the curing temperature of *400°F* ~~400F~~ for a period of 5 **to** 8 minutes. Each sample weighed approximately 100 grams. After completion of curing, each rubber sample was removed and allowed to cool down in the enclosure and another sample of the same compound **was** placed in the oven and brought up to temperature.

The oven was set up with a preheated sweep gas inlet and an exhaust gas outlet. A temporary enclosure was erected around the oven to contain emissions during the curing and **cool-down** and when the door was opened. An exhaust duct similar to that used for the platen press was constructed to vent the enclosure and to provide the sampling locations.

3.2 Tire Curing

3.2.1 Full-Scale Tire Curing

Evaluation of tire curing press emissions was conducted on a full-scale tire press equipped with a single mold set and an integral **cool-down** rack. A total of ~~9~~ *nine* tire types/brands were press-cured, representing ~~2~~ *two* tire sizes from ~~7~~ *seven* manufacturers. The tires were received uncured and varied in size, weight, and type. Multiple tires for each type were ~~press-cured~~cured during each test run to allow for adequate sampling times. The ~~2~~ *two* sizes tested were 195/75 and 205/70. A generic ~~obsolete~~ mold for each tire size was used for the ~~press~~-curing. The different types received were: original equipment (OEM), replacement, and *high-performance*.

Mold temperatures ranged from ~~*330*~~ *330°F* to ~~*355F*~~ *355°F* and steam pressures ranged from 200 to 300 psig. Each tire was cured for a period of 10 to 15 minutes. There were ~~2~~ *two* emission zones sampled on the tire press: the press itself and the tire cool-down zone. An enclosure was set up on the tire press to collect fugitive emissions during the press curing of green tires. The enclosure was equipped with an outlet exhaust duct in which sampling was conducted for the target parameters. A similar enclosure was erected around the integral cool-down rack where the tire cools after completion of ~~the~~ press curing.

3.3 Other Rubber Processing

3.3.1 ~~Warmup~~ Milling

~~Warmup mills areMilling~~

~~are~~ Milling is utilized by the industry as a preparation/warmup step for feeding rubber to calenders and extruders ~~following each drop from a internal mixer,~~ or to warm the rubber to prepare it for subsequent processing. A warmup mill is similar or identical to a drop mill in that it has a series of rollers, some toothed, to increase the shearing of the compound. The mill can be batch or continuously fed, depending ~~of~~ *on* the production need.

Evaluations of ~~warmup mill~~milingl emissions were conducted at ~~2~~ *two* facilities during this program. Emissions from both were captured using a temporary enclosure and exhaust duct system. Emissions from a *lab-scale* warmup mill were tested during the milling of the following ~~3~~ *three* compounds:

- Tire Ply Coat (#2)
- Tire Belt Coat (#3)
- Tire Base/Sidewall (#4)

Multiple ~~drops~~batches were made for each test run. One test run was conducted per compound. Each drop was approximately 2.5 pounds of rubber, which represents a fill of approximately 65 percent.

A second warmup ~~mill~~milling test was conducted at an engineered ~~rubber~~ products manufacturing facility. This was a production facility that operated ~~its~~a warmup mill in a batch mode for the test. The facility ran a *Neoprene* compound in the warmup mill for the ~~3~~ *three* test runs ~~and collected the milled rubber on pigs~~. The mill roll temperature was approximately ~~*90F*~~ *90°F*. The rubber was milled to a thickness of 0.3 inche~~s~~ and a temperature of approximately ~~*175F*~~ *175°F*.

3.3.2 Calendering

The calendering process is used to bond a continuous textile or metal mesh web to ~~1~~ *one* or ~~2~~ *two* layers of rubber for use in building tires and other engineered rubber products. The ~~latex-dipped textile~~web passes through a series of rollers through which ~~1~~ *one* or ~~2~~ two rubber strips also passe~~s~~. Under pressure and elevated temperatures induced by the rollers, the rubber is bonded to the web. The nip of the rollers can be adjusted to vary the thickness of the calendered product. The ~~rubberized fabric~~calendered material is then cooled and cut to the proper dimensions.

During this program, emissions from the calendering process were tested at ~~2~~ *two* facilities. The first was a continuous production process where the rubber was continuously fed from a warmup mill. A tire ply coat rubber compound was being run on the test days. Three test runs were conducted from an exhaust collector system outlet stack.

The second process tested involved a *batch- or "pig-"*fed calender during calendering of a neoprene compound at an engineered rubber products manufacturing facility. The calender itself had 54-inch wide rolls and ran approximately 1100 linear yards of a neoprene compound during each of the ~~3~~ three test runs. The emissions from this system were measured using a temporary enclosure and exhaust duct configuration.

3.4 Tire Grinding Processes

The grinding processes used in tire manufacturing are specific to each application. Four types were identified for this program: retread buffing, carcass grinding, whitewall (sidewall) **grinding**, and truing (force)or uniformity **grinding**. The grinding processes, in general, generate quantities of rubber dust and particles, and may generate HAP emissions, depending on the rubber formulation and the amount of heat generated during grinding. To control these emissions, cyclones, baghouses, and electrostatic precipitators (ESPs) are used either alone or in combination.

Grinding operations are typically conducted in a collector hood with an exhaust duct leading to ~~a primary and possibly secondary~~the control device(s). Emissions sampling was conducted in the hood's exhaust duct (control device inlet)~~ to determine the potential to emit of the process~~. Simultaneous sampling was also conducted at the outlet duct of each downstream control device to determine control efficiency and the final pollutant emissions rate.

~~3.4.1 Force/Balance Grinding~~

~~A screening evaluation of emissions from a force grinder was conducted at a *full-scale* tire manufacturing facility using FTIR and total hydrocarbon analyzers.~~ The processes described below, although typical of industry operations, represent the specific machinery tested, and may not represent the description of all such units in the industry.

3.4.1 Force/Balance Grinding

A screening evaluation of emissions from a force or uniformity grinder was conducted at a *full-scale* tire manufacturing facility using FTIR and total hydrocarbon analyzers. The force grinder is used to buff areas of a tire that are out of specification when the tire is put under load. Observations of the force grinder showed that only *a small percentage of tires are force ground*, ~~few tires per hour are actually buffed~~, and the quantity of rubber removed is very ~~slight~~low, resulting in insignificant or no emissions. **See Section 4.1.6 for details.**

3.4.2 Sidewall/Whitewall Grinding

Another surface grinding process, sidewall/whitewall grinding, was also evaluated. The grinder ~~consists~~tested consisted of ~~2~~ *two* stones set in a wheel which ~~rotate~~rotated at high ~~rpms~~ *speed* over the whitewall area of the tire, ~~removing~~to remove a thin coat of black rubber which ~~overlays~~overlaid the whitewall section. The grinder ~~is~~was set into a frame equipped with ~~4~~ *four* powered exhaust ducts. Emissions from the grinding operation ~~are~~were carried via *flexible* hose to overhead ductwork. Emissions ~~at this facility~~ ~~are~~were ducted to a cyclone for removal of rubber dust and pieces ground from the tires. The exhaust air ~~passes~~passed through the cyclone and ~~is~~was exhausted to the atmosphere. Approximate grinding time per tire ~~is~~was 20 seconds. Testing was conducted during normal operations, and ~~emissions are~~emission factors were based on pounds emitted per ~~hour and pounds emitted per~~ pound of rubber removed, as measured by the quantity of rubber dust and particles collected in the cyclone hopper.

3.4.3 Retread Buffing

Retread buffing was also studied as a surface grinding operation in this program. ~~In this process~~At the testing facility, the surface of the back of the tread ~~is~~was buffed to prepare it to receive adhesive *before application to a tire carcass*. ~~further down the line~~. The retread buffer consists of an edger and ~~4~~ *four* inline buffing wheels with hasps around the circumference of each wheel. Each wheel ~~is~~was covered by a hood exhausted ~~by an~~ *through a* flexible duct. The ~~4~~ *four* exhaust ducts ~~enter~~entered a common header duct. ~~At the facility tested, the header duct conveys the emissions to an American Air Filter cyclone/fabric filter control system. The fabric filter is Model Number 12-84-1347.~~

A tread section approximately 37 feet long ~~is~~was fed to the edger where the edge ~~is~~was squared. The tread ~~is~~was then fed to the first wheel of the inline buffer which ~~catches~~caught and ~~draws~~drew the tread into the line. As the tread ~~passes~~passed each succeeding wheel, the wheel ~~comes~~came down onto the surface. A ~~given~~ **predetermined** pressure is applied to the buffing wheels to remove the required layer of rubber. As the hasps dull, ~~a~~ greater pressure on the surface is required to remove the same amount of material. The emissions ~~are~~ ~~consist~~**consisted of** solid rubber particles and volatile and semivolatile organic compounds. It ~~takes~~took approximately 40 seconds to buff a tread with approximately ~~5~~ *five* seconds between tread sections. Sampling was conducted in the 20-inch inlet duct to the cyclone, in the 20-inch baghouse outlet duct prior to the I.D. fan, and in the 22-inch stack after the I.D. fan. Emission ~~are presented as pounds per hour and pounds emitted per pound of rubber processed, as no actual rubber removal rates~~factors were ~~calculable~~presented as pounds emitted per pound of rubber processed.

3.4.4 Tire Carcass Grinding

Tire carcass grinding is used for gross rubber removal (tread section) and for preparation of the resulting tire carcass for retreading. This operation consists of ~~2~~ *two* phases, a coarse grind module and a fine grind module. The tire is first ground to a predetermined depth with a coarse grind hasp to prepare it for the fine grind operation. The fine grind operation completely removes the old tread and prepares the carcass surface to receive the new tread. The tire carcass to be ground is placed on a shaft and rotated at **a** predetermined *speed* ~~revolutions per minute~~. The carcass is then placed against a rotating *fine-tooth*ed hasp at a *desired* ~~given~~ pressure. The hasp moves across the surface of the carcass in a predetermined pattern.

The fine *grinding* operation was selected for the study ~~due to the fact~~ **because** ~~that~~ the grinding period is longer, the pressure of the hasp on the wheel is greater than the coarse grind, and the temperature of the carcass surface is higher than for the coarse *grinding* operation. The grinding time for the coarse grind operation is ~~1-2~~ *one to two* minutes, while the grinding time for the fine grind operation is ~~4~~ *four* minutes. Approximately 10 to 12 tires are ground per hour.

The fine grind module consists of the rotating shaft on which the carcass is placed and a rotating *fine-tooth* hasp which is covered by a hood. At the facility tested, a flexible exhaust duct connects the hood to an elevated horizontal duct which leads to a cyclone ~~manufactured by Retread Equipment Corp. of Charlotte, NC~~. The exhaust from the cyclone passes through a horizontal centrifugal fan to an outlet stack on the roof. The entire module was enclosed with Tedlar sheeting to enhance the capture of volatiles, semivolatiles, and particulate matter by the hasp hood. Sampling was conducted in the 10-inch horizontal cyclone inlet duct and in the 16-inch outlet stack. Emissions are presented as pounds ~~per hour and as pounds~~ emitted per pound of rubber removed, measured by the quantity of rubber dust and rubber particles collected in the cyclone hopper.

3.5 Engineered Products Grinding - Drive Belts

The belt grinding operation selected for this study **was** ~~is~~ located at an engineered rubber products manufacturing facility. The selected process line was deemed to be representative of surface grinding operations. This particular line was used for V-belt grinding and consists of ~~8~~ *eight* grinders. Each grinder is enclosed within a *close-fitting* hood. An exhaust duct **exited** from each hood and **entered** an overhead exhaust manifold. The combined exhaust streams **entered** the 16-inch diameter central cyclone inlet duct which ~~leads~~ led to a ~~Fisher-Kloster XQ-120-20~~ cyclone. An 18-inch duct **exited** from the top of the cyclone and enters a dual ~~3~~ *three*-stage electrostatic precipitator (ESP). The effluent streams exiting the ESP ~~are~~ **were** combined into a single 14-inch duct which **exited** the roof through an I.D. fan. During the grinding operation the belts ~~are~~ were cooled with a localized water spray located within each grinder hood. Sampling was conducted in the cyclone inlet duct, cyclone exit duct, and ESP exit duct. Emissions are presented as pounds per hour and as pounds emitted per pound of rubber removed, as measured by initial and final weights of the belt batches for each test run.

4. Data Analysis, ~~and~~ Discussion of Results, *and Use of the Emission Factors*

This section provides ~~point~~ estimates~~, means, and maxima~~ of emission factors for *the following* individual compounds and elements:

- speciated organic compounds (including volatile compounds, volatile ozone precursors, and semivolatile compounds)
- sulfur compounds
- amines
- metals
- particulate matter

Process and rubber mix/formulation specific emission factors are provided in the following sections. ~~When applicable, rubber formulations are grouped into categories for calculation of means and maxima. Standard deviations are also included for all processes.~~

4.1 Processes Employing Generic Materials

~~A series of 23~~ *Twenty-three* rubber formulations/products ~~and 3 polymers~~ were tested to determine emission factors for internal mixing and milling, extrusion, autoclave curing, and platen press curing. Emission~~s~~ tests for the mixers were performed on ~~3~~ *three* different size systems: ~~2~~ *two* 2-pound laboratory mixers, a 200-pound pilot scale system, and a 500-pound production mixer. Emissions ~~do~~ **did** not appear to be dependent on mixer size, based on the emission factors of pounds of pollutant emitted per pound of rubber mixed.

4.1.1 Internal Mixing / Drop Mill

All 23 formulations ~~and 3 polymers~~ were tested once on ~~small internal~~ **Small** Mixer No. 2.

During the earlier stages of the project, data collected on Small Mixer No. 1 and Large Mixer No. 1 were compared for scale differences. Emission factors were calculated for Compounds **#4, #6, #9, and #22**. Results for these ~~2~~ *two* mixers were found to be ~~somewhat~~ consistent based on emission rate categories. Emissions for the large and ~~the~~ small mixers ~~do~~did not appear to be dependent on mixer size. Mixers did show variability for total metals. This ~~is~~was likely the result of greater losses into the ventilation system when charging the larger equipment versus ~~what is experienced on~~ smaller scale equipment.

Means, maxima, and standard deviations were determined for tire compounds (1-7) *and* engineered product compounds (~~1~~ **8**-23) ~~and polymers (SBRs 24-26)~~. Pollutant emission factors include organic compounds, metals, sulfur compounds, and particulate matter.

In using these factors to estimate emissions from sources, the following guidelines should be used:

- Internal mixing in rubber production facilities are referred to as "non-productive" and "productive". The former encompasses mixing of rubber from its main components - oils, carbon black, sulfur, and a variety of other additives. "Productive" rubber is frequently made from "non-productive" rubber plus additional materials. In some facilities, a mixer may be dedicated to mixing either non-productive or productive batches. In other facilities, however, a single mixer may be used for both non-productive and productive batches. It is conceivable that a batch of mixed rubber that is ready for use in succeeding manufacturing steps could have passed through a mixing operation more than once. The mixing factors, however, are based on the weight of "productive" rubber.

- If in a specific application it is necessary to separate the fractions of emissions between "non-productive" and "productive" mixers, 90% of the emissions factors (in terms of unit weight of emissions per unit weight of rubber mixed) should be assigned to "non-productive" mixers and 10% of the factor should be applied to "productive" mixers.

- The emissions factors consider the number of passes through the mixer necessary for a compound to be mixed. Therefore, it is not necessary to multiply by the number of passes.

- The emissions factors encompass emissions from certain rubber processing equipment that may be directly associated with the mixer itself, such as "drop mills" or roller die extruders. However, if mills or extruders in a specific facility are clearly distinct and separate from a mixer, then it may be appropriate to calculate emissions ~~separate from~~ **separately for** those mills or extruders, using emissions factors developed for those units of equipment.

- Emissions capture and control device efficiencies should be applied as appropriate to the factors. For example, particulate matter emissions reductions should be based on the efficiency of the specific control devices being used in specific facilities, as compared to the efficiency of a generic fabric filter control device.

- No VOC or gaseous pollutant reductions were assumed through fabric filter control devices.

- Since metallic compounds in rubber mixing are in the form of particulate matter, reductions in emissions of metallic compounds through air pollution control devices can be assumed to be similar to reductions in particulate matter emissions.

4.1.2 Milling

Warmup mills are utilized by the industry for further mixing of rubber compounds following each drop from an internal mixer, or to warm the rubber to prepare it for subsequent processing (*e.g.*, calendering). A warmup mill is similar or identical to a drop mill in that it has a series of rollers, some toothed, to increase the shearing of the compound. The mill can be batch or continuously fed, depending on the production need.

In using these factors to estimate emissions from sources, the following guideline should be observed:

- The emission factor assumes rubber arrives at the mill after having received one pass through a "warmup mill". Beyond this, where multiple mills are used, emissions from each mill should be counted separately.

4.1.3 ~~Extruding~~Extruder

In using these factors to estimate emissions from sources, the following should be observed:

- The emission factor encompasses all emissions from a cold-feed extruder, including the die head and cooling conveyor.

- For a hot-feed extruder, it is necessary to calculate and add separately the emissions from the mill(s) that may precede the extruder.

4.1.4 ~~Calendering~~Calender

The calendering process is used to bond a continuous textile or metal mesh web to one or two layers of rubber for use in building tires or engineered products. The textile passes through a series of rollers through which one or two rubber strips also passes. Under pressure and elevated temperatures induced by the rollers, the rubber is bonded to the web. The nip of the rollers can be adjusted to vary the thickness of the calendered product. The calendered materical is then cooled and cut to the proper dimensions.

In using these factors to estimate emissions from sources, the following should be observed:

- The emission factor does not include emissions from mill(s) that may precede the calender.

4.1.5 ~~Autoclave~~ Curing

4.1.5.1 General Information

In using these factors to estimate emissions from sources, the following should be observed:

- The emission factor includes emissions from vulcanizing, opening of the curing device, and cooling of the cured product.

4.1.5.2 Autoclave Curing

Autoclave curing is a process which can utilize either a steam contact or non-contact system. During this program, air emissions and water *discharges* were evaluated from a steam contact system. Emission factors were calculated using ~~10~~ **ten** of the generic rubber mixtures tested in ~~the~~ **Small** Mixer No. 2. One rubber compound, EPDM 2 (Compound ~~No.~~**#9**), was also tested using extruded and unextruded rubber to determine what, if any, differences result in curing emissions if *the rubber was* previously extruded. Based on the limited amount of data available, there were no substantial differences between ~~the~~ extruded and unextruded EPDM.

In this steam contact autoclave system, uncured rubber loaded into the pressurization chamber is in full contact with the steam, resulting in both *waterborne and airborne* pollutants. The steam condensate from this type of system is discharged during blowdown at the end of the curing cycle and, often~~times~~, from the water trap during the curing cycle.

In the non-contact system, the uncured rubber is enclosed in a bladder within the pressurization chamber and does not come into contact with the steam. Therefore, pollutants are not discharged with the steam condensate as occurs with the steam contact system, but are emitted as *airborne* pollutants upon opening of the autoclave chamber.

In evaluating pollutant discharges from the steam contact type of system, samples were collected and analyzed from ~~2~~ *two* aqueous (water trap and blowdown condensate) and ~~1~~ *one* gaseous (cooldown air) matrices. The total emissions for the autoclave system were obtained by combining the emission and discharge rates (lbs/hr and lbs/lb rubber) for volatiles, semivolatiles, and sulfur compounds. This total is most representative of a non-contact system where all pollutants are discharged as air contaminants and should be considered in an emissions inventory. To enable a comparison of a steam contact system with a non-contact system, the *waterborne* pollutants from a steam contact system could be considered separately, possibly as a discharge under a NPDES permit, and not as an air emission. *Please see the related discussion below.* However, there is a possibility of downstream fugitive emissions from this aqueous discharge.

In using these factors to estimate emissions from sources, the following should be observed:

- The emission factor is based on the use of "non-contact" steam. In other curing applications where steam contacts the product being cured, the test program determined that 17% of each component condenses out with the steam rather than being emitted into air.

- The emission factor does not encompass emissions of mold release agents that may be used in specific facilities.

Certain classes of pollutants exhibit higher condensibility or solubility properties and a higher percentage of removal in the aqueous discharge streams. As much as 100 percent of sulfur emissions are removed in the aqueous streams, and ~~could be discounted from inclusion~~ *need not be included* in air emissions inventories when steam contact autoclaves are in use. Similarly, up to 95 percent of semivolatile organic emissions are removed in aqueous streams. Predictably, volatile organics exhibited a much lower removal rate, with a maximum of 36 percent removal in the aqueous streams.

As ~~the~~ *Table 4.12-9* indicates, the removal percentages vary *not only by* pollutant class, but also by rubber compound. It should be noted that the table presents only a comparison of the totals of the pollutant categories, and not the individual chemical species. This information ~~could~~ *can* be determined through further detailed review of the speciated data.

4.1.5.3 Platen Press Curing

The platen press curing process is a general approach to pressure curing engineered rubber products in molds. Specific molds are used to form the desired engineered product at set pressures and curing temperatures.

In using these factors to estimate emissions from sources, the following should be observed:

- The emission factor includes emissions from curing and cooling of the cured rubber article.

- The emission factor does not encompass emissions of mold release agents that may be used in specific facilities.

- Emissions of methylene chloride were found in the test program, but are suspected of being laboratory anomalies. Therefore, methylene chloride, if reported at all, should be calculated using the detection level of the test.

4.1.5.4 Hot Air Curing

In using these factors to estimate emissions from sources, the following should be observed:

- Emissions of methylene chloride wer found in the test program, but are suspected of being laboratory anomalies. Therefore, methylene chloride, if reported at all, should be calculated using the detection level of the test.

- The emission factor does not encompass emissions of mold release agents that may be used in specific facilities.

4.1.6 Grinding Operations

~~Emission~~In using these factors ~~were developed for 4~~ ~~*four*~~ ~~grinding operations~~to estimate emissions from sources, the following should be observed:~~-sidewall/whitewall grinding, retread carcass grinding, retread buffing, and belt grinding~~

- For the specific application of "force grinding" in tire manufacture, the emission factor for white sidewall grinding may be used.~~-Inlet and outlet concentrations were measured in order to determine control efficiencies. Force grinding was also evaluated but was found to have insignificant VOC emissions at the facility tested. Specifications of the grinding test series are summarized as follows:~~

~~Grinding operations are typically conducted in a collector hood with an exhaust duct leading to a primary and possibly secondary control device. Emissions sampling was conducted in the hood's exhaust duct (control device inlet) to determine the potential to emit of the process. Simultaneous sampling was also conducted at the outlet duct of each downstream control device to determine control efficiency and the final pollutant emission rate.~~

~~In using these factors to estimate emissions from sources, the following should be observed:~~

- ~~For the specific application of "force grinding" in tire manufacture, the emission factor for white sidewall grinding may be used.~~ **However, the weight of rubber ground from each tire can vary from manufacturer to manufacturer.**

- For white sidewall grinding, it may be assumed that 0.061 pound of rubber is removed on average from every tire that is ground.

- For V-belt grinding, the compound tested was approximated closely by Compound #12 (see Table 4.12-2).

4.2 Effects of Temperature

Specific tests were not conducted to determine the effects of elevated temperatures ~~in~~ *on* ~~a given~~ **any** compound. However, several compounds were subjected to temperatures varying from *200°F* to *400°F*, as a result of the tests conducted for each process. No compounds were tested at multiple temperatures on *any* ~~given~~ process.

These data should be used as a guide for making decisions in plant-specific situations. The test program was conducted using analytical methods and rubber compounds that were common in 1994 and 1995. In specific situations, significantly different compounds or processing temperatures may require specific emission factors to be developed.

VOL 1.1 VOL 1.4 BACKGROUND REPORT

3/21/97 RR

BACKGROUND REPORT

"b045l2B. WPD" 12-17-97

1. INTRO
2. INDUSTRY DATA
3. LIT Search
3.1
4. Review of Spec Data Sets

SECTION 1

1. Introduction

1.1 Program Overview And Objectives

The Clean Air Act Amendments (CAAA) of 1990 contain a variety of new programs and approaches designed to reduce emissions of hazardous air pollutants (HAPs), improve urban air quality and to control the precursors of acid rain. The Environmental Protection Agency (EPA) and the state/local air agencies now have at their disposal an expanded authority base to meet the CAAA objectives including an expanded array of enforcement tools. As the CAAA implementation moves forward, industry will be faced with numerous complex and burdensome air compliance issues.

On July 21, 1992, EPA promulgated the Operating Permit Rule, which represents an expanded and very different approach to permitting air emission sources. The operating permit program commonly referred to as *Title V* is a national program which is now being implemented on a state by state (and in the case of California, county by county) basis. In other words, each state has been charged with developing and implementing its own federally enforceable operating permit program which meets or exceeds the CAAA requirements.

Title V now requires each facility which exceeds a major source threshold to secure a facility wide permit. The Title V program defines major source applicability on the basis of **potential to emit**. All facilities which have the **potential to emit** more than any of the following must secure a facility operating permit:

- 100 tons/year of a criteria pollutant except in selected urban areas (non attainment areas) where the threshold can be as low as 10 tons/year

- 10 tons/year of a single HAP or 25 tons/year in aggregate of any listed HAPs

Title V requirements represent a significant departure from past state permitting programs which addressed some but not all sources at a facility on a process by process basis. Before the federal 1990 CAAA, fewer than 20 pollutants were federally regulated. Now there are in excess of 200 regulated pollutants when taking into account additional state air toxics requirements.

To prepare a facility Title V permit, there are several tasks which must be completed. One such activity is the development of the plant emissions inventory which is the largest part of the permitting effort and also one of the areas where accuracy is critical. An inaccurate inventory can result in future compliance problems.

Producing an accurate inventory is contingent upon the availability of sound emissions data or emission factors for each process in a facility. These factors coupled with commonly archived process and production data are used to calculate emissions and produce the inventory.

Unfortunately, emission factors have not been established by EPA or the states for many industrial processes, including the rubber manufacturing industry. In the absence of established emissions factors or readily available emissions data, EPA and the states have typically adopted the fallback position of requiring emissions testing for each significant process within a facility, an endeavor which is expensive in addition to being very complex.

As a result of the lack of documented emissions factors for the industry, the Rubber Manufacturers Association (RMA), on behalf of its membership, embarked on a large project to address the emission factor issue. Specifically, the objectives of the project were as follows:

- Develop emission factors for the commonly used rubber manufacturing processes;

- Develop a consistent applications approach for developing plant-wide emissions inventories;

- Develop a standard protocol for estimating emissions related to future process changes;

- Provide background information for addressing Title V record keeping and compliance demonstration requirements;

- Provide support for addressing future enhanced monitoring requirements; and

- Provide information sufficient to address equipment scale differences.

An intense testing-based project was conducted which resulted in emission factors for the commonly used rubber compounds and processes. The results of the project and the emission factors now available are discussed in the remainder of this report.

1.2 Emission Factor Project Definitions

The following is a brief list of key definitions which define pollutant categories measured in the test program, as well as terminologies which will assist the reader in interpreting the emission factor data provided in this volume.

called organics in tables NO - ... 6

(1) *Total Speciated Volatiles:* The sum of the target volatile organic compounds as well as those compounds tentatively identified during a mass spectral library search.

(2) *Total Speciated Semivolatiles:* The sum of the target semivolatile organic compounds as well as those compounds tentatively identified during a mass spectral library search.

(3) *TVOC:* Total volatile organic compounds measured as total hydrocarbons (THC) calibrated to a methane standard. Measurements were made on a continuous basis using a THC analyzer in accordance with EPA Reference Method 25A.

(4) *Total Metals:* The sum of the target analytes detected. The target analytes are cadmium, chromium, copper, lead, magnesium, nickel and zinc.

(5) *Total Sulfur:* The sum of the target sulfur compounds detected during sample analysis using gas chromatography flame photometric detection (GC/FPD).

(6) *Total Speciated Organics*, as used in the summary and speciation tables: The total speciated organic compounds measured in the test program, is the sum of the semivolatile and volatile emissions for a given rubber compound minus any duplicate compounds. Where there is duplication of a chemical compound in the analyte list, the higher value was used to present a conservative emissions total. The other value was ignored and not included in the total.

(7) *Speciation Factors:* These are the fraction by weight, of a particular compound to the total for a specific pollutant category. For example, a speciation factor for benzene is determined by dividing the measured benzene emissions by the total speciated organic compound emissions (total speciated organics is defined above). why not THC?

(8) *Volatile Organic Compounds (VOCs)* as defined for permitting requirements is based on the EPA definition cited in 52.21:

Volatile Organic Compounds (VOC) means any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate which participates in atmospheric photochemical reactions. This includes any organic compound other than the following which have been determined to have negligible photochemical reactivity:

(a) Methane (CAS 74-82-8);
(b) Ethane (CAS 74-84-0);
(c) 1,1,1-Trichloroethane (CAS 71-55-6);
(d) Methylene Chloride (CAS 75-09-2);
(e) Trichlorofluoromethane (CAS 75-69-4);
(f) Dichlorodifluoromethane (CAS 75-71-8);
(g) Chlorodifluoromethane (CAS 75-45-6);
(h) Trifluoromethane (CAS 75-46-7);
(i) Trichlorotrifluoroethane (CAS 76-13-1);
(j) Dichlorotetrafluoroethane (CAS 76-14-2);
(k) Chloropentafluoroethane (CAS 76-15-3);
(l) Dichlorotrifluoroethane (CAS 306-83-2);
(m) Tetrafluoroethane (CAS 811-97-2);
(n) Dichlorofluoroethane (CAS 1717-00-6);
(o) Chlorodifluoroethane (CAS 75-68-3);
(p) Chlorotetrafluoroethane (CAS 2837-89-0);
(q) Pentafluoroethane (CAS 354-33-6);
(r) Tetrafluoroethane (CAS 359-35-3);
(s) Trifluoroethane (CAS 420-46-2);
(t) Difluoroethane (CAS 75-37-6);
(u) Perchloroethylene (CAS 127-18-4); and,
(v) the following 4 classes of perfluorocarbon compounds:

(1) Cyclic, branched, or linear, completely fluorinated alkanes;
(2) Cyclic, branched, or linear, completely fluorinated ethers with no unsaturation;
(3) Cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturation; and
(4) Sulfur-containing perfluorocarbons with no unsaturations and with sulfur bonds only to carbon and fluorine.

1.3 Emission Factor Summary

what processes not by actual?

Standardized rubber formulations based on published industry references such as The Vanderbilt Rubber Handbook, 13th Edition, were used as the test compounds for the mixing/milling, platen press, extruder, autoclave, and warmup mill tests. Data for the calendering, grinding, and tire cure processes were generated in actual manufacturing settings. For tire curing, actual tires from several of the participating companies were used to collect test data.

removed 12-17-97

remove text - table not available per Henry on 3/21/97 telecon

A summary of the average emission factors for each compound class are presented in Table 1-1. The data presented in this table are average emission factors for all runs conducted for each process. These averages are presented to provide an overview of the relative contribution of each process. Actual emission factor tables for a specific manufacturing process require knowledge of the type of rubber formulation being utilized.

This matches Vol 1 or 2 File

SECTION 2

deleted all material already in section 12-17-97 file 6045123.wpd

Emissions Factor Development Approach

2.1 General Process Description

Many of the rubber manufacturing facilities in the United States produce pneumatic tires for automobile, trucks, airplanes and farm machinery. However, the majority of rubber manufacturing facilities produce other engineered rubber products. The processes involved in these industries are very similar. Differences basically consist of the raw rubber material (natural or synthetic) used, the chemical additives, and the type of curing employed. The following is a description of a generic rubber manufacturing facility applicable to both tire and other manufactured rubber products, except where noted.

The manufacturing of rubber products involves several processing steps. Initially, the raw rubber (natural or synthetic) is mixed with several additives which are chosen based upon the desired properties of the final product. The mixed rubber is often milled and transferred to an extruder where it can be combined with other rubbers. Many rubber products contain synthetic fabric or fibers for strengthening purposes. These fibers are typically coated with mixed rubber using a calendering machine. The extruded rubber and rubber coated materials are then assembled into its final shape and cured. It is during the curing process that the rubber vulcanizes (crosslinks), producing the characteristic properties of finished rubber. Once the final product is cured, it is often ground to remove rough surfaces and/or to achieve symmetry.

Mixing consists of taking the raw rubber and mixing it with several chemical additives. These additives consist of an accelerator (accelerates the vulcanization rate), zinc oxides (assists in accelerating vulcanization), retarders (prevents premature vulcanization), antioxidants (prevents aging), softeners (facilitates processing of the rubber), carbon black or other fillers (reinforcing/strengthening agents), and inorganic or organic sulfur compounds (vulcanizing agent).

Mixing is typically performed in an internal batch mixer. The internal mixer contains 2 rotors which shear the rubber mix against the wall of the vessel. Internal mixing is performed at elevated temperatures up to approximately 330F.

Non-productive compound consists of the polymers, process oils, reinforcing materials such as carbon black and/or silicia and the antioxidant/antiozonant protection system. These materials are usually mixed together in 2 or more stages called non-productives which are mixed at temperatures around 330F. The last non-productive stage is then taken and the activators, accelerators and sulfur curing agents are mixed into it, making what is called the productive stage. This stage is mixed at a lower temperature (around 230F) because the rubber compound will now scorch and cure at elevated temperatures.

why not 2.1?

The majority of rubber products produced in the United States are composed of 1 or more of 23 generic rubber compounds ~~shown in~~ Table 1.2. Emissions factors were derived from the specific compound recipes shown in Table 1.3. Emissions from manufacturing aids such as solvents, adhesives and mold release compounds ARE NOT included in these emission factors.

pg #5?

Emissions of volatile organic compounds (VOCs) due to use of cements, solvent tackifiers, and release agents in rubber manufacturing are generally determined by either material balance, assuming a 100% loss to the atmosphere or, in some cases, by direct measurement. In cases where solvent emissions are determined by a mass balance calculation which assumes 100% loss at the time of application to the rubber substrate, there is a potential for double - counting a small percentage of the solvent emissions when using the emission factors to determine process volatile organic emissions. This situation is due to the partial absorbtion of some solvents into the rubber surface during manufacturing, and the subsequent volatilization during downstream processing or curing.

It is not possible to determine to what extent typical hydrocarbon solvent constituents reported in the emission factors may have resulted from use of solvents and/or adhesives upstream in the manufacturing process. Anecdotal evidence suggests that as much as 5% of the solvent applied to the surface of the rubber may migrate into the rubber and show up later in the process as a volatile emission. Caution should therefore be exercised when compiling a facility wide VOC emission inventory which combines the use of process emission factors and mass balance calculations of solvent usage. This methology will generally result in a slight overstatement of the actual facility wide VOC emissions.

Once the rubber is properly mixed, it can be extruded. Extrusion is often performed to combine several types of previously mixed rubber compounds. The extruder consists of a power driven screw within a stationary cylinder. A die is attached to the head of the screw to produce the desired shape or cross section of the extruded rubber. Extrusion can be performed with both warm or cold rubber feed. The extruder is jacketed to maintain the desired operating temperature.

Calendering is often used in the rubber manufacturing industry to apply a rubber coat onto synthetic or steel fibers. These calenders employ either 3 or 4 rolls and are hollow to allow for heating or cooling. The openings between the rolls can be adjusted to control the coating thickness. An example of calendering is in the manufacturing of radial tires where synthetic fibers are rubber coated and subsequently combined with rubber stock to create a more durable product.

The final step in manufacturing of rubber products is vulcanizing (curing). There are 3 predominant vulcanizing processes: press mold curing, autoclave curing, and hot air curing. Press mold curing uses high temperature and pressure to cure the final product. The high pressure (600-10,000 psi) forces the rubber to conform to the shape of the mold. Press mold curing is used in tire and engineered products manufacturing.

Autoclave curing utilizes saturated steam at an elevated pressure to cure the rubber mix. Unlike press mold curing, the product is formed into its final shape prior to the curing process. Autoclave curing is the predominant curing method in non-tire rubber manufacturing facilities.

Hot air curing entails passing uncured, green engineered products through a chamber with a heated atmosphere. Temperature and residence times may vary, depending on the product type and formulation. As with the autoclave curing, these products have already been formed into their final shape prior to undergoing the curing process.

Grinding is often performed to remove rough edges and other blemishes from the final product or in some cases to actually form and shape the product. The ground rubber is occasionally recycled and utilized as filler in some rubber manufacturing processes. In the tire manufacturing industry, grinding is performed to balance the tire and also to expose the white sidewall or lettering. Relative to the engineered products industry, grinding may actually be used to obtain the correct shape of the final product such as the final shaping of drive belts.

2.2 Equipment Scale Considerations

Emissions testing was performed on several sizes of similar process equipment. These size differences are the most profound on the sizes of internal mixers tested. Emissions tests were performed on internal mixers ranging from a 2 pound laboratory mixer, to a 200 pound pilot scale system up to a 500 pound production mixer. On a pound pollutant emitted per pound of rubber mixed basis, test data indicated that emissions were not dependent on mixer size. This is especially true for the volatiles and semivolatile emissions. There was some variability of metals emissions which is most likely the result of greater particulate losses into the ventilation system on the larger mixers during charging than is experienced on smaller scale equipment.

Since there were no direct correlation to process equipment size and emissions, no scaling factors were developed for equipment size.

2.3 Selection of Compounds and Target Pollutants

< SECTION HAS Vol 1.2a material here
— THIS STUFF DOES NOT APPEAR IN SECTION.

The initial step necessary in developing emission factors is to identify which pollutants are emitted to the atmosphere from the process. Previous investigations into the emissions from rubber manufacturing show that the predominant emissions are low molecular weight organic compounds (C_6-C_8). However, the potential for heavier, less volatile organic compound emissions also exists due to the chemistry and the elevated temperatures of many of the processes. Particulate matter emissions can also be significant, especially during the mixing process when carbon black is added to the mix.

Title III of 1990 CAAA lists 189 HAPs. Many of these are applicable to the rubber manufacturing industry. In addition, many states where rubber manufacturing facilities operate have developed their own HAP lists. Since the Title V operating program will be administered by the individual states, there exists the possibility that facilities will need to conduct emission inventories for all of the HAPs in Title III as well as on the state lists. A comprehensive target test list was developed using all the chemicals from Title III, selected state air toxic lists, as well as the SARA 313 toxic chemical list. ~~Information presented in the tables includes only HAPs data.~~

The emissions from each process change depending upon the type of rubber used (natural or synthetic) and the specific additives (metal oxides, accelerators, retardants, antioxidants, softeners, fillers, and vulcanizing agents) in the mix. The emissions vary due to the physical properties of the raw rubber, the physical characteristics of the processes, chemical additives, and the reaction chemistry of the processes.

The tire manufacturing industry principally uses natural rubber, styrene-butadiene (SBR) rubber, and polybutadiene rubber. Polybutadiene is often mixed with SBR to improve the abrasion and cracking resistance of the tire. For non-tire rubber goods where oil resistance is a priority, rubbers such as polyacrylates, nitrile, neoprene, polyurethanes, epichlorohydrins, chlorosulfonated polyethylene, chlorinated polyethylene, and fluoroelastomers are used. Potential emissions from these rubbers consist of breakdown compounds such as the monomers used to create the rubber.

Accelerators are added to the mix to speed up the vulcanization rate. Typical accelerators are metal oxides (zinc oxide, lead oxide, and magnesium oxide) and a large variety of organic accelerators. These organic accelerators are typically from the following classes of organic compounds: benzothiazoles, benzothiazolesulfonamides, dithiocarbamates, dithiophosphates, guanidines, thioureas, and thiurams.

Antioxidants help to prevent oxidation (aging) of the vulcanized product. Antioxidants are usually high molecular weight amine compounds such as dioctylated diphenylamine.

Retarders are used to prevent the premature vulcanization (scorching) of the rubber during processing. Retarders currently in use mainly consist of organic acids (salicyclic and benzoic acids), phthalic anhydride, and N-(cyclohexylthio)phthalimide. Again, the potential emissions consist of the retarders themselves along with their thermal breakdown components.

Softeners are used to increase the workability of the mix for lubrication during extrusion and molding and, to aid in the dispersion of fillers. The predominant softener used in the rubber industry is petroleum oil. The potential emission compounds from petroleum oil are extensive. The majority of the compounds would most likely be aromatic hydrocarbons of various sizes and types.

Fillers are added to the rubber mix for several reasons. Fillers provide color but are mainly used to reinforce the final product. Fillers are fine particles which increase the abrasion resistance and tensile strength of the product. Carbon black is used as the primary filler in tire manufacturing. Rubber goods requiring a color other than black use numerous types of inorganic fillers. Due to the extremely fine particle size of fillers, they are easily emitted to the atmosphere during mixing.

Sulfur compounds comprise the vast majority of vulcanizing agents currently used. Sulfur can be added as elemental sulfur or within inorganic or organic sulfur compounds. The presence of sulfur and the high temperatures involved in the processes creates the possibility of sulfur compounds such as carbon disulfide to be emitted.

Twenty six rubber compounds/mixtures were studied in this program. These include 4 specific tire-related mixtures: 1 tread mixture, 5 "sidewall mixtures", 4 styrene-butadiene rubbers (SBR), and 3 ethylene-propylene-diene-mixture (EPDM) terpolymers. Thirteen other compounds/mixtures were also studied.

The target compounds for the emission factor development program are the list of 189 HAPs, in addition to total VOCs and other pollutants prevalent in typical rubber manufacturing processes.

? where?

2.1 Description of Sampling / Analytical Regimes

? where?

The ten processes tested are summarized in Table 2-2 and the test methods employed are shown in Table 2-3: tire press, oven cure of tire cuts, autoclave, extruder, internal mixers, grinding, platen press, calender, warmup mill, and oven cure of engineered products. Nine of the processes were tested for: total volatile organic compounds, speciated volatiles, volatile ozone precursors, sulfur compounds, and semivolatile organic compounds. Two processes (tire press and autoclave) were tested for amines. Four processes (tire press, oven cure of tire cuts, extruder, and some grinding processes) were tested by Fourier transform infrared spectroscopy (FTIR). Three processes (extruder, internal mixers, and grinding) were tested for particulate matter and metals.

To accurately quantify the emissions from each process, the emissions tests were conducted using enclosure methodologies to ensure that all emissions were captured. The design of each enclosure was based upon the criteria in EPA Method 204 for a total enclosure. The objective in using the enclosure approach was to collect and "concentrate" non-point source emissions from the individual process in a way that enclosure exhaust could be sampled.

A highly ventilated enclosure with rapid air turnover would not allow for adequate detection limits of the target parameters. EPAs criteria for enclosures have been followed, as guidance. However, air velocities have been varied to allow for optimal sampling conditions within the exhaust duct. Specific enclosure construction and exhaust details vary with the process, fugitive release rate, and target sampling parameters.

During each test run for all processes, all pertinent operating parameters were recorded. These parameters consisted of the quantity and type of materials being processed, processing and/or production rate, process temperature, and process pressure. This data was recorded at the start of each test run and at 15 minute intervals thereafter until the completion of the test run.

The emissions test data, process data, and laboratory data acquired from the sampling program was compiled and evaluated for each test run. Mass emission rates from each rubber type and each pollutant were calculated from the laboratory results and field test data. The mass emission rates were calculated utilizing the measured exhaust air flow rate and concentration of each target pollutant in the sample vent for each individual test run. All emission calculations were performed in accordance with the specific sampling methodologies utilized for this program.

In addition to the sampling conducted at each process emission vent, numerous sampling runs were conducted to quantify background concentrations of target pollutants present in the atmosphere where the sampling was conducted. These background tests were conducted since most of the emissions testing was performed in process areas containing several air pollutant emitting processes. The necessity of background emissions testing was determined by the team leader for each test program based upon field observations. These field observations included assessing the presence of visible emissions, odors, and plant activities which could bias the test data such as maintenance painting. Quantifiable background concentrations were subtracted from the sample concentrations for that day to provide more accurate emission results from the processes.

2-2

Laboratory and field blank samples were also collected for each sampling method to recognize and quantify contamination of any sampling media. The results of these blank sample runs were compared with the process sample runs to identify emission results which may be biased. If quantifiable pollutant concentrations were found in the sample blanks, these concentrations were subtracted from the specific test results associated with the blank sample. Sample results which were found to have values less than or equal to background or blank sample concentrations were assumed to be equal to 0.

The emission sampling results and the process data were then correlated to quantify emissions on a basis of pounds of pollutant emitted per pound of rubber processed. For 3 of the grinding operations (sidewall grinding, carcass grinding, and belt grinding), emissions were quantified on a pound of pollutant emitted per pound of rubber removed basis. For batch operations such as the internal mixer and autoclave, this was done by determining the total pounds of pollutant emitted and dividing by the total pounds of rubber processed. For continuous operations such as the extruder and calendering, this was performed by dividing the average hourly mass emission rate by the average hourly rubber processing rate. Results for the tire press were developed on both a lb/lb tire and lb/lb rubber basis due to the non-rubber components of the tires such as fabric and steel cords, wire beads, and belts.

In addition to the results of the compound specific sampling methods data, total organic compound emissions were determined using the data collected during the Method 25A continuous process monitoring. Average total organic concentrations were recorded for each 1 minute interval for each test run. An average value was then determined from the average of all the 1 minute data points collected over the duration of each test. Background concentrations were quantified at the beginning of each test run to correct the final result. Mass emissions of total organics were then quantified for each run.

Concentration data are provided for every target analyte and every tentatively identified compound. In each case where a particular compound was not detected, the detection limit is provided.

For sampling methods having more than 1 target pollutant, the pollutant emissions were aggregated to provide total emissions by pollutant category. Total emissions were developed in this manner for metals, organics (including volatiles, ozone precursors, and semivolatiles), sulfur compounds, and in some cases, amines. Many of the target pollutants in these sampling methods were not present in the sample exhaust at quantifiable concentrations. Mass emission rates of these pollutants were calculated based upon their detection limit, as stated in the laboratory results, and their values were denoted with a "<" symbol prior to their stated emission value in the results tables. Emissions totals for detected compounds include emissions of all compounds which were detected in the sample by the chemical analysis.

2.~~5~~ 3 Development of Final Factors

The results of the data analysis were assembled to develop pollutant and rubber type specific emission factors for each process. This effort involved collecting and collating the results of several emission tests performed on similar processes at different facilities. Emission factors are reported as point estimates, ~~means, and maxima~~. The emission factors were developed based upon the aggregate emission totals in the data analysis discussed above.

delete means & maxima per Nancy & Alva 3-21-97 telecon

removed 12-17-97

For calculation of emission factors, emissions of all organic compounds were computed as the sum of ozone precursors, volatile organic compounds, and semivolatile organic compounds. For organic compounds which were detected by more than 1 method, the higher concentration value was used. ?

Target analytes which were not detected in any runs for a particular process or compound were not included on the tables. The assumption is that if a target analyte went undetected in any runs, there is a high probability that even if it was present, the low non-detection limits indicate its overall contribution is insignificant.

Target analytes detected in one or more runs were averaged with target analytes at less than detect at the detection limit divided by two.

clarify

2-4

Vol 1.3

SECTION 3

3 - Description of Test Facilities

3.1 Processes Employing Generic Rubber Compounds

3.1.1 Internal Mixer/Drop Mill

Emissions during mixing were evaluated from 4 internal mixers at 3 facilities during this program. For this report series, the mixers are designated as:

Large Banbury Mixer (F-80)	Large Mixer No. 1
Small Banbury Mixer (BR-1600)	Small Mixer No. 1
Small Banbury Mixer (BR-1600)	Small Mixer No. 2
Large Banbury Mixer/Torit Control Device	Mixer Control Device

Emissions from Large Mixer No. 1 occurred at 2 points in the process, during charging and mixing, and during drop milling. Batch sizes of 125 to 140 pounds per drop were mixed during the testing. Temperatures of the nonproductive runs were approximately 335F. The productive run temperatures were typically 220F (240F for the EPDM 2). The configuration of the unit tested allowed for sampling of the fume collector and duct system. The charging/mixing zone is serviced by an 18-inch exhaust duct leading to a baghouse for control of emissions. Sampling was conducted in the round duct in an area with a suitable length of straight run. Emissions from the drop milling zone were handled similarly, being routed to a collector duct via a long rectangular duct.

The small internal mixers were similar in design and capacity. Emissions were sampled from a section of duct installed in a flexible exhaust hose. Sampling took place during charging and mixing. Batch sizes were typically 2 to 3 pounds for each drop with a fill of approximately 65 percent. Mixing temperatures were the same as with the larger units, and consistent with the recipes (335F. for the non-productive and 220F. for the productive drops). At the completion of the mixing, the rubber dropped into a tray drawer for transfer to the adjacent milling unit.

The milling units used with the small internal mixers were enclosed to contain pollutants released during operation. The enclosures were equipped with an outlet exhaust duct to facilitate sampling. Monitoring/sampling continued once the mixed rubber was placed inside the enclosures and continued throughout the milling process.

Control efficiencies of emissions from the large internal mixer were determined through the simultaneous sampling of inlet and outlet ducts of a Torit fabric filter control device. The sampling was conducted during 2 modes of operation, charging/mixing and drop milling. Batch sizes of approximately 465 pounds per drop were mixed during the testing. Temperatures of these master batch nonproductive runs ranged from 315° to 330F.

3-1

3.1.2 Extrusion

Evaluation of emissions during the extrusion process was conducted on a 3.5-inch extruder. The compounds extruded were mixed and provided by the Goodyear Tire and Rubber Company's St. Mary's, OH facility. Two pallets each of wigwagged tread (Compound No. 6), sidewall (Compound No. 4), emulsion SBR (Compound No. 22), and peroxide-cure EPDM (Compound No. 9) were provided. Optimum target melt temperatures were provided for each compound. These were as follows:

Tread -	255 - 275F
Sidewall -	230 - 260F
SBR 1502 -	255 - 275F
EPDM 2 -	250 - 280F

The extruder consists of a power driven screw within a stationary cylinder. A die with a 1/8 x 3-inch extrusion slot was attached to the head of the screw to produce the desired cross section of the extruded rubber. During the testing, it became necessary to install additional screens behind the die plate to increase rubber back pressure and temperature. The rubber strips were fed manually into the hopper rollers.

There were 2 zones sampled during operation of the extruder process. The extruder outlet, or head, was enclosed to permit capture of emissions throughout operation. The small enclosure was equipped with an outlet exhaust duct from which sampling was conducted. This was designated as Location A. After extrusion, the product entered the cool-down zone, designated as Location B, which was also enclosed to allow for sampling of pollutant emissions. Rubber temperatures were measured at the die head and at 2 points of the cooldown zone.

3.1.3 Autoclave Curing

Autoclave curing utilizes saturated steam at an elevated pressure to cure the rubber mix and is the predominant curing method in nontire rubber manufacturing facilities. The 11 rubber compounds selected for testing included compounds used primarily for engineered products, but also included compounds used in tire manufacturing. These compounds were provided by several manufacturers. The compounds selected and their designated compound numbers were as follows:

- Tire Base/Sidewall (#4)
- Tire Tread (#6)
- EPDM 2 (unextruded peroxide-cured) (#9)
- EPDM 2 (extruded peroxide-cured) (#9)
- HNBR Hydrogenated Nitrile (#18)
- CPE Chlorinated Polyethylene (#21)
- Tire Apex (#5)
- EPDM 1 (sulfur-cured) (#8)
- CRW Neoprene (#11)
- Hypalon (#15)
- Emulsion SBR (SBR 1502) (#22)

The curing tests were conducted using a steam-contact autoclave setup. A rack loaded with the desired quantity of rubber strips was loaded by electric winch into the autoclave chamber. Three batches of approximately 50 pounds each were loaded and cured for each rubber type. The autoclave was operated at 340F and approximately 110 psig during each curing run.

Sampling of the autoclave emissions was conducted throughout the 3 basic modes of operation. Sampling was initiated during the curing phase with sampling of the water trap effluent, conducted during the blowdown phase, and continued through the cool-down phase.

The approach was to set up a total capture method whereby all steam and pollutant releases were sampled. The autoclave curing entailed sampling of the water trap condensate (during curing), the blowdown steam, and cooldown air emissions. All steam releases were vented through the 1-inch water trap or blowdown pipe into a series of condensing impingers and sorbent tubes kept under negative pressure by a metering pump. During curing, the water trap condensate was directed into sample containers and large impingers for volume determination. The blowdown pipe was connected to the condensing coils and the first of a series of large impingers. Steam and entrained pollutants were directed into the impingers for condensing and gross pollutant scrubbing through impingement. Remaining gaseous or entrained pollutants then passed through the sorbent traps for the collection of organic species. We installed a controlling valve on the blowdown system to control the rate of steam release during the blowdown cycle.

Following completion of each autoclave run, the rack containing the cured rubber products was removed from the autoclave but kept within the temporary enclosure for sampling during the cooldown period.

3.1.4 Platen Press Curing

The platen press curing process is a general approach to pressure curing engineered rubber products in molds. Specific molds are used to form the desired engineered product at set pressures and curing temperatures. Emissions from platen presses can be controlled using an exhaust hood and duct. Most emissions occur during mold release, at the end of the curing cycle.

The platen press used in this program was manufactured by Pasadena Hydraulics, Inc. of Pasadena, CA and provided for the test program by Goodyear Tire and Rubber Company.

Testing was conducted at TRC's Lowell, MA facility. Emission rates were developed based on: pounds of pollutant emitted per hour (lbs/hr) and pounds emitted per pound of rubber (lbs/lb rubber) cured.

During this program, 17 rubber compounds were cured at temperatures between 340° and 350° F and pressures of 30 tons for the first 3 minutes and 20 tons for the second 3 minutes. The rubber compounds were from batches mixed during testing of small internal mixer No. 2. The compounds cured and their designated numbers were as follows:

- #1 Tire Inner Liner
- #3 Tire Belt Coat
- #7 Tire Curing Bladder
- #9 EPDM 2 (unextruded peroxide-cured)
- #10 EPDM 3 (non-black sulfur-cured)
- #13 Paracryl OZO
- #14 Paracryl BLT
- #20 Acrylate Rubber
- #23 Epichlorohydrin
- #2 Tire Ply Coat
- #5 Tire Apex
- #11 CRW Neoprene
- #12 CRG Neoprene
- #16 Fluoroelastomer
- #17 AEM
- #19 Silicone
- #22 Emulsion SBR (SBR 1502)

Nine samples of approximately 50 grams each were cured for each rubber type. Each 50-gram tab of rubber was placed directly onto the lower plate and pressed into a "pancake" approximately 185mm diameter and 1mm thickness. The cooldown period lasted for 6 minutes when the cured samples were removed from the press and left inside the enclosure. Emissions were contained by an exhaust hood and flexible Tyvek sheeting, and exhausted by a single 5-inch duct and blower.

3.1.5 Hot Air Oven Curing

Hot air oven curing of engineered rubber products is used to final cure preformed products. Three rubber compounds were evaluated. One compound used in tire manufacturing (Tire Apex, Compound #5) and 2 compounds typical of engineered rubber products manufacturing (sulfur-cured EPDM 1, Compound #8; and Emulsion SBR 1502, Compound #22) were selected. To simulate the process for this program, a lab scale system with enclosure was designed and set up to evaluate the emissions during curing and cooldown. The rubber compound samples were placed in the oven and allowed to reach the curing temperature of 400F for a period of 5-8 minutes. Each sample weighed approximately 100 grams. After completion of curing, each rubber sample was removed and allowed to cool down in the enclosure and another sample of the same compound placed in the oven and brought up to temperature.

The oven was set up with a preheated sweep gas inlet and an exhaust gas outlet. A temporary enclosure was erected around the oven to contain emissions during the curing and cooldown and when the door was opened. An exhaust duct similar to that used for the platen press was constructed to vent the enclosure and to provide the sampling locations.

3.2 Tire Curing

3.2.1 Full-Scale Tire Curing

Evaluation of tire press emissions was conducted on a full-scale tire press equipped with a single mold set and an integral cooldown rack. A total of 9 tire types/brands were press-cured, representing 2 tire sizes from 7 manufacturers. The tires were received uncured and varied in size, weight, and type. Multiple tires for each type were press-cured during each test run to allow for adequate sampling times. The 2 sizes tested were 195/75 and 205/70. A generic, obsolete mold for each tire size was used for the press curing. The different types received were: original equipment (OEM), replacement, and high performance.

Mold temperatures ranged from 330 to 355F and steam pressures ranged from 200 to 300 psig. Each tire was cured for a period of 10 to 15 minutes. There were 2 emission zones sampled on the tire press: the press itself and the tire cool-down zone. An enclosure was set up on the tire press to collect fugitive emissions during the press curing of green tires. The enclosure was equipped with an outlet exhaust duct in which sampling was conducted for the target parameters. A similar enclosure was erected around the integral cool-down rack where the tire cools after completion of the press curing.

3.3 Other Rubber Processing

3.3.1 Warmup Milling

Warmup mills are utilized by the industry as a preparation/warmup step for feeding calenders and extruders following each drop from a internal mixer or, to warm the rubber to prepare it for subsequent processing. A warmup mill is similar or identical to a drop mill in that it has a series of rollers, some toothed, to increase the shearing of the compound. The mill can be batch or continuously fed, depending of the production need.

Evaluations of warmup mill emissions were conducted at 2 facilities during this program. Emissions from both were captured using a temporary enclosure and exhaust duct system. Emissions from a lab scale warmup mill were tested during the milling of the following 3 compounds:

- Tire Ply Coat (#2)
- Tire Belt Coat (#3)
- Tire Base/Sidewall (#4)

Multiple drops were made for each test run. One test run was conducted per compound. Each drop was approximately 2.5 pounds of rubber which represents a fill of approximately 65 percent.

A second warmup mill test was conducted at an engineered rubber products manufacturing facility. This was a production facility that operated its warmup mill in a batch mode for the test. The facility ran a neoprene compound in the warmup mill for the 3 test runs and collected the milled rubber on pigs for running through the calender. The mill roll temperature was approximately 90F. The rubber was milled to a thickness of 0.3 inches and a temperature of approximately 175F.

3.3.2 Calendering

The calendering process is used to bond a continuous textile or metal mesh web to 1 or 2 layers of rubber for use in building tires and other engineered rubber products. The latex-dipped textile passes through a series of rollers through which 1 or 2 rubber strips also passes. Under pressure and elevated temperatures induced by the rollers, the rubber is bonded to the web. The nip of the rollers can be adjusted to vary the thickness of the calendered product. The rubberized fabric is then cooled and cut to the proper dimensions.

During this program, emissions from the calendering process were tested at 2 facilities. The first was a continuous production process where the rubber was continuously fed from a warmup mill. A tire ply coat rubber compound was being run on the test days. Three test runs were conducted from an exhaust collector system outlet stack.

The second process tested involved a batch or "pig" fed calender during calendering of a neoprene compound at an engineered rubber products manufacturing facility. The calender itself had 54-inch wide rolls and ran approximately 1100 linear yards of a neoprene compound during each of the 3 test runs. The emissions from this system were measured using a temporary enclosure and exhaust duct configuration.

3.4 Tire Grinding Processes

Different versions

The grinding processes used in tire manufacturing are specific to each application. Four types were identified for this program: retread buffing, carcass grinding, whitewall (sidewall), and truing (force). The grinding processes, in general, generate quantities of rubber dust and particles, and may generate HAP emissions, depending on the rubber formulation and the amount of heat generated during grinding. To control these emissions, cyclones, baghouses, and electrostatic precipitators (ESPs) are used either alone, or in combination.

Grinding operations are typically conducted in a collector hood with an exhaust duct leading to a primary and possibly secondary control device. Emissions sampling was conducted in the hood's exhaust duct (control device inlet) to determine the process' potential to emit. Simultaneous sampling was also conducted at the outlet duct of each downstream control device to determine control efficiency and the final pollutant emissions rate.

3.4.1 Force/Balance Grinding

— No EF in tables?

A screening evaluation of emissions from a force grinder was conducted at a full scale tire manufacturing facility using FTIR and total hydrocarbon analyzers. The force grinder is used to buff areas of a tire that are out of specification when the tire is put under load. Observations of the force grinder showed that only a few tires per hour are actually buffed, and the quantity of rubber removed is very slight, resulting in insignificant or no emissions.

3.4.2 Sidewall/Whitewall Grinding

Another surface grinding process, sidewall/whitewall grinding, was also evaluated. The grinder consists of 2 stones set in a wheel which rotate at high rpms over the whitewall area of the tire, removing a thin coat of black rubber which overlays the whitewall section. The grinder is set into a frame equipped with 4 powered exhaust ducts. Emissions from the grinding operation are carried via flex hose to overhead ductwork. Emissions at this facility are ducted to a cyclone for removal of rubber dust and pieces ground from the tires. The exhaust air passes through the cyclone and is exhausted to the atmosphere. Approximate grinding time per tire is 20 seconds. Testing was conducted during normal operations, and emissions are based on pounds emitted per hour and pounds emitted per pound of rubber removed, as measured by the quantity of rubber dust and particles collected in the cyclone hopper.

3.4.3 Retread Buffing

— Is this for new Tires?? or new treads?? for old tires? or does it go w/ buffed carcasses for Retreads?

Retread buffing was also studied as a surface grinding operation in this program. In this process, the surface of the back of the tread is buffed to prepare it to receive adhesive further down the line. The retread buffer consists of an edger and 4 inline buffing wheels with hasps around the circumference of each wheel. Each wheel is covered by a hood exhausted by an flexible duct. The 4 exhaust ducts enter a common header duct. At the facility tested, the header duct conveys the emissions to an American Air Filter cyclone/fabric filter control system. The fabric filter is Model Number 12-84-1347.

Call RMA

A tread section approximately 37 feet long is fed to the edger where the edge is squared. The tread is then fed to the first wheel of the inline buffer which catches and draws the tread into the line. As the tread passes each succeeding wheel, the wheel comes down onto the surface. A given pressure is applied to the buffing wheels to remove the required layer of rubber. As the hasps dull, a greater pressure on the surface is required to remove the same amount of material. The emissions are solid rubber particles and volatile and semivolatile organic compounds. It takes approximately 40 seconds to buff a tread with approximately 5 seconds between tread sections. Sampling was conducted in the 20-inch inlet duct to the cyclone, in the 20-inch baghouse outlet duct prior to the I.D. fan, and in the 22-inch stack after the I.D. fan. Emission are presented as pounds per hour and pounds emitted per pound of rubber processed, as no actual rubber removal rates were calculable.

What does this mean?

where?

3.4.4 Tire Carcass Grinding

0.545 lb/lb removed

Tire carcass grinding is used for gross rubber removal (tread section) and for preparation of the resulting tire carcass for retreading. This operation consists of 2 phases, a coarse grind module and a fine grind module. The tire is first ground to a predetermined depth with a coarse grind hasp to prepare it for the fine grind operation. The fine grind operation completely removes the old tread and prepares the carcass surface to receive the new tread. The tire carcass to be ground is placed on a shaft and rotated at predetermined revolutions per minute. The carcass is then placed against a rotating fine tooth hasp at a given pressure. The hasp moves across the surface of the carcass in a predetermined pattern.

The fine grind operation was selected for the study due to the fact that the grinding period is longer, the pressure of the hasp on the wheel is greater than the coarse grind, and the temperature of the carcass surface is higher than for the coarse grind operation. The grinding time for the coarse grind operation is 1-2 minutes, while the grinding time for the fine grind operation is 4 minutes. Approximately 10 to 12 tires are ground per hour.

The fine grind module consists of the rotating shaft on which the carcass is placed and a rotating fine tooth hasp which is covered by a hood. At the facility tested, a flexible exhaust duct connects the hood to an elevated horizontal duct which leads to a cyclone manufactured by Retread Equipment Corp. of Charlotte, NC. The exhaust from the cyclone passes through a horizontal centrifugal fan to an outlet stack on the roof. The entire module was enclosed with Tedlar sheeting to enhance the capture of volatiles, semivolatiles, and particulate matter by the hasp hood. Sampling was conducted in the 10-inch horizontal cyclone inlet duct and in the 16-inch outlet stack. Emissions are presented as pounds per hour and as pounds emitted per pound of rubber removed, measured by the quantity of rubber dust and rubber particles collected in the cyclone hopper.

for just the fine grind?

before or after control?

where?

3.5 Engineered Products Grinding - Drive Belts

The belt grinding operation selected for this study is located at an engineered rubber products manufacturing facility. The selected process line was deemed to be representative of surface grinding operations. This particular line was used for V-belt grinding and consists of 8 grinders. Each grinder is enclosed within a close fitting hood. An exhaust duct exits from each hood and enters an overhead exhaust manifold. The combined exhaust streams enter the 16-inch diameter central cyclone inlet duct which leads to a Fisher Kloster XQ-120-20 cyclone. An 18-inch duct exits from the top of the cyclone and enters a dual 3-stage electrostatic precipitator (ESP). The effluent streams exiting the ESP are combined into a single 14-inch duct which exits the roof through an I.D. fan. During the grinding operation the belts are cooled with a localized water spray located within each grinder hood. Sampling was conducted in the cyclone inlet duct, cyclone exit duct, and ESP exit duct. Emissions are presented as pounds per hour and as pounds emitted per pound of rubber removed, as measured by initial and final weights of the belt batches for each test run.

CONTROLLED
OR UNCONTROLLED?

3-9

Vol 1.4

SECTION 4

Data Analysis and Discussion of Results

This section provides point estimates, means, and maxima of emission factors for individual compounds and elements:

- speciated organic compounds (including volatile compounds, volatile ozone precursors, and semivolatile compounds)
- sulfur compounds
- amines
- metals
- particulate matter

Process and rubber mix/formulation specific emission factors are provided in the following sections. When applicable, rubber formulations are grouped into categories for calculation of means and maxima. Standard deviations are also included for all processes.

4.1 Processes Employing Generic Materials

A series of 23 rubber formulations/products and 3 polymers were tested to determine emission factors for: mixing, extrusion, autoclave curing, and platen press curing. Emissions tests for the mixers were performed on 3 different size systems: 2 2-pound laboratory mixers, a 200-pound pilot scale system, and a 500-pound production mixer. Emissions do not appear to be dependent on mixer size, based on the emission factors of pounds of pollutant emitted per pound of rubber mixed.

4.1.1 Internal Mixing / Drop Mill

All 23 formulations and 3 polymers were tested once on small internal Mixer No. 2.

During the earlier stages of the project, data collected on Small Mixer No. 1 and Large Mixer No. 1 were compared for scale differences. Emission factors were calculated for Compounds 4, 6, 9, and 22. Results for these 2 mixers were found to be somewhat consistent based on emission rate categories. Emissions for the large and the small mixers do not appear to be dependent on mixer size. Mixers did show variability for total metals. This is likely the result of greater losses into the ventilation system when charging the larger equipment versus what is experienced on smaller scale equipment.

Means, maxima, and standard deviations were determined for tire compounds (1-7), engineered product compounds (1-23) and polymers (SBRs 24-26). Pollutant emission factors include organic compounds, metals, sulfur compounds, and particulate matter.

4-1

4.1.2 Autoclave Curing

Autoclave curing is a process which can utilize either a steam contact or non-contact system. During this program, air emissions and water discharge were evaluated from a steam contact system. Emission factors were calculated using 10 of the generic rubber mixtures tested in the small Mixer No. 2. One rubber compound, EPDM 2 (Compound No. 9) was also tested using extruded and unextruded rubber to determine what, if any, differences result in curing emissions if previously extruded. Based on the limited amount of data available, there were no substantial differences between the extruded and unextruded EPDM.

In this steam contact autoclave system, uncured rubber loaded into the pressurization chamber is in full contact with the steam, resulting in both water-borne and air-borne pollutants. The steam condensate from this type of system is discharged during blowdown at the end of the curing cycle and, oftentimes, from the water trap during the curing cycle.

In the non-contact system, the uncured rubber is enclosed in a bladder within the pressurization chamber and does not come into contact with the steam. Therefore, pollutants are not discharged with the steam condensate as occurs with the steam contact system, but are emitted as air-borne pollutants upon opening of the autoclave chamber.

In evaluating pollutant discharges from the steam contact type of system, samples were collected and analyzed from 2 aqueous (water trap and blowdown condensate) and 1 gaseous (cooldown air) matrices. The total emissions for the autoclave system were obtained by combining the emission and discharge rates (lbs/hr and lbs/lb rubber) for volatiles, semivolatiles, and sulfur compounds. This total is most representative of a non-contact system where all pollutants are discharged as air contaminants and should be considered in an emissions inventory. To enable a comparison of a steam contact system with a non-contact system, the water-borne pollutants from a steam contact system could be considered separately, possibly as a discharge under a NPDES permit, and not as an air emission. However, there is a possibility of downstream fugitive emissions from this aqueous discharge.

Certain classes of pollutants exhibit higher condensibility or solubility properties and a higher percentage removal in the aqueous discharge streams. As much as 100 percent of sulfur emissions are removed in the aqueous streams, and could be discounted from inclusion in air emissions inventories when steam contact autoclaves are in use. Similarly, up to 95 percent of semivolatile organic emissions are removed in aqueous streams. Predictably, volatile organics exhibited a much lower removal rate with a maximum of 36 percent removal in the aqueous streams.

As the table indicates, the removal percentages vary by not only pollutant class, but also by rubber compound. It should be noted that the table presents only a comparison of the totals of the pollutant categories, and not the individual chemical species. This information could be determined through further detailed review of the speciated data.

4.1.3 Grinding

Emission factors were developed for 4 grinding operations: sidewall/whitewall grinding, retread carcass grinding, retread buffing, and belt grinding. Inlet and outlet concentrations were measured in order to determine control efficiencies. Force grinding was also evaluated but was found to have insignificant VOC emissions at the facility tested. Specifications of the grinding test series are summarized as follows:

4.2 Effects of Temperature

Specific tests were not conducted to determine the effects of elevated temperatures in a given compound. However, several compounds were subjected to temperatures varying from 200F to 400F, as a result of the tests conducted for each process. No compounds were tested at multiple temperatures on a given process.

These data, while not conclusive, can be used as a guide for making decisions when applying data from this study to plant-specific situations.

4-3

RMA question

6-13-96 Morris Moffett of
OK (405-271-5220 x163) called.
UNIROYAL-ARDMORE
Permittee of >1000 TPY now comes in as
240 TPY source citing "preliminary AP-42
factors" Tread and Cementing
Mixing Line Mill 108TPY → 1.35TPY
David Shutz is engr. reviewing permit
I left message for Beitelon @ S.C.
who reviewed "AP-42 Rubber Manuf Chapter"

Appendix A

Put notes at before table, along with citation of what table in report to congress this came from, and any adjustments made to that table, if any. Notes could be keyed to column headings.

Suggest omitting per capita numbers for each subcategory line, and present just for category and group totals, for clarity. My table probably did not print as intended due to WP problems, but headings and heading total lines should stand out somehow. Also should be landscape.

South Carolina
DHEC
Department of Health and Environmental Control
2600 Bull Street, Columbia, SC 29201

September 22, 1995

Dale Louda, Manager
Regulatory Affairs
Rubber Manufacturers Association
1400 K Street, NW
Washington, DC 200055

Re: Draft AP-42 Section Comments

Dear Mr. Louda:

This office has completed review of the AP-42 Rubber Manufacturing Chapter received August 21, 1995. Several staff within the South Carolina air permitting program have experience in the field and were asked to review the document. Upon review they had no recommendations for change to the chapter.

Thank you for the opportunity to comment.

Sincerely,

Bob Betterton

Bob Betterton, Manager
Emission Inventory Section
Bureau of Air Quality

cc: Steve Hawkins, BAQ Terry Davenport ?
Ron Ryan, US EPA, OAQPS

Colonial Rubber Co.

Ron Ryan

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

August 1, 1995

Mr. Dale Louda
Manager, Public Affairs
Rubber Manufacturers Association
1400 K Street, NW
Washington, D.C. 20005

Dear Dale:

Outlined below are my general comments on the draft AP-42 Section prepared by RMA. Many of these comments were touched upon at our meeting here in RTP. Submittal of a revised draft in electronic form should be enough for us to proceed with the public review portion of our task. I have some other items to discuss with you about the handling of all of the project documentation. I will be on vacation from July 17 to July 31, and will contact you in early August.

1. Using a revision of the old section or material from Sections 2.1 and 2.2 of Volume I of the Final Report as an introduction to the industry and a process description would be helpful.

   After the existing three paragraphs of Process Description, add a short paragraph for each of the six major processes tested to describe the type of equipment used in the industry. Volume I of the Final Report by TRC should serve as a good Background Report to provide more details. Can this volume be made available to EPA in electronic form for distribution and review and documentmentation via our bulletin board system? Any discussion in the section that may help the reader determine if the factors are likely to be representative of their operations would be helpful.

2. The third paragraph of the Process Description in the draft submitted should continue with some discussion of how emissions for the solvents, adhesives, and mold release agents are calculated. Mention the potential for a small amount of overlap, or double-counting of emissions from the downstream processes, where solvents are present.

3. Can you report the emission factors in lbs/1000 lbs or lbs/million lbs of rubber, rather than lbs/lb rubber? It would probably be best to choose units that will still keep all of the exponents as negative numbers, to avoid typos or misreads.

4. All tables and text will need to be in electronic format, to allow for both the distribution and storage of the AP-42 section as well as incorporating the multitude of factors into our FIRE electronic database. WordPerfect 5.1 or 6.0 should be used. The tables will need to be formatted somehow to be more readable in hardcopy, including FAXes. This will make some of the tables several pages long, but I don't see any way around after our agreement that showing the < values was important. I note that the tables in Final Report Volume I are much more readable, so getting access to those electronic files may solve part of this problem.

5. The handwritten pages for autoclaves would be useful in the section, under Emissions and Controls. If the resulting emissions tables are not already in the section, they should be added, at whatever level of detail you feel is warranted. Any derivation details should be shown in the Background Report (Volume 1?).

6. Are all of the bottom line results from the handwritten pages on Interpolation Factors already reflected in the footnotes to the tables? If so, then the handwritten pages should be part of the Background Report, to show the derivation of the interpolation factors. If readers may need to generate additional interpolation factors not already shown in the footnotes, the procedure should be given in the section, probably in a new subsection at the end.

7. Does the handwritten discussion on Non-productive/ Productive mixing need to be shown somewhere in the section, along with a short description of what those terms mean?

8. Item 7 under 6.X.3 should be clarified to stress that the non-detect individual HAPs were assumed to be present at the detection levels <u>FOR PURPOSES OF CREATING THE HAP SUMS</u>. This item is also a little confusing about when HAPs are shown with the < symbol versus when they are left out entirely.

9. To help orient readers to the main areas of concern and away from some of the insignificant sources, can you incorporate a couple of John Finn's overheads from his presentation here at RTP or maybe Table 1-1 from Volume I of the Final Report? Any other significant information learned from your study could also be mentioned in the text, such as what was found about the effects of temperature.

Please direct any questions on general format to Whit Joyner at (919) 541-5493, or any procedural questions to Jim Southerland at (919) 541-5523 during my absence.

Sincerely,

Ronald B. Ryan

Ronald B. Ryan
Environmental Engineer
Emission Factor and Inventory Group

Ron Ryan

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

JUL 5 1994

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

Mr. Dale Louda
Manager of Public Affairs
Rubber Manufacturer's Association
1400 K Street, Northwest
Washington, D.C. 20005

Dear Mr. Louda:

Enclosed per your request at our June 22 meeting is a copy of the draft AP-42 section and associated Background Document for Rubber Tire Manufacturing. This draft was prepared in early 1978 but was never finalized or published. We will be happy to work with the tire manufacturers and other rubber processors to develop one or more updated AP-42 sections describing the preferred methods for estimating emissions from your industry. These sections can cover hazardous air pollutant (HAP) as well as criteria pollutants, from solvent evaporation, grinding, rubber compounding and warming operations, and any other emitting processes identified. Please call me at (919) 541-4330 if you have any questions.

Sincerely,

Ron Ryan

Ron Ryan
Environmental Engineer
Emission Factor and Methodologies Section

Enclosure

5.23 RUBBER TIRES MANUFACTURING

5.23.1 Process Description[1,2]

The tire and inner tube industry manufactures pneumatic and solid tires, inner tubes, and tire repair and retreading materials; it uses 62 to 66 percent of all new rubber each year. The manufacturing of inner tubes involves compounding, extrusion, and curing (discussed below), but represents only three percent of the value of product shipments in the industry and so will not be separately described. Both synthetic and natural rubber are used, the latter mainly for steel belted and large size tires, which are not discussed here. Tires consist of five basic parts: the tread, sidewall, cord, bead, and inner liner. The major steps of tire manufacturing are enumerated in Figure 5.23-1.

Compounding is carried out in Banbury mixers (1); after mixing, the nonreactive compound is discharged to a battery of roll mills, where curing agents are added to form the reactive stock (2). Compounded rubber is either sheeted out for immediate use or pelletized and stored.

In tread and sidewall formation, rubber stock from the compounding section is fed manually to warmup mills, where it is heated and further mixed (3). The heated stock goes to a stripfeed mill for final mixing; the rubber is then peeled off the front roller and fed continuously to a single head dual extruder (4). Here two types of rubber stocks from two different strip mills are joined to form the tread and the two sidewalls. A cushioning layer is attached to the underside of the tread, which is cemented ("undertread and tread end cementing") once the tread-sidewall combination has been cooled and cut to the proper length (5).

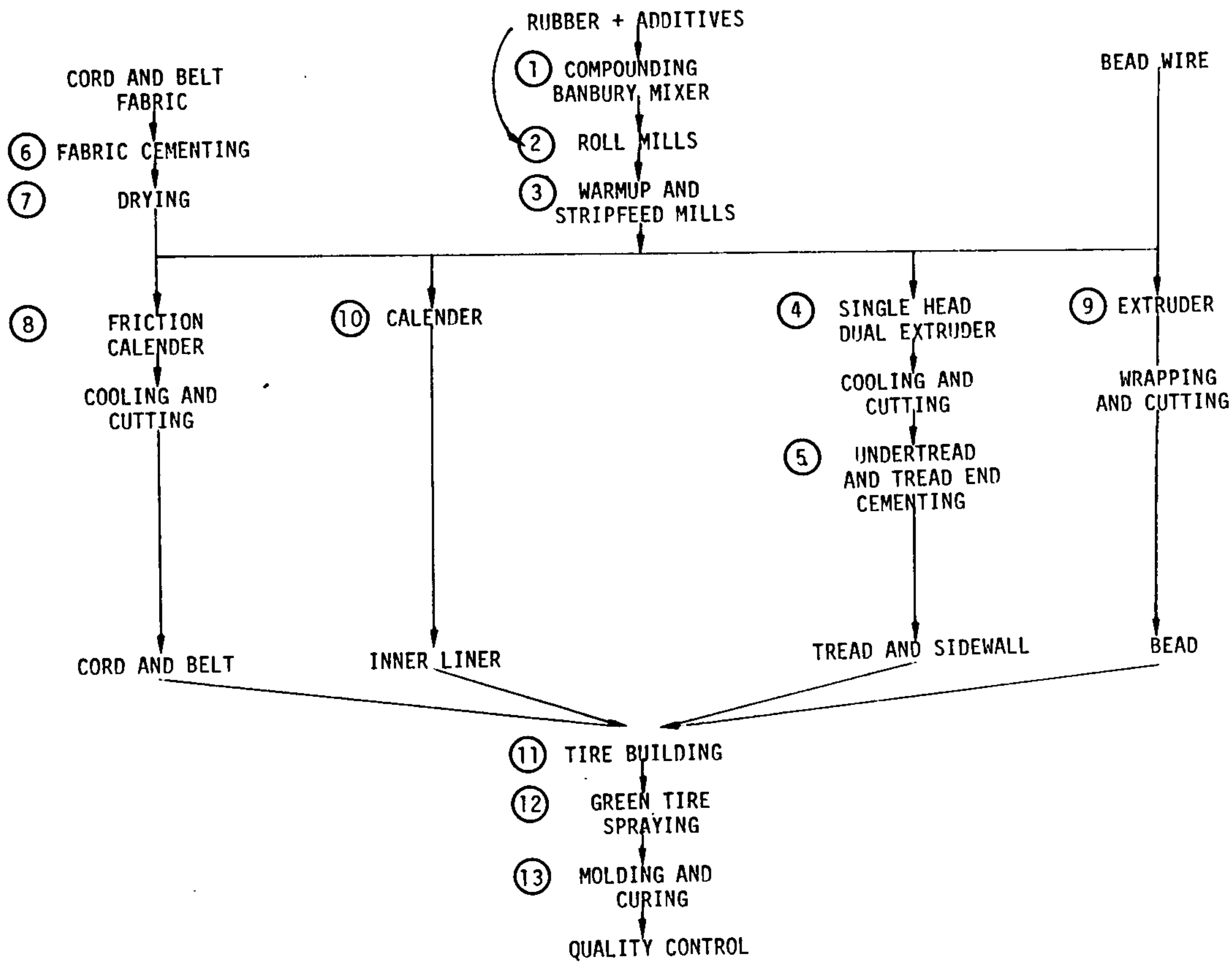


Figure 5.23-1. Tire Manufacturing Emission Points

Tire cords and belts are made from woven synthetic fabric that has been cemented or latex-dipped and dried (6, 7). This operation is often performed at a large central facility prior to shipping fabric to the tire plant. After pretreatment, the fabric is passed through a four-roll friction calendering machine, where both sides of the cord plies are simultaneously impregnated with rubber (8); the fabric is then cooled and cut. The rubber stock used in the frictioning operation is worked up on a series of warmup and strip-feed mills in the same manner as the tread and sidewall stocks.

Tire bead is made by extruding rubber onto a series of copper-plated steel wires, several of which are then passed simultaneously through the die of an extruder and rolled together to make a bead (9). The bead is wrapped and then rewrapped with rubberized square woven fabric, and cut to the specified length. The rubber stock is worked up in the manner described above.

The inner liner is formed by calendering or extruding the appropriate rubber stock in a manner similar to the tread forming or fabric frictioning operations (10).

In tire building, each tire is assembled on a rotating drum slightly larger than the tire itself. The inner liner is applied to the drum, followed by four to eight cord plies, which are tied under and over the bead in a manner that securely locks the bead. Belt fabric ("impact plies") may be laid onto the cord for extra impact resistance. The tread and sidewall are then placed over the cord and belt and wrapped around the bead. At this point, the tire is cylindrical in shape (11). The drum is then collapsed and the green tire removed and sprayed with release agents (12).

Passenger tires are molded and cured in an automatic press. A curing bag is inflated inside the tire, causing it to assume its characteristic shape, while the mold closes over the outside. Various combinations of steam, air, and water supply heat and pressure through the mold and the inflated bag; this vulcanization process usually takes 20 to 60 minutes at 100 to 200°C (13). Final quality control operations, such as grinding, buffing, sidewall painting, and inspection, follow.

The retreading process consists of buffing to remove the old tread (1), cleaning, measuring, rubber cement spraying (2), tread winding, curing (3), and finish painting (4). (Refer to Figure 5.23-2.)

5.23.2 Emissions and Controls[1,2,3]

Emission sources in tire manufacturing include, in descending order of magnitude: green tire spraying (12), fabric cementing (6, 7), tire building (11), undertread cementing (5), curing (13), compounding (1), milling (2, 3), calendering (8, 10), and extrusion (4, 9).*

Green tire spraying utilizes two distinct solvent-based sprays (one internally and one externally) which evaporate both inside and outside of the spray booth, thus accounting for more emissions than any other process in tire manufacturing. This source could be virtually eliminated by use of water-based solvents; it would be greatly reduced through either carbon adsorption of incineration.

*Any process involving a temperature higher than 72°C is considered a potential hydrocarbon emission point because the potential for release of hydrocarbons from the rubber material itself is assumed to exist.

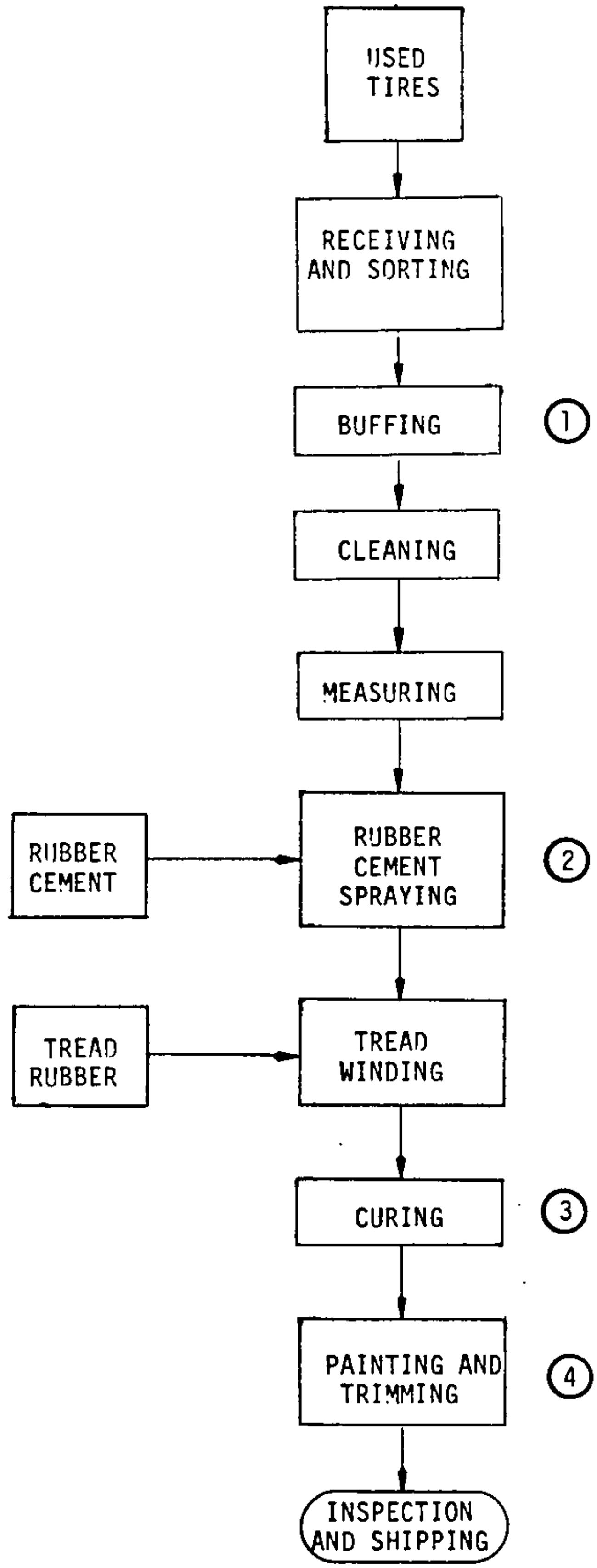


Figure 5.23-2. Tire Retreading Emission Points

Fabric cementing is often performed at a large capacity facility rather than at the individual tire plant. In either case, large quantities of solvent hydrocarbons are emitted, particularly during drying. Ventilation and incineration or carbon adsorption can minimize emissions from this source.

In some tire building operations, the solvent that is used to tackify the various rubber components before fabrication produces hydrocarbon emissions for which there is at present no control technology. Undertread and tread end cementing generally use naptha-based solvents; present control systems combine ventilation and carbon adsorption, but incineration is also a possibility. Curing temperatures cause hydrocarbon emissions both from the rubber itself and from any residual organic additives. A ventilation enclosure for the entire press area combined with incineration could reduce these emissions.

Emissions from compounding consist of particulates and hydrocarbons. The particulates are solids (carbon black, zinc oxide, soapstone, etc.) and liquid aerosols (organic additives), and occur when additives are introduced to the batch. The hydrocarbon vapors originate from impurities in the rubber and from organic additives, and occur as a result of heat generated during mechanical mixing of the batch. Compounding units are equipped with exhaust hoods to remove both heat and particulate and hydrocarbon emissions from the working area. Bag filters are often installed to recover the solid particulates for recycling within the plant; scrubbers may also be used to scrub out oil vapors and mists present in some blends. Incineration or carbon adsorption are feasible for reducing the presently uncontrolled hydrocarbon emissions.

Heat and thus hydrocarbon emissions are also generated during milling, calendering, and extrusion; these vapors are usually emitted to the general work area and vented through the plant ventilation system. Incineration is the only technically viable control for milling and calendering, while vented extruders combined with condensers could control extrusion emissions. Fugitive emissions from pump seals and valves used to transport solvent in the plant and solvent storage loss may also occur.

Retreading produces particulate emissions from the buffing process (1), and hydrocarbons from the rubber cementing (2), curing (3), and painting and trimming operations (4). (Refer to Figure 5.23-2.) Emissions from curing are substantially less than those in new tire manufacturing because the old tread is already vulcanized.

Emission factor estimates for new tires and retreads are given in Table 5.23-1. Because there is little quantitative data available, these estimates are engineering judgments based on plant visits and information from the literature. Material balance tests may be a viable alternative, but require sufficient knowledge of the organic content of all incoming and outgoing process streams. The effectiveness of various control devices and procedures can be estimated from the efficiency factors given in the table.

Table 5.23-1. EMISSION FACTORS FOR NEW TIRES, INNER TUBES AND RETREADS

Emission Source	Emission Type	Uncontrolled Emission Factors, k/g Product		Control Practices				
					Efficiency		Current Usage	
		Hydro-carbons[a]	Particu-lates	Device	Hydro-carbons	Particu-lates	Hydro-carbons	Parti-culates
NEW TIRES AND INNER TUBES								
Green Tire Spraying	solvent[b]	19.7		water based sprays	90		some	
				carbon absorption	80		none	
				incineration	80		none	
Fabric Cementing	solvent[b]	5[d]		incineration	90		some	
				carbon absorption	85		some	
Tire building	solvent[b]	3.6[e]		none				
Undertread cementing	solvent[b]	1.25[d]		carbon absorption	90		some	
				incinceration	90		rare	
Tread end cementing	solvent[b]	0.25[f]		carbon absorption	90		some	
				incinceration	90		rare	
Curing	rubber volatiles[c]; particles	0.22[g]	0.1[g]	incinceration	60	60	none	none
Compounding	rubber volatiles[c]; particles	0.05[h]	11	incinceration	90		none	
				carbon absorption	90		none	
				fabric filtration	0	90		common
Milling	rubber volatiles[c]	0.01[h]		incineration	60		none	
Calendering	rubber volatiles[c]	0.01[h,i]		incineration	55		none	
Extrusion	rubber volatiles[c]	0.01[j]		venter extruders	80		none	
Solvent Storage	solvent[b]	0.01		floating covers absorption emergency flares improved housekeeping	50-80		rare	
Total		30.11	11.1					
RETREADS								
Painting and trimming	solvent[b]	3.2		water based sprays or paints	90		some	
Cement spraying	solvent[b]	2.75		incineration[k]	90		none	
				carbon absorption[k]	90		none	
Curing	rubber volatiles[c]; particles	0.09[g]	.04[g]	incineration	60	60	none	none
Buffing	particles	--	20	fabric filtration	0	90		common
Total		6.04	20.0					

a. Entirely nonmethane hydrocarbons.

b. Ducted hydrocarbon emissions from four stacks of tire manufacturing plant indicated 27% straight and isoparaffins, 69% cycloparaffins, and 4% aromatics by weight, on the average (Reference 3, p. 234).

c. Major constituent is toluene with smaller amounts of 4-vinyl cyclohexene, ethyl benzene, t-butylisothiocyanate, benzothiazole, methyl naphthalenes and diphenyl guanidine and traces of butadiene oligomers, other aromatic hydrocarbons, and products derived from antiozonants.

d. Assumed to be utilized in tire production in 50% of the final product weight.

e. Assumed to be utilized in tire production in 75% of the final product weight.

f. Assumed to be utilized in tire production 10% of the final product weight.

g. Assume formation of an oil mist equivalent to 50% of the hydrocarbon vapor emissions.

h. Calculations of pp. 405-406, Reference 1, revised to use regression equation of p. 403 to estimate weight loss.

i. Assumed to be utilized in tire production in 80% of the final product weight.

j. Assumed to be utilized in tire production in 20% of the final product weight.

k. Control is applicable only if a spray booth is used.

References for Section 5.23

1. Hoogheem, T.J.; Chi, C.T.; Rinaldi, G.M.; McCormick, R.J.; and Hughes, T.W. Identification and Control of Hydrocarbon Emissions from Rubber Processing Operations. MRC-DA-654. Monsanto Research Corporation, Dayton, Ohio. Prepared for U.S. Environmental Protection Agency, Research Triangle Park, N.C. 27711, under Contract No. 68-02-1411, Task No. 17, November 23, 1977.

2. Chi, C.T.; Hughes, T.W.; Ctvrtnicek, T.E.; Horn, D.A.; and Serth, R.W. Source Assessment: Rubber Processing--State of the Art. IERL-Ci. Monsanto Research Corporation, Dayton, Ohio. Prepared for U.S. Environmental Protection Agency, Research Triangle Park, N.C. 27711, under Contract No. 68-02-1874, Program Element No. 1AB604, November 1977.

3. Taback, H.J.; Sonnichsen, T.W.; Brunetz, N.; and Stredler, J.L. Control of Hydrocarbon Emissions from Stationary Sources in the California South Coast Air Basin. Final Report, Volume I. KVB 5804-714, Approval Draft Copy. KVB, Inc., Tustin, CA. Prepared for California Air Resources Board, Sacramento, CA, under Contract No. ARB 5-1323, December 1977, pp.186, 234.

BACKGROUND DOCUMENT

RUBBER TIRES MANUFACTURING

1.0 INTRODUCTION

The emission factors listed in Table 5.23-1 of AP-42 section 5.23 are derived primarily from Reference 1. To the extent that Reference 1 explains the derivation of these factors, this document also explains them. Those factors that are not explained were probably derived by the authors of Reference 1 by applying their best engineering judgment to a collection of data obtained in plant surveys. The details of their reasoning are not given herein.

2.0 EMISSIONS OF RUBBER VOLATILES

All emissions labeled "rubber volatiles" or "rubber volatiles, particles" in Table 5.23-1 were derived from a series of laboratory experiments conducted by Rappaport (Reference 2) in which he heated rubber stock at various temperatures, determined the loss in weight, performed a regression analysis on the data, and derived the following equation:

$$C = 0.00212T - 0.15328$$

Where C = amount of hydrocarbon lost, percent weight fraction of rubber

T = curing temperature, ^{o}C

When this equation is solved for zero weight loss, the temperature is $72^{o}C$. Therefore any plant operation in which rubber is heated to more than $72^{o}C$ will produce hydrocarbon emissions. Curing temperatures were estimated to average around $180^{o}C$, which, using the above equation, gives a weight loss of 0.223 percent. Unpublished research by one tire company indicates that 90 percent of the calculated weight loss can be attributed to water loss (Reference 1). The hydrocarbon loss during curing was, therefore, assumed to be 0.0223 percent.

The temperature for compounding was assumed to be 100^{o}C and for milling, calendering and extrusion, 80^{o}C. For some reason, the authors of Reference 1 did not use the regression equation to calculate these emissions but instead multiplied the curing emissions by 100/180 or 80/180--a method which certainly will not show zero emissions at 72^{o}C. For Table 5.23-1, these emissions have been recalculated using the regression equation and applying the factor of 90 percent for water loss.

Rappaport (Reference 2) collected air samples inside a tire plant and performed GC-MS analyses to identify individual chemical species that were produced by heating rubber stock. The list of compounds in footnote c of Table 5.23-1 is taken from Rappaport's work. He estimated concentrations of these species within the curing room but did not relate these concentrations to the amounts of rubber volatilized. Concentrations ranged from 1.1 ppm for toluene to 0.006 ppm for 1,5 cyclooctadiene. The authors of Reference 1 showed that these concentrations were consistent with reasonable assumptions about the total daily tire production and the air flow rate in the curing room.

3.0 EMISSIONS OF SOLVENTS

No explanation is given in Reference 1 for the derivation of the emission factors listed for "solvent emissions," nor is there any detailed information on the average composition of the solvents used. A listing of about 50 solvent types is given (apparently taken directly from responses to questionnaires), but there is no information about the relative usage of each. The information in footnote b to Table 5.23-1 is taken from an emissions survey in Los Angeles which included hydrocarbon analyses by GC-MS on four stacks at a tire company (Reference 3). The tire company is not identified and the stacks are labeled as follows:

Process Name	Flow Rate (SCFM)	Emissions (tons/yr)	Composition (percent) Straight and Isoparaffins	Cyclo-paraffins	Aromatics
Rubber Tire Mfg. #4 Tuber Solvents, Adhes.	5066	160	31	65	4
Rubber Tire Mfg. #5 Tuber Cement	5471	60	14	83	3
Rubber Tire Mfg. #6 White Sidewall Tubers	3654	30	58	34	8
Rubber Tire Mfg. #69 Bead Dip Tank	3739	30	3	96	1

A weighted (by total emissions) average of these test results gives the compositional data presented in footnote b of Table 5.23-1.

FROM: DAVE SALMAN

0859

indicated that the rubber product manufacturing facilities have minimal storm water pollution concerns. The draft NPDES permits published in the Federal Register on November 19, 1993 for the rubber industry reflect this "minimal concern" by proposing the following provisions:

- No specific numerical effluent limitations are needed.
- Best management practices (BMP) are effective at reducing pollutants.
- Quarterly visual observation of storm water discharges will help minimize pollution.

Many States are not waiting for EPA to finalize the permitting requirements and have requested that plants obtain local permits with reporting and chemical analysis provisions.

FYI: Jim, Dennis B.
The RMA has supplied info on the AP-42 proposed to Enforcement for use in an inspector's training manual. Dave Salman asked me to verify their assertions.
Ron Ryan 6-27-95

Air Emissions

The RMA is also looking into air emissions. Accurate emissions factors for hazardous air pollutants (HAPs) are required by CAA Title V for preparation of emissions inventories in rubber manufacturing plants. The rubber manufacturing industry is one of the industries for which up-to-date emissions factors are not available. The RMA has initiated an emissions sampling program, on behalf of its members, to develop HAP emissions factors for processes with little available air pollutant emissions data. Six processes common to both the tire and general rubber products industries were the subject of this project. The processes were: mixing, milling, extruding, calendering, vulcanizing, and grinding. Twenty-six rubber compounds/mixtures were studied in this program. For each test, emissions rates were developed as pounds of pollutant emitted per pound of rubber (or product) processed.

The emissions factors project is breaking new ground as this type of testing has never been done on such a scale for the tire and rubber industry. RMA and members of its Environment Committee have held ~~two~~ three meetings with EPA's air program in Research Triangle Park. ~~RMA representatives have received positive feedback from EPA officials that the test methodology is sound and will be accepted in calculating emissions.~~ ~~EPA expects to use~~ this project as the basis for a new section of AP-42, ~~the official emissions factors handbook~~. EPA predicts that the new rubber industry factors could be on EPA's Bulletin Board by the end of 1995 and that full print publication could take place in 1996.

EPA officials have indicated to RMA representatives a willingness to use the results of

EPA's compilation of air pollutant emission factors.

OECA draft report

RMA

RUBBER MANUFACTURERS ASSOCIATION

VIA UPS OVERNIGHT

June 6, 1995

Ron Ryan, Environmental Engineer
Emission Factors and Inventory Group
Emissions Monitoring and Analysis Division (EMAD)
Office of Air Quality Planning and Standards
United States Environmental Protection Agency
79 T. W. Alexander Drive
Building 4201, 4th Floor
Research Triangle Park, North Carolina 27709

Dear Mr. Ryan:

Several RMA member company representatives and I look forward to our June 12, 1995, meeting with you concerning our desire to have the recently developed emission factors for rubber products manufacturing incorporated into the EPA AP 42 publication. Since we are extremely interested in moving the process of incorporation along as quickly as possible, our proposed addition to AP 42 and substantiating analytical and engineering data is arriving under separate cover.

We will judge the June 12 meeting a success if it provides us with a clear understanding of what we need to do to keep the process moving in as prompt a manner as possible.

Questions that come to mind are:

1) If the format and content of our proposal is not acceptable, what revisions are necessary?

2) If the substantiating data is not adequate, what additional data is necessary?

3) What other information is required?

4) What is the reasonable schedule, i.e., when would you anticipate the factors to be incorporated into AP 42?

5) What impediments to a prompt and smooth incorporation of our proposal do you anticipate?

6) What additional assistance can we provide to ensure the process goes smoothly?

x 13 ?=Dale

1400 K STREET, N.W., WASHINGTON, D.C. 20005 • TELEPHONE (202) 682-4800 • FAX (202) 682-4854

We feel strongly that the Title V permitting activity and understanding of air emissions from rubber manufacturing facilities will be greatly enhanced by having this emission data in the hands of state air pollution control agencies. We therefore anticipate making the proposal we have presented to you available to them after our June 12 meeting.

We are committed to this AP 42 activity and want to be your partner in bringing it to a prompt resolution.

Sincerely,

Dale A. Louda, Jr.,
Manager of Regulatory Affairs

c: RMA Environment Committee

Enclosure: Suggested Agenda

Separately: Proposed Section 6.X Rubber Products (clear copy) 6/95.

Proposed Section 6.X Rubber Products (annotated copy with reverences to the source of the data) 6/95.

Development of Emission Factors for the Rubber Manufacturing Industry: TRC Environmental Corporation; Volume 1, May, 1995; Volume 2, January, 1995; Volume 3, January, 1995; Volume 4, May, 1995.

Emissions from Autoclaves calculations: E. W. Karger, 2/28/95.

Interpolation Factors for Total VOC, Total Speciated Organics, Total Organic HAPs, Total Metal HAPs, Total HAPs, and Total Particulate Matter: E. W. Karger, 6/2/95.

Emissions from non-productive/productive mixing: E. W. Karger, 5/30/95.

SUGGESTED AGENDA

Meeting to discuss rubber manufacturing industry proposal to AP 42

Monday, June 12, 1995
Research Triangle Park, North Carolina

Introductions
Project Overview
Summary of Results
Submittal Completeness and Applicability
Open Discussion

RMA ATTENDEES

NAME	COMPANY
John Finn	Continental General Tire Incorporated
Nancy Ray Jandrokovic	The Goodyear Tire and Rubber Company
Ernie Karger	The Gates Rubber Company
Dale Louda	Rubber Manufacturers Association
Dan Pyanowski	Dunlop Tire Corporation

6.X RUBBER PRODUCTS

6.X.1 Process Description

The manufacture of a rubber product involves all or some of six common processes, i.e., rubber mixing, milling, extruding calendering, curing and grinding as shown in Figure 6.X-1. Emission factors have been developed for volatiles that are released during these common processes.

Curing is accomplished in a variety of equipment such as platen presses, autoclaves (steam pressure vessels) and hot air ovens.

The majority of rubber products produced in the United States are composed of one or more of twenty-three basic rubber compounds shown in Table 6.X-1. Emissions factors were derived from the specific compound recipes shown in Table 6.X-2. Emissions from manufacturing aids such as solvents, adhesives and mold release compounds ARE NOT included in these emission factors.

6.X.2 Emissions and Controls

The mechanically created or externally added heat utilized during the six common processes cause volatile organic chemicals (VOCs) and hazardous air pollutants (HAPS) to be emitted. Particulate matter is primarily emitted from the dry chemicals utilized in mixing and as a result of grinding.

Dust collectors (baghouses, fabric filters) are commonly used to control particulate matter from mixing. Cyclone separators in combination with dust collectors or electrostatic precipitators are used in grinding applications.

6.X.3 Emission Factors

The following is common to each of the Emission Factors tables:

1) Total VOCs were analyzed by EPA reference method 25A/FID.

2) Total speciated organics were analyzed by EPA reference methods TO-14/GC-MS (speciated volatiles), TO-14/GC-FID (volatile ozone precursors) and M8270 (semi volatiles).
   Note: Results from Method 25A and results from the total speciated organics reference methods are not directly comparable due to the inherent differences in the method of analysis.

3) Total Organic HAPs are hazardous air pollutants as defined by the Clean Air Act of 1990, Section 301 and were analyzed by EPA reference methods TO-14/GC-MS and M8240 (Volatiles), M8270 (semi volatiles), and TO-14/GC/FPD (Sulfur compounds).

4) Total Metal HAPs are hazardous air pollutants as defined by the Clean Air Act of 1990, Section 301 and were analyzed by EPA reference methods M6010 and M7000 (metals)

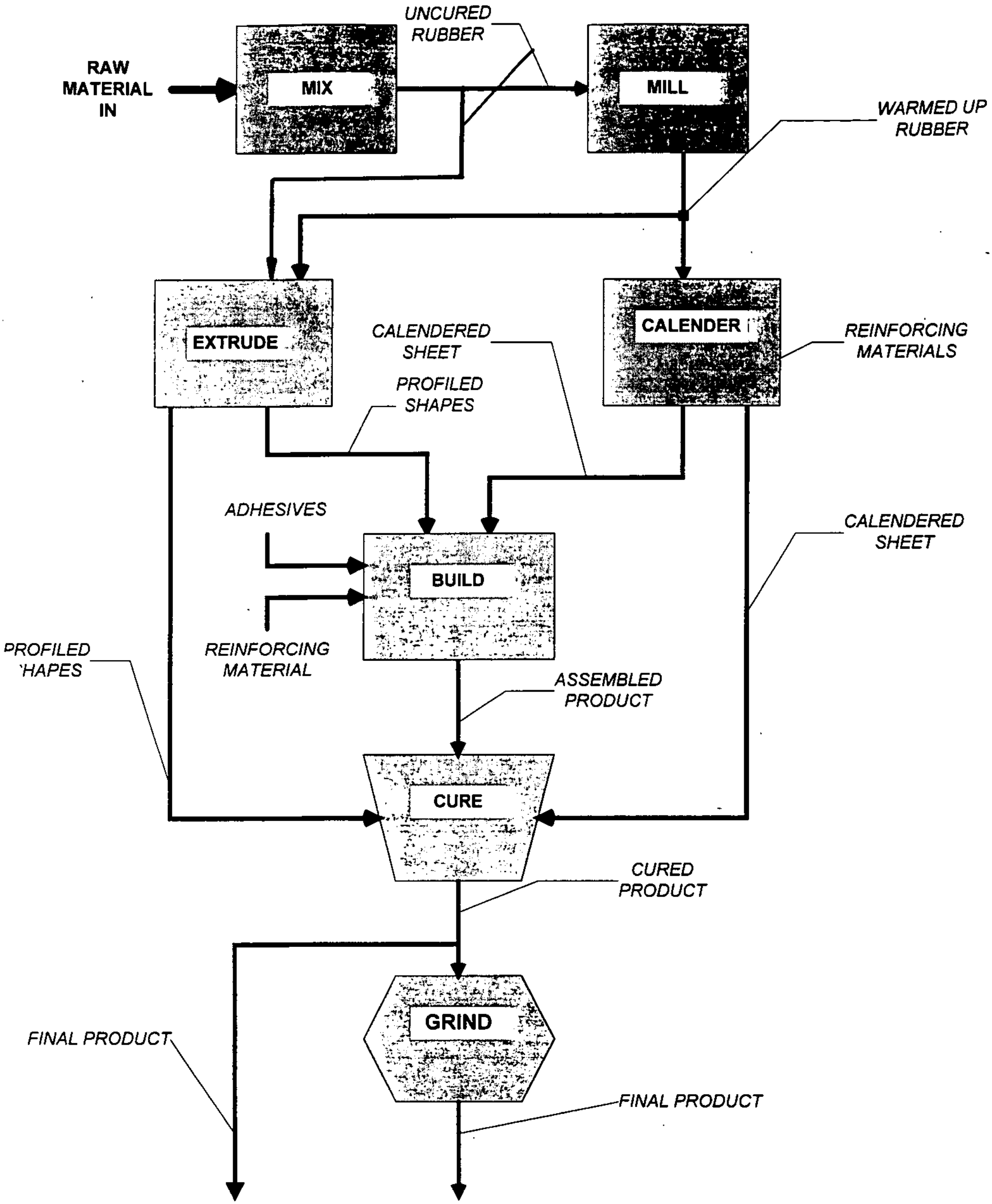
5. Total HAPs are the sum of total organic HAPs and total metal HAPs.

6. Total Particlulate Matter (PM) was analyzed by reference method 5/Gravimetric.

7. HAPs known to be present, but not detected in actual testing of a particular process, are assumed to be present at the detection level in all processes where not detected. The "<" notation in the table indicates that the compound was not observed in all measurements for a given process or was below the detection limit. The method detection limit was therefore used as a conservative default value.

   It should also be noted that, if a HAP was not found during any testing of the individual rubber products tested even though it was suspected to be present, and that HAP is not known to exist in the manufacture of that rubber product, then it is not included in the reported data, even as a "<" value.

8. Metals were expected to be detected in the particulate matter emitted during rubber mixing but were not expected to be a significant emission in any other process. To confirm this assumption, metals were analyzed in the extruder emission. Metals emitted proved to be so small that they could be within the margin of error of the analytical procedure. Metal emissions were therefore considered to be insignificant in other processes.



FIQURE 6.x-1. RUBBER PRODUCTS MANUFACTURING PROCESS

TABLE 6.X-1. RUBBER COMPOUNDS

Compound #1: Tire Inner Liner (BrIIR/NR)

Compound #2: Tire Ply Coat (Natural Rubber/Synthetic Rubber)

Compound #3: Tire Belt Coat (Natural Rubber)

Compound #4: Tire Base/Sidewall (Natural Rubber/Polybutadiene Rubber)

Compound #5: Tire Apex (Natural Rubber)

Compound #6: Tire Tread (Styrene Butadiene Rubber/Polybutadiene Rubber)

Compound #7: Tire Bladder (Butyl Rubber)

Compound #8: EPDM 1 (EPDM Sulfur Cure)

Compound #9: EPDM 2 (Peroxide Cure)

Compound #10: EPDM 3 (Non−black EPDM Sulfur Cure)

Compound #11: CRW (Polychloroprene W Type)

Compound #12: CRG (Polychloroprene G Type)

Compound #13: Paracryl OZO (NBR/PVC)

Compound #14: Paracryl BLT (NBR)

Compound #15: Hypalon (CSM)

Compound #16: Fluoroelastomer (FKM)

Compound #17: AEM (Vamac)

Compound #18: Hydrogenated Nitrile (HNBR)

Compound #19: Silicone (VMQ)

Compound #20: Acrylate Rubber (ACM)

Compound #21: Chlorinated Polyethylene (CPE)

Compound #22: Emulsion SBR (SBR 1502)

Compound #23: Epichlorohydrin (ECO)

Ryan
Mer'k-ups

RMA

RUBBER MANUFACTURERS ASSOCIATION

VIA UPS OVERNIGHT

June 6, 1995

Ron Ryan, Environmental Engineer
Emission Factors and Inventory Group
Emissions Monitoring and Analysis Division (EMAD)
Office of Air Quality Planning and Standards
United States Environmental Protection Agency
79 T. W. Alexander Drive
Building 4201, 4th Floor
Research Triangle Park, North Carolina 27709

Dear Mr. Ryan:

Several RMA member company representatives and I look forward to our June 12, 1995, meeting with you concerning our desire to have the recently developed emission factors for rubber products manufacturing incorporated into the EPA AP 42 publication. Since we are extremely interested in moving the process of incorporation along as quickly as possible, our proposed addition to AP 42 and substantiating analytical and engineering data is arriving under separate cover.

We will judge the June 12 meeting a success if it provides us with a clear understanding of what we need to do to keep the process moving in as prompt a manner as possible.

Questions that come to mind are:

1) If the format and content of our proposal is not acceptable, what revisions are necessary?

2) If the substantiating data is not adequate, what additional data is necessary?

3) What other information is required?

4) What is the reasonable schedule, i.e., when would you anticipate the factors to be incorporated into AP 42?

5) What impediments to a prompt and smooth incorporation of our proposal do you anticipate?

6) What additional assistance can we provide to ensure the process goes smoothly?

1400 K STREET, N.W., WASHINGTON, D.C. 20005 • TELEPHONE (202) 682-4800 • FAX (202) 682-4854

We feel strongly that the Title V permitting activity and understanding of air emissions from rubber manufacturing facilities will be greatly enhanced by having this emission data in the hands of state air pollution control agencies. We therefore anticipate making the proposal we have presented to you available to them after our June 12 meeting.

We are committed to this AP 42 activity and want to be your partner in bringing it to a prompt resolution.

Sincerely,

Dale A. Louda, Jr.,
Manager of Regulatory Affairs

c: RMA Environment Committee

Enclosure: Suggested Agenda

Separately: Proposed Section 6.X Rubber Products (clear copy) 6/95.

Proposed Section 6.X Rubber Products (annotated copy with reverences to the source of the data) 6/95.

Development of Emission Factors for the Rubber Manufacturing Industry: TRC Environmental Corporation; Volume 1, May, 1995; Volume 2, January, 1995; Volume 3, January, 1995; Volume 4, May, 1995.

Emissions from Autoclaves calculations: E. W. Karger, 2/28/95.

Interpolation Factors for Total VOC, Total Speciated Organics, Total Organic HAPs, Total Metal HAPs, Total HAPs, and Total Particulate Matter: E. W. Karger, 6/2/95.

Emissions from non-productive/productive mixing: E. W. Karger, 5/30/95.

SUGGESTED AGENDA

Meeting to discuss rubber manufacturing industry proposal to AP 42

Monday, June 12, 1995
Research Triangle Park, North Carolina

Introductions
Project Overview
Summary of Results
Submittal Completeness and Applicability
Open Discussion

RMA ATTENDEES

NAME	COMPANY
John Finn	Continental General Tire Incorporated
Nancy Ray Jandrokovic	The Goodyear Tire and Rubber Company
Ernie Karger	The Gates Rubber Company
Dale Louda	Rubber Manufacturers Association
Dan Pyanowski	Dunlop Tire Corporation

6.X RUBBER PRODUCTS

6.X.1 Process Description

The manufacture of a rubber product involves all or some of six common processes, i.e., rubber mixing, milling, extruding calendering, curing and grinding as shown in Figure 6.X-1. Emission factors have been developed for volatiles that are released during these common processes.

Curing is accomplished in a variety of equipment such as platen presses, autoclaves (steam pressure vessels) and hot air ovens.

The majority of rubber products produced in the United States are composed of one or more of twenty-three basic rubber compounds shown in Table 6.X-1. Emissions factors were derived from the specific compound recipes shown in Table 6.X-2. Emissions from manufacturing aids such as solvents, adhesives and mold release compounds ARE NOT included in these emission factors.

6.X.2 Emissions and Controls

The mechanically created or externally added heat utilized during the six common processes cause volatile organic chemicals (VOCs) and hazardous air pollutants (HAPS) to be emitted. Particulate matter is primarily emitted from the dry chemicals utilized in mixing and as a result of grinding.

Dust collectors (baghouses, fabric filters) are commonly used to control particulate matter from mixing. Cyclone separators in combination with dust collectors or electrostatic precipitators are used in grinding applications.

6.X.3 Emission Factors

The following is common to each of the Emission Factors tables:

1) Total VOCs were analyzed by EPA reference method 25A/FID.

2) Total speciated organics were analyzed by EPA reference methods TO-14/GC-MS (speciated volatiles), TO-14/GC-FID (volatile ozone precursors) and M8270 (semi volatiles).
Note: Results from Method 25A and results from the total speciated organics reference methods are not directly comparable due to the inherent differences in the method of analysis.

3) Total Organic HAPs are hazardous air pollutants as defined by the Clean Air Act of 1990, Section 301 and were analyzed by EPA reference methods TO-14/GC-MS and M8240 (Volatiles), M8270 (semi volatiles), and TO-14/GC/FPD (Sulfur compounds).

4) Total Metal HAPs are hazardous air pollutants as defined by the Clean Air Act of 1990, Section 301 and were analyzed by EPA reference methods M6010 and M7000 (metals)

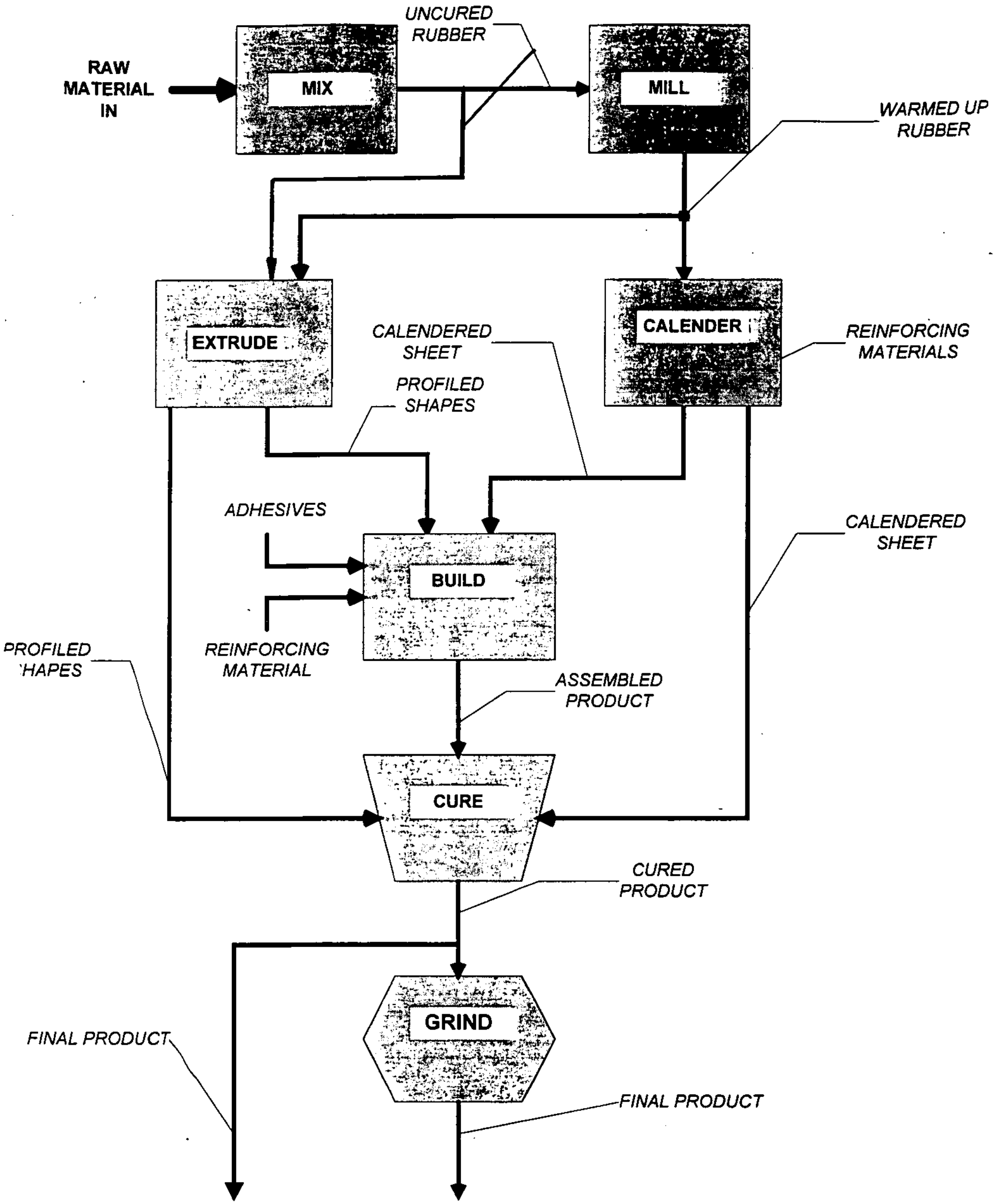
5. Total HAPs are the sum of total organic HAPs and total metal HAPs.

6. Total Particlulate Matter (PM) was analyzed by reference method 5/Gravimetric.

7. HAPs known to be present, but not detected in actual testing of a particular process, are assumed to be present at the detection level in all processes where not detected. The "<" notation in the table indicates that the compound was not observed in all measurements for a given process or was below the detection limit. The method detection limit was therefore used as a conservative default value.

   It should also be noted that, if a HAP was not found during any testing of the individual rubber products tested even though it was suspected to be present, and that HAP is not known to exist in the manufacture of that rubber product, then it is not included in the reported data, even as a "<" value.

8. Metals were expected to be detected in the particulate matter emitted during rubber mixing but were not expected to be a significant emission in any other process. To confirm this assumption, metals were analyzed in the extruder emission. Metals emitted proved to be so small that they could be within the margin of error of the analytical procedure. Metal emissions were therefore considered to be insignificant in other processes.



FIQURE 6.x-1. RUBBER PRODUCTS MANUFACTURING PROCESS

TABLE 6.X-1. RUBBER COMPOUNDS

Compound #1: Tire Inner Liner (BrIIR/NR)

Compound #2: Tire Ply Coat (Natural Rubber/Synthetic Rubber)

Compound #3: Tire Belt Coat (Natural Rubber)

Compound #4: Tire Base/Sidewall (Natural Rubber/Polybutadiene Rubber)

Compound #5: Tire Apex (Natural Rubber)

Compound #6: Tire Tread (Styrene Butadiene Rubber/Polybutadiene Rubber)

Compound #7: Tire Bladder (Butyl Rubber)

Compound #8: EPDM 1 (EPDM Sulfur Cure)

Compound #9: EPDM 2 (Peroxide Cure)

Compound #10: EPDM 3 (Non-black EPDM Sulfur Cure)

Compound #11: CRW (Polychloroprene W Type)

Compound #12: CRG (Polychloroprene G Type)

Compound #13: Paracryl OZO (NBR/PVC)

Compound #14: Paracryl BLT (NBR)

Compound #15: Hypalon (CSM)

Compound #16: Fluoroelastomer (FKM)

Compound #17: AEM (Vamac)

Compound #18: Hydrogenated Nitrile (HNBR)

Compound #19: Silicone (VMQ)

Compound #20: Acrylate Rubber (ACM)

Compound #21: Chlorinated Polyethylene (CPE)

Compound #22: Emulsion SBR (SBR 1502)

Compound #23: Epichlorohydrin (ECO)

TABLE 6.X-2. RUBBER COMPOUND RECIPES

Compound #1: Tire Inner Liner (BrIIR/NR)

Recipe:

Brominated IIR X-2	85.00
SMR 20 Natural Rubber	15.00
GPF Black	60.00
Stearic Acid	1.00
Paraffinic Medium Process Oil	15.00
Unreactive Phenol formaldehyde type resin (Arofene 8318, SP1068)	5.00
Zinc Oxide	3.00
Sulfur	.50
MBTS	1.50
	186.00

Number of Passes/Temperature:

1 (NP Temperature: 320°F: Chlorobutyl or 290°F Bromobutyl

2 (P) Temperature: 220°F

Compound #2: Tire Ply Coat (Natural Rubber/Synthetic Rubber)

Recipe:

50472 Natural Rubber

SMR-GP Natural Rubber	70.00
Duradene 707	30.00
N330	36.50
Sundex 790	20.00
Flectol H	1.50
Santoflex IP	2.30
Sunproof Super Wax	1.20
Zinc Oxide	5.00
Stearic Acid	1.00
Sulfur	2.30
CBS	.80
	170.60

Number of Passes/Temperature:

1 (NP) Temperature: 330°F

2 (P) Temperature: 220°F

Compound #3: Tire Belt Coat (Natural Rubber)

Recipe:

#1RSS Natural Rubber	100.00
HAF Black (N330)	55.00
Aromatic Oil	5.00
N-(1,3 dimethylbutyl) -N-phenyl-P-phenylene diamine (Santoflex 13)	1.00
Zinc Oxide	10.00
Stearic Acid	2.00
n-tertiary -butyl-2-benzothiazole disulfide (Vanax NS)	.80
Sulfur	4.00
Cobalt Neodecanate (20.5% cobalt)	2.50
	180.30

Number of Passes/Temperatures:

1 (NP) Temperature: 330°F; add 1/2 black, add 1/2 oil

2 (NP) Temperature: 330°F; add remainder of black and oil

3 (remill) Temperature 300°F

4 (P) Temperature: 220°F

TABLE 6.X-2. RUBBER COMPOUND RECIPES

Compound #4: Tire Base/Sidewall (Natural Rubber/Polybutadiene Rubber)

Non-Productive Recipe:	
NR-SMR-5 CV	50.00
Taktene 1220	50.00
N330 Carbon Black	50.00
Zinc Oxide	1.50
Stearic Acid	2.00
Agerite Resin D	2.00
Vulkanox 4020	3.00
Vanwax H Special	3.00
Flexon 580 Oil	10.00
	171.50
Productive Recipe:	
Non Productive	171.50
Zinc Oxide	1.50
Rubber Maker Sulfur	1.75
DPG	0.10
CBS	0.60
	175.45

Number of Passes/Temperatures:
1 (NP) Temperature: 330°F
2 (P) Temperature: 220°F

Compound #5: Tire Apex (Natural Rubber)

Recipe:	
TSR 20 Natural Rubber	100.00
HAF Black (N330)	80.00
Aromatic Oil	8.00
Stearic Acid	1.00
Resorcinol	3.00
Hexamethylenetetramine	3.00
Zinc Oxide	3.00
N-tertiary-butyl-2-benzothiazole disulfide (Vanax NS)	1.50
n-cyclohexylthiopthalimide (Santogard PVI)	.30
Sulfur	3.00
	202.80

1 (NP) Temperature: 330°F; add 60 parts black, add 6 parts oil
2 (NP) Temperature: 330°F; add Resorcinol, add 20 parts black, add 2 parts oil
3 (P) Temperature 200°F; add Hexam.

TABLE 6.X-2. RUBBER COMPOUND RECIPES

Compound #6: Tire Tread (Styrene Butadiene Rubber/Polybutadiene Rubber)

Non-Productive Recipe #1:	
SBR 1712C	110.00
N299 Carbon Black	60.00
Taktene 1220	20.00
Zinc Oxide	1.50
Stearic Acid	3.00
Vulkanox 4020	2.00
Wingstay 100	2.00
Vanox H Special	2.50
Sundex 8125 Oil	20.00
	221.00
Non-Productive Recipe #2:	
Non-Productive #1:	221.00
N299 Carbon Black	20.00
Sundex 8125 Oil	5.00
	246.00
Productive Recipe:	
Non Productive #2	246.00
Zinc Oxide	1.50
Rubber Maker Sulfur	1.60
TMTD	0.20
CBS	3.00
	252.30

Number of Passes/Temperatures:
1 (NP) Temperature: 330°F; add 60 parts black, add 20 parts oil
2 (NP) Temperature: 330°F; add 20 parts black; add 5 parts oil
3 (P) Temperature: 220°F

Compound #7: Tire Bladder

Recipe:	
BUTYL 268	100.00
N330	55.00
Castor Oil	5.00
SP 1045 Resin	10.00
Zinc Oxide	5.00
Neoprene W	5.00
	180.00

Number of Passes/Temperatures:
NP 1 All Butyl, Castor Oil, Zinc Oxide, 45 phr N330, discharge approx 330°F/340°F
+Resin, 10 phr N330, discharge approx 270/280°F DO NOT EXCEED 290°F
PROD NP2 = neoprene, discharge approx 250F/260°F

Compound #8: EPDM 1 (EPDM Sulfur Cure)

Non-Productive Recipe:	
Vistalon 7000	50.00
Vistalon 3777	87.50
N650 GPF-HS Black	115.00
N762 SRF-LM Black	115.00
Process Oil Type 104B (Sunpar 2280)	100.00
Zinc Oxide	5.00
Stearic Acid	1.00
	473.50
Productive Recipe:	
Non-Productive	473.50
Sulfur	0.50
TMTDS	3.00
ZDBDC	3.00
ZDMDC	3.00
DTDM	2.00
	485.00

Number of Passes/Temperatures
1 (NP) Temperature: 340°F; upside down mix, rubber then black and oil
2 (P) Temperature: 220°F

Compound #9: EPDM 2 (Peroxide Cure)

Non-Productive Recipe:	
Royalene 502	100.00
N 762 Carbon Black	200.00
Sunpar 2280 Oil	85.00
Zinc Oxide	5.00
Stearic Acid	1.00
	391.00
Productive:	
Non-Productive	391.00
DICUP 40C	6.00
SARET 500 (on carrier/2 parts active)	2.56
	399.56

NP Temperature: 330°F
P Temperature: 240°F

Compound #10: EPDM 3 (Non-black EPDM Sulfur Cure)

Recipe:	
Vistalon 5600	50.00
Vistalon 3777	87.50
Hard Clay (Suprex)	180.00
Mistron Vapor Talc	100.00
Atomite Whiting	40.00
Process Oil Type 104B (Sunpar 2280)	60.00
Silane (A-1100)	1.50
Paraffin Wax	5.00
Zinc Oxide	5.00
Stearic Acid	1.00
Sulfur	1.50
Cupsac	0.50
TMTD	3.00
	535.00

Number of Passes/Temperatures:
1 (NP) Temperature: 330°F
2 (P) Temperature: 220°F, add Sulfur, Cupsac, and TMTDS

TABLE 6.X-2. RUBBER COMPOUND RECIPES

Compound #11: CRW (Polychloroprene W Type)

Recipe:	
Non Productive:	
Neoprene WRT	100.00
N 550	13.20
N 762	15.70
Agerite Staylite S	2.00
Sunproof Super Wax	2.00
Santoflex IP	1.00
Magnesium Oxide	4.00
Stearic Acid	0.50
PlastHall Doz	15.00
	153.40
Productive Recipe:	
Non-Productive	153.40
Zinc Oxide	5.00
TMTD	0.50
Dispersed Ethylene Thiourea	1.00
	159.90

Number of Passes/Temperatures:
1 pass at 240°F; add accelerator package at 200°F

Compound #12: CRG (Polychloroprene G Type)

Non Productive Recipe:	
Neoprene GN	100.00
SRF	50.00
Sundex 790	10.00
Octamine	2.00
Stearic Acid	1.00
Maglite D	4.00
	167.00
Productive Recipe:	
Non-Productive	167.00
TMTM	0.50
Sulfur	1.00
DOTG	0.50
Zinc Oxide	5.00
	174.00

Number of Passes/Temperatures:
1 (NP) Temperatures: 240°F; add zinc oxide and cureatives late at 200°F
2 (P) Temperature: 200°F

TABLE 6.X-2. RUBBER COMPOUND RECIPES

Compound #13: Paracryl OZO (NBR/PVC)

Recipe:	
PARACRIL OZO	100.00
Zinc Oxide	5.00
OCTAMINE	2.00
Hard Clay	80.00
FEF (N-550) Black	20.00
Stearic Acid	1.00
MBTS	2.50
TUEX	1.50
ETHYL TUEX	1.50
DOP	15.00
KP-140	15.00
Spider Sulfur	0.20
	243.70

Number of Passes:
(NP) Temperature: 330°F
(P) Temperature: 220°F; add MBTS, TUEX, ETHYL TUEX, Spider Sulfur

Compound #14: Paracryl BLT (NBR)

Recipe:	
PARACRIL BLT	100.00
Zinc Oxide	5.00
SRF (N-774) Black	100.00
TP-95	15.00
Paraplex G-25	5.00
AMINOX	1.50
Stearic Acid	1.00
ESEN	0.50
MONEX	1.50
Sulfur	0.75
	230.25

Number of Passes/Temperatures:
(NP) Temperature: 280°F
(P) Temperature: 220°F; add sulfur, MONEX, and possibly ESEN

Compound #15: Hypalon (CSM)

Recipe:	
Hypalon 40	100.00
CLS 4 PBD	3.00
Carbo wax 4000	3.00
PE 617A	3.00
Mag Lite D	5.00
PE 200	3.00
Whiting (Atomite)	100.00
N650	100.00
TOTM Oil	70.00
MBTS	1.00
Tetrone A	1.50
NBC	0.50
HVA-2	0.50
	390.50

Uses of Formulas/Temperatures:
Number of Passes:
1 (P) Temperature: 280°F

TABLE 6.X-2. RUBBER COMPOUND RECIPES

Compound #16: Fluoroelastomer (FKM)

Recipe:	
Viton E60C	100.00
N990 Black	20.00
Calcium Hydroxide	6.00
Maglite D	3.00
	129.00

Compound #17: AEM (Vamac)

Recipe:	
VAMAC*B-124 Masterbatch	124.00
ARMEEN 18D	.50
Stearic Acid	.20
SRF Carbon Black (N-774)	10.00
DIAK #1	4.00
DPG	4.00
	142.70

Compound #18: Hydrogenated Nitrile (HNBR)

Non-Productive Recipe:	
HNBR Zetpol 2020	100.00
N650 Black	45.00
Flexone 7P	1.00
Agerite Resin D	1.00
ZMTI	1.00
Kadox 911 C	5.00
Stearic Acid	1.00
Trioctyl trimellitate (TOTM)	7.00
	161.00
Productive Recipe:	
Sulfur	0.50
MBTS	1.50
TMTD	1.50
MTD Monex	.50
	165.00

Number of Passes/Temperatures:
1 (NP) Temperature: 275°F
2 (P) Temperature: 210°F

Compound #19: Silicone (VMQ)

Recipe:	
Silicone Rubber	70.00
Silastic NPC-80 silicone rubber	30.00
5 Micron Min-U-Sil	68.00
Silastic HT-1 modifier	0.80
Vulcanizing agent: Varox DBPH 50	1.00
	169.80

TABLE 6.X-2. RUBBER COMPOUND RECIPES

Compound #20: Acrylate Rubber (ACM)

Non-Productive Recipe:	
Hytemp AR71	100.00
Stearic Acid	1.00
N 550	65.00
	166.00
Productive Recipe:	
Non-Productive	166.00
Sodium Stearate	2.25
Potassium Stearate	0.75
Sulfur	0.30
	169.30

Number of Passes/Temperatures:
1 (NP) Temperature: 260°F
2 (P) Temperature: 220°F

Compound #21: Chlorinated Polyethylene (CPE)

Recipe:	
CM 0136	100.00
Maglite D	10.00
N 774 Black	30.00
Sterling VH	35.00
DER 331 DLC	7.00
Agerite Resin D	0.20
TOTM Oil	35.00
Triallyl Isocyanurate Cure 5223 (provided by Gates)	2.90
Trigonox 17/40	10.00
	230.10

Number of Passes/Temperatures:
Single pass mixed to 240°F; add Triallyisocyanurate, Triganox 17/40 at 200°F.

Compound #22: Emulsion SBR (SBR 1502)

Non-Productive Recipe:	
SBR 1502	100.00
N330 Carbon Black	58.50
Zinc Oxide	10.00
Stearic Acid	2.00
Agerite Resin D (Naugard Q)	2.00
Flexone 7P	1.00
Sunproof Super Wax	1.50
Sundex 790 Oil	7.00
	182.00
Productive Recipe:	
Non-Productive	182.00
Rubber Makers Sulfur	2.00
TBBS	1.80
	185.80

Number of Passes/Temperatures:
Non-productive pass mixed to 330°F,
Second pass mixed to 220°F.

TABLE 6.X-2. RUBBER COMPOUND RECIPES

Compound #23: Epichlorohydrin (ECO)

Recipe:	
Hydrin 2000	100.00
N330 Carbon Black	50.00
Stearic Acid	1.00
Vulkanox MB-2/MG/C	1.00
Calcium Carbonate	5.00
Zisnet F-PT	1.00
Diphenylguanadine	0.50
Santogard PVI	0.50
	159.00

Number of Passes/Temperatures:
1 Pass at 240°F

TABLE 6.X-3. UNCONTROLLED EMISSION FACTORS FOR AN INTERNAL MIXER AND ITS DROP MILL OR ROLLER DIE EXTRUDER [d]

Pollutant Category	CAS #	Cmpd. #1 lbs/lb rubber	Cmpd. #2 lbs/lb rubber	Cmpd. #3 lbs/lb rubber	Cmpd. #4 lbs/lb rubber	Cmpd. #5 lbs/lb rubber	Cmpd. #6 lbs/lb rubber	Cmpd. #7 lbs/lb rubber	Cmpd. #8 lbs/lb rubber	Cmpd. #9 lbs/lb rubber	Cmpd. #10 lbs/lb rubber	Cmpd. #11 lbs/lb rubber	Cmpd. #12 lbs/lb rubber	Cmpd. #13 lbs/lb rubber
TOTAL VOCs		6.11E-05	3.86E-05	1.37E-04	3.86E-05	2.15E-04	3.96E-05	1.20E-01	1.55E-05	2.84E-05	2.90E-04	3.22E-05	1.59E-05	2.28E-04
TOTAL SPECIATED ORGANICS [a]		< 8.08E-05	< 6.61E-05	< 1.09E-04	< 6.09E-05	< 7.36E-05	< 1.25E-04	< 1.16E-04	< 6.04E-05	< 6.53E-05	< 3.13E-04	< 4.21E-05	< 6.70E-05	< 1.63E-04
TOTAL PARTICULATE MATTER (PM)		1.75E-04	4.02E-04	8.99E-04	3.00E-04	9.25E-04	4.00E-04	5.66E-04	2.22E-04	4.92E-05	3.58E-04	7.82E-05	1.83E-04	2.46E-04
TOTAL ORGANIC HAPS		< 4.03E-05	< 1.85E-05	< 7.12E-05	< 2.97E-05	< 5.05E-05	< 8.76E-05	< 6.57E-05	< 5.99E-05	< 2.02E-05	< 1.40E-04	< 1.60E-05	< 5.90E-05	< 1.91E-05
TOTAL METAL HAPs		< 9.67E-08	< 3.76E-08	< 1.74E-07	< 7.07E-08	< 7.73E-08	< 4.90E-08	< 1.86E-07	< 3.91E-08	< 3.32E-08	< 5.18E-08	< 2.51E-08	< 2.87E-08	< 4.85E-08
TOTAL HAPS		< 4.04E-05	< 1.86E-05	< 7.14E-05	< 2.98E-05	< 5.05E-05	< 8.76E-05	< 6.59E-05	< 5.99E-05	< 2.03E-05	< 1.40E-04	< 1.60E-05	< 5.90E-05	< 1.92E-05
Individual HAPs														
1,1-Dichloroethane	00075-34-3	< 4.64E-07	< 1.31E-07	< 2.57E-07	< 9.95E-08	< 2.04E-07	< 4.60E-07	< 4.75E-07	< 1.07E-07	< 1.27E-07	< 4.88E-07	< 9.87E-08	< 8.41E-08	< 1.77E-07
1,1-Dichloroethene	00075-35-4	< 4.64E-07	< 1.31E-07	< 2.57E-07	5.47E-07	< 2.04E-07	< 4.60E-07	< 4.75E-07	1.00E-07	1.90E-07	< 4.88E-07	< 9.87E-08	< 8.41E-08	< 1.77E-07
1,1,1-Trichloroethane	00071-55-6	< 4.64E-07	8.01E-08	3.19E-07	4.23E-08	1.84E-07	< 4.60E-07	< 4.75E-07	2.67E-08	7.30E-08	1.34E-07	< 9.87E-08	2.94E-08	5.32E-08
1,1,2-Trichloroethane	00079-00-5	< 4.64E-07	< 1.31E-07	< 2.57E-07	< 9.95E-08	< 2.04E-07	< 4.60E-07	< 4.75E-07	< 1.07E-07	< 1.27E-07	< 4.88E-07	< 9.87E-08	< 8.41E-08	< 1.77E-07
1,1,2,2-Tetrachloroethane	00079-34-5	< 4.64E-07	< 1.31E-07	< 2.57E-07	< 9.95E-08	< 2.04E-07	< 4.60E-07	< 4.75E-07	< 1.07E-07	< 1.27E-07	< 4.88E-07	< 9.87E-08	< 8.41E-08	< 1.77E-07
1,2-Dibromo-3-Chloropropane	00096-12-8	< 9.27E-07	< 2.62E-07	< 5.15E-07	< 1.99E-07	< 4.08E-07	< 9.19E-07	< 9.49E-07	< 2.14E-07	< 2.54E-07	< 8.76E-07	< 1.97E-07	< 1.68E-07	< 3.55E-07
1,2-Dibromoethane	00106-93-4	< 4.64E-07	< 1.31E-07	< 2.57E-07	< 9.95E-08	< 2.04E-07	< 4.60E-07	< 4.75E-07	< 1.07E-07	< 1.27E-07	< 4.88E-07	< 9.87E-08	< 8.41E-08	< 1.77E-07
1,2-Dichloroethane	00107-06-2	< 4.64E-07	< 1.31E-07	< 2.57E-07	< 9.95E-08	< 2.04E-07	< 4.60E-07	< 4.75E-07	< 1.07E-07	< 1.27E-07	< 4.88E-07	< 9.87E-08	< 8.41E-08	< 1.77E-07
1,2-Dichloropropane	00078-87-5	< 4.64E-07	< 1.31E-07	< 2.57E-07	< 9.95E-08	< 2.04E-07	< 4.60E-07	< 4.75E-07	< 1.07E-07	< 1.27E-07	< 4.88E-07	< 9.87E-08	< 8.41E-08	< 1.77E-07
1,2,4-Trichlorobenzene	120-82-1	< 7.42E-09	< 4.60E-09	< 1.24E-08	< 3.65E-09	< 6.86E-09	< 9.57E-09	< 1.17E-08	< 5.61E-09	< 5.44E-09	< 5.70E-09	< 4.65E-09	< 3.74E-09	< 4.96E-09
1,3-Butadiene	00106-99-0	9.78E-08	< 1.81E-08	< 3.62E-08	2.17E-07	< 1.15E-08	< 8.46E-08	4.67E-07	1.13E-07	1.70E-07	< 8.86E-08	3.82E-07	8.57E-08	1.12E-07
1,4-Dichlorobenzene	00106-46-7	< 4.64E-07	< 1.31E-07	< 2.57E-07	< 9.95E-08	< 2.04E-07	< 4.60E-07	< 4.75E-07	< 1.07E-07	< 1.27E-07	< 4.88E-07	< 9.87E-08	< 8.41E-08	< 1.77E-07
1,4-Dioxane	00123-91-1	< 1.85E-06	< 5.25E-07	< 1.01E-06	< 3.98E-07	< 8.16E-07	< 1.84E-06	< 1.90E-06	< 4.27E-07	< 5.08E-07	< 1.95E-06	< 3.95E-07	< 3.36E-07	< 7.10E-07
1,4-Phenylenediamine	106-50-3	< 1.59E-08	< 9.34E-09	< 3.67E-08	< 1.26E-08	< 1.46E-08	< 1.72E-08	< 2.47E-08	< 1.36E-08	< 1.33E-08	< 1.02E-08	< 8.31E-09	< 9.11E-09	< 8.89E-09
2-Butanone	00078-93-3	5.91E-06	1.59E-06	9.01E-07	2.74E-06	1.53E-06	4.40E-07	1.40E-06	5.08E-07	4.92E-07	1.18E-06	8.64E-08	8.20E-07	3.22E-07
2-Butene [b]	00126-99-8							1.19E-06						
2-Methylphenol	95-48-7	< 8.31E-09	< 5.50E-09	8.61E-08	8.34E-10	1.30E-08	6.00E-09	< 1.29E-08	< 7.35E-09	< 6.50E-09	< 6.55E-09	< 5.26E-09	< 4.51E-09	< 5.77E-09
2,4-Dinitrophenol	51-28-5	< 2.97E-08	< 2.88E-08	< 7.51E-08	< 2.82E-08	< 2.87E-08	< 4.83E-08	< 4.48E-08	< 2.94E-08	< 3.10E-08	< 2.95E-08	< 2.42E-08	< 2.15E-08	< 2.61E-08
2,4-Dinitrotoluene	121-14-2	< 9.45E-09	< 6.91E-09	< 1.92E-08	< 5.52E-09	< 9.14E-09	< 1.23E-08	< 1.43E-08	< 6.03E-09	< 8.32E-09	< 7.49E-09	< 6.15E-09	< 4.40E-09	< 8.63E-09
2,4,5-Trichlorophenol	95-95-4	< 1.00E-08	< 7.04E-09	< 1.92E-08	< 5.68E-09	< 9.67E-09	< 1.38E-08	< 1.50E-08	< 7.47E-09	< 7.88E-09	< 8.43E-09	< 6.85E-09	< 5.46E-09	< 7.44E-09
2,4,6-Trichlorophenol	88-06-2	< 1.01E-08	< 7.42E-09	< 1.90E-08	< 5.63E-09	< 9.73E-09	< 1.40E-08	< 1.52E-08	< 7.82E-09	< 8.26E-09	< 8.53E-09	< 7.04E-09	< 5.72E-09	< 7.55E-09
3,3'-Dichlorobenzidine	91-94-1	< 2.07E-08	< 3.58E-09	< 7.11E-08	< 1.01E-08	< 2.21E-08	< 5.05E-09	< 3.89E-08	< 3.23E-09	< 3.88E-09	< 2.93E-09	< 2.86E-09	< 2.02E-09	< 3.56E-09
3,3' Dimethoxybenzidine	119-90-4	< 2.20E-08	< 6.01E-09	< 9.02E-08	< 1.57E-08	< 2.35E-08	< 7.13E-09	< 4.14E-08	< 4.72E-09	< 5.83E-09	< 4.17E-09	< 4.18E-09	< 2.95E-09	< 5.07E-09
3,3' Dimethylbenzidine	119-93-7	< 8.82E-09	< 2.05E-09	< 2.70E-08	< 5.58E-09	< 9.26E-09	< 2.87E-09	< 1.63E-08	< 1.85E-09	< 2.19E-09	< 1.69E-09	< 1.69E-09	< 1.14E-09	< 2.05E-09
3/4 Methylphenol	108-39-4/106-44-5	1.01E-08	< 5.12E-09	2.37E-07	< 4.07E-09	1.11E-07	< 1.12E-08	< 1.24E-08	< 6.87E-09	< 8.13E-09	1.54E-09	< 5.07E-09	< 4.27E-09	< 5.55E-09
4-Aminobiphenyl	92-67-1	< 4.12E-09	< 2.37E-09	< 7.29E-09	< 2.92E-09	< 3.81E-09	< 3.83E-09	< 6.32E-09	< 2.21E-09	< 2.38E-09	< 2.23E-09	< 1.83E-09	< 1.50E-09	< 1.94E-09
4-Methyl-2-Pentanone	00108-10-1	< 4.64E-07	1.97E-07	1.26E-05	1.49E-05	< 2.04E-07	3.06E-05	< 4.75E-07	1.27E-07	1.24E-07	4.15E-07	8.79E-08	< 8.41E-08	9.87E-08
4-Nitrobiphenyl	92-93-3	< 8.94E-09	< 4.73E-09	< 1.64E-08	< 6.62E-09	< 8.21E-09	< 7.22E-09	< 1.37E-08	< 4.42E-09	< 4.75E-09	< 4.22E-09	< 3.43E-09	< 2.95E-09	< 3.61E-09
4-Nitrophenol	100-02-7	< 2.50E-08	< 2.19E-08	< 5.85E-08	< 1.43E-08	< 2.41E-08	< 3.25E-08	< 3.77E-08	< 1.88E-08	< 1.97E-08	< 1.90E-08	< 1.63E-08	< 1.37E-08	< 1.75E-08
4,4'-Methylenedianiline	101-77-9	< 1.63E-08	< 4.48E-09	< 4.79E-08	< 1.12E-08	< 1.75E-08	< 6.00E-09	< 3.07E-08	< 3.82E-09	< 4.57E-09	< 3.52E-09	< 3.52E-09	< 2.42E-09	< 4.20E-09
4,6-Dinitro-2-methylphenol	534-52-1	< 2.25E-08	< 1.33E-08	< 4.73E-08	< 2.14E-08	< 2.07E-08	< 2.63E-08	< 3.45E-08	< 1.54E-08	< 1.64E-08	< 1.53E-08	< 1.23E-08	< 1.03E-08	< 1.32E-08
Acetaldehyde [b]	00075-07-0	8.95E-07												
Acetonitrile	75-05-8	< 9.27E-07	< 2.62E-07	< 5.15E-07	< 1.99E-07	< 4.08E-07	< 9.19E-07	< 9.49E-07	< 2.14E-07	< 2.54E-07	< 8.76E-07	< 1.97E-07	< 1.68E-07	< 3.55E-07
Acetophenone	98-86-2	4.24E-08	2.13E-08	5.13E-08	3.75E-09	1.85E-08	7.67E-08	1.23E-07	1.29E-08	1.47E-06	8.46E-08	2.20E-07	3.45E-07	5.21E-08
Acrolein	00107-02-8	< 9.27E-07	< 2.62E-07	< 5.15E-07	< 1.99E-07	< 4.08E-07	< 9.19E-07	< 9.49E-07	< 2.14E-07	< 2.54E-07	< 8.76E-07	< 1.97E-07	< 1.68E-07	7.10E-07
Acrylonitrile	00107-13-1	< 9.27E-07	< 2.62E-07	< 5.15E-07	< 1.99E-07	< 4.08E-07	< 9.19E-07	< 9.49E-07	8.81E-08	< 2.54E-07	< 8.76E-07	< 1.97E-07	< 1.68E-07	8.54E-07
Allyl Chloride	00107-05-1	< 9.27E-07	< 2.62E-07	< 5.15E-07	< 1.99E-07	< 4.08E-07	< 9.19E-07	< 9.49E-07	< 2.14E-07	< 2.54E-07	< 8.76E-07	< 1.97E-07	< 1.68E-07	< 3.55E-07
Aniline	62-53-3	< 5.71E-09	4.80E-07	< 1.30E-08	4.30E-07	< 5.33E-09	9.97E-08	< 8.91E-09	7.70E-09	5.13E-09	4.71E-09	2.39E-08	< 2.55E-09	< 3.56E-09
a,a,a-Trichlorotoluene	98-07-7	< 5.07E-09	< 3.77E-09	< 9.58E-09	< 3.13E-09	< 4.69E-09	< 7.83E-09	< 7.95E-09	< 4.54E-09	< 4.38E-09	< 4.61E-09	< 3.75E-09	< 3.04E-09	< 4.04E-09
Benzene	00071-43-2	5.46E-08	4.62E-08	1.13E-07	1.14E-07	2.98E-07	< 8.22E-08	9.13E-08	< 1.45E-08	4.90E-08	< 8.61E-08	< 1.34E-08	3.64E-08	8.61E-07
Benzidine	92-87-5	< 1.12E-08	< 2.94E-09	< 2.75E-08	< 7.77E-09	< 1.20E-08	< 4.35E-09	< 2.11E-08	< 2.75E-09	< 3.25E-09	< 2.53E-09	< 2.53E-09	< 1.72E-09	< 3.07E-09
Benzyl Chloride	00100-44-7	< 9.27E-07	< 2.62E-07	< 5.15E-07	< 1.99E-07	< 4.08E-07	< 9.19E-07	< 9.49E-07	< 2.14E-07	< 2.54E-07	< 8.76E-07	< 1.97E-07	< 1.68E-07	< 3.55E-07
Biphenyl	92-52-4	< 2.66E-09	< 2.30E-09	5.63E-08	5.42E-09	< 2.58E-09	1.17E-08	< 4.02E-09	< 2.45E-09	< 2.56E-09	< 2.78E-09	< 2.30E-09	< 1.80E-09	< 2.48E-09
bis(2-Chloroethyl)ether	111-44-4	< 9.26E-09	< 5.24E-09	< 1.87E-08	< 5.00E-09	< 8.73E-09	< 1.18E-08	< 1.45E-08	< 7.05E-09	< 8.25E-09	< 8.65E-09	< 5.35E-09	< 4.36E-09	< 5.88E-09
bis(2-Ethylhexyl)phthalate	117-81-7	3.91E-08	3.01E-08	1.19E-07	0.00E+00	2.29E-08	1.79E-07	3.34E-08	0.00E+00	7.07E-09	< 1.29E-09	2.69E-07	8.93E-08	7.40E-07
Bromoform	00075-25-2	2.78E-07	< 1.31E-07	< 2.57E-07	< 9.95E-08	< 2.04E-07	< 4.60E-07	< 4.75E-07	< 1.07E-07	< 1.27E-07	< 4.88E-07	< 9.87E-08	< 8.41E-08	< 1.77E-07
Bromomethane	00074-83-9	< 4.64E-07	< 1.31E-07	< 2.57E-07	< 9.95E-08	< 2.04E-07	< 4.60E-07	< 4.75E-07	< 1.07E-07	< 1.27E-07	< 4.88E-07	< 9.87E-08	< 8.41E-08	< 1.77E-07

TABLE 6.X-3. UNCONTROLLED EMISSION FACTORS FOR AN INTERNAL MIXER AND ITS DROP MILL OR ROLLER DIE EXTRUDER[d]

Pollutant Category	CAS #	Cmpd. #14 lbs/lb rubber	Cmpd. #15 lbs/lb rubber	Cmpd. #16 lbs/lb rubber	Cmpd. #17 lbs/lb rubber	Cmpd. #18 lbs/lb rubber	Cmpd. #19 lbs/lb rubber	Cmpd. #20 lbs/lb rubber	Cmpd. #21 lbs/lb rubber	Cmpd. #22 lbs/lb rubber	Cmpd. #23 lbs/lb rubber	Mean lbs/lb rubber	Max. lbs/lb rubber
Carbon Disulfide	00075 15 0	4.26E-06	1.54E-07	4.50E-08	< 1.89E-07	3.54E-05	< 6.34E-08	2.60E-07	4.06E-08	9.56E-08	5.07E-07	< 1.01E-05	1.03E-04
Carbon Tetrachloride	00056 23 5	< 1.03E-07	4.68E-05	< 8.38E-08	< 1.89E-07	< 1.83E-07	< 6.34E-08	< 1.09E-07	< 9.83E-08	< 1.09E-07	2.36E-07	< 2.22E-06	4.68E-05
Carbonyl sulfide	00463 58 1	1.13E-05	2.73E-06	< 1.05E-07	< 4.36E-07	< 2.29E-06	1.69E-07	1.58E-06	3.52E-07	< 1.34E-07	2.88E-06	< 2.43E-06	2.24E-05
Chlorobenzene	00108 90 7	< 1.03E-07	< 5.85E-08	< 8.38E-08	< 1.89E-07	< 1.83E-07	< 6.34E-08	< 1.09E-07	< 9.83E-08	< 1.09E-07	< 4.61E-07	< 2.01E-07	< 4.88E-07
Chloroethane	00075 00 3	< 1.01E-07	< 5.85E-08	1.70E-06	2.01E-07	< 1.83E-07	< 6.34E-08	4.24E-07	< 9.81E-08	< 1.09E-07	< 4.61E-07	< 2.86E-07	1.70E-06
Chloroform	00067 66 3	2.45E-08	6.51E-07	1.23E-08	< 1.89E-07	< 1.83E-07	< 6.34E-08	< 1.09E-07	1.72E-08	< 1.09E-07	< 4.61E-07	< 2.17E-07	8.51E-07
Chloromethane	00074 87 3	3.61E-08	1.02E-07	1.44E-08	8.86E-07	< 1.83E-07	1.48E-07	3.35E-07	3.93E-07	3.82E-08	< 4.61E-07	< 2.06E-07	8.86E-07
Cumene	00098 82 8	< 1.43E-08	< 8.12E-09	< 1.16E-08	< 1.31E-07	1.21E-07	1.06E-08	< 1.52E-08	2.80E-08	5.61E-08	< 1.80E-08	< 2.64E-07	3.17E-06
Dibenzofuran	132 64 9	2.41E-09	7.41E-10	< 1.19E-09	< 3.81E-09	< 2.06E-09	< 1.81E-09	8.61E-10	3.06E-10	< 1.84E-09	5.31E-10	< 3.27E-09	3.42E-08
Dimethylaminoazobenzene	60 11 7	< 2.71E-09	1.64E-08	< 2.42E-09	< 2.52E-08	< 3.29E-09	< 3.58E-09	< 1.37E-08	< 2.88E-09	< 2.95E-09	< 2.83E-09	< 8.62E-09	< 2.87E-08
Dimethylphthalate	131 11 3	3.00E-09	2.18E-09	3.12E-09	< 4.75E-09	< 2.58E-09	< 2.22E-09	< 2.64E-09	< 1.70E-09	< 1.96E-09	< 1.86E-09	< 3.19E-09	1.57E-08
Di n butylphthalate c	84-74 2	8.95E-09	0.00E+00	3.68E-09	0.00E+00	8.27E-08	2.81E-08	2.17E-08	2.86E-07	3.57E-08	8.78E-08	< 4.72E-08	3.34E-07
Epichlorohydrin	00106 89 8	< 2.06E-07	< 1.17E-07	< 1.68E-07	< 3.78E-07	< 3.66E-07	< 1.27E-07	< 2.19E-07	< 1.97E-07	< 2.18E-07	< 9.23E-07	< 4.03E-07	< 8.76E-07
Ethyl Acrylate b					4.73E-06							4.73E-06	4.73E-06
Ethylbenzene	00100 41 4	8.12E-08	4.84E-08	< 1.16E-08	< 1.30E-07	2.78E-07	3.24E-08	7.92E-08	< 1.76E-08	1.28E-07	< 1.59E-08	< 2.86E-07	4.32E-06
Hexachlorobenzene	118-74 1	< 4.81E-09	< 3.61E-09	< 4.61E-09	< 1.56E-08	< 7.81E-09	< 6.71E-09	< 7.40E-09	< 4.02E-09	< 5.88E-09	< 5.35E-09	< 7.47E-09	< 1.82E-08
Hexachlorobutadiene	00087 68 3	< 2.06E-07	< 1.17E-07	< 1.68E-07	< 3.78E-07	< 3.66E-07	< 1.27E-07	< 2.19E-07	< 1.97E-07	< 2.18E-07	< 9.23E-07	< 4.03E-07	< 8.76E-07
Hexachlorocyclopentadiene	77 47 4	< 8.48E-09	< 4.05E-09	< 8.81E-09	< 1.84E-08	< 1.50E-08	< 1.11E-08	< 9.93E-09	< 8.62E-09	< 8.51E-09	< 8.00E-09	< 1.18E-08	2.39E-08
Hexachloroethane	67 72 1	< 8.59E-09	1.21E-06	< 6.43E-09	< 1.87E-08	< 1.11E-08	< 7.46E-09	< 1.05E-08	< 8.13E-09	< 7.42E-09	6.06E-09	< 6.39E-08	1.23E-06
Hydroquinone	123 31 9	< 2.83E-08	< 6.39E-09	< 6.43E-09	< 1.48E-08	< 1.03E-08	< 6.76E-09	< 9.12E-09	< 8.01E-09	< 7.80E-09	< 7.74E-09	< 1.19E-06	2.62E-05
Isophorone	78 59 1	< 8.24E-09	< 1.64E-09	< 2.01E-09	< 7.03E-09	< 3.29E-09	< 2.70E-09	< 3.50E-09	7.91E-09	3.37E-07	< 2.26E-09	< 4.95E-08	8.63E-07
Methylene bis chloroaniline	101-14 4	< 5.89E-09	< 1.55E-08	< 4.87E-09	< 5.41E-08	< 6.58E-09	< 6.98E-09	< 4.70E-08	< 5.68E-09	< 8.44E-09	< 6.15E-09	< 1.98E-08	< 9.80E-08
Methylene Chloride	00075 09 2	1.68E-06	7.02E-07	5.00E-07	1.65E-05	8.68E-07	3.74E-07	1.03E-06	2.82E-07	1.01E-06	1.10E-06	3.58E-06	3.86E-05
m p Xylenes	00108 38-3/00106 42 3	3.35E-07	3.07E-07	1.07E-07	4.76E-07	8.83E-07	1.01E-07	3.36E-07	1.42E-07	4.22E-07	1.18E-07	1.05E-06	1.44E-05
Naphthalene	91 20 3	< 5.18E-09	2.76E-08	1.13E-08	4.01E-08	3.30E-08	1.21E-08	1.71E-08	1.25E-08	5.52E-08	3.18E-08	< 4.74E-08	3.08E-07
n Hexane	00110 54 3	6.78E-07	7.88E-07	1.81E-06	1.13E-04	4.03E-07	2.37E-07	4.86E-07	2.53E-07	7.75E-07	6.22E-07	< 8.89E-06	1.13E-04
Nitrobenzene	98 95 3	< 1.48E-08	< 2.92E-09	< 3.75E-09	< 1.29E-08	< 8.07E-09	< 4.80E-09	< 6.03E-09	< 4.28E-09	< 4.09E-09	< 4.07E-09	< 7.30E-08	2.02E-08
n Nitrosodimethylamine c	62 75 9	< 7.89E-09	0.00E+00	< 6.43E-09	0.00E+00	< 1.11E-08	< 8.33E-09	< 1.94E-08	< 9.04E-09	< 8.82E-09	< 8.94E-09	< 8.90E-09	< 4.50E-08
n Nitrosomorpholine	59 89 2	< 7.59E-09	< 5.42E-09	< 5.87E-09	< 1.40E-08	< 1.01E-08	< 7.20E-09	< 8.07E-09	< 7.91E-09	< 8.55E-09	< 8.72E-09	< 8.78E-09	< 2.10E-08
N N Dimethylaniline	121 69 7	< 1.04E-08	< 2.07E-09	< 2.60E-09	< 8.27E-09	< 4.18E-09	< 3.40E-09	< 3.86E-09	< 3.00E-09	< 2.89E-09	< 2.81E-09	< 4.40E-09	< 1.04E-08
o-Anisidine	90 04 0	< 1.86E-08	< 4.73E-09	< 4.76E-09	< 1.27E-08	< 7.81E-09	< 6.19E-09	< 7.35E-09	< 5.50E-09	< 5.13E-09	< 5.09E-09	< 8.28E-09	< 1.86E-08
o-Toluidine	95 53 4	< 3.85E-09	< 2.74E-09	< 2.82E-09	< 8.09E-09	< 4.90E-09	< 3.58E-09	< 4.92E-09	< 3.89E-09	< 3.11E-09	< 3.10E-09	< 1.74E-08	2.23E-07
o-Xylene	00095 47 6	1.71E-07	8.07E-08	5.49E-08	5.09E-07	3.66E-07	4.81E-08	1.25E-07	1.59E-07	3.82E-07	< 1.59E-08	< 5.77E-07	7.73E-06
Pentachloronitrobenzene	82 68 8	< 1.51E-08	< 1.18E-08	< 1.35E-08	< 3.63E-08	< 2.23E-08	< 1.96E-08	< 2.01E-08	< 1.18E-08	< 1.80E-08	< 1.68E-08	< 2.17E-08	< 4.50E-08
Pentachlorophenol	87 86 5	< 8.77E-09	< 1.02E-08	< 7.43E-09	< 4.36E-08	< 1.22E-08	1.25E-08	< 1.63E-08	< 6.51E-09	< 7.81E-09	< 7.43E-09	< 1.43E-08	< 4.36E-08
Phenol	108 95 2	5.31E-08	2.61E-08	4.56E-08	1.27E-06	5.63E-08	< 3.79E-09	1.84E-08	9.35E-09	8.87E-07	1.25E-08	< 1.57E-07	1.27E-06
Propylene Oxide	00075-56 9	8.97E-06	< 1.17E-07	< 1.68E-07	< 3.78E-07	< 3.66E-07	< 1.27E-07	< 2.19E-07	< 1.97E-07	< 2.18E-07	< 9.23E-07	< 8.97E-07	8.97E-06
Styrene	00100 42 5	8.50E-08	< 7.92E-09	< 1.13E-08	< 1.28E-07	5.45E-08	< 8.58E-09	< 1.48E-08	6.32E-08	1.48E-06	< 1.56E-08	< 2.95E-07	4.25E-06
t-Butyl Methyl Ether	01634 04 4	< 2.06E-07	< 1.17E-07	< 1.68E-07	< 3.78E-07	< 3.66E-07	< 1.27E-07	< 2.19E-07	7.98E-08	< 2.18E-07	< 9.21E-07	< 7.15E-07	7.98E-06
Tetrachloroethene	00127-18 4	1.42E-07	6.95E-07	< 8.38E-08	< 1.89E-07	7.86E-08	2.81E-08	7.59E-08	< 9.81E-08	1.81E-08	< 4.81E-07	< 4.27E-07	4.10E-06
Toluene	00108 88 3	1.55E-06	3.16E-07	1.75E-07	1.04E-06	6.88E-07	4.34E-07	4.75E-07	1.38E-07	2.47E-08	2.31E-05	2.14E-06	2.31E-05
Trichloroethene	00079 01 6	< 1.03E-07	< 5.85E-08	< 8.38E-08	< 1.89E-07	< 1.83E-07	< 6.31E-08	< 1.09E-07	< 9.81E-08	< 1.09E-07	< 4.81E-07	< 2.03E-07	< 4.88E-07
Trifluralin	1582 09 8	< 1.08E-08	< 6.98E-09	< 8.10E-09	< 1.73E-08	< 1.38E-08	< 1.07E-08	< 1.31E-08	< 8.21E-09	< 1.08E-08	< 1.02E-08	< 1.29E-08	< 3.16E-08
Vinyl Acetate	00108 05 4	< 1.03E-07	< 5.85E-08	< 8.38E-08	< 1.89E-07	< 1.83E-07	< 6.34E-08	< 1.09E-07	< 9.81E-08	< 1.09E-07	< 4.81E-07	< 2.94E-07	2.35E-06
Vinyl Chloride	00075 01-4	< 1.03E-07	1.32E-08	< 8.38E-08	< 1.89E-07	< 1.83E-07	< 6.34E-08	< 1.09E-07	< 9.81E-08	< 1.09E-07	< 4.61E-07	< 1.99E-07	< 4.88E-07
Chromium		4.05E-09	1.96E-09	8.29E-10	4.20E-08	< 1.62E-08	< 1.06E-08	9.17E-09	1.08E-09	3.81E-09	2.11E-08	< 1.83E-08	1.23E-07
Nickel		< 2.70E-08	2.16E-08	< 1.66E-08	3.21E-08	3.89E-08	2.65E-08	< 2.34E-08	< 2.15E-08	< 2.54E-08	2.81E-08	< 3.30E-08	8.53E-08
Cadmium		3.38E-09	1.66E-09	6.09E-10	2.65E-09	1.47E-09	6.06E-10	1.35E-09	8.27E-10	2.79E-09	1.04E-09	< 2.49E-09	9.35E-09
Lead		5.39E-09	2.27E-10	NI	NI	NI	1.86E-09	NI	NI	4.97E-09	2.73E-10	< 3.55E-09	2.03E-08

Pollutant Category	CAS #	Cmpd #14 lbs/lb rubber	Cmpd. #15 lbs/lb rubber	Cmpd #16 lbs/lb rubber	Cmpd #17 lbs/lb rubber	Cmpd #18 lbs/lb rubber	Cmpd. #19 lbs/lb rubber	Cmpd #20 lbs/lb rubber	Cmpd. #21 lbs/lb rubber	Cmpd. #22 lbs/lb rubber	Cmpd. #23 lbs/lb rubber	Mean lbs/lb rubber	Max lbs/lb rubber
TOTAL VOCs		2.30E-04	9.69E-06	8.18E-05	4.43E-04	8.48E-05	2.70E-05	8.22E-06	1.56E-04	1.23E-04	4.02E-05	1.08E-04	4.43E-04
TOTAL SPECIATED ORGANICS a		< 1.47E-04	< 6.32E-05	< 3.48E-05	< 3.20E-04	< 1.35E-04	< 2.40E-05	< 1.97E-05	< 1.40E-05	< 9.27E-05	< 8.19E-05	< 9.80E-05	< 3.20E-04
TOTAL PARTICULATE MATTER (PM)		1.30E-04	1.42E-04	3.17E-04	8.96E-05	1.92E-04	8.89E-05	7.84E-04	7.50E-05	4.49E-04	3.39E-04	3.21E-04	9.25E-04
TOTAL ORGANIC HAPS		< 4.58E-05	< 5.79E-05	< 8.40E-06	< 1.50E-04	< 5.84E-05	< 6.40E-06	< 1.15E-05	< 1.49E-05	< 3.36E-05	< 5.12E-05	< 4.76E-05	< 1.50E-04
TOTAL METAL HAPs		< 3.98E-08	< 2.54E-08	< 1.80E-08	< 7.68E-08	< 5.66E-08	< 3.96E-08	< 3.41E-08	< 2.32E-08	< 3.70E-08	< 5.15E-08	< 5.74E-08	< 1.86E-07
TOTAL HAPS		< 4.59E-05	< 5.79E-05	< 8.42E-06	< 1.50E-04	< 5.85E-05	< 6.44E-06	< 1.15E-05	< 1.50E-05	< 3.36E-05	< 5.13E-05	< 4.77E-05	< 1.50E-04
Individual HAPs													
1,1-Dichloroethane	00075-34-3	< 1.03E-07	< 5.85E-08	< 8.38E-08	< 1.89E-07	< 1.83E-07	< 6.34E-08	< 1.09E-07	< 9.83E-08	< 1.09E-07	< 4.61E-07	< 2.01E-07	< 4.88E-07
1,1 Dichloroethene	00075-35-4	2.19E-07	1.39E-08	< 8.38E-08	< 1.89E-07	8.80E-08	< 6.34E-08	< 1.09E-07	< 9.83E-08	< 1.09E-07	< 4.61E-07	< 2.22E-07	5.47E-07
1,1,1-Trichloroethane	00071-55-6	3.61E-08	1.83E-08	1.75E-08	6.03E-08	< 1.83E-07	1.14E-07	7.31E-07	1.04E-08	8.55E-08	< 4.61E-07	< 1.80E-07	7.31E-07
1,1,2-Trichloroethane	00079-00-5	< 1.03E-07	< 5.85E-08	< 8.38E-08	< 1.89E-07	< 1.83E-07	< 8.34E-08	< 1.09E-07	< 9.83E-08	< 1.09E-07	< 4.61E-07	< 2.01E-07	< 4.88E-07
1,1,2,2-Tetrachloroethane	00079-34-5	< 1.03E-07	< 5.85E-08	< 8.38E-08	< 1.89E-07	< 1.83E-07	< 6.34E-08	< 1.09E-07	< 9.83E-08	< 1.09E-07	< 4.61E-07	< 2.01E-07	< 4.88E-07
1,2 Dibromo-3 Chloropropane	00096-12-8	< 2.06E-07	< 1.17E-07	< 1.68E-07	< 3.78E-07	< 3.66E-07	< 1.27E-07	< 2.19E-07	< 1.97E-07	< 2.18E-07	< 9.23E-07	< 4.03E-07	< 9.76E-07
1,2 Dibromoethane	00106-93-4	< 1.03E-07	< 5.85E-08	< 8.38E-08	< 1.89E-07	< 1.83E-07	< 6.34E-08	< 1.09E-07	< 9.83E-08	< 1.09E-07	< 4.61E-07	< 2.01E-07	< 4.88E-07
1,2 Dichloroethane	00107-06-2	< 1.03E-07	< 5.85E-08	< 8.38E-08	< 1.89E-07	< 1.83E-07	< 6.34E-08	< 1.09E-07	< 9.83E-08	< 1.09E-07	< 4.61E-07	< 2.01E-07	< 4.88E-07
1,2 Dichloropropane	00078-87-5	< 1.03E-07	< 5.85E-08	< 8.38E-08	< 1.89E-07	< 1.83E-07	< 6.34E-08	< 1.09E-07	< 9.83E-08	< 1.09E-07	< 4.61E-07	< 2.01E-07	< 4.88E-07
1,2,4 Trichlorobenzene	120-82-1	< 1.41E-08	< 2.57E-09	< 3.64E-09	< 1.20E-08	< 5.87E-09	< 4.75E-09	< 5.32E-09	< 4.19E-09	< 3.88E-09	< 3.85E-09	< 6.37E-09	< 1.41E-08
1,3 Butadiene	00106-99-0	2.39E-07	6.12E-08	< 1.18E-08	< 1.31E-07	1.80E-07	5.79E-08	< 1.54E-08	< 1.30E-08	1.31E-07	1.43E-07	< 1.21E-07	4.67E-07
1,4 Dichlorobenzene	00106-46-7	< 1.03E-07	< 5.85E-08	< 8.38E-08	< 1.89E-07	< 1.83E-07	< 6.34E-08	< 1.09E-07	< 9.83E-08	< 1.09E-07	< 4.61E-07	< 2.01E-07	< 4.88E-07
1,4 Dioxane	00123-91-1	< 4.13E-07	< 2.34E-07	< 3.35E-07	< 7.56E-07	< 7.31E-07	< 2.53E-07	< 4.37E-07	< 3.93E-07	< 4.37E-07	< 1.85E-06	< 8.05E-07	< 1.95E-06
1,4 Phenylenediamine	106-50-3	< 2.88E-08	< 8.85E-09	< 6.81E-09	< 2.19E-08	< 1.42E-08	< 8.50E-09	< 1.58E-08	< 7.56E-09	< 7.97E-09	< 7.92E-09	< 1.41E-08	< 3.67E-08
2 Butanone	00078-93-3	3.10E-07	8.78E-08	3.95E-08	1.01E-06	1.26E-06	6.30E-08	1.30E-07	4.71E-07	4.37E-06	< 9.23E-07	1.16E-06	5.91E-06
2 Butene b	00126-99-8											1.19E-06	1.19E-06
2 Methylphenol	95-48-7	< 5.47E-09	< 3.20E-09	< 4.31E-09	< 1.39E-08	< 7.42E-09	< 5.06E-09	1.01E-09	< 5.50E-09	< 4.63E-09	< 4.82E-09	< 8.71E-09	8.64E-08
2,4 Dinitrophenol	51-28-5	< 2.50E-08	< 2.07E-08	< 1.86E-08	< 1.01E-07	< 3.17E-08	1.62E-08	< 3.12E-08	< 1.95E-08	< 2.51E-08	< 2.37E-08	< 3.30E-08	< 1.01E-07
2,4 Dinitrotoluene	121-14-2	< 6.00E-09	< 4.05E-09	< 3.79E-09	< 1.68E-08	< 8.45E-09	< 6.45E-09	< 8.01E-09	< 4.94E-09	< 8.00E-09	< 5.66E-09	< 7.91E-09	< 1.92E-08
2,4,5 Trichlorophenol	95-95-4	< 8.12E-09	< 4.17E-09	< 4.72E-09	< 1.72E-08	< 8.07E-09	< 7.28E-09	< 8.01E-09	< 5.59E-09	< 6.11E-09	< 5.75E-09	< 8.57E-09	< 1.82E-08
2,4,6 Trichlorophenol	88-06-2	< 8.42E-09	< 4.13E-09	< 4.94E-09	< 1.76E-08	< 8.45E-09	< 7.37E-09	< 7.81E-09	< 5.84E-09	< 8.44E-09	< 8.10E-09	< 8.74E-09	< 1.90E-08
3,3' Dichlorobenzidine	91-94-1	< 2.88E-09	< 7.72E-09	< 2.30E-09	< 2.55E-08	< 3.21E-09	< 3.58E-09	< 3.31E-08	< 2.93E-09	< 3.17E-09	< 3.05E-08	< 1.21E-08	< 7.11E-08
3,3' Dimethoxybenzidine	119-90-4	< 4.89E-09	< 1.21E-08	< 3.46E-09	< 3.84E-08	< 4.71E-09	< 5.06E-09	< 4.29E-08	< 4.11E-09	< 5.29E-09	< 5.09E-08	< 1.59E-08	< 9.02E-08
3,3' Dimethylbenzidine	119-93-7	< 1.65E-09	< 4.29E-09	< 1.34E-09	< 1.51E-08	< 1.81E-09	< 2.09E-09	< 1.29E-08	< 1.64E-09	< 1.80E-09	< 1.72E-09	< 5.50E-09	< 2.70E-08
3/4 Methylphenol	108-39-4/106-44-5	< 5.12E-09	< 3.00E-09	< 4.05E-09	< 1.23E-08	< 8.97E-09	< 4.84E-09	< 6.69E-09	< 5.24E-09	< 4.42E-09	< 4.51E-09	< 2.08E-08	2.37E-07
4-Aminobiphenyl	92-67-1	< 1.71E-09	< 2.07E-09	< 1.45E-09	< 5.86E-09	< 2.39E-09	< 2.27E-09	< 3.24E-09	< 1.35E-09	< 2.02E-09	< 1.90E-09	< 2.91E-09	< 7.29E-09
4 Methyl 2 Pentanone	00108-10-1	8.26E-07	4.90E-08	8.64E-08	1.65E-07	4.57E-06	< 6.34E-08	1.91E-07	2.76E-08	1.37E-05	< 4.61E-07	< 3.50E-06	3.08E-05
4 Nitrobiphenyl	92-93-3	< 3.47E-09	< 4.68E-09	< 2.90E-09	< 1.27E-08	< 4.78E-09	< 4.23E-09	< 7.30E-09	< 2.53E-09	< 4.04E-09	< 3.80E-09	< 8.07E-09	< 1.64E-08
4 Nitrophenol	100-02-7	< 1.80E-08	< 1.05E-08	< 1.18E-08	< 3.91E-08	< 2.01E-08	9.90E-09	< 2.44E-08	< 1.31E-08	< 1.90E-08	< 1.80E-08	< 2.10E-08	< 5.85E-08
4,4' Methylenedianiline	101-77-9	< 3.59E-09	< 6.58E-09	< 2.82E-09	< 2.05E-08	< 3.81E-09	< 4.27E-09	< 2.28E-08	< 3.45E-09	< 3.93E-09	< 3.76E-09	< 1.05E-08	< 4.79E-08
4,6 Dinitro-2-methylphenol	534-52-1	< 9.77E-09	< 1.51E-08	< 1.01E-08	< 7.21E-08	< 1.66E-08	< 1.53E-08	< 2.10E-08	< 9.17E-09	< 1.15E-08	< 1.07E-08	< 2.00E-08	< 7.21E-08
Acetaldehyde b	00075-07-0		5.12E-07									< 8.04E-07	8.95E-07
Acetonitrile	75-05-8	< 2.06E-07	< 1.17E-07	< 1.68E-07	< 3.78E-07	< 3.66E-07	4.83E-07	< 2.19E-07	< 1.97E-07	< 2.18E-07	< 9.23E-07	< 4.17E-07	< 9.76E-07
Acetophenone	98-86-2	1.70E-08	1.10E-08	1.11E-08	1.45E-08	5.72E-08	2.48E-08	1.61E-07	1.76E-08	2.92E-08	9.02E-09	1.25E-07	1.47E-06
Acrolein	00107-02-8	8.26E-07	< 1.17E-07	< 1.68E-07	< 3.78E-07	< 3.66E-07	< 1.27E-07	< 2.19E-07	2.27E-07	3.00E-07	< 9.23E-07	< 4.50E-07	< 9.76E-07
Acrylonitrile	00107-13-1	1.17E-05	< 1.17E-07	< 1.68E-07	< 3.78E-07	8.00E-07	< 1.27E-07	< 2.19E-07	< 1.97E-07	< 2.18E-07	< 9.23E-07	< 8.43E-07	1.17E-05
A'yl Chloride	00107-05-1	< 2.06E-07	< 1.17E-07	< 1.68E-07	< 3.78E-07	< 3.66E-07	< 1.27E-07	< 2.19E-07	< 1.97E-07	< 2.18E-07	< 9.23E-07	< 4.03E-07	< 9.76E-07
Aniline	62-53-3	< 3.08E-09	< 2.92E-09	< 2.45E-09	5.13E-07	1.66E-07	< 3.10E-09	7.20E-09	< 3.36E-09	4.68E-07	2.23E-07	< 1.08E-07	5.13E-07
a,a,a-Trichlorotoluene	98-07-7	< 1.17E-08	< 2.18E-09	< 2.94E-09	< 6.97E-09	< 4.71E-09	< 3.84E-09	< 4.10E-09	< 3.41E-09	< 3.22E-09	< 3.18E-09	< 4.90E-09	< 1.17E-08
Benzene	00071-43-2	5.24E-07	1.74E-08	2.61E-08	< 1.28E-07	3.77E-08	1.42E-07	5.92E-08	< 1.33E-08	8.07E-08	< 1.56E-08	< 1.16E-07	8.61E-07
Benzidine	92-87-5	< 2.35E-09	1.80E-08	< 2.01E-09	< 1.85E-08	< 2.71E-09	< 3.10E-09	< 1.31E-08	< 2.53E-09	< 2.57E-09	< 2.48E-09	< 7.43E-09	< 2.75E-08
Benzyl Chloride	00100-44-7	< 2.06E-07	< 1.17E-07	< 1.68E-07	< 3.78E-07	< 3.66E-07	< 1.27E-07	< 2.19E-07	< 1.97E-07	< 2.18E-07	< 9.23E-07	< 4.03E-07	< 9.76E-07
Biphenyl	92-52-4	1.24E-08	< 1.48E-09	< 1.56E-09	< 3.75E-09	< 2.65E-09	< 2.40E-09	< 2.64E-09	< 1.83E-09	9.77E-09	< 1.90E-09	< 5.58E-09	5.63E-08
bis(2 Chloroethyl)ether	111-44-4	< 5.24E-09	< 3.74E-09	< 4.12E-09	< 1.50E-08	< 7.10E-09	< 5.14E-09	< 8.11E-09	< 5.55E-09	< 4.53E-09	< 4.84E-09	< 7.48E-09	< 1.07E-08
bis(2 Ethylhexyl)phthalate	117-81-7	0.00E+00	4.60E-08	3.54E-08	2.40E-09	2.20E-08	1.31E-08	4.53E-08	1.31E-07	8.41E-09	8.74E-07	1.08E-07	7.40E-07
Bromoform	00075-25-2	< 1.03E-07	< 5.85E-08	< 8.38E-08	< 1.89E-07	< 1.83E-07	< 6.34E-08	< 1.09E-07	< 9.83E-08	< 1.09E-07	< 4.61E-07	< 1.93E-07	< 4.88E-07
Bromomethane	00074-83-9	< 1.03E-07	< 5.85E-08	< 8.38E-08	< 1.89E-07	< 1.83E-07	5.82E-08	< 1.09E-07	< 9.83E-08	< 1.09E-07	< 4.61E-07	< 2.01E-07	< 4.88E-07

TABLE 6.X-3. UNCONTROLLED EMISSION FACTORS FOR AN INTERNAL MIXER AND ITS DROP MILL

Pollutant Category	CAS #	Cmpd #1 lbs/lb rubber	Cmpd #2 lbs/lb rubber	Cmpd #3 lbs/lb rubber	Cmpd #4 lbs/lb rubber	Cmpd #5 lbs/lb rubber	Cmpd #6 lbs/lb rubber	Cmpd #7 lbs/lb rubber	Cmpd #8 lbs/lb rubber	Cmpd #9 lbs/lb rubber	Cmpd #10 lbs/lb rubber	Cmpd #11 lbs/lb rubber	Cmpd #12 lbs/lb rubber	Cmpd #13 lbs/lb rubber
Carbon Disulfide	00075-15-0	< 4.64E-07	< 1.31E-07	< 2.57E-07	1.99E-07	1.84E-07	3.83E-06	< 4.75E-07	2.81E-05	6.66E-07	1.03E-04	8.64E-06	4.52E-05	8.32E-07
Carbon Tetrachloride	00056-23-5	< 4.64E-07	< 1.31E-07	1.19E-07	< 9.95E-08	< 2.04E-07	< 4.60E-07	< 4.75E-07	< 1.07E-07	< 1.27E-07	< 4.88E-07	< 9.87E-08	< 8.41E-08	< 1.77E-07
Carbonyl Sulfide	00463-58-1	< 2.32E-07	< 1.61E-07	< 3.15E-07	< 1.22E-07	5.34E-07	1.59E-06	< 2.33E-07	2.24E-05	1.15E-06	< 2.44E-07	< 1.23E-07	8.14E-06	5.85E-07
Chlorobenzene	00108-90-7	< 4.64E-07	< 1.31E-07	< 2.57E-07	< 9.95E-08	< 2.04E-07	< 4.60E-07	< 4.75E-07	< 1.07E-07	< 1.27E-07	< 4.88E-07	< 9.87E-08	< 8.41E-08	< 1.77E-07
Chloroethane	00075-00-3	< 4.64E-07	< 1.31E-07	< 2.57E-07	< 9.95E-08	< 2.04E-07	< 4.60E-07	< 4.75E-07	< 1.07E-07	< 1.27E-07	< 4.88E-07	< 9.87E-08	< 8.41E-08	< 1.77E-07
Chloroform	00067-66-3	< 4.64E-07	< 1.31E-07	< 2.57E-07	< 9.95E-08	< 2.04E-07	< 4.60E-07	< 4.75E-07	< 1.07E-07	< 1.27E-07	< 4.88E-07	< 9.87E-08	< 8.41E-08	< 1.77E-07
Chloromethane	00074-87-3	< 4.64E-07	3.13E-08	< 2.57E-07	2.08E-08	< 2.04E-07	3.25E-07	< 4.75E-07	3.74E-08	3.17E-08	9.27E-08	< 9.87E-08	2.31E-08	6.43E-08
Cumene	00098-82-8	< 2.58E-08	< 1.82E-08	< 3.58E-08	< 1.38E-08	< 1.13E-08	< 6.38E-08	8.31E-08	9.65E-08	3.17E-06	8.81E-07	< 1.37E-08	9.05E-08	9.86E-08
Dibenzofuran	132-64-9	< 2.22E-09	2.11E-09	3.42E-08	1.41E-09	< 2.11E-09	3.31E-09	< 3.35E-09	< 1.91E-09	< 2.00E-09	< 2.13E-09	< 1.78E-09	< 1.36E-09	< 1.89E-09
Dimethylaminoazobenzene	60-11-7	< 1.45E-08	< 3.31E-09	< 2.87E-08	< 9.54E-09	< 1.54E-08	< 4.96E-09	< 2.72E-08	< 3.34E-09	< 3.94E-09	< 2.93E-09	< 2.91E-09	< 2.07E-09	< 3.56E-09
Dimethylphthalate	131-11-3	< 2.85E-09	< 2.30E-09	1.57E-08	1.56E-09	< 2.75E-09	< 4.18E-09	< 4.31E-09	< 2.39E-09	< 2.56E-09	< 2.58E-09	< 2.11E-09	< 1.76E-09	< 2.26E-09
Di-n-butylphthalate c	84-74-2	8.00E-08	1.61E-08	5.49E-08	0.00E+00	0.00E+00	1.50E-08	0.00E+00	7.47E-09	1.31E-09	1.47E-08	0.00E+00	5.94E-09	3.34E-07
Epichlorohydrin	00106-89-8	< 9.27E-07	< 2.62E-07	< 5.15E-07	< 1.99E-07	< 4.08E-07	< 9.19E-07	< 9.49E-07	< 2.14E-07	< 2.54E-07	< 9.76E-07	< 1.97E-07	< 1.68E-07	< 3.55E-07
Ethyl Acrylate b														
Ethylbenzene	00100-41-4	< 2.56E-08	1.45E-07	2.13E-07	1.17E-07	1.18E-07	2.43E-07	4.32E-06	1.11E-07	7.36E-08	< 6.74E-08	6.81E-08	5.74E-08	2.08E-07
Hexachlorobenzene	118-74-1	< 1.05E-08	< 6.59E-09	9.29E-09	< 5.11E-09	< 9.73E-09	< 1.16E-08	< 1.62E-08	< 7.05E-09	< 7.51E-09	< 6.75E-09	< 5.44E-09	< 4.71E-09	< 5.82E-09
Hexachlorobutadiene	00087-68-3	< 9.27E-07	< 2.62E-07	< 5.15E-07	< 1.99E-07	< 4.08E-07	< 9.19E-07	< 9.49E-07	< 2.14E-07	< 2.54E-07	< 9.76E-07	< 1.97E-07	< 1.68E-07	< 3.55E-07
Hexachlorocyclopentadiene	77-47-4	< 9.38E-09	< 9.79E-09	< 2.39E-08	< 5.52E-09	< 9.08E-09	< 2.11E-08	< 1.47E-08	< 1.40E-08	< 1.47E-08	< 1.29E-08	< 1.06E-08	< 1.02E-08	< 1.14E-08
Hexachloroethane	67-72-1	< 1.29E-08	< 8.63E-09	< 2.43E-08	< 6.05E-09	< 1.21E-08	< 1.73E-08	< 2.00E-08	< 1.10E-08	< 9.76E-09	< 9.72E-09	< 7.79E-09	< 6.78E-09	< 8.52E-09
Hydroquinone	123-31-9	< 1.07E-08	< 9.15E-09	< 2.13E-08	8.10E-07	2.62E-05	< 1.37E-08	< 1.68E-08	< 9.91E-09	< 9.63E-09	< 8.13E-09	< 6.62E-09	< 8.65E-09	< 7.12E-09
Isophorone	78-59-1	< 4.18E-09	8.63E-07	< 8.15E-09	5.93E-08	< 3.91E-09	< 5.48E-09	< 6.61E-09	< 3.17E-09	< 3.06E-09	< 3.27E-09	< 2.63E-09	< 2.11E-09	< 2.86E-09
Methylene bis chloroaniline	101-14-4	< 3.10E-08	< 7.29E-09	< 9.88E-08	< 2.02E-08	< 3.31E-08	< 9.74E-09	< 5.83E-08	< 6.61E-09	< 7.94E-09	< 5.75E-09	< 5.73E-09	< 4.14E-09	< 6.95E-09
Methylene Chloride	00075-09-2	1.10E-06	9.51E-07	3.84E-05	1.86E-06	4.18E-07	2.49E-06	1.14E-06	4.81E-07	6.98E-07	9.04E-08	5.00E-07	6.51E-07	2.22E-07
m,p-Xylenes	00108-38-3/00106-42-3	2.62E-07	5.79E-07	7.11E-07	5.15E-07	4.11E-07	6.24E-07	1.44E-05	4.35E-07	4.82E-07	1.08E-06	1.51E-07	3.65E-07	7.96E-07
Naphthalene	91-20-3	2.50E-08	3.31E-08	3.08E-07	1.73E-08	2.52E-07	5.11E-08	4.32E-08	2.72E-08	2.79E-08	8.18E-09	8.87E-09	3.02E-08	1.14E-08
n-Hexane	00110-54-3	8.24E-06	1.08E-06	1.58E-06	1.56E-06	5.91E-06	1.49E-06	1.08E-05	1.28E-06	3.21E-08	1.66E-06	2.84E-07	4.68E-07	2.05E-06
Nitrobenzene	98-95-3	< 7.80E-09	< 4.80E-09	< 1.40E-08	< 4.12E-09	< 7.21E-09	< 9.74E-09	< 1.23E-08	< 5.79E-09	< 5.63E-09	< 5.80E-09	2.02E-08	< 3.87E-09	< 5.07E-09
n-Nitrosodimethylamine c	62-75-9	0.00E+00	< 7.93E-09	< 4.50E-08	0.00E+00	0.00E+00	< 1.92E-08	0.00E+00	< 1.09E-08	< 9.76E-09	< 1.08E-08	< 8.68E-09	< 8.78E-09	< 8.49E-09
n-Nitrosomorpholine	59-89-2	< 1.15E-08	< 7.81E-09	< 2.10E-08	< 7.30E-09	< 1.08E-08	< 1.69E-08	< 1.80E-08	< 1.00E-08	< 8.88E-09	< 9.47E-09	< 7.60E-09	< 8.21E-09	< 8.30E-09
N,N-Dimethylaniline	121-69-7	< 4.57E-09	< 3.39E-09	< 8.87E-09	< 2.92E-09	< 4.22E-09	< 6.96E-09	< 7.09E-09	< 4.06E-09	< 3.84E-09	< 4.12E-09	< 3.33E-09	< 2.68E-09	< 3.61E-09
o-Anisidine	90-04-0	< 9.19E-09	< 6.01E-09	< 1.72E-08	< 8.15E-09	< 8.50E-09	< 1.25E-08	< 1.44E-08	< 7.35E-09	< 7.13E-09	< 7.44E-09	< 6.05E-09	< 4.89E-09	< 8.47E-09
o-Toluidine	95-53-4	< 4.82E-09	< 3.65E-09	< 1.14E-08	< 3.13E-09	< 4.51E-09	2.23E-07	< 7.47E-09	< 4.84E-09	< 4.25E-09	< 4.61E-09	< 3.71E-09	8.24E-08	< 4.10E-09
o-Xylene	00095-47-6	9.60E-08	3.89E-07	3.20E-07	3.77E-07	1.52E-07	9.51E-07	7.73E-06	1.55E-07	1.66E-07	3.91E-07	1.33E-07	1.68E-07	3.55E-07
Pentachloronitrobenzene	82-68-8	< 2.58E-08	< 2.09E-08	< 4.50E-08	< 1.67E-08	< 2.35E-08	< 3.36E-08	< 3.92E-08	< 2.06E-08	< 2.20E-08	< 1.96E-08	< 1.58E-08	< 1.38E-08	< 1.69E-08
Pentachlorophenol	87-86-5	< 1.80E-08	< 9.21E-09	< 3.66E-08	< 1.43E-08	< 1.71E-08	< 1.87E-08	< 2.85E-08	< 1.13E-08	< 1.21E-08	< 1.09E-08	< 8.82E-09	< 7.57E-09	4.53E-09
Phenol	108-95-2	7.21E-08	4.90E-08	2.77E-07	1.47E-08	7.61E-07	4.43E-08	2.39E-08	3.19E-08	5.95E-08	1.21E-08	9.20E-09	2.72E-08	4.20E-08
Propylene Oxide	00075-56-9	< 9.27E-07	< 2.62E-07	< 5.15E-07	< 1.99E-07	< 4.08E-07	< 9.19E-07	< 9.49E-07	< 2.14E-07	< 2.54E-07	< 9.76E-07	< 1.87E-07	< 1.68E-07	< 3.55E-07
Styrene	00100-42-5	< 2.51E-08	< 1.78E-08	< 3.49E-08	4.44E-08	< 1.10E-08	4.25E-06	< 2.57E-08	4.12E-08	1.63E-07	2.18E-07	5.01E-08	< 1.14E-08	5.40E-08
t-Butyl Methyl Ether	01634-04-4	< 9.27E-07	< 2.62E-07	< 5.15E-07	< 1.99E-07	< 4.08E-07	3.25E-07	< 9.49E-07	< 2.14E-07	< 2.54E-07	< 9.76E-07	< 1.97E-07	< 1.68E-07	< 3.55E-07
Tetrachloroethene	00127-18-4	< 4.64E-07	4.10E-06	9.65E-08	6.59E-08	< 2.04E-07	1.01E-07	< 4.75E-07	7.75E-08	1.13E-07	1.22E-07	2.41E-08	7.88E-08	1.33E-07
Toluene	00108-88-3	1.65E-06	2.06E-06	2.11E-06	5.99E-07	1.73E-06	5.45E-07	1.05E-06	1.32E-06	2.26E-06	1.84E-06	3.92E-07	5.72E-07	2.79E-06
Trichloroethene	00079-01-6	< 4.64E-07	< 1.31E-07	< 2.57E-07	< 9.95E-08	< 2.04E-07	< 4.60E-07	< 4.75E-07	< 1.07E-07	< 1.27E-07	< 4.88E-07	< 9.87E-08	< 8.41E-08	2.22E-07
Trifluralin	1582-09-8	< 1.23E-08	< 1.24E-08	< 3.16E-08	< 9.49E-09	< 1.19E-08	< 2.00E-08	< 1.85E-08	< 1.28E-08	< 1.35E-08	< 1.24E-08	< 1.02E-08	< 9.38E-09	< 1.10E-08
Vinyl Acetate	00108-05-4	< 4.64E-07	< 1.31E-07	< 2.57E-07	< 9.95E-08	2.35E-06	< 4.60E-07	< 4.75E-07	< 1.07E-07	< 1.27E-07	< 4.88E-07	< 9.87E-08	< 8.41E-08	< 1.77E-07
Vinyl Chloride	00075-01-4	< 4.64E-07	< 1.31E-07	< 2.57E-07	< 9.95E-08	< 2.04E-07	< 4.60E-07	< 4.75E-07	1.07E-07	< 1.27E-07	< 4.88E-07	< 9.87E-08	< 8.41E-08	< 1.77E-07
Chromium		3.18E-08	8.89E-09	5.81E-08	2.38E-08	2.72E-08	4.26E-09	1.23E-07	4.41E-09	1.53E-09	1.56E-08	ND	6.44E-09	6.58E-09
Nickel		4.92E-08	< 2.79E-08	9.53E-08	4.09E-08	2.47E-08	< 4.26E-08	< 4.91E-08	3.38E-08	< 3.05E-08	2.40E-08	< 2.33E-08	2.15E-08	3.42E-08
Cadmium		8.35E-09	2.40E-09	7.01E-09	2.55E-09	5.05E-09	2.18E-09	3.89E-09	9.09E-10	1.12E-09	4.08E-09	1.27E-09	7.29E-10	5.94E-10
Lead		6.35E-09	3.24E-10	1.25E-08	3.42E-09	2.03E-08	ND	1.03E-08	ND	ND	8.16E-09	5.51E-10	ND	7.10E-09

a Particulate matter collection efficiency of 99.3% was observed on a baghouse control device used on this process.

b Compounds detected only as tentatively identified compounds (TICs) in emissions from indicated rubber compounds. No applicable data for non-detects.

c Blank correction caused a negative value. A "O" is reported for these cases, but i~~n~~s not included in the statistics summary.

d Emission factor is a combination of emissions from productive and nonproductive passes. Emissions from nonproductive mixing are approximately 90% of the total.

TABLE 6.X-4. UNCONTROLLED EMISSION FACTORS FOR A MILL [a]

Pollutant Category	CAS Number	Cmpd. 2 lb/lb-rubber	Cmpd. 3 lb/lb-rubber	Cmpd. 4 lb/lb-rubber	Cmpd. 12 lb/lb-rubber	Mean lb/lb-rubber	Max. lb/lb-rubber
TOTAL VOCs		1.10E-04	1.12E-04	8.40E-05	1.71E-06	7.69E-05	1.12E-04
TOTAL SPECIATED ORGANICS		< 3.47E-05	< 4.39E-05	< 5.08E-05	< 9.61E-07	< 3.26E-05	< 5.08E-05
TOTAL HAPs		< 9.04E-06	< 2.31E-05	< 1.75E-05	< 1.49E-07	< 1.24E-05	< 2.31E-05
Individual HAPs:							
1,1,1-Trichloroethane	00071-55-6	3.32E-08	< 7.04E-08	< 6.63E-08	< 3.46E-09	< 4.33E-08	< 7.04E-08
1,2-Dibromo-3-chloropropane	96-12-8	< 9.32E-09	< 2.89E-08	< 8.82E-09	< 7.68E-11	< 1.18E-08	< 2.89E-08
1,2,4-Trichlorobenzene	120-82-1	< 5.25E-09	< 1.39E-08	< 4.33E-09	< 4.19E-11	< 5.89E-09	< 1.39E-08
1,3-Butadiene	106-99-0	< 2.08E-08	< 9.90E-09	< 9.33E-09	< 9.74E-11	< 1.00E-08	< 2.08E-08
1,4-Dichlorobenzene	106-46-7	< 4.07E-09	< 1.26E-08	< 3.84E-09	< 3.40E-11	< 5.13E-09	< 1.26E-08
2-Butanone	00078-93-3	8.12E-07	7.61E-08	4.06E-07	< 6.93E-09	< 3.25E-07	8.12E-07
2-Methylphenol	95-48-7	1.99E-08	< 1.87E-08	< 5.73E-09	2.31E-11	< 1.11E-08	1.99E-08
2,4-Dinitrophenol	105-67-9	< 3.06E-08	< 5.81E-08	< 2.01E-08	< 2.64E-10	< 2.73E-08	< 5.81E-08
2,4-Dinitrotoluene	121-14-2	< 7.74E-09	< 1.47E-08	< 5.08E-09	< 6.55E-11	< 6.89E-09	< 1.47E-08
2,4,5-Trichlorophenol	95-95-4	< 8.76E-09	< 1.66E-08	< 5.73E-09	< 6.26E-11	< 7.79E-09	< 1.66E-08
2,4,6-Trichlorophenol	88-06-2	< 8.87E-09	< 1.68E-08	< 5.83E-09	< 6.58E-11	< 7.88E-09	< 1.68E-08
3,3'-Dimethoxybenzidine	119-90-4	< 3.79E-09	< 1.08E-08	< 3.29E-09	< 7.37E-11	< 4.48E-09	< 1.08E-08
3,3'-Dimethylbenzidine	119-93-7	< 1.58E-09	< 4.49E-09	< 1.35E-09	< 2.43E-11	< 1.86E-09	< 4.49E-09
3/4-Methylphenol	108-39-4/106-44-5	5.58E-08	< 1.80E-08	1.13E-08	< 3.40E-11	< 2.13E-08	< 5.58E-08
4-Aminobiphenyl	92-67-1	< 2.49E-09	< 4.34E-09	< 1.54E-09	< 7.77E-11	< 2.11E-09	< 4.34E-09
4-Methyl-2-Pentanone	00108-10-1	1.57E-07	1.14E-06	9.12E-06	< 3.46E-09	< 2.61E-06	9.12E-06
4-Nitrobiphenyl	92-93-3	< 4.69E-09	< 8.08E-09	< 2.84E-09	< 4.32E-11	< 3.91E-09	< 8.08E-09
4-Nitrophenol	100-02-7	< 2.05E-08	< 3.89E-08	< 1.35E-08	< 2.00E-10	< 1.83E-08	< 3.89E-08
4,4'-Methylenedianiline	101-77-9	< 3.22E-09	< 9.13E-09	< 2.74E-09	< 5.31E-11	< 3.79E-09	< 9.13E-09
Acetonitrile	01722-09-4	< 2.95E-07	< 1.41E-07	< 1.33E-07	< 6.93E-09	< 1.44E-07	< 2.95E-07
Acetophenone	98-86-2	< 5.08E-09	2.80E-07	2.84E-08	3.06E-10	< 7.83E-08	2.80E-07
Acrolein	107-02-8	< 2.95E-07	< 1.41E-07	< 1.33E-07	< 6.93E-09	< 1.44E-07	< 2.95E-07
Acrylonitrile	00107-13-1	1.29E-07	< 1.41E-07	< 1.33E-07	< 6.93E-09	< 1.02E-07	< 1.41E-07
Allyl Chloride	00107-05-1	< 2.95E-07	< 1.41E-07	< 1.33E-07	< 6.93E-09	< 1.44E-07	< 2.95E-07
Aniline	62-53-3	7.50E-08	5.32E-06	3.48E-06	< 2.37E-10	< 2.22E-06	5.32E-06
Benzene	71-43-2	5.99E-08	1.76E-08	5.39E-08	3.47E-10	3.29E-08	5.99E-08
Benzidine	92-87-5	< 2.32E-09	< 6.58E-09	< 1.99E-09	< 3.19E-11	< 2.73E-09	< 6.58E-09
Benzyl Chloride	100-44-7	< 3.22E-09	< 9.88E-09	< 3.04E-09	< 6.93E-09	< 5.77E-09	< 9.88E-09
Biphenyl	92-52-4	3.55E-08	3.65E-08	4.16E-08	9.50E-11	2.84E-08	4.16E-08
bis(2-Ethylhexyl)phthalate	117-81-7	3.25E-08	8.63E-07	1.09E-07	1.41E-09	2.51E-07	8.63E-07
Bromoform	00075-25-2	< 1.48E-07	< 7.04E-08	< 6.63E-08	< 3.46E-09	< 7.19E-08	< 1.48E-07
Carbon Disulfide	00075-15-0	5.90E-07	9.67E-08	2.49E-07	1.76E-07	2.78E-07	5.90E-07
Carbon Tetrachloride	00056-23-5	< 1.48E-07	< 7.04E-08	< 6.63E-08	< 3.46E-09	< 7.19E-08	< 1.48E-07
Carbonyl Sulfide	463-58-1	8.38E-07	< 4.31E-07	< 2.40E-07	< 8.49E-10	< 3.77E-07	8.38E-07
Chlorobenzene	00108-90-7	< 1.48E-07	< 7.04E-08	< 6.63E-08	< 3.46E-09	< 7.19E-08	< 1.48E-07
Chloroform	00067-66-3	< 1.48E-07	< 7.04E-08	< 6.63E-08	< 3.46E-09	< 7.19E-08	< 1.48E-07
Cumene	98-82-8	< 2.37E-09	1.47E-08	1.44E-09	2.48E-11	< 4.63E-09	1.47E-08
Dibenzofuran	132-64-9	1.73E-08	< 4.19E-09	1.06E-08	< 3.53E-11	< 8.02E-09	1.73E-08
Dimethylphthalate	131-11-3	< 2.66E-09	7.21E-08	< 1.74E-09	< 2.08E-11	< 1.91E-08	7.21E-08
Di-n-butylphthalate	84-74-2	2.49E-09	1.37E-07	1.70E-07	2.22E-10	7.74E-08	1.70E-07
Epichlorohydrin	00106-89-8	< 2.95E-07	< 1.41E-07	< 1.33E-07	< 6.93E-09	< 1.44E-07	< 2.95E-07
Ethylbenzene	100-41-4	1.12E-07	< 9.71E-09	7.78E-08	2.61E-10	< 5.00E-08	1.12E-07
Hexachlorobenzene	118-74-1	< 7.46E-09	< 1.29E-08	< 4.58E-09	< 5.71E-11	< 6.24E-09	< 1.29E-08
Hexachlorobutadiene	87-68-3	< 8.36E-09	< 2.20E-08	< 6.88E-09	< 7.14E-11	< 9.33E-09	< 2.20E-08
Hexachlorocyclopentadiene	77-47-4	< 1.34E-08	< 2.54E-08	< 8.82E-09	< 8.55E-11	< 1.19E-08	< 2.54E-08
Hexachloroethane	67-72-1	< 8.93E-09	< 2.77E-08	< 8.42E-09	< 8.03E-11	< 1.13E-08	< 2.77E-08
Hydroquinone	123-31-9	< 7.51E-09	< 1.98E-08	< 6.18E-09	< 8.20E-11	< 8.38E-09	< 1.98E-08
Isophorone	78-59-1	6.50E-09	1.12E-05	3.07E-07	< 2.43E-11	< 2.88E-06	1.12E-05
Methylene Chloride	00075-09-2	1.01E-06	4.13E-07	6.80E-07	< 6.03E-08	< 5.42E-07	1.01E-06
m-Xylene + p-Xylene	108-38-3/106-42-3	6.11E-07	3.50E-08	2.56E-07	1.14E-09	2.26E-07	6.11E-07
Naphthalene	91-20-3	1.30E-07	3.73E-07	1.66E-07	2.87E-10	1.67E-07	3.73E-07

TABLE 6.X-4. UNCONTROLLED EMISSION FACTORS FOR A MILL [a]

Pollutant Category	CAS Number	Cmpd. 2 lb/lb-rubber	Cmpd. 3 lb/lb-rubber	Cmpd. 4 lb/lb-rubber	Cmpd. 12 lb/lb-rubber	Mean lb/lb-rubber	Max. lb/lb-rubber
n-Hexane	110-54-3	7.16E-07	1.21E-07	2.48E-07	2.94E-08	2.79E-07	7.16E-07
Nitrobenzene	98-95-3	< 5.37E-09	< 1.41E-08	< 4.38E-09	< 4.35E-11	< 5.97E-09	< 1.41E-08
n-Nitrosodimethylamine	62-75-9	< 9.94E-09	< 3.08E-08	< 9.42E-09	< 7.20E-11	< 1.26E-08	< 3.08E-08
n-Nitrosomorpholine	59-89-2	< 8.70E-09	< 2.69E-08	< 8.22E-09	< 7.18E-11	< 1.10E-08	< 2.69E-08
o-Anisidine	90-04-0	< 6.89E-09	< 1.81E-08	< 5.68E-09	< 5.59E-11	< 7.68E-09	< 1.81E-08
o-Toluidine	95-53-4	< 4.29E-09	< 1.32E-08	< 4.04E-09	< 3.41E-11	< 5.38E-09	< 1.32E-08
o-Xylene	95-47-6	3.46E-07	< 9.71E-09	1.37E-07	< 1.89E-10	< 1.23E-07	3.46E-07
Pentachloronitrobenzene	82-68-8	< 2.17E-08	< 3.74E-08	< 1.33E-08	< 1.88E-10	< 1.81E-08	< 3.74E-08
Pentachlorophenol	87-86-5	< 1.21E-08	< 2.08E-08	< 7.37E-09	< 7.82E-11	< 1.01E-08	< 2.08E-08
Phenol	108-95-2	4.65E-08	< 1.41E-08	< 4.28E-09	6.99E-10	< 1.64E-08	4.65E-08
Propylene Oxide	00075-56-9	< 2.95E-07	< 1.41E-07	< 1.33E-07	< 6.93E-09	< 1.44E-07	< 2.95E-07
Styrene	100-42-5	1.55E-07	< 9.53E-09	< 8.98E-09	< 9.38E-11	< 4.34E-08	1.55E-07
Tetrachloroethene	00127-18-4	8.39E-08	< 7.04E-08	< 6.63E-08	< 3.46E-09	< 5.60E-08	8.39E-08
Toluene	108-88-3	3.28E-07	3.71E-07	1.95E-07	3.88E-08	2.33E-07	3.71E-07
Trifluralin	1582-09-8	< 1.29E-08	< 2.44E-08	< 8.47E-09	< 1.18E-10	< 1.15E-08	< 2.44E-08
Vinyl Acetate	00108-05-4	< 1.48E-07	< 7.04E-08	< 6.63E-08	< 3.46E-09	< 7.19E-08	< 1.48E-07
Vinyl Chloride	00075-01-4	< 1.48E-07	< 7.04E-08	< 6.63E-08	< 3.46E-09	< 7.19E-08	< 1.48E-07

a To determine emission factors for compounds not listed in this table, multiply table 6.X-3 VOC data by 0.73, speciated organics by 0.33, and HAPs by 0.26.

TABLE 6.X-5. UNCONTROLLED EMISSION FACTORS FOR AN EXTRUDER AND ITS COOLING CONVEYOR [a]

Pollutant Category	CAS #	Cmpd. #4 lb/lb-rubber	Cmpd. #6 lb/lb-rubber	Cmpd. #9 lb/lb-rubber	Cmpd. #22 lb/lb-rubber	Mean lb/lb-rubber	Max. lb/lb-rubber
TOTAL VOC		8.35E-06	1.76E-05	1.73E-05	1.24E-05	1.39E-05	1.76E-05
TOTAL SPECIATED ORGANICS		< 1.50E-05	< 5.87E-05	< 2.77E-05	< 1.25E-05	< 2.85E-05	< 5.87E-05
TOTAL METAL HAPs		4.63E-07	1.05E-07	1.95E-07	7.57E-07	3.80E-07	7.57E-07
TOTAL ORGANIC HAPs		< 1.32E-05	< 3.70E-05	< 1.89E-05	< 9.14E-06	< 1.96E-05	< 3.70E-05
TOTAL PARTICULATE MATTER (PM)		2.38E-05	1.28E-06	5.75E-06	2.66E-05	1.44E-05	2.66E-05
TOTAL HAPs		< 1.37E-05	< 3.71E-05	< 1.91E-05	< 9.90E-06	< 2.00E-05	< 3.71E-05
Individual HAPs:							
1,1,1-Trichloroethane	71-55-6	< 8.47E-08	< 3.31E-08	< 1.08E-07	< 6.56E-08	< 8.77E-08	< 1.08E-07
1,2-Dibromo-3-Chloropropane	96-12-8	< 2.38E-07	< 2.00E-07	< 1.66E-07	< 1.32E-07	< 1.84E-07	< 2.38E-07
1,2,4-Trichlorobenzene	120-82-1	< 2.51E-08	< 6.79E-09	< 1.66E-08	< 8.57E-09	< 1.43E-08	< 2.51E-08
1,3-Butadiene	00106-99-0	< 9.92E-08	5.06E-07	< 6.01E-08	< 7.83E-08	< 1.83E-07	5.06E-07
1,4-Dichlorobenzene	106-46-7	< 1.20E-08	< 5.96E-09	< 1.36E-08	1.97E-09	< 8.36E-09	< 1.36E-08
2-Butanone	78-93-3	1.34E-07	1.17E-07	1.18E-07	9.29E-08	1.15E-07	1.34E-07
2-Chloroacetophenone	532-27-4	< 1.24E-08	< 3.54E-09	< 5.55E-09	3.70E-09	< 6.29E-09	< 1.24E-08
2-Chloronaphthalene	1335-88-2	< 1.29E-08	< 3.28E-09	< 6.43E-09	1.07E-09	< 5.93E-09	< 1.29E-08
2,4-Dinitrophenol	5-12-85	< 1.48E-07	< 3.30E-08	< 9.51E-08	< 6.64E-08	< 8.57E-08	< 1.48E-07
2,4-Dinitrotoluene	121-14-2	< 3.65E-08	< 8.85E-09	< 2.42E-08	< 1.26E-08	< 2.05E-08	< 3.65E-08
2,4,5-Trichlorophenol	95-95-4	< 4.37E-08	< 9.62E-09	< 2.82E-08	< 1.59E-08	< 2.44E-08	< 4.37E-08
2,4,6-Trichlorophenol	88-06-2	< 4.15E-08	< 9.79E-09	< 2.72E-08	< 1.57E-08	< 2.36E-08	< 4.15E-08
3,3'-Dimethoxybenzidine	119-90-4	< 5.49E-08	< 3.00E-08	< 4.69E-08	< 4.19E-08	< 4.34E-08	< 5.49E-08
3,3'-Dimethylbenzidine	119-93-7	< 2.34E-08	< 8.25E-09	< 1.74E-08	< 1.45E-08	< 1.59E-08	< 2.34E-08
3/4-Methylphenol	108-39-4/106-44-5	< 2.24E-08	< 8.85E-09	< 1.87E-08	2.87E-09	< 1.32E-08	< 2.24E-08
4-Aminobiphenyl	92-67-1	< 1.76E-08	< 4.22E-09	< 1.18E-08	< 6.53E-09	< 1.01E-08	< 1.76E-08
4-Methyl-2-Pentanone	108-10-1	5.54E-06	2.66E-06	2.85E-07	1.61E-06	2.52E-06	5.54E-06
4-Nitrobiphenyl	92-93-3	< 3.61E-08	< 9.26E-09	< 2.61E-08	< 1.35E-08	< 2.12E-08	< 3.61E-08
4-Nitrophenol	100-02-7	< 1.11E-07	< 2.80E-08	< 7.22E-08	< 6.39E-08	< 6.87E-08	< 1.11E-07
4,4'-Methylenedianiline	107-77-9	< 4.81E-08	< 1.63E-08	< 3.55E-08	< 3.08E-08	< 3.27E-08	< 4.81E-08
Acetonitrile	75-05-8	< 2.38E-07	< 3.19E-07	< 1.66E-07	< 1.32E-07	< 2.14E-07	< 3.19E-07
Acetophenone	98-86-2	2.09E-08	3.04E-06	8.18E-06	1.61E-08	2.81E-06	8.18E-06
Acrolein	107-02-8	< 3.33E-07	< 3.10E-07	< 1.75E-07	< 1.66E-07	< 2.46E-07	< 3.33E-07
Acrylonitrile	107-13-1	< 2.38E-07	< 2.00E-07	< 1.66E-07	< 1.32E-07	< 1.84E-07	< 2.38E-07
Allyl Chloride	107-05-1	< 2.38E-07	< 2.00E-07	< 4.20E-07	< 1.32E-07	< 2.48E-07	< 4.20E-07
Aniline	62-53-3	4.66E-07	1.87E-07	< 8.72E-09	2.21E-07	< 2.21E-07	4.66E-07
Benzene	00071-43-2	< 4.46E-08	2.69E-07	7.51E-08	1.22E-07	< 1.28E-07	2.69E-07
Benzidine	92-87-5	< 2.73E-08	< 9.87E-09	< 2.08E-08	< 1.71E-08	< 1.88E-08	< 2.73E-08
Benzyl Chloride	100-44-7	< 2.38E-07	< 1.83E-07	< 1.66E-07	< 1.32E-07	< 1.80E-07	< 2.38E-07
Biphenyl	92-52-4	4.61E-09	1.42E-08	3.27E-09	4.42E-09	< 6.62E-09	1.42E-08
bis(2-Ethylhexyl)phthalate	117-81-7	9.28E-08	1.00E-07	6.70E-08	1.48E-07	1.02E-07	1.48E-07
Bromoform	75-25-2	< 1.19E-07	< 1.00E-07	< 9.02E-08	< 6.60E-08	< 9.38E-08	< 1.19E-07
Carbon Disulfide	75-15-0	1.09E-07	< 2.66E-07	9.60E-08	1.16E-07	< 1.47E-07	< 2.66E-07
Carbon Tetrachloride	56-23-5	< 1.19E-07	< 1.00E-07	< 9.02E-08	< 6.60E-08	< 9.38E-08	< 1.19E-07
Carbonyl Sulfide	463-58-1	< 1.33E-07	< 2.46E-07	< 1.11E-07	< 8.77E-08	< 1.44E-07	< 2.46E-07
Chlorobenzene	108-90-7	< 1.19E-07	< 1.00E-07	< 9.02E-08	< 6.60E-08	< 9.38E-08	< 1.19E-07
Chloroform	67-66-3	< 1.19E-07	< 1.00E-07	< 8.77E-08	< 6.89E-08	< 9.39E-08	< 1.19E-07
Chloromethane	74-87-3	< 7.06E-08	6.64E-08	< 6.11E-08	1.83E-07	< 9.52E-08	1.83E-07
Cumene	98-82-8	6.35E-09	1.11E-07	1.48E-06	3.59E-08	4.09E-07	1.48E-06
Dibenzofuran	38178-38-0	< 5.50E-09	2.81E-09	< 5.22E-09	2.58E-09	< 4.03E-09	< 5.50E-09
Dimethylphthalate	131-11-13	< 1.16E-08	3.83E-09	< 6.58E-09	< 4.15E-09	< 6.55E-09	< 1.16E-08
Di-n-butylphthalate	84-74-2	8.19E-08	1.96E-07	3.65E-07	< 7.49E-08	< 1.79E-07	3.65E-07
Epichlorohydrin	106-89-8	< 2.38E-07	< 1.83E-07	< 1.66E-07	< 1.32E-07	< 1.80E-07	< 2.38E-07
Ethylbenzene	00100-41-4	< 3.30E-08	8.10E-08	3.03E-08	< 3.57E-07	< 1.25E-07	< 3.57E-07
Hexachlorobenzene	118-74-1	< 3.43E-08	< 9.35E-09	< 2.37E-08	< 1.23E-08	< 1.99E-08	< 3.43E-08
Hexachlorobutadiene	87-68-3	< 4.22E-08	< 1.04E-08	7.17E-08	< 1.46E-08	< 3.47E-08	7.17E-08
Hexachlorocyclopentadiene	77-47-4	< 4.71E-08	< 1.08E-08	< 3.08E-08	< 1.50E-08	< 2.59E-08	< 4.71E-08
Hexachloroethane	67-72-1	< 4.14E-08	< 1.22E-08	< 2.87E-08	< 1.56E-08	< 2.45E-08	< 4.14E-08
Hydroquinone	123-31-9	< 4.06E-08	< 9.51E-09	< 2.58E-08	< 1.69E-08	< 2.32E-08	< 4.06E-08

TABLE 6.X-5. UNCONTROLLED EMISSION FACTORS FOR AN EXTRUDER AND ITS COOLING CONVEYOR [a]

Pollutant Category	CAS #	Cmpd. #4 lb/lb-rubber	Cmpd. #6 lb/lb-rubber	Cmpd. #9 lb/lb-rubber	Cmpd. #22 lb/lb-rubber	Mean lb/lb-rubber	Max. lb/lb-rubber
Isophorone	78-59-1	2.85E-08	< 3.78E-09	< 7.99E-09	6.35E-08	< 2.59E-08	6.35E-08
Methylene Chloride	79-09-2	1.60E-06	1.32E-05	2.44E-06	< 8.18E-08	< 4.32E-06	1.32E-05
m-Xylene + p-Xylene	00108-38-3/00106-42-3	< 7.65E-08	3.32E-07	1.53E-07	6.00E-08	< 1.55E-07	3.32E-07
Naphthalene	91-20-3	6.66E-08	1.77E-07	7.81E-07	6.04E-08	2.71E-07	7.81E-07
n-Hexane	110-54-3	1.02E-07	3.94E-07	8.38E-07	2.45E-06	9.46E-07	2.45E-06
Nitrobenzene	98-95-3	< 2.20E-08	< 6.81E-09	< 1.52E-08	< 8.14E-09	< 1.30E-08	< 2.20E-08
n-Nitrosodimethylamine	62-75-9	< 8.72E-08	< 1.79E-08	< 5.65E-08	< 2.06E-08	< 4.56E-08	< 8.72E-08
n-Nitrosomorpholine	59-89-2	< 3.77E-08	< 9.86E-09	< 2.54E-08	< 1.43E-08	< 2.18E-08	< 3.77E-08
o-Anisidine	90-04-0	< 3.34E-08	< 1.04E-08	< 2.30E-08	< 1.17E-08	< 1.96E-08	< 3.34E-08
o-Toluidine	95-53-4	< 1.84E-08	< 1.18E-07	< 1.26E-08	< 6.63E-09	< 3.89E-08	< 1.18E-07
o-Xylene	00095-47-6	4.14E-08	2.58E-07	7.55E-08	4.77E-07	2.13E-07	4.77E-07
Pentachloronitrobenzene	82-68-8	< 1.05E-07	< 2.72E-08	< 7.17E-08	< 4.10E-08	< 6.13E-08	< 1.05E-07
Pentachlorophenol	87-86-5	< 8.37E-08	< 1.89E-08	< 5.47E-08	< 3.85E-08	< 4.89E-08	< 8.37E-08
Phenol	108-95-2	1.20E-07	1.42E-07	1.73E-07	1.17E-08	1.12E-07	1.73E-07
Propylene Oxide	75-56-9	< 2.38E-07	< 1.85E-06	< 2.36E-07	< 5.04E-07	< 7.08E-07	< 1.85E-06
Styrene	00100-42-5	< 1.07E-08	7.25E-07	< 2.38E-08	< 3.93E-08	< 2.00E-07	7.25E-07
Tetrachloroethene	127-18-4	< 1.07E-07	< 9.47E-08	< 7.39E-08	< 2.02E-07	< 1.20E-07	< 2.02E-07
Toluene	00108-88-3	< 1.16E-07	9.26E-06	< 9.02E-08	< 7.09E-08	< 2.38E-06	9.26E-06
Trifluralin	1582-09-8	< 6.39E-08	< 1.45E-08	< 4.18E-08	< 1.95E-08	< 3.49E-08	< 6.39E-08
Vinyl Acetate	108-05-4	< 1.19E-07	< 1.00E-07	< 1.05E-07	< 6.60E-08	< 9.74E-08	< 1.19E-07
Vinyl Chloride	75-01-4	< 1.19E-07	< 1.00E-07	< 8.07E-08	< 6.34E-08	< 9.08E-08	< 1.19E-07
Chromium		2.45E-07	2.25E-08	7.81E-08	2.54E-07	1.50E-07	2.54E-07
Cobalt		1.90E-08	9.92E-09	1.51E-08	1.04E-08	1.36E-08	1.90E-08
Nickel		1.99E-07	7.24E-08	1.02E-07	4.93E-07	2.16E-07	4.93E-07

a To determine emission factors for compounds not listed in this table, multiply table 6.X-3 VOC data by 0.13, speciated organics by 0.29, metal HAPs by 6.62, organic HAPs by 0.41, PM by 0.04 and HAPs by 0.42,.

TABLE 6.X-6. UNCONTROLLED EMISSION FACTORS FOR A CALENDER [a,b]

Pollutant Category	CAS Number	Cmpd. 2 lb/lb rubber	Cmpd. 12 lb/lb rubber	Mean lb/lb rubber	Max. lb/lb rubber
TOTAL VOCs		5.31E-05	4.67E-06	2.89E-05	5.31E-05
TOTAL SPECIATED ORGANICS		< 7.34E-05	< 4.49E-06	< 3.89E-05	< 7.34E-05
TOTAL HAPs		< 1.34E-05	< 3.49E-06	< 8.43E-06	< 1.34E-05
Individual HAPs:					
1,1,1-Trichloroethane	71-55-6	< 5.27E-08	< 2.12E-08	< 3.70E-08	< 5.27E-08
1,2-Dibromo-3-Chloropropane	00096-12-8	< 1.56E-07	< 4.24E-08	< 9.94E-08	< 1.56E-07
1,2-Dichloroethane	107-06-2	1.22E-07	< 2.12E-08	< 7.18E-08	1.22E-07
1,2,4-Trichlorobenzene	120-82-1	< 2.62E-09	< 3.47E-11	< 1.33E-09	< 2.62E-09
1,3-Butadiene	106-99-0	< 1.10E-08	< 1.19E-10	< 5.56E-09	< 1.10E-08
1,4-Dichlorobenzene	106-46-7	< 5.54E-08	< 2.12E-08	< 3.83E-08	< 5.54E-08
2-Butanone	78-93-3	< 2.61E-07	< 4.24E-08	< 1.52E-07	< 2.61E-07
2-Methylphenol	95-48-7	< 1.91E-09	1.86E-10	< 1.05E-09	< 1.91E-09
2,4-Dinitrophenol	51-28-5	< 1.01E-08	< 1.87E-10	< 5.16E-09	< 1.01E-08
2,4-Dinitrotoluene	121-14-2	< 3.19E-09	< 4.96E-11	< 1.62E-09	< 3.19E-09
2,4,5-Trichlorophenol	95-95-4	< 3.41E-09	< 4.19E-11	< 1.73E-09	< 3.41E-09
2,4,6-Trichlorophenol	88-06-2	< 3.60E-09	< 4.32E-11	< 1.82E-09	< 3.60E-09
3,3'-Dimethoxybenzidine	119-90-4	< 6.00E-09	< 3.54E-11	< 3.02E-09	< 6.00E-09
3,3'-Dimethylbenzidine	119-93-7	< 2.18E-09	< 1.15E-11	< 1.09E-09	< 2.18E-09
3/4-Methylphenol	108-39-4/106-44-5	< 1.76E-09	1.26E-10	< 9.41E-10	< 1.76E-09
4-Aminobiphenyl	92-67-1	< 1.94E-09	1.27E-09	< 1.61E-09	< 1.94E-09
4-Methyl-2-pentanone	108-10-1	< 6.42E-07	< 2.12E-08	< 3.31E-07	< 6.42E-07
4-Nitrobiphenyl	92-93-3	< 3.19E-09	< 2.86E-11	< 1.61E-09	< 3.19E-09
4-Nitrophenol	100-02-7	< 5.10E-09	< 1.40E-10	< 2.62E-09	< 5.10E-09
4,4'-Methylenedianiline	101-77-9	< 3.77E-09	< 2.44E-11	< 1.90E-09	< 3.77E-09
Acetonitrile	01722-09-4	< 1.56E-07	< 4.24E-08	< 9.94E-08	< 1.56E-07
Acetophenone	98-86-2	4.94E-07	1.17E-09	2.48E-07	4.94E-07
Acrolein	107-02-8	< 1.29E-07	< 4.24E-08	< 8.56E-08	< 1.29E-07
Acrylonitrile	00107-13-1	< 1.56E-07	< 4.24E-08	< 9.94E-08	< 1.56E-07
Allyl Chloride	00107-05-1	< 1.56E-07	< 4.24E-08	< 9.94E-08	< 1.56E-07
Aniline	62-53-3	< 9.44E-08	9.64E-09	< 5.20E-08	< 9.44E-08
Benzene	71-43-2	4.54E-08	1.33E-09	2.34E-08	4.54E-08
Benzidine	92-87-5	< 1.96E-09	< 1.27E-11	< 9.85E-10	< 1.96E-09
Benzyl Chloride	00100-44-7	< 1.56E-07	< 4.24E-08	< 9.94E-08	< 1.56E-07
Biphenyl	92-52-4	1.78E-08	8.88E-10	9.33E-09	1.78E-08
bis(2-Ethylhexyl)phthalate	117-81-7	7.34E-07	9.35E-10	3.68E-07	7.34E-07
Bromoform	00075-25-2	< 7.82E-08	< 2.12E-08	< 4.97E-08	< 7.82E-08
Carbon Disulfide	75-15-0	2.41E-06	2.61E-06	2.51E-06	2.61E-06
Carbon Tetrachloride	00056-23-5	< 7.82E-08	< 2.12E-08	< 4.97E-08	< 7.82E-08
Carbonyl Sulfide	463-58-1	< 9.58E-08	4.19E-08	< 6.88E-08	< 9.58E-08
Chlorobenzene	00108-90-7	< 7.82E-08	< 2.12E-08	< 4.97E-08	< 7.82E-08
Chloroform	00067-66-3	< 7.82E-08	< 2.12E-08	< 4.97E-08	< 7.82E-08
Chloromethane	74-87-3	2.18E-08	< 2.12E-08	< 2.15E-08	2.18E-08

TABLE 6.X-6. UNCONTROLLED EMISSION FACTORS FOR A CALENDER [a,b]

Pollutant Category	CAS Number	Cmpd. 2 lb/lb rubber	Cmpd. 12 lb/lb rubber	Mean lb/lb rubber	Max. lb/lb rubber
Cumene	98-82-8	6.31E-08	7.05E-10	3.19E-08	6.31E-08
Dibenzofuran	132-64-9	< 9.38E-10	< 1.97E-10	< 5.67E-10	< 9.38E-10
Di-n-butylphthalate	84-74-2	0.00E+00	2.62E-10	2.62E-10	2.62E-10
Epichlorohydrin	00106-89-8	< 1.56E-07	< 4.24E-08	< 9.94E-08	< 1.56E-07
Ethylbenzene	100-41-4	1.57E-07	2.06E-09	7.94E-08	1.57E-07
Hexachlorobenzene	118-74-1	< 2.78E-09	< 3.45E-11	< 1.41E-09	< 2.78E-09
Hexachlorobutadiene	00087-68-3	< 1.56E-07	< 4.24E-08	< 9.94E-08	< 1.56E-07
Hexachlorocyclopentadiene	77-47-4	< 5.80E-09	< 5.55E-11	< 2.93E-09	< 5.80E-09
Hexachloroethane	67-72-1	< 3.48E-09	< 6.47E-11	< 1.77E-09	< 3.48E-09
Hydroquinone	123-31-9	< 3.95E-08	< 6.47E-11	< 1.98E-08	< 3.95E-08
Isophorone	78-59-1	1.30E-07	< 1.98E-11	< 6.51E-08	1.30E-07
Methylene Chloride	75-09-2	< 7.96E-08	< 3.55E-08	< 5.75E-08	< 7.96E-08
m-Xylene + p-Xylene	108-38-3/106-42-3	2.86E-07	6.09E-09	1.46E-07	2.86E-07
Naphthalene	91-20-3	1.21E-07	2.21E-09	6.15E-08	1.21E-07
n-Hexane	110-54-3	5.59E-07	3.83E-08	2.99E-07	5.59E-07
Nitrobenzene	98-95-3	< 2.38E-09	< 3.55E-11	< 1.21E-09	< 2.38E-09
n-Nitrosodimethylamine	62-75-9	< 7.41E-09	< 5.57E-11	< 3.74E-09	< 7.41E-09
n-Nitrosomorpholine	59-89-2	< 6.51E-09	< 5.94E-11	< 3.28E-09	< 6.51E-09
o-Anisidine	90-04-0	< 5.78E-09	< 4.74E-11	< 2.91E-09	< 5.78E-09
o-Toluidine	95-53-4	< 3.22E-09	< 2.84E-11	< 1.63E-09	< 3.22E-09
o-Xylene	95-47-6	2.84E-07	2.45E-09	1.43E-07	2.84E-07
Pentachloronitrobenzene	82-68-8	< 2.03E-08	< 1.22E-10	< 1.02E-08	< 2.03E-08
Pentachlorophenol	87-86-5	< 3.51E-09	< 4.63E-11	< 1.78E-09	< 3.51E-09
Phenol	108-95-2	1.49E-07	< 2.72E-11	< 7.44E-08	1.49E-07
Propylene Oxide	00075-56-9	< 1.56E-07	< 4.24E-08	< 9.94E-08	< 1.56E-07
Styrene	100-42-5	4.86E-07	7.73E-10	2.43E-07	4.86E-07
Tetrachloroethene	00127-18-4	< 7.82E-08	< 2.12E-08	< 4.97E-08	< 7.82E-08
Toluene	108-88-3	3.92E-06	5.73E-08	1.99E-06	3.92E-06
Trifluralin	1582-09-8	< 1.01E-08	< 8.80E-11	< 5.11E-09	< 1.01E-08
Vinyl Acetate	00108-05-4	< 7.82E-08	< 2.12E-08	< 4.97E-08	< 7.82E-08
Vinyl Chloride	00075-01-4	< 7.82E-08	< 2.12E-08	< 4.97E-08	< 7.82E-08

a Warm up mill for the calender is not included, see table 6.X-4 for its emission factor.

b To determine emission factors for compounds not listed in this table, multiply table 6.X-3 VOC data by 0.27, speciated organics by 0.40, and HAPs by 0.18.

TABLE 6.X-7. UNCONTROLLED EMISSION FACTORS FOR A TIRE CURING PRESS [a]

Pollutant Category	CAS Numbers	Type A lb/lb rubber	Type B lb/lb rubber	Type C lb/lb rubber	Type D lb/lb rubber	Type E lb/lb rubber	Type F [b] lb/lb rubber	Type G lb/lb rubber	Type H lb/lb-rubber	Type I lb/lb-rubber	Mean lb/lb-rubber	Max. lb/lb-rubber
TOTAL VOCs		3.37E-04	2.51E-04	1.68E-04	2.08E-04	1.64E-04	1.73E-04	2.07E-04	2.61E-04	1.87E-04	2.26E-04	3.37E-04
TOTAL SPECIATED ORGANICS		< 1.48E-04	< 1.57E-04	< 1.12E-04	< 1.66E-04	< 1.71E-04	< 2.76E-04	< 2.11E-04	< 3.15E-04	< 1.91E-04	< 1.94E-04	< 3.15E-04
TOTAL HAPs		< 8.78E-05	< 7.23E-05	< 4.40E-05	< 1.01E-04	< 1.04E-04	< 1.31E-04	< 8.16E-05	< 1.58E-04	< 8.31E-05	< 9.59E-05	< 1.58E-04
Individual HAPs:												
1,1-Dichloroethane	75-34-3	< 2.11E-07	< 2.54E-07	2.50E-07	< 2.10E-07	< 2.12E-07	7.64E-08	< 1.80E-07	< 1.89E-07	< 1.98E-07	< 2.13E-07	< 2.54E-07
1,1 Dichloroethene	75-35-4	< 2.11E-07	< 2.54E-07	2.50E-07	< 2.10E-07	< 2.12E-07	5.62E-07	< 1.80E-07	< 1.89E-07	< 1.98E-07	< 2.13E-07	< 2.54E-07
1,1,1-Trichloroethane [b]	71-55-6	7.02E-08	< 2.54E-07	1.85E-07	< 2.10E-07	4.25E-07	4.04E-05	1.33E-07	1.66E-07	1.31E-07	< 1.98E-07	4.25E-07
1,1,2-Trichloroethane	79-00-5	< 2.11E-07	< 2.54E-07	2.50E-07	< 2.10E-07	< 2.12E-07	< 1.80E-07	< 1.80E-07	< 1.89E-07	< 1.98E-07	< 2.13E-07	< 2.54E-07
1,1,2,2-Tetrachloroethane	79-34-5	< 2.11E-07	< 2.54E-07	2.50E-07	2.10E-07	< 2.12E-07	< 1.80E-07	< 1.80E-07	< 1.89E-07	< 1.98E-07	< 2.13E-07	< 2.54E-07
1,2-Dibromo-3-Chloropropane	96-12-8	< 4.23E-07	< 5.08E-07	5.00E-07	4.19E-07	< 4.25E-07	< 3.59E-07	< 3.60E-07	< 3.70E-07	< 3.97E-07	< 4.26E-07	< 5.08E-07
1,2-Dibromoethane	106-93-4	< 2.11E-07	< 2.54E-07	2.50E-07	< 2.10E-07	< 2.12E-07	< 1.80E-07	< 1.80E-07	< 1.89E-07	< 1.98E-07	< 2.13E-07	< 2.54E-07
1,2 Dichloroethane	107-06-2	< 2.11E-07	< 2.54E-07	2.50E-07	< 2.10E-07	< 2.12E-07	< 1.80E-07	< 1.80E-07	< 1.89E-07	< 1.98E-07	< 2.13E-07	< 2.54E-07
1,2-Dichloropropane	78-87-5	< 2.11E-07	< 2.54E-07	2.50E-07	< 2.10E-07	< 2.12E-07	< 1.80E-07	< 1.80E-07	< 1.89E-07	< 1.98E-07	< 2.13E-07	< 2.54E-07
1,2,4-Trichlorobenzene	00120-82-1	< 9.29E-09	7.76E-09	< 4.77E-09	< 9.60E-09	< 9.16E-09	< 7.02E-09	< 9.30E-09	< 9.09E-09	< 1.20E-08	< 8.99E-09	< 1.29E-08
1,3-Butadiene	106-99-0	< 4.23E-07	< 5.08E-07	5.00E-07	< 4.19E-07	< 4.25E-07	< 3.59E-07	< 3.60E-07	< 3.70E-07	< 3.97E-07	< 4.26E-07	< 5.08E-07
1,4 Dichlorobenzene	00106-46-7	4.98E-09	6.15E-09	2.50E-07	< 9.12E-09	< 4.15E-09	6.51E-07	5.62E-08	6.49E-10	8.62E-09	< 4.25E-08	2.50E-07
1,4-Dioxane	123-91-1	< 8.45E-07	< 1.02E-06	1.00E-06	< 8.39E-07	< 8.49E-07	< 7.19E-07	< 7.20E-07	< 7.58E-07	< 7.94E-07	< 8.53E-07	< 1.02E-06
2-Butanone	78-93-3	3.96E-07	4.34E-07	4.86E-07	8.91E-07	1.03E-06	1.48E-06	6.07E-07	1.66E-06	7.69E-07	7.84E-07	1.66E-06
2-Methylphenol	00095-48-7	1.08E-08	1.39E-08	5.90E-09	< 1.18E-08	< 1.15E-08	< 1.02E-08	7.52E-09	1.95E-08	< 1.59E-08	< 1.21E-08	1.95E-08
3/4-Methylphenol	00108-39-4/00106-44-5	< 1.13E-08	3.97E-08	< 5.69E-09	< 1.14E-08	< 1.10E-08	< 5.89E-09	3.16E-09	1.49E-08	< 1.52E-08	< 1.40E-08	3.97E-08
4-Methyl-2-Pentanone	108-10-1	1.40E-05	1.96E-05	1.04E-05	1.26E-05	9.82E-06	9.21E-06	1.28E-05	1.63E-05	8.93E-06	1.31E-05	1.96E-05
Acetonitrile	75-05-8	< 4.23E-07	< 5.08E-07	5.00E-07	< 4.19E-07	< 4.25E-07	< 3.59E-07	< 3.60E-07	< 3.79E-07	< 3.97E-07	< 4.26E-07	< 5.08E-07
Acetophenone	00098-86-2	7.50E-08	1.50E-07	8.96E-08	1.33E-07	7.05E-08	1.08E-07	1.21E-07	1.31E-07	1.22E-07	1.11E-07	1.50E-07
Acrolein	107-02-8	< 4.23E-07	< 4.39E-07	4.86E-07	< 4.19E-07	< 4.25E-07	< 3.59E-07	< 3.60E-07	< 3.79E-07	< 3.97E-07	< 4.16E-07	4.86E-07
Acrylonitrile	107-13-1	< 4.23E-07	< 5.08E-07	5.00E-07	< 4.19E-07	< 4.25E-07	< 3.59E-07	< 3.60E-07	< 3.79E-07	< 3.97E-07	< 4.26E-07	< 5.08E-07
Allyl Chloride	107-05-1	< 4.23E-07	< 5.08E-07	5.00E-07	< 4.19E-07	< 4.25E-07	< 3.59E-07	< 3.60E-07	< 3.79E-07	< 3.97E-07	< 4.26E-07	< 5.08E-07
Aniline	00062-53-3	1.76E-06	2.56E-06	5.74E-07	5.73E-06	7.40E-07	4.36E-06	6.99E-07	3.36E-07	7.57E-06	< 2.50E-06	7.57E-06
Benzene	71-43-2	1.98E-07	< 2.33E-07	2.71E-07	2.07E-07	4.25E-07	3.37E-07	5.40E-07	4.74E-07	4.96E-07	< 3.55E-07	5.40E-07
Benzyl Chloride	100-44-7	< 5.75E-09	< 2.01E-08	5.00E-07	< 5.69E-09	< 5.54E-09	4.42E-08	< 5.56E-09	< 5.41E-09	< 7.85E-09	< 6.95E-08	5.00E-07
Biphenyl	00092-52-4	9.53E-08	6.98E-08	4.93E-08	4.05E-08	4.43E-08	< 2.39E-08	6.98E-08	4.81E-08	< 7.09E-09	< 5.30E-08	9.53E-08
bis(2-Ethylhexyl)phthalate	00117-81-7	1.14E-07	1.60E-06	1.36E-07	2.41E-08	< 9.48E-08	< 6.05E-08	< 7.04E-08	2.10E-08	3.98E-08	< 2.63E-07	1.60E-06
Bromoform	75-25-2	< 2.11E-07	< 2.54E-07	2.50E-07	< 2.10E-07	< 2.12E-07	< 1.80E-07	< 1.80E-07	< 1.89E-07	< 1.98E-07	< 2.13E-07	< 2.54E-07
Bromomethane	74-83-9	1.14E-07	< 2.54E-07	2.50E-07	7.08E-08	< 2.12E-07	< 1.80E-07	< 1.80E-07	< 1.89E-07	< 1.98E-07	< 1.84E-07	< 2.54E-07
Carbon Disulfide	75-15-0	2.56E-05	9.01E-06	3.49E-06	7.34E-07	7.70E-06	4.72E-07	6.07E-06	6.87E-06	2.08E-06	7.70E-06	2.56E-05
Carbon Tetrachloride	56-23-5	< 2.11E-07	< 2.54E-07	2.50E-07	< 2.10E-07	< 2.12E-07	< 1.80E-07	< 1.80E-07	< 1.89E-07	< 1.98E-07	< 2.13E-07	< 2.54E-07
Carbonyl Sulfide	463-58-1	1.09E-06	< 4.59E-07	< 4.04E-07	< 2.57E-07	< 2.60E-07	< 4.49E-07	< 2.20E-07	< 4.74E-07	< 2.43E-07	< 4.37E-07	1.09E-06
Chlorobenzene	108-90-7	< 2.11E-07	< 2.54E-07	2.50E-07	< 2.10E-07	< 2.12E-07	< 1.80E-07	< 1.80E-07	< 1.89E-07	< 1.98E-07	< 2.13E-07	< 2.54E-07
Chloroethane	75-00-3	< 2.11E-07	< 2.54E-07	2.50E-07	< 2.10E-07	< 2.12E-07	< 1.80E-07	< 1.80E-07	< 1.89E-07	< 1.98E-07	< 2.13E-07	< 2.54E-07
Chloroform	67-66-3	< 2.11E-07	< 2.54E-07	2.50E-07	< 2.10E-07	< 2.12E-07	< 1.80E-07	6.52E-08	< 1.89E-07	< 1.98E-07	< 1.99E-07	< 2.54E-07
Chloromethane	74-87-3	9.77E-08	< 2.54E-07	8.34E-08	8.91E-08	< 2.12E-07	4.72E-08	1.03E-07	9.24E-08	6.70E-08	< 1.25E-07	< 2.54E-07

TABLE 6.X-7. UNCONTROLLED EMISSION FACTORS FOR A TIRE CURING PRESS [a]

Pollutant Category	CAS Numbers	Type A lb/lb-rubber	Type B lb/lb-rubber	Type C lb/lb-rubber	Type D lb/lb-rubber	Type E lb/lb-rubber	Type F lb/lb-rubber	Type G lb/lb-rubber	Type H lb/lb-rubber	Type I lb/lb-rubber	Mean lb/lb-rubber	Max. lb/lb-rubber
Cumene	98-82-8	1.21E-07	3.37E-07	5.00E-07	3.41E-07	4.51E-07	4.04E-07	2.92E-07	6.87E-07	2.08E-07	3.67E-07	6.87E-07
Dibenzofuran	00132-64-9	1.16E-08	1.26E-08	9.54E-09	6.64E-09	3.94E-09	< 6.30E-09	6.32E-09	7.25E-09	7.31E-09	< 8.15E-09	1.26E-08
Dimethylphthalate	00131-11-3	5.64E-09	2.66E-08	2.22E-08	9.12E-09	5.28E-08	4.06E-08	2.20E-07	1.51E-08	1.39E-08	4.57E-08	2.20E-07
Di-n-butylphthalate	00084-74-2	2.07E-07	6.42E-07	6.26E-07	1.87E-07	3.14E-07	9.49E-07	1.74E-07	3.76E-07	8.73E-08	3.27E-07	6.42E-07
Epichlorohydrin	106-89-8	< 4.23E-07	< 5.08E-07	5.00E-07	< 4.10E-07	< 4.25E-07	< 3.59E-07	< 3.60E-07	< 3.79E-07	< 3.97E-07	< 4.26E-07	< 5.08E-07
Ethylbenzene	100-41-4	5.28E-06	2.93E-06	1.03E-06	1.21E-05	1.27E-05	9.88E-06	6.75E-06	2.13E-05	7.19E-06	8.66E-06	2.13E-05
Hexachlorobutadiene	87-68-3	< 4.23E-07	< 5.08E-07	5.00E-07	4.10E-07	< 4.25E-07	< 3.59E-07	< 3.60E-07	< 3.79E-07	< 3.97E-07	< 4.26E-07	< 5.08E-07
Isophorone	00078-59-1	< 5.09E-09	< 4.36E-09	2.29E-08	9.12E-09	6.17E-08	4.37E-09	< 4.72E-08	< 7.47E-08	< 7.31E-09	< 2.91E-08	< 7.47E-08
m & p-Xylenes	108-38-3/106-42-3	1.72E-05	1.06E-05	5.64E-06	2.88E-05	2.82E-05	2.75E-05	2.00E-05	5.21E-05	2.18E-05	2.32E-05	5.21E-05
Methylene Chloride	75-09-2	9.77E-07	9.35E-07	2.02E-06	7.60E-06	4.78E-06	5.39E-06	1.01E-06	2.84E-06	3.72E-06	2.99E-06	7.60E-06
Naphthalene	91-20-3	6.93E-08	7.82E-08	1.50E-07	2.84E-07	2.31E-07	< 3.13E-07	1.26E-07	2.47E-07	1.44E-07	< 1.66E-07	2.84E-07
n-Hexane	110-54-3	4.75E-07	1.10E-06	2.72E-07	8.65E-07	3.18E-06	2.92E-06	6.75E-06	8.05E-06	3.47E-06	< 3.02E-06	8.05E-06
o-Toluidine	00095-53-4	1.82E-07	2.88E-07	1.55E-08	< 8.41E-09	1.09E-08	7.21E-09	1.30E-07	2.28E-08	< 9.82E-09	< 8.35E-08	2.88E-07
o Xylene	95-47-6	4.21E-06	2.15E-06	1.21E-06	8.13E-06	9.55E-06	7.41E-06	5.40E-06	1.14E-05	5.95E-06	< 6.00E-06	1.14E-05
Phenol	00108-95-2	7.79E-08	5.07E-07	2.21E-07	< 8.53E-09	2.16E-07	1.30E-07	5.89E-07	5.86E-07	4.32E-07	< 3.30E-07	5.89E-07
Propylene Oxide	75-56-9	< 4.23E-07	< 5.08E-07	2.23E-06	< 4.10E-07	< 4.25E-07	< 3.59E-07	< 3.60E-07	< 3.79E-07	< 3.97E-07	< 6.43E-07	2.23E-06
Styrene	100-42-5	3.96E-07	3.11E-07	3.74E-07	2.08E-07	9.55E-07	3.82E-06	7.87E-07	3.08E-07	8.19E-07	5.30E-07	9.55E-07
t-Butyl Methyl Ether	1634-04-4	< 4.23E-07	< 5.08E-07	5.00E-07	< 4.10E-07	< 4.25E-07	2.92E-07	< 3.60E-07	< 3.79E-07	< 3.97E-07	< 4.26E-07	< 5.08E-07
Tetrachloroethene	127-18-4	7.66E-08	< 2.54E-07	2.50E-07	< 2.10E-07	7.96E-08	2.04E-07	8.99E-08	1.18E-07	< 1.98E-07	< 1.60E-07	< 2.54E-07
Toluene	108-88-3	8.60E-06	7.31E-06	2.92E-06	1.26E-05	1.30E-05	1.17E-05	1.08E-05	2.61E-05	1.07E-05	1.12E-05	2.61E-05
Trichloroethene	79-01-6	< 2.11E-07	< 2.54E-07	2.50E-07	< 2.10E-07	< 2.12E-07	< 1.80E-07	< 1.80E-07	< 1.89E-07	1.12E-07	< 2.02E-07	< 2.54E-07
Vinyl Acetate	108-05-4	< 2.11E-07	< 2.54E-07	2.50E-07	< 2.10E-07	< 2.12E-07	< 1.80E-07	< 1.80E-07	< 1.89E-07	< 1.98E-07	< 2.13E-07	< 2.54E-07
Vinyl Chloride	75-01-4	< 2.11E-07	< 2.54E-07	2.50E-07	< 2.10E-07	< 2.12E-07	< 1.80E-07	< 1.80E-07	< 1.89E-07	< 1.98E-07	< 2.13E-07	< 2.54E-07

a Type A,D,F are original equipment, type E,G,H are high performance, and type B,C,I are replacement tires

b 1,1,1-Trichloroethane for Tire F is not included in the Total HAPs or in the statistical summary due to its suspected presence from mold release agent.

TABLE 6.X-8. UNCONTROLLED EMISSION FACTORS FOR AN AUTOCLAVE (STEAM PRESSURE VESSEL)[c,d]

Pollutant Category	CAS #	Cmpd. #4 lb/lb-rubber	Cmpd. #5 lb/lb-rubber	Cmpd. #6 lb/lb-rubber	Cmpd. #8 lb/lb-rubber	Cmpd. #9 [a] lb/lb-rubber	Cmpd. #9 lb/lb-rubber	Cmpd. #11 lb/lb-rubber
TOTAL VOCs		1.61E-04	1.78E-04	1.33E-04	5.42E-05	1.63E-04	3.61E-04	9.32E-05
TOTAL SPECIATED ORGANICS		< 5.62E-04	< 5.54E-04	< 8.27E-04	< 6.68E-04	< 1.22E-03	< 8.17E-04	< 3.55E-04
TOTAL HAPs		< 2.89E-04	< 1.98E-04	< 1.74E-04	< 5.25E-04	< 2.13E-04	< 1.35E-04	< 1.46E-04
Individual HAPs:								
1,1-Dichloroethane	75-34-3	< 1.49E-07	< 2.01E-07	< 1.09E-07	< 5.54E-07	< 1.06E-07	< 1.02E-07	< 1.95E-07
1,1-Dichloroethene	75-35-4	< 1.51E-07	< 2.04E-07	< 1.11E-07	< 5.59E-07	< 1.10E-07	< 1.04E-07	< 1.97E-07
1,1,1-Trichloroethane	71-55-6	< 1.49E-07	< 2.01E-07	< 1.09E-07	< 5.53E-07	< 1.06E-07	< 1.01E-07	< 1.95E-07
1,1,2-Trichloroethane	79-00-5	< 1.51E-07	< 2.04E-07	< 1.12E-07	< 5.57E-07	< 1.09E-07	< 1.04E-07	< 1.98E-07
1,1,2,2-Tetrachloroethane	79-34-5	< 1.51E-07	< 2.03E-07	< 1.12E-07	< 5.56E-07	< 1.09E-07	< 1.04E-07	< 1.97E-07
1,2-Dibromo-3-Chloropropane	00096-12-8	< 2.95E-07	< 3.98E-07	< 2.14E-07	< 1.10E-06	< 2.05E-07	< 1.99E-07	< 3.86E-07
1,2-Dibromoethane	00106-93-4	< 1.47E-07	< 1.99E-07	< 1.07E-07	< 5.50E-07	< 1.03E-07	< 9.96E-08	< 1.93E-07
1,2-Dichloroethane	107-06-2	< 1.50E-07	< 2.02E-07	< 1.10E-07	< 5.55E-07	< 1.07E-07	< 1.03E-07	< 1.95E-07
1,2-Dichloropropane	78-87-5	< 1.50E-07	< 2.02E-07	< 1.11E-07	< 5.55E-07	< 1.08E-07	< 1.03E-07	< 1.96E-07
1,2-Epoxybutane	106-88-7	< 1.17E-08	< 1.06E-08	< 1.11E-08	< 1.78E-08	< 1.80E-08	< 1.15E-08	< 1.30E-08
1,2,4-Trichlorobenzene	120-82-1	< 1.56E-08	< 1.52E-08	< 1.21E-08	< 3.61E-08	< 8.92E-08	< 7.79E-08	< 1.52E-08
1,3-Butadiene	106-99-0	1.73E-06	< 2.13E-06	7.52E-07	< 3.59E-08	< 5.17E-08	< 8.77E-07	< 1.55E-07
1,4-Dichlorobenzene	00106-46-7	< 1.47E-07	< 1.99E-07	< 1.07E-07	< 5.50E-07	< 9.99E-08	1.01E-07	< 1.93E-07
1,4-Dioxane	00123-91-1	< 5.69E-07	< 7.96E-07	< 4.28E-07	< 2.20E-06	< 4.10E-07	< 3.98E-07	< 7.72E-07
1,4-Phenylenediamine	106-50-3	< 2.27E-08	< 2.61E-08	< 2.20E-08	< 5.59E-08	< 1.43E-07	< 1.08E-07	< 1.80E-08
2-Butanone	78-93-3	1.77E-06	2.12E-06	4.55E-07	3.43E-06	2.45E-06	1.42E-06	1.38E-06
2-Chloroacetophenone	532-27-4	< 7.00E-09	2.46E-07	< 6.60E-09	< 1.98E-08	< 4.69E-08	3.45E-08	8.39E-07
2-Methylphenol	95-48-7	< 2.15E-08	< 1.09E-08	< 2.04E-08	< 2.94E-08	< 1.05E-07	< 9.18E-08	1.94E-08
2,4-Dinitrophenol	51-28-5	< 6.35E-08	< 6.25E-08	< 4.72E-08	< 1.21E-07	< 3.20E-07	< 2.86E-07	< 1.01E-07
2,4-Dinitrotoluene	121-14-2	< 2.03E-08	< 1.58E-08	< 1.38E-08	< 3.36E-08	< 9.18E-08	< 8.25E-08	< 2.15E-08
2,4,5-Trichlorophenol	95-95-4	< 2.28E-08	< 2.12E-08	< 1.56E-08	< 4.44E-08	< 1.16E-07	< 1.04E-07	< 2.42E-08
2,4,6-Trichlorophenol	88-06-2	< 2.42E-08	< 2.27E-08	< 1.64E-08	< 4.93E-08	< 1.29E-07	< 1.16E-07	< 2.49E-08
3,3'-Dichlorobenzidine	91-94-1	< 3.02E-08	< 1.37E-08	< 2.89E-08	< 2.74E-08	< 8.17E-08	< 6.99E-08	< 3.65E-08
3,3'-Dimethoxybenzidine	119-90-4	< 1.80E-08	< 2.40E-08	< 1.51E-08	< 4.90E-08	< 1.53E-07	< 1.15E-07	< 1.54E-08
3,3'-Dimethylbenzidine	119-93-7	< 5.94E-09	< 8.42E-09	< 4.98E-09	< 1.75E-08	< 5.07E-08	< 3.84E-08	< 5.21E-09
3/4-Methylphenol	108-39-4/106-44-5	1.48E-08	< 2.12E-08	< 1.88E-08	< 2.35E-08	< 9.80E-08	< 8.53E-08	3.28E-08
4-Aminobiphenyl	92-67-1	< 5.27E-09	< 6.59E-09	< 4.25E-09	< 1.42E-08	< 3.79E-08	< 2.78E-08	< 4.23E-09
4-Methyl-2-pentanone	108-[illegible]-1	1.61E-04	< 6.61E-07	7.27E-05	< 5.55E-07	1.24E-05	< 8.40E-07	< 1.96E-07
4-Nitrobiphenyl	92-93-3	< 8.85E-09	< 1.16E-08	< 7.29E-09	< 2.53E-08	< 6.59E-08	< 4.80E-08	< 7.77E-09
4-Nitrophenol	100-02-7	< 4.36E-08	< 3.11E-08	< 3.04E-08	< 6.88E-08	< 1.93E-07	< 1.74E-07	< 4.80E-08
4,4'-Methylenedianiline	101-77-9	< 1.15E-08	< 1.72E-08	< 9.68E-09	< 3.46E-08	< 9.62E-08	< 7.24E-08	< 9.73E-09
4,6-Dinitro-2-methylphenol	534-52-1	< 4.08E-08	< 3.66E-08	< 2.99E-08	< 7.35E-08	< 1.83E-07	< 1.61E-07	< 5.69E-08
Acetaldehyde b	00075-07-0		1.83E-06		2.74E-07			1.02E-07
Acetonitrile	75-05-8	< 2.95E-07	1.60E-06	< 2.14E-07	< 1.10E-06	< 2.05E-07	< 1.99E-07	< 3.86E-07
Acetophenone b	00098-86-2	4.88E-06		9.12E-06		1.33E-04	8.80E-05	
Acrolein	00107-02-8	< 2.95E-07	< 2.82E-07	< 2.14E-07	< 1.10E-06	< 3.59E-07	< 1.99E-07	< 3.86E-07
Acrylonitrile	107-13-1	< 3.10E-07	< 4.59E-07	< 2.30E-07	< 1.17E-06	< 2.32E-07	< 2.16E-07	< 3.99E-07
Allyl chloride	107-05-1	< 3.01E-07	< 4.04E-07	< 2.21E-07	< 1.11E-06	< 2.17E-07	< 2.06E-07	< 3.92E-07
Aniline	62-53-3	1.04E-05	8.98E-06	2.58E-05	8.45E-07	2.67E-06	1.57E-07	2.21E-06
a.a.a-Trichlorotoluene	98-07-7	< 1.04E-08	< 1.27E-08	< 9.86E-09	< 3.09E-08	< 7.70E-08	< 5.85E-08	< 8.81E-09
Benzene	71-43-2	1.16E-05	5.39E-06	9.09E-06	2.23E-05	4.39E-06	1.46E-06	1.66E-06
Benzidine	92-87-5	< 5.75E-09	< 3.72E-07	< 4.93E-09	5.06E-08	< 5.07E-08	< 3.69E-08	< 6.33E-09
Benzyl Chloride	00100-44-7	< 2.95E-07	< 3.98E-07	< 2.14E-07	< 1.10E-06	< 2.05E-07	< 1.99E-07	< 3.86E-07
Biphenyl	92-52-4	6.99E-08	2.70E-07	3.84E-07	4.22E-08	1.25E-07	< 4.13E-08	5.48E-09
bis(2-Chloroethyl)ether	111-44-4	< 2.32E-08	< 2.43E-08	< 2.22E-08	< 5.31E-08	< 1.11E-07	< 9.69E-08	< 2.12E-08
bis(2-Ethylhexyl)phthalate	117-81-7	4.42E-07	3.30E-07	2.37E-08	3.68E-07	1.74E-07	1.90E-07	7.48E-07
Bromoform	75-25-2	< 1.51E-07	< 2.03E-07	< 1.12E-07	< 5.57E-07	< 1.10E-07	< 1.04E-07	< 1.98E-07
Bromomethane	74-83-9	< 1.53E-07	< 2.08E-07	< 1.13E-07	< 5.65E-07	< 1.12E-07	< 1.05E-07	< 1.99E-07
Carbon disulfide	75-15-0	4.77E-07	2.17E-08	6.07E-07	3.84E-04	5.81E-08	1.39E-08	8.93E-05
Carbon tetrachloride	56-23-5	< 1.49E-07	< 2.01E-07	< 1.09E-07	< 5.53E-07	< 1.05E-07	< 1.01E-07	< 1.82E-07
Carbonyl Sulfide	463-58-1	4.58E-07	4.66E-07	5.48E-07	1.97E-05	8.15E-07	5.18E-07	2.02E-06
Chlorobenzene	108-90-7	1.58E-07	< 2.00E-07	< 1.08E-07	< 5.52E-07	< 1.04E-07	< 1.01E-07	< 1.94E-07
Chloroethane	75-00-3	< 1.53E-07	< 2.06E-07	< 1.13E-07	< 5.63E-07	< 1.12E-07	< 1.06E-07	< 1.98E-07
Chloroform	67-66-3	< 1.49E-07	< 2.01E-07	< 1.09E-07	< 5.54E-07	< 1.06E-07	< 1.02E-07	< 1.95E-07
Chloromethane	74-87-3	< 1.52E-07	< 2.05E-07	< 1.59E-07	< 5.60E-07	< 3.14E-07	< 1.86E-07	< 1.99E-07
Chloroprene	126-99-8	< 2.16E-09	< 2.13E-09	< 2.34E-09	< 4.55E-09	< 3.81E-09	< 2.38E-09	3.28E-07
Cumene	98-82-8	6.75E-08	3.30E-08	6.42E-08	4.97E-08	1.30E-08	8.04E-07	7.00E-09
Dibenzofuran	132-64-9	1.75E-08	4.15E-08	< 1.22E-08	< 7.19E-09	< 2.92E-08	< 2.80E-09	< 6.15E-09

TABLE 6.X-8. UNCONTROLLED EMISSION FACTORS FOR AN AUTOCLAVE (STEAM PRESSURE VESSEL) [c,d]

Pollutant Category	CAS #	Cmpd. #4 lb/lb-rubber	Cmpd. #5 lb/lb-rubber	Cmpd. #6 lb/lb-rubber	Cmpd. #8 lb/lb-rubber	Cmpd. #9 [a] lb/lb-rubber	Cmpd. #9 lb/lb-rubber	Cmpd. #11 lb/lb-rubber
Dimethylaminoazobenzene	60-11-7	< 7.69E-09	< 1.13E-08	< 6.67E-09	< 2.24E-08	< 6.01E-08	< 4.38E-08	< 7.25E-09
Dimethylphthalate	131-11-3	< 7.06E-09	< 5.89E-09	< 4.64E-09	6.90E-09	< 3.47E-08	< 3.12E-08	1.05E-08
Di-n-butylphthalate	84-74-2	< 4.39E-09	4.34E-09	2.16E-08	< 2.16E-09	6.37E-08	9.69E-08	1.76E-08
Epichlorohydrin	00106-89-8	< 2.95E-07	< 3.98E-07	< 2.14E-07	< 3.57E-06	< 2.05E-07	< 1.99E-07	< 3.86E-07
Ethyl acrylate	140-88-5	< 2.59E-09	< 2.21E-09	< 3.22E-09	< 3.73E-09	< 4.86E-09	< 2.97E-09	< 2.78E-09
Ethylbenzene	100-41-4	4.77E-06	1.75E-06	2.91E-06	3.90E-06	3.31E-06	3.02E-06	< 8.17E-08
Ethylene dibromide	106-93-4	< 2.81E-09	< 3.49E-09	< 3.19E-09	< 5.43E-09	< 4.65E-09	< 2.95E-09	< 3.92E-09
Hexachlorobenzene	118-74-1	< 1.85E-08	< 1.82E-08	< 1.26E-08	< 3.88E-08	< 1.04E-07	< 9.20E-08	< 2.16E-08
Hexachlorobutadiene	00087-68-3	< 2.95E-07	< 3.98E-07	< 2.14E-07	< 1.10E-06	< 3.96E-07	< 5.07E-07	< 1.45E-07
Hexachlorocyclopentadiene	77-47-4	< 2.32E-08	< 2.83E-08	< 1.64E-08	< 6.51E-08	< 1.60E-07	< 1.45E-07	< 2.90E-08
Hexachloroethane	67-72-1	< 2.71E-08	< 3.71E-08	< 2.48E-08	< 6.50E-08	< 1.50E-07	< 1.30E-07	< 7.50E-08
Hydroquinone	123-31-9	< 1.42E-08	< 2.09E-08	< 1.37E-08	< 4.96E-08	< 1.17E-07	< 8.63E-08	< 1.45E-08
Iodomethane	74-88-4	< 1.23E-09	< 1.79E-09	< 1.31E-09	< 3.20E-09	< 2.14E-09	< 1.34E-09	< 1.73E-09
Isooctane	540-84-1	4.78E-07	7.27E-07	2.88E-07	9.76E-07	5.54E-08	2.80E-07	7.39E-08
Isophorone	78-59-1	2.37E-07	2.00E-07	< 7.76E-09	< 2.13E-08	< 5.71E-08	< 4.30E-08	< 8.98E-09
Methyl methacrylate	80-62-6	< 7.16E-09	< 6.27E-09	< 8.64E-09	< 1.01E-08	< 1.31E-08	< 7.98E-09	< 7.59E-09
Methylene bis-chloroaniline	101-14-4	< 1.99E-08	< 2.73E-08	< 1.68E-08	< 5.75E-08	< 1.72E-07	< 1.30E-07	< 1.76E-08
Methylene chloride	75-09-2	3.72E-06	7.34E-05	2.26E-06	3.08E-06	2.15E-06	4.41E-06	5.32E-07
m-/p-Xylene	108-38-3/106-42-3	4.48E-05	6.19E-05	9.71E-06	1.95E-05	1.28E-05	9.79E-06	2.75E-07
Naphthalene	91-20-3	3.02E-07	2.89E-07	9.83E-07	2.41E-07	1.76E-07	1.69E-07	6.18E-08
n-Hexane	110-54-3	1.85E-06	3.05E-06	1.08E-06	3.94E-06	1.22E-06	1.88E-06	9.58E-07
Nitrobenzene	98-95-3	< 1.79E-08	< 1.59E-08	< 1.44E-08	< 3.67E-08	< 8.76E-08	< 7.63E-08	< 1.54E-08
n-Nitrosodimethylamine	62-75-9	< 4.79E-08	< 4.65E-08	< 5.30E-08	< 1.11E-07	< 2.23E-07	< 1.73E-07	< 2.82E-08
n-Nitrosomorpholine	59-89-2	< 2.38E-08	< 3.36E-08	< 2.50E-08	< 7.24E-08	< 1.47E-07	< 1.13E-07	< 1.93E-08
N,N-Dimethylaniline	121-69-7	< 9.98E-09	< 1.22E-08	< 9.52E-09	2.76E-08	< 6.85E-08	< 5.19E-08	< 8.02E-09
o-Anisidine	90-04-0	< 1.83E-08	< 2.29E-08	< 1.71E-08	< 5.45E-08	< 1.33E-07	< 1.01E-07	< 1.57E-08
o-Toluidine	95-53-4	2.14E-07	< 1.63E-08	1.53E-05	< 3.58E-08	< 7.53E-08	< 5.68E-08	< 9.82E-09
o-Xylene	95-47-6	4.97E-06	4.22E-06	3.31E-06	4.81E-06	1.25E-05	2.93E-06	2.01E-05
Pentachloronitrobenzene	82-68-8	< 3.49E-08	< 4.33E-08	< 2.94E-08	< 9.27E-08	< 2.65E-07	< 1.90E-07	< 3.04E-08
Pentachlorophenol	87-86-5	< 3.02E-08	4.36E-07	< 2.28E-08	< 6.27E-08	< 1.58E-07	< 1.39E-07	3.85E-07
Phenol	108-95-2	< 1.75E-08	< 1.19E-07	< 1.65E-08	< 6.45E-08	1.42E-06	8.81E-07	< 4.04E-08
Propylene Oxide	00075-56-9	< 2.95E-07	< 3.98E-07	< 2.14E-07	< 1.10E-06	< 2.05E-07	< 1.99E-07	< 2.14E-07
Styrene	100-42-5	1.31E-06	7.18E-07	3.28E-06	< 3.56E-07	1.27E-06	4.38E-07	2.93E-08
tert-Butyl methyl ether	1634-04-4	3.09E-07	2.84E-07	2.34E-07	1.12E-06	< 2.08E-07	< 3.02E-07	1.13E-06
Tetrachloroethene	127-18-4	< 1.53E-07	< 2.02E-07	< 1.10E-07	< 5.58E-07	< 1.10E-07	< 1.02E-07	< 1.96E-07
Toluene	108-88-3	2.08E-05	1.56E-05	7.09E-06	2.79E-05	5.01E-06	6.91E-06	7.45E-06
Trichloroethene	79-01-6	< 1.49E-07	< 2.05E-07	< 1.09E-07	< 5.55E-07	< 1.06E-07	< 1.02E-07	< 1.96E-07
Trifluralin	1582-09-8	< 2.42E-08	< 3.44E-08	< 2.28E-08	< 7.81E-08	< 2.07E-07	< 1.60E-07	< 2.03E-08
Vinyl acetate	108-05-4	< 1.49E-07	< 2.01E-07	< 1.09E-07	< 5.53E-07	< 1.05E-07	< 1.01E-07	< 1.95E-07
Vinyl Bromide	593-60-2	< 3.95E-09	< 6.79E-09	< 4.13E-09	< 1.17E-08	< 6.65E-09	< 4.26E-09	< 4.17E-09
Vinyl Chloride	75-01-4	< 1.52E-07	< 2.04E-07	< 1.12E-07	< 5.60E-07	< 1.11E-07	< 1.05E-07	< 1.97E-07

TABLE 6.X-8. UNCONTROLLED EMISSION FACTORS FOR AN AUTOCLAVE (STEAM PRESSURE VESSEL)[c,d]

Pollutant Category	CAS #	Cmpd. #15 lb/lb-rubber	Cmpd. #18 lb/lb-rubber	Cmpd. #21 lb/lb-rubber	Cmpd. #22 lb/lb-rubber	Mean lb/lb-rubber	Max. lb/lb-rubber
TOTAL VOCs		7.34E-05	9.27E-05	2.26E-04	1.11E-04	1.50E-04	3.61E-04
TOTAL SPECIATED ORGANICS		< 5.08E-04	< 2.09E-03	< 1.96E-03	< 2.37E-04	< 8.91E-04	< 2.09E-03
TOTAL HAPs		< 3.36E-04	< 1.17E-03	< 4.74E-04	< 1.26E-04	< 3.44E-04	< 1.17E-03
Individual HAPs:							
1,1-Dichloroethane	75-34-3	< 2.82E-07	< 5.66E-07	< 4.21E-07	< 6.28E-08	< 2.50E-07	< 5.66E-07
1,1-Dichloroethene	75-35-4	< 2.83E-07	< 5.67E-07	< 4.23E-07	< 6.45E-08	< 2.52E-07	< 5.67E-07
1,1,1-Trichloroethane	71-55-6	< 2.82E-07	< 5.66E-07	< 4.21E-07	< 6.25E-08	< 2.50E-07	< 5.66E-07
1,1,2-Trichloroethane	79-00-5	< 2.84E-07	< 5.68E-07	< 4.24E-07	< 6.46E-08	< 2.52E-07	< 5.68E-07
1,1,2,2-Tetrachloroethane	79-34-5	< 2.84E-07	< 5.67E-07	< 4.23E-07	< 6.47E-08	< 2.52E-07	< 5.67E-07
1,2-Dibromo-3-Chloropropane	00096-12-8	< 5.59E-07	< 1.13E-06	< 8.38E-07	< 1.22E-07	< 4.95E-07	< 1.13E-06
1,2-Dibromoethane	00106-93-4	< 2.80E-07	< 5.64E-07	< 4.19E-07	< 6.08E-08	< 2.47E-07	< 5.64E-07
1,2-Dichloroethane	107-06-2	< 2.82E-07	< 5.66E-07	< 4.22E-07	< 6.33E-08	< 2.50E-07	< 5.66E-07
1,2-Dichloropropane	78-87-5	< 2.83E-07	< 5.66E-07	< 4.22E-07	< 6.40E-08	< 2.51E-07	< 5.66E-07
1,2-Epoxybutane	106-88-7	< 2.49E-08	< 9.22E-09	< 1.53E-08	< 9.81E-09	< 1.39E-08	< 2.49E-08
1,2,4-Trichlorobenzene	120-82-1	< 1.21E-08	< 1.15E-08	< 2.48E-08	< 1.52E-08	< 2.95E-08	< 8.92E-08
1,3-Butadiene	106-99-0	< 2.01E-08	< 6.25E-08	< 1.74E-08	< 3.34E-07	< 5.61E-07	< 2.13E-06
1,4-Dichlorobenzene	00106-46-7	< 2.50E-07	< 5.64E-07	< 4.19E-07	< 6.08E-08	< 2.45E-07	< 5.64E-07
1,4-Dioxane	00123-91-1	< 1.12E-06	< 2.26E-06	< 1.68E-06	< 2.43E-07	< 9.90E-07	< 2.26E-06
1,4-Phenylenediamine	106-50-3	< 2.29E-08	< 2.21E-08	< 2.94E-08	< 3.04E-08	< 4.55E-08	< 1.43E-07
2-Butanone	78-93-3	< 1.08E-06	1.60E-06	1.93E-05	8.71E-07	< 3.26E-06	1.93E-05
2-Chloroacetophenone	532-27-4	< 7.24E-09	< 6.40E-09	< 8.98E-09	< 8.99E-09	< 1.12E-07	8.39E-07
2-Methylphenol	95-48-7	< 1.49E-08	1.55E-08	< 3.53E-08	< 2.10E-08	< 3.50E-08	< 1.05E-07
2,4-Dinitrophenol	51-28-5	< 7.05E-08	< 4.24E-08	< 1.30E-07	< 6.49E-08	< 1.19E-07	< 3.20E-07
2,4-Dinitrotoluene	121-14-2	< 1.51E-08	< 1.28E-08	< 2.87E-08	< 1.78E-08	< 3.22E-08	< 9.18E-08
2,4,5-Trichlorophenol	95-95-4	< 1.79E-08	< 1.43E-08	< 3.24E-08	< 2.03E-08	< 3.94E-08	< 1.16E-07
2,4,6-Trichlorophenol	88-06-2	< 1.81E-08	< 1.59E-08	< 3.42E-08	< 2.21E-08	< 4.30E-08	< 1.29E-07
3,3'-Dichlorobenzidine	91-94-1	< 2.19E-08	< 9.80E-09	< 5.78E-08	< 1.38E-08	< 3.56E-08	< 8.17E-08
3,3'-Dimethoxybenzidine	119-90-4	< 3.32E-08	< 1.64E-08	< 4.01E-08	< 2.38E-08	< 4.57E-08	< 1.53E-07
3,3'-Dimethylbenzidine	119-93-7	< 1.09E-08	< 5.26E-09	< 1.36E-08	< 7.94E-09	< 1.54E-08	< 5.07E-08
3/4-Methylphenol	108-39-4/106-44-5	< 1.45E-08	< 1.43E-08	< 3.32E-08	< 1.94E-08	< 3.42E-08	< 9.80E-08
4-Aminobiphenyl	92-67-1	< 6.12E-09	< 4.78E-09	< 7.12E-09	< 1.39E-08	< 1.20E-08	< 3.79E-08
4-Methyl-2-pentanone	108-10-1	< 2.83E-07	5.72E-05	< 4.22E-07	6.46E-05	< 3.37E-05	1.61E-04
4-Nitrobiphenyl	92-93-3	< 1.21E-08	< 8.20E-09	< 1.40E-08	< 2.38E-08	< 2.12E-08	< 6.59E-08
4-Nitrophenol	100-02-7	< 3.24E-08	< 2.45E-08	< 6.80E-08	< 3.35E-08	< 6.81E-08	< 1.93E-07
4,4'-Methylenedianiline	101-77-9	< 1.99E-08	< 1.05E-08	< 2.44E-08	< 1.52E-08	< 2.92E-08	< 9.62E-08
4,6-Dinitro-2-methylphenol	534-52-1	< 4.14E-08	< 2.39E-08	< 8.52E-08	< 7.32E-08	< 7.32E-08	< 1.83E-07
Acetaldehyde b	00075-07-0			1.18E-06		8.47E-07	1.83E-06
Acetonitrile	75-05-8	< 5.59E-07	< 1.13E-06	< 8.38E-07	< 1.22E-07	< 6.04E-07	1.60E-06
Acetophenone b	00098-86-2				7.36E-06	4.85E-05	1.33E-04
Acrolein	00107-02-8	< 5.39E-07	< 1.13E-06	< 4.44E-06	< 1.22E-07	< 8.24E-07	< 4.44E-06
Acrylonitrile	107-13-1	< 5.76E-07	< 1.14E-06	< 8.52E-07	< 1.38E-07	< 5.20E-07	< 1.17E-06
Allyl chloride	107-05-1	< 5.66E-07	< 1.13E-06	< 8.44E-07	< 1.28E-07	< 5.02E-07	< 1.13E-06
Aniline	62-53-3	2.69E-08	1.68E-06	1.48E-08	8.27E-06	< 5.55E-06	2.58E-05
a,a,a-Trichlorotoluene	98-07-7	< 9.20E-09	< 9.27E-09	< 1.20E-08	< 1.30E-08	< 2.29E-08	< 7.70E-08
Benzene	71-43-2	5.26E-06	3.54E-07	5.25E-06	1.14E-05	7.12E-06	2.23E-05
Benzidine	92-87-5	< 1.19E-08	< 5.70E-09	< 1.56E-08	< 8.89E-09	< 5.17E-08	< 3.72E-07
Benzyl Chloride	00100-44-7	< 5.59E-07	< 1.13E-06	< 8.38E-07	< 1.22E-07	< 4.95E-07	< 1.13E-06
Biphenyl	92-52-4	1.19E-08	7.23E-09	7.44E-09	3.99E-07	< 1.24E-07	3.99E-07
bis(2-Chloroethyl)ether	111-44-4	< 1.45E-08	< 1.63E-08	< 3.50E-08	< 2.21E-08	< 4.00E-08	< 1.11E-07
bis(2-Ethylhexyl)phthalate	117-81-7	1.00E-06	4.54E-08	2.20E-06	1.75E-07	< 7.32E-07	2.37E-06
Bromoform	75-25-2	< 2.85E-07	< 5.67E-07	< 4.24E-07	< 6.49E-08	< 2.52E-07	< 5.67E-07
Bromomethane	74-83-9	< 2.86E-07	< 5.69E-07	< 4.26E-07	< 6.58E-08	< 2.55E-07	< 5.69E-07
Carbon disulfide	75-15-0	1.47E-04	1.06E-03	1.02E-06	1.86E-06	1.54E-04	1.06E-03
Carbon tetrachloride	56-23-5	5.67E-05	< 5.65E-07	6.00E-07	< 6.24E-08	< 5.39E-06	5.67E-06
Carbonyl Sulfide	463-58-1	8.80E-07	9.17E-06	1.42E-07	4.36E-07	3.19E-06	1.97E-05
Chlorobenzene	108-90-7	< 2.81E-07	5.74E-07	< 4.20E-07	< 6.18E-08	< 2.50E-07	5.74E-07
Chloroethane	75-00-3	< 2.86E-07	< 5.68E-07	< 4.25E-07	< 6.61E-08	< 2.54E-07	< 5.68E-07
Chloroform	67-66-3	1.64E-05	< 5.66E-07	5.98E-07	< 6.26E-08	< 1.73E-06	1.64E-05
Chloromethane	74-87-3	< 2.85E-07	< 5.67E-07	< 4.44E-06	< 1.81E-07	< 6.57E-07	< 4.44E-06
Chloroprene	126-99-8	< 2.02E-09	< 1.46E-09	< 2.04E-09	< 2.06E-09	< 3.21E-08	3.28E-07
Cumene	98-82-8	3.83E-08	7.49E-08	1.26E-07	7.17E-08	< 2.40E-07	1.30E-06
Dibenzofuran	132-64-9	5.64E-09	< 4.12E-09	< 8.20E-09	< 5.82E-09	< 1.50E-08	4.15E-08

TABLE 6.X-8. UNCONTROLLED EMISSION FACTORS FOR AN AUTOCLAVE (STEAM PRESSURE VESSEL)[c,d]

Pollutant Category	CAS #	Cmpd. #15 lb/lb-rubber	Cmpd. #18 lb/lb-rubber	Cmpd. #21 lb/lb-rubber	Cmpd. #22 lb/lb-rubber	Mean lb/lb-rubber	Max. lb/lb-rubber
Dimethylaminoazobenzene	60-11-7	< 1.37E-08	< 7.12E-09	< 1.75E-08	< 1.02E-08	< 1.89E-08	< 6.01E-08
Dimethylphthalate	131-11-3	8.73E-09	< 4.69E-09	2.28E-08	< 6.62E-09	< 1.31E-08	< 3.47E-08
Di-n-butylphthalate	84-74-2	4.51E-07	2.91E-09	2.12E-07	3.42E-07	< 1.11E-07	4.51E-07
Epichlorohydrin	00106-89-8	< 5.59E-07	< 1.13E-06	< 8.38E-07	< 1.22E-07	< 7.19E-07	< 3.57E-06
Ethyl acrylate	140-88-5	< 3.18E-09	< 1.68E-09	< 3.02E-09	< 2.73E-09	< 3.00E-09	< 4.86E-09
Ethylbenzene	100-41-4	8.91E-06	1.39E-07	3.24E-06	1.30E-06	< 3.03E-06	8.91E-06
Ethylene dibromide	106-93-4	< 3.50E-09	< 2.19E-09	< 4.27E-09	< 2.71E-09	< 3.56E-09	< 5.43E-09
Hexachlorobenzene	118-74-1	< 1.61E-08	< 1.26E-08	< 3.33E-08	< 3.63E-08	< 3.67E-08	< 1.04E-07
Hexachlorobutadiene	00087-68-3	< 5.59E-07	< 1.13E-06	< 8.38E-07	< 1.22E-07	< 5.18E-07	< 1.13E-06
Hexachlorocyclopentadiene	77-47-4	< 2.00E-08	< 1.85E-08	< 4.12E-08	< 2.74E-08	< 5.22E-08	< 1.60E-07
Hexachloroethane	67-72-1	4.94E-07	< 2.04E-08	6.02E-08	< 2.81E-08	< 1.01E-07	4.94E-07
Hydroquinone	123-31-9	< 1.74E-08	< 1.48E-08	< 2.31E-08	< 2.18E-08	< 3.58E-08	< 1.17E-07
Iodomethane	74-88-4	< 1.47E-09	< 8.64E-10	< 2.03E-09	< 1.15E-09	< 1.66E-09	< 3.20E-09
Isooctane	540-84-1	1.07E-06	< 4.06E-09	3.84E-06	1.57E-07	< 1.39E-06	7.39E-06
Isophorone	78-59-1	< 6.94E-09	2.35E-08	< 1.37E-08	3.45E-07	< 8.77E-08	3.45E-07
Methyl methacrylate	80-62-6	< 8.34E-09	< 4.81E-09	< 8.25E-09	< 7.35E-09	< 8.15E-09	< 1.31E-08
Methylene bis-chloroaniline	101-14-4	< 3.70E-08	< 1.80E-08	< 4.62E-08	< 2.69E-08	< 5.18E-08	< 1.72E-07
Methylene chloride	75-09-2	1.18E-05	4.68E-07	4.88E-05	1.21E-05	1.53E-05	7.34E-05
m-/p-Xylene	108-38-3/106-42-3	3.24E-05	1.43E-06	1.24E-05	4.74E-06	1.91E-05	6.19E-05
Naphthalene	91-20-3	2.99E-07	9.23E-08	9.41E-08	3.36E-07	2.77E-07	9.83E-07
n-Hexane	110-54-3	< 1.83E-06	< 2.77E-08	1.96E-06	4.03E-07	< 1.65E-06	3.94E-06
Nitrobenzene	98-95-3	< 1.19E-08	< 1.26E-08	< 2.34E-08	< 1.63E-08	< 2.99E-08	< 8.76E-08
n-Nitrosodimethylamine	62-75-9	< 3.60E-08	< 4.21E-08	< 4.73E-08	< 5.33E-08	< 7.83E-08	< 2.23E-07
n-Nitrosomorpholine	59-89-2	< 1.70E-08	< 2.04E-08	< 2.50E-08	< 2.77E-08	< 4.77E-08	< 1.47E-07
N,N-Dimethylaniline	121-69-7	< 9.14E-09	< 9.06E-09	< 1.16E-08	< 1.26E-08	< 2.09E-08	< 6.85E-08
o-Anisidine	90-04-0	< 1.72E-08	< 1.68E-08	< 2.23E-08	< 2.42E-08	< 4.03E-08	< 1.33E-07
o-Toluidine	95-53-4	< 1.01E-08	6.19E-08	< 1.46E-08	1.66E-07	< 1.45E-06	1.53E-05
o-Xylene	95-47-6	7.34E-06	4.14E-08	9.16E-05	2.93E-06	< 1.41E-05	9.16E-05
Pentachloronitrobenzene	82-68-8	< 3.65E-08	< 3.13E-08	< 4.50E-08	< 9.76E-08	< 8.14E-08	< 2.65E-07
Pentachlorophenol	87-86-5	< 3.59E-08	< 1.82E-08	< 7.31E-08	< 5.98E-08	< 1.29E-07	4.36E-07
Phenol	108-95-2	< 8.13E-08	< 1.50E-08	7.30E-08	< 1.63E-08	< 2.50E-07	1.42E-06
Propylene Oxide	00075-56-9	< 5.59E-07	< 1.13E-06	< 8.38E-07	< 1.22E-07	< 4.79E-07	< 1.13E-06
Styrene	100-42-5	6.62E-07	3.08E-07	1.68E-08	9.78E-07	< 8.51E-07	3.28E-06
tert-Butyl methyl ether	1634-04-4	5.63E-07	1.14E-06	2.30E-04	1.43E-07	< 2.14E-05	2.30E-04
Tetrachloroethene	127-18-4	1.58E-06	< 5.72E-07	4.15E-07	< 6.35E-08	< 3.78E-07	1.68E-06
Toluene	108-88-3	2.31E-05	3.88E-06	2.53E-05	2.84E-06	1.37E-06	2.81E-05
Trichloroethene	79-01-6	< 2.82E-07	< 5.66E-07	< 4.22E-07	< 6.28E-08	< 2.50E-07	< 5.66E-07
Trifluralin	1582-09-8	< 3.12E-08	< 2.26E-08	< 3.21E-08	< 3.44E-08	< 8.06E-08	< 2.07E-07
Vinyl acetate	108-05-4	< 2.82E-07	< 5.65E-07	< 4.21E-07	< 6.20E-08	< 2.49E-07	< 5.65E-07
Vinyl Bromide	593-60-2	< 4.50E-09	< 2.95E-09	< 4.90E-09	< 3.64E-09	< 5.24E-09	< 1.17E-08
Vinyl Chloride	75-01-4	< 2.85E-07	< 5.67E-07	< 4.24E-07	< 6.53E-08	< 2.53E-07	< 5.67E-07

a Extruded EPDM (Peroxide-cure).

b Tentatively identified compound (TIC)- no data is given if not detected.

c Includes pollutants in steam blow-off (when depressurizing the vessel) and in the condensate produced during curing. For noncontact steam applications, the total values shall be used. For direct contact, steam curing, 17% of the emission factor is discharged in the condensate produced during curing and is not therefore released as an air emission.

d To determine emission factors for compounds not listed in this table, multiply table 6.X-3 VOC data by 1.42, speciated organics by 9.09, and HAPs by 7.21.

TABLE 6.X-9. UNCONTROLLED EMISSION FACTORS FOR A PLATEN PRESS[a]

		b,d			c,d						
Pollutant Category	CAS #	Cmpd. #1 lb/lb-rubber	Cmpd. #2 lb/lb-rubber	Cmpd. #3 lb/lb-rubber	Cmpd. #5 lb/lb-rubber	Cmpd. #7 lb/lb-rubber	Cmpd. #9 lb/lb-rubber	Cmpd. #10 lb/lb-rubber	Cmpd. #11 lb/lb-rubber	Cmpd. #12 lb/lb-rubber	Cmpd. #13 lb/lb-rubber
TOTAL VOCs		3.10E-04	1.51E-04	3.77E-04	5.56E-04	9.34E-05	1.68E-03	3.15E-04	2.35E-04	2.53E-04	5.21E-04
TOTAL SPECIATED ORGANICS		< 1.59E-03	< 1.39E-03	< 2.85E-03	< 1.39E-03	< 9.54E-04	< 5.70E-03	< 2.87E-03	< 2.50E-03	< 2.81E-03	< 2.80E-03
TOTAL HAPs		< 1.32E-03	< 1.15E-03	< 2.45E-03	< 2.75E-04	< 7.44E-04	< 5.13E-03	< 2.55E-03	< 2.17E-03	< 2.30E-03	< 2.57E-03
Individual HAPs:											
1,1,1-Trichloroethane	00071-55-6	3.54E-06	2.52E-06	3.15E-06	3.80E-06	4.19E-06	4.20E-06	2.52E-06	< 2.81E-06	3.03E-05	3.58E-04
1,2,4-Trichlorobenzene	120-82-1	< 3.51E-07	< 1.37E-07	< 1.67E-07	< 1.98E-07	< 3.84E-07	< 2.02E-07	< 1.25E-07	< 1.37E-07	< 1.59E-07	< 1.63E-07
1,3-Butadiene	106-99-0	< 7.25E-07	1.20E-05	< 7.08E-07	5.84E-08	9.42E-08	7.53E-08	7.43E-08	< 9.28E-07	< 6.81E-07	< 6.68E-07
1,4-Dichlorobenzene	106-46-7	1.03E-07	7.53E-08	5.52E-08	< 1.65E-07	5.42E-08	< 1.75E-07	5.53E-08	< 1.17E-07	5.78E-08	< 1.11E-07
2-Butanone	00078-93-3	1.84E-06	2.77E-06	2.89E-06	2.04E-06	< 2.58E-05	3.02E-06	< 5.03E-06	< 1.79E-06	1.18E-06	< 1.19E-06
2-Chloro-1,3-Butadiene	00126-99-8								9.08E-08		
2-Methylphenol	95-48-7	< 3.28E-07	< 1.17E-07	2.98E-08	< 2.15E-07	< 3.33E-07	< 2.29E-07	< 1.09E-07	< 1.53E-07	< 1.31E-07	< 1.44E-07
3/4-Methylphenol	108-39-4/106-44-5	< 3.10E-07	< 1.28E-07	3.69E-08	< 2.04E-07	< 3.14E-07	< 2.18E-07	5.10E-08	< 1.45E-07	< 1.22E-07	< 1.34E-07
4-Methyl-2-pentanone	00108-10-1	< 2.58E-06	< 6.29E-06	1.16E-04	< 1.57E-06	< 1.29E-05	< 3.06E-06	< 2.52E-06	< 9.90E-07	< 2.42E-06	< 5.94E-06
Acetaldehyde	00075-07-0				6.69E-08		7.64E-08		1.65E-08		
Acetonitrile	75-05-8	< 5.15E-08	< 1.26E-05	< 5.03E-06	5.47E-08	< 2.58E-05	< 6.12E-06	< 5.03E-08	< 1.98E-08	< 4.84E-08	< 1.19E-05
Acetophenone	98-86-2	5.09E-07	1.39E-06	4.25E-07	0.00E+00	8.74E-07	4.40E-04	4.36E-07	0.00E+00	2.17E-06	5.05E-07
Acrylonitrile	00107-13-1	< 5.15E-06	< 1.25E-05	< 5.03E-06	< 2.68E-06	< 2.58E-05	< 6.12E-06	< 5.03E-06	< 1.38E-06	< 4.84E-06	< 1.19E-05
Aniline	62-53-3	< 1.56E-07	4.16E-07	7.28E-07	2.01E-06	< 1.59E-07	< 1.49E-07	< 5.24E-08	2.81E-07	< 6.38E-08	< 6.96E-08
Benzene	71-43-2	1.08E-06	1.25E-06	1.18E-06	< 1.14E-06	< 2.09E-06	< 1.24E-06	< 1.02E-06	< 8.04E-07	< 9.83E-07	< 9.65E-07
Benzidine	92-87-5	< 1.91E-07	< 3.50E-08	< 1.28E-07	4.54E-06	< 1.78E-07	< 7.62E-08	< 8.01E-08	< 2.92E-07	< 9.49E-08	< 1.07E-07
Biphenyl	92-52-4	< 1.28E-07	< 5.62E-08	1.40E-07	3.06E-07	< 1.30E-07	< 9.41E-08	< 5.24E-08	< 5.91E-08	< 6.82E-08	< 6.96E-08
bis(2-Ethylhexyl)phthalate	117-81-7	4.20E-06	2.48E-06	2.14E-06	3.83E-06	1.15E-05	2.60E-06	2.83E-06	1.69E-06	3.63E-06	1.78E-05
Carbon Disulfide	00075-15-0	2.16E-06	5.35E-04	3.15E-06	3.46E-06	< 1.29E-05	4.20E-06	1.32E-03	3.47E-04	5.75E-04	9.50E-04
Carbonyl Sulfide	463-58-1	< 3.16E-06	2.65E-06	< 3.08E-06	< 4.50E-06	< 6.44E-06	< 3.75E-06	< 3.11E-06	< 3.25E-06	4.39E-05	3.33E-05
Chloroethane	00075-00-3	< 2.58E-06	< 6.29E-06	< 2.52E-06	< 1.34E-06	< 1.29E-05	< 3.06E-06	< 2.52E-06	< 9.90E-07	< 2.42E-06	< 5.94E-06
Chloromethane	00074-87-3	1.06E-06	< 6.29E-06	7.87E-07	< 1.34E-06	< 1.29E-06	< 3.06E-06	< 2.52E-06	< 9.90E-07	8.77E-07	< 5.94E-06
Cumene	98-82-8	3.64E-08	5.90E-08	5.96E-08	9.03E-08	7.43E-08	2.76E-06	3.20E-08	3.55E-08	4.00E-08	4.55E-08
Dibenzofuran	132-64-9	6.38E-08	5.04E-08	1.54E-07	< 6.45E-08	< 1.33E-07	< 6.87E-08	2.77E-08	< 4.81E-08	5.64E-08	3.27E-08
Dimethylphthalate	131-11-3	< 1.61E-07	7.78E-08	< 8.60E-08	1.80E-07	< 1.64E-07	6.72E-08	< 5.97E-08	< 6.16E-08	< 7.71E-08	< 7.82E-08
Di-n-butylphthalate	84-74-2	5.47E-08	2.11E-06	3.01E-07	1.39E-07	7.80E-07	7.16E-08	8.30E-08	0.00E+00	2.58E-07	0.00E+00
Ethylbenzene	100-41-4	< 1.42E-06	< 1.39E-06	< 1.39E-06	1.34E-06	< 2.85E-06	< 1.69E-06	< 1.39E-06	< 1.09E-06	< 1.34E-06	< 1.31E-06
Hexachlorobutadiene	87-68-3	< 6.16E-07	< 2.38E-07	< 2.92E-07	< 3.37E-07	< 6.39E-07	3.93E-07	< 2.17E-07	< 2.33E-07	< 2.77E-07	< 2.86E-07
Methylene Chloride	00075-09-2	1.26E-03	4.09E-04	2.27E-03	1.76E-04	5.15E-04	4.59E-03	1.16E-03	1.72E-03	1.60E-03	1.13E-03
m-Xylene + p-Xylene	108-38-3/106-42-3	1.01E-06	1.91E-06	3.03E-06	9.24E-06	3.20E-06	< 1.69E-06	< 1.39E-06	< 1.08E-06	< 1.34E-06	< 1.31E-06
Naphthalene	91-20-3	3.29E-07	4.59E-07	5.78E-07	1.57E-06	2.37E-06	4.04E-06	2.81E-07	1.67E-06	3.71E-07	3.31E-07
n-Hexane	110-54-3	7.49E-06	1.23E-05	6.96E-06	1.66E-05	9.22E-06	1.64E-05	4.12E-06	3.12E-05	2.69E-06	< 1.06E-06
o-Toluidine	95-53-4	< 1.82E-07	1.53E-06	< 8.05E-08	< 1.39E-07	< 1.84E-07	< 1.51E-07	< 6.26E-08	< 9.86E-08	2.21E-06	< 8.24E-08
o-Xylene	95-47-6	< 1.42E-06	< 1.39E-06	< 1.39E-06	2.01E-06	1.78E-06	< 1.69E-06	< 1.39E-06	< 1.09E-06	< 1.34E-06	< 1.31E-06
Phenol	108-95-2	6.12E-07	5.37E-07	5.19E-07	9.67E-07	4.22E-07	1.28E-06	4.16E-07	4.62E-07	5.37E-07	7.79E-07
Propylene Oxide	00075-56-9	< 5.15E-06	1.34E-04	< 5.03E-06	< 2.68E-06	< 2.58E-05	< 6.12E-06	< 5.03E-06	3.63E-05	< 4.84E-06	< 1.19E-05
Tetrachloroethene	00127-18-4	< 2.58E-06	< 6.29E-06	5.35E-07	< 1.34E-06	< 1.29E-05	< 3.06E-06	< 2.52E-06	< 9.90E-07	< 2.42E-06	< 5.94E-06
Toluene	108-88-3	4.23E-06	5.20E-06	5.03E-06	1.18E-05	3.00E-06	2.72E-06	2.76E-06	2.30E-06	2.98E-06	< 1.14E-06

TABLE 6.X-9. UNCONTROLLED EMISSION FACTORS FOR A PLATEN PRESS[a]

Pollutant Category	CAS #	Cmpd. #14 lb/lb-rubber	Cmpd. #18 lb/lb-rubber	Cmpd. #17 lb/lb-rubber	Cmpd. #19 lb/lb-rubber	Cmpd. #20 lb/lb-rubber	Cmpd. #22 lb/lb-rubber	Cmpd. #23 lb/lb-rubber	Mean lb/lb-rubber	Max. lb/lb-rubber
TOTAL VOCs		1.93E-04	2.91E-04	2.25E-03	2.43E-03	2.26E-04	4.68E-04	1.12E-04	8.15E-04	2.43E-03
TOTAL SPECIATED ORGANICS		< 3.93E-03	< 1.99E-03	< 3.95E-03	< 3.60E-03	< 2.87E-03	< 2.89E-03	< 1.41E-03	< 2.88E-03	< 5.70E-03
TOTAL HAPs		< 3.66E-03	< 1.66E-03	< 2.20E-03	< 6.13E-04	< 2.59E-03	< 2.61E-03	< 1.24E-03	< 2.07E-03	< 5.13E-03
Individual HAPs:										
1,1,1-Trichloroethane	00071-55-6	2.05E-06	2.45E-06	1.51E-05	2.25E-06	3.34E-06	4.51E-08	2.04E-06	< 2.82E-05	3.56E-04
1,2,4-Trichlorobenzene	120-82-1	< 5.08E-08	< 1.50E-07	1.66E-08	< 1.39E-07	< 4.84E-08	< 1.93E-07	< 1.30E-07	< 1.61E-07	< 3.64E-07
1,3-Butadiene	106-99-0	2.17E-06	< 7.08E-07	< 7.08E-07	1.00E-06	2.58E-05	< 6.78E-07	6.77E-06	< 6.80E-06	2.56E-05
1,4-Dichlorobenzene	106-46-7	8.94E-08	9.15E-08	5.27E-08	5.01E-08	9.11E-08	< 1.59E-07	8.08E-08	< 9.32E-08	< 1.75E-07
2-Butanone	00078-93-3	< 5.14E-06	1.20E-06	< 5.03E-06	1.30E-05	1.78E-06	< 9.62E-06	1.30E-06	< 5.80E-06	< 2.58E-05
2-Chloro-1,3-Butadiene	00126-99-8						4.01E-08		6.54E-08	9.08E-08
2-Methylphenol	95-48-7	< 5.24E-08	< 1.28E-07	< 4.97E-08	< 2.06E-07	1.42E-08	< 2.07E-07	< 1.14E-07	< 1.50E-07	< 3.33E-07
3/4-Methylphenol	108-39-4/106-44-5	< 4.93E-08	7.25E-08	< 4.67E-08	< 1.93E-07	6.69E-08	< 1.97E-07	5.88E-08	< 1.40E-07	< 3.14E-07
4-Methyl-2-pentanone	00108-10-1	< 2.57E-06	< 2.52E-06	< 2.52E-06	< 5.76E-06	< 2.43E-06	< 2.21E-05	< 2.47E-06	< 1.15E-05	1.16E-04
Acetaldehyde	00075-07-0						4.01E-08		5.00E-08	7.84E-08
Acetonitrile	75-05-8	< 5.14E-06	< 5.03E-06	< 5.03E-06	< 1.15E-05	< 4.86E-06	< 9.62E-08	< 4.94E-06	< 7.65E-06	< 2.58E-05
Acetophenone	98-86-2	2.16E-06	5.44E-07	6.49E-07	2.21E-07	8.33E-07	4.01E-08	3.37E-07	< 2.67E-05	4.40E-04
Acrylonitrile	00107-13-1	3.02E-05	< 5.03E-06	< 5.03E-06	< 1.15E-05	< 4.86E-06	< 9.62E-08	< 4.94E-06	< 8.98E-06	3.02E-05
Aniline	62-53-3	< 2.93E-08	< 6.15E-08	1.02E-03	< 1.05E-07	< 2.71E-08	4.26E-08	2.83E-08	< 6.04E-05	1.02E-03
Benzene	71-43-2	1.15E-06	9.88E-07	1.06E-06	5.62E-06	1.00E-06	< 1.09E-06	< 1.00E-06	< 1.40E-06	5.62E-06
Benzidine	92-87-5	< 4.62E-08	< 3.55E-08	< 5.12E-08	< 1.03E-07	< 3.84E-08	2.79E-07	< 8.97E-08	< 3.80E-07	4.54E-06
Biphenyl	92-52-4	< 2.31E-08	< 6.00E-08	< 2.41E-08	< 7.77E-08	< 2.14E-08	< 7.75E-08	< 5.38E-08	< 8.47E-08	3.06E-07
bis(2-Ethylhexyl)phthalate	117-81-7	2.41E-06	3.07E-06	4.14E-06	4.33E-06	2.57E-06	2.65E-06	6.50E-06	4.81E-06	1.78E-05
Carbon Disulfide	00075-15-0	8.67E-04	5.56E-06	6.29E-06	< 5.76E-06	4.25E-06	1.83E-04	8.84E-06	< 2.83E-04	1.32E-03
Carbonyl Sulfide	463-58-1	8.79E-05	< 3.08E-06	< 3.08E-06	< 2.88E-06	< 2.98E-06	< 4.00E-06	2.84E-06	< 1.40E-05	8.79E-05
Chloroethane	00075-00-3	< 2.57E-06	1.48E-06	< 2.52E-06	< 5.76E-06	< 2.43E-06	< 4.81E-06	< 2.47E-06	< 3.88E-06	< 1.29E-05
Chloromethane	00074-87-3	< 2.57E-06	5.81E-07	1.04E-06	< 5.78E-06	9.73E-07	< 4.81E-06	1.05E-06	< 3.08E-06	< 1.29E-05
Cumene	98-82-8	5.08E-08	< 4.05E-08	4.82E-08	< 7.27E-08	4.27E-08	9.44E-08	2.24E-08	< 2.12E-07	2.78E-06
Dibenzofuran	132-64-9	5.70E-08	4.05E-08	3.31E-08	< 6.52E-08	3.99E-08	< 6.21E-08	4.19E-08	< 6.10E-08	1.54E-07
Dimethylphthalate	131-11-3	6.82E-08	5.55E-08	5.18E-08	< 8.14E-08	< 2.28E-08	9.80E-08	< 6.13E-08	< 8.81E-08	1.80E-07
Di-n-butylphthalate	84-74-2	4.78E-07	5.40E-08	9.64E-08	2.12E-07	4.47E-07	1.42E-07	3.59E-08	< 1.50E-08	9.84E-08
Ethylbenzene	100-41-4	< 1.42E-06	< 1.29E-06	< 1.39E-06	< 1.27E-06	< 1.34E-06	< 1.33E-06	< 1.36E-06	< 1.45E-06	< 2.85E-06
Hexachlorobutadiene	87-68-3	< 1.02E-07	< 2.61E-07	< 9.94E-08	< 1.88E-07	< 9.54E-08	< 3.38E-07	< 2.26E-07	< 2.84E-07	< 6.39E-07
Methylene Chloride	00075-09-2	2.60E-03	1.57E-03	1.10E-03	1.96E-04	2.49E-03	2.30E-03	1.14E-03	1.54E-03	4.59E-03
m-Xylene + p-Xylene	108-38-3/106-42-3	< 1.42E-06	< 1.29E-06	< 1.39E-06	< 1.27E-06	< 1.34E-06	< 1.42E-06	< 1.36E-06	< 2.40E-06	9.24E-06
Naphthalene	91-20-3	6.12E-07	2.50E-07	5.23E-07	0.00E+00	3.70E-07	3.00E-06	3.71E-07	1.01E-06	4.04E-06
n-Hexane	110-54-3	6.50E-06	5.25E-06	5.26E-06	3.00E-04	2.83E-05	8.53E-06	4.98E-06	< 2.72E-05	3.00E-04
o-Toluidine	95-53-4	< 3.24E-08	< 7.25E-08	< 3.01E-08	< 1.13E-07	< 2.99E-08	< 1.06E-07	< 6.58E-08	< 3.07E-07	2.21E-06
o-Xylene	95-47-6	< 1.42E-06	< 1.39E-06	< 1.39E-06	< 1.27E-06	< 1.34E-06	< 1.33E-06	< 1.36E-06	< 1.43E-06	2.01E-06
Phenol	108-95-2	2.67E-06	5.19E-07	< 3.61E-08	< 1.44E-07	5.85E-07	5.53E-07	3.98E-07	< 6.72E-07	2.67E-06
Propylene Oxide	00075-56-9	< 5.14E-06	< 5.03E-06	< 5.03E-06	< 1.15E-05	< 4.86E-06	< 2.66E-05	< 4.94E-06	< 1.59E-05	1.04E-04
Tetrachloroethene	00127-18-4	< 2.57E-06	< 2.52E-06	< 2.52E-06	< 5.76E-06	< 2.43E-06	< 4.81E-06	< 2.47E-06	< 3.83E-06	< 1.29E-05
Toluene	108-88-3	3.87E-06	3.98E-05	3.27E-06	9.94E-06	4.49E-06	4.22E-06	5.57E-06	< 6.71E-06	3.98E-05

TABLE 6.X-9 UNCONTROLLED EMISSION FACTORS FOR A PLATEN PRESS [a]

a To determine emission factors for compounds not listed in this table, multiply table 6.X-3 VOC data by 5.80, speciated organics by 27.14, and HAPs by 43.40.
b Formaldehyde 1.88×10^{-6} lb/lb rubber
c Formaldehyde 1.23×10^{-6} lb/lb rubber
d Compound judged to be one of the most prodigious emitters of formaldehyde. Sampling was conducted using EPA method TO-11. Analysis was conducted using EPA method TO-11/HPLC. Due to the high reactivity and propensity of formaldehyde to become quickly bound up with other available chemicals, formaldehyde emissions from other compounds and processes are judged to be insignificant.
A blank space indicates that the compound was a Tentatively identified Compound (TIC) and was not detected in that sample.
A "O" indicates a blank correction that resulted in a "O" or a negative value.

TABLE 6.X-10. UNCONTROLLED EMISSION FACTORS FOR A HOT AIR OVEN [c]

Chemical Compound	CAS Numbers	Cmpd. #5 (a) lbs/lb rubber	Cmpd. #8 (a) lbs/lb rubber	Cmpd. #22 (a) lbs/lb rubber	MEAN lbs/lb rubber	MAX lbs/lb rubber
TOTAL VOCs		5.56E-04	1.68E-03	1.12E-04	7.83E-04	1.68E-03
TOTAL SPECIATED ORGANICS		< 3.77E-04	< 2.06E-03	< 3.36E-03	< 2.10E-03	< 3.36E-03
TOTAL HAPs		< 1.38E-04	< 1.09E-03	< 2.03E-03	< 1.08E-03	< 2.03E-03
Individual HAPs:						
1,1-Dichloroethane	00075-34-3	< 1.29E-06	< 4.26E-06	< 5.84E-06	< 3.80E-06	< 5.84E-06
1,1-Dichloroethene	00075-35-4	< 1.29E-06	< 4.26E-06	< 5.84E-06	< 3.80E-06	< 5.84E-06
1,1,1-Trichloroethane	00071-55-6	1.12E-06	< 4.26E-06	< 5.84E-06	< 3.74E-06	< 5.84E-06
1,1,2-Trichloroethane	00079-00-5	< 1.29E-06	< 4.26E-06	< 5.84E-06	< 3.80E-06	< 5.84E-06
1,1,2,2-Tetrachloroethane	00079-34-5	< 1.29E-06	< 4.26E-06	< 5.84E-06	< 3.80E-06	< 5.84E-06
1,2-Dibromo-3-Chloropropane	00096-12-8	< 2.59E-06	< 8.52E-06	< 1.17E-05	< 7.59E-06	< 1.17E-05
1,2-Dibromoethane	00106-93-4	< 1.29E-06	< 4.26E-06	< 5.84E-06	< 3.80E-06	< 5.84E-06
1,2-Dichloroethane	00107-06-2	< 1.29E-06	< 4.26E-06	< 5.84E-06	< 3.80E-06	< 5.84E-06
1,2-Dichloropropane	00078-87-5	< 1.29E-06	< 4.26E-06	< 5.84E-06	< 3.80E-06	< 5.84E-06
1,2,4-Trichlorobenzene	120-82-1	< 3.94E-08	< 7.23E-08	< 1.83E-07	< 1.18E-07	< 1.83E-07
1,3-Butadiene	00106-99-0	< 3.58E-07	1.24E-06	< 3.23E-07	< 6.39E-07	1.24E-06
1,4-Dichlorobenzene	00106-46-7	< 1.29E-06	< 4.26E-06	< 5.84E-06	< 3.80E-06	< 5.84E-06
1,4-Dioxane	00123-91-1	< 5.18E-06	< 1.70E-05	< 2.33E-05	< 1.52E-05	< 2.33E-05
1,4-Phenylenediamine	106-50-3	< 3.94E-08	< 7.23E-08	< 1.83E-07	< 1.18E-07	< 1.83E-07
2-Butanone	00078-93-3	1.52E-06	< 8.52E-06	< 1.17E-05	< 7.27E-06	< 1.17E-05
2-Methylphenol	95-48-7	< 1.25E-07	< 8.50E-08	< 2.12E-07	< 1.41E-07	< 2.12E-07
2,2,4-Trimethylpentane	00565-75-3	< 3.78E-07	5.54E-07	5.79E-06	< 2.24E-06	5.79E-06
2,4-Dinitrophenol	005-12-85	< 6.15E-07	< 5.19E-07	< 1.29E-06	< 8.07E-07	< 1.29E-06
2,4-Dinitrotoluene	121-14-2	< 1.44E-07	< 1.22E-07	< 3.02E-07	< 1.89E-07	< 3.02E-07
2,4,5-Trichlorophenol	95-95-4	< 1.30E-07	< 1.08E-07	< 2.70E-07	< 1.69E-07	< 2.70E-07
2,4,6-Trichlorophenol	88-06-2	< 1.27E-07	< 1.06E-07	< 2.61E-07	< 1.65E-07	< 2.61E-07
3,3'-Dichlorobenzidine	91-94-1	< 5.33E-08	< 5.95E-08	< 1.19E-07	< 8.73E-08	< 1.19E-07
3,3'-Dimethoxybenzidine	119-90-4	< 1.31E-07	< 9.46E-08	< 1.89E-07	< 1.38E-07	< 1.89E-07
3,3'-Dimethylbenzidine	119-93-7	< 4.81E-08	< 3.51E-08	< 6.97E-08	< 5.09E-08	< 6.97E-08
3/4-Methylphenol	108-39-4/106-44-5	3.19E-07	< 8.19E-08	2.03E-07	< 2.01E-07	3.19E-07
4-Aminobiphenyl	92-67-1	< 4.97E-08	< 4.15E-08	< 9.29E-08	< 6.13E-08	< 9.29E-08
4-Methyl-2-pentanone	00108-10-1	< 1.29E-06	< 4.26E-06	< 5.84E-06	< 3.80E-06	< 5.84E-06
4-Nitrobiphenyl	92-93-3	< 9.30E-08	< 7.55E-08	< 1.71E-07	< 1.13E-07	< 1.71E-07
4-Nitrophenol	100-02-7	< 2.38E-07	< 2.51E-07	< 6.21E-07	< 3.90E-07	< 6.21E-07
4,4'-Methylenedianiline	101-77-9	< 1.17E-07	< 8.40E-08	< 1.68E-07	< 1.23E-07	< 1.68E-07
4,6-Dinitro-2-methylphenol	534-52-1	< 2.69E-07	< 2.21E-07	< 4.99E-07	< 3.30E-07	< 4.99E-07
Acetonitrile	75-05-8	5.31E-07	< 8.52E-06	< 1.17E-05	< 6.94E-06	< 1.17E-05
Acetophenone	00098-86-2	3.06E-07	2.13E-04	1.46E-05	7.60E-05	2.13E-04
Acrolein	00107-02-8	7.92E-07	< 8.52E-06	9.34E-06	< 6.22E-06	9.34E-06
Acrylonitrile	00107-13-1	< 2.59E-06	< 8.52E-06	< 1.17E-05	< 7.59E-06	< 1.17E-05
Allyl Chloride	00107-05-1	< 2.59E-06	< 8.52E-06	< 1.17E-05	< 7.59E-06	< 1.17E-05
Aniline	62-53-3	< 7.53E-08	1.48E-07	8.85E-07	< 3.69E-07	8.85E-07
a,a,a-Trichlorotoluene	98-07-7	< 9.30E-08	< 6.80E-08	< 1.71E-07	< 1.11E-07	< 1.71E-07
Benzene	00071-43-2	1.46E-06	4.88E-05	4.04E-06	1.81E-05	4.88E-05
Benzidine	92-87-5	< 4.97E-08	< 3.51E-08	< 6.97E-08	< 5.15E-08	< 6.97E-08
Benzyl Chloride	00100-44-7	< 2.59E-06	< 8.52E-06	< 1.17E-05	< 7.59E-06	< 1.17E-05
Biphenyl	92-52-4	3.77E-07	3.92E-07	< 3.96E-06	< 1.58E-06	< 3.96E-06
bis(2-Chloroethyl)ether	111-44-4	< 1.14E-07	< 7.87E-08	< 1.94E-07	< 1.29E-07	< 1.94E-07
bis(2-Ethylhexyl)phthalate	117-81-7	< 2.72E-08	2.74E-07	1.05E-06	< 4.52E-07	1.05E-06
Bromoform	00075-25-2	< 1.29E-06	< 4.26E-06	< 5.84E-06	< 3.80E-06	< 5.84E-06
Bromomethane	00074-83-9	< 1.29E-06	< 4.26E-06	< 5.84E-06	< 3.80E-06	< 5.84E-06
Carbon Disulfide	00075-15-0	1.60E-06	4.69E-04	1.20E-03	5.56E-04	1.20E-03
Carbon Tetrachloride	00056-23-5	< 1.29E-06	< 4.26E-06	< 5.84E-06	< 3.80E-06	< 5.84E-06
Carbonyl Sulfide	463-58-1	< 3.23E-06	< 2.13E-05	< 2.86E-05	< 1.77E-05	< 2.86E-05
Chlorobenzene	00108-90-7	< 1.29E-06	< 4.26E-06	< 5.84E-06	< 3.80E-06	< 5.84E-06
Chloroethane	00075-00-3	< 1.29E-06	< 4.26E-06	< 5.84E-06	< 3.80E-06	< 5.84E-06
Chloroform	00067-66-3	< 1.29E-06	< 4.26E-06	< 5.84E-06	< 3.80E-06	< 5.84E-06
Chloromethane	00074-87-3	4.21E-07	< 4.26E-06	< 5.84E-06	< 3.51E-06	< 5.84E-06
Cumene	98-82-8	< 5.13E-08	8.08E-08	3.86E-07	< 1.73E-07	3.86E-07
Dibenzofuran	132-64-9	1.95E-06	2.10E-06	3.29E-06	< 2.45E-06	3.29E-06
Dimethylaminoazobenzene	60-11-7	< 7.37E-08	< 5.32E-08	< 1.04E-07	< 7.71E-08	< 1.04E-07
Dimethylphthalate	131-11-3	4.65E-08	3.19E-08	< 8.71E-08	< 5.52E-08	< 8.71E-08
Di-n-butylphthalate	84-74-2	7.61E-06	0.00E+00	1.00E-06	2.87E-06	7.61E-06
Epichlorohydrin	00106-89-8	< 2.59E-06	< 8.52E-06	< 1.17E-05	< 7.59E-06	< 1.17E-05
Ethylbenzene	00100-41-4	< 3.51E-07	< 2.31E-07	< 3.17E-07	< 3.00E-07	< 3.51E-07

TABLE 6.X-10. UNCONTROLLED EMISSION FACTORS FOR A HOT AIR OVEN [c]

Chemical Compound	CAS Numbers	Cmpd. #5 (a) lbs\lb rubber	Cmpd. #8 (a) lbs\lb rubber	Cmpd. #22 (a) lbs\lb rubber	MEAN lbs\lb rubber	MAX lbs\lb rubber
Hexachloro-1,3-butadiene	00087-68-3	< 2.59E-06	< 8.52E-06	< 1.17E-05	< 7.59E-06	< 1.17E-05
Hexachlorobenzene	118-74-1	< 1.03E-07	< 8.40E-08	< 1.89E-07	< 1.25E-07	< 1.89E-07
Hexachlorobutadiene	87-68-3	< 1.59E-07	< 1.16E-07	< 2.93E-07	< 1.89E-07	< 2.93E-07
Hexachlorocyclopentadiene	77-47-4	< 1.55E-07	< 1.32E-07	< 3.25E-07	< 2.04E-07	< 3.25E-07
Hexachloroethane	67-72-1	< 2.05E-07	< 1.40E-07	< 3.51E-07	< 2.32E-07	< 3.51E-07
Hydroquinone	123-31-9	< 8.82E-08	< 6.49E-08	< 1.63E-07	< 1.05E-07	< 1.63E-07
Isooctane	00540-84-1	1.79E-06	< 2.49E-07	< 3.41E-07	< 7.95E-07	1.79E-06
Isophorone	78-59-1	< 4.97E-08	< 3.61E-08	< 9.00E-08	< 5.86E-08	< 9.00E-08
Methylene bis-chloroaniline	101-14-4	< 1.57E-07	< 1.14E-07	< 2.26E-07	< 1.66E-07	< 2.26E-07
Methylene Chloride	00075-09-2	2.59E-05	5.86E-05	3.21E-04	1.35E-04	3.21E-04
m-Xylene	00108-38-3	< 3.51E-07	1.33E-06	< 3.17E-07	< 6.66E-07	1.33E-06
Naphthalene	91-20-3	1.34E-06	1.07E-06	2.32E-06	1.58E-06	2.32E-06
n-Hexane	00110-54-3	3.90E-06	3.13E-06	6.86E-06	4.63E-06	6.86E-06
Nitrobenzene	98-95-3	< 8.98E-08	< 6.59E-08	< 1.65E-07	< 1.07E-07	< 1.65E-07
n-Nitrosodimethylamine	62-75-9	< 2.05E-07	< 1.40E-07	< 3.48E-07	< 2.31E-07	< 3.48E-07
n-Nitrosomorpholine	59-89-2	< 2.45E-07	< 1.68E-07	< 4.18E-07	< 2.77E-07	< 4.18E-07
N,N-Dimethylaniline	121-69-7	< 6.89E-08	< 5.00E-08	< 1.26E-06	< 4.60E-07	< 1.26E-06
o-Anisidine	90-04-0	< 1.31E-07	< 9.57E-08	< 2.44E-07	< 1.57E-07	< 2.44E-07
o-Toluidine	95-53-4	< 3.17E-08	< 5.63E-08	< 1.39E-07	< 9.25E-08	< 1.39E-07
o-Xylene	00095-47-6	5.44E-07	4.92E-05	< 3.17E-07	< 1.67E-05	4.92E-05
Pentachloronitrobenzene	82-68-8	< 3.48E-07	< 2.86E-07	< 6.47E-07	< 4.27E-07	< 6.47E-07
Pentachlorophenol	87-86-5	< 1.62E-07	< 1.33E-07	< 2.99E-07	< 1.98E-07	< 2.99E-07
Phenol	108-95-2	1.20E-06	3.41E-07	2.16E-06	1.23E-06	2.16E-06
Propylene Oxide	00075-56-9	< 2.59E-06	< 8.52E-06	< 1.17E-05	< 7.59E-06	< 1.17E-05
p-Xylene	00106-42-3	1.93E-06	2.95E-06	2.53E-05	1.01E-05	2.53E-05
Styrene	00100-42-5	8.61E-07	4.25E-07	4.51E-07	5.79E-07	8.61E-07
Substituted Benzene	71-43-2	b	2.13E-06		2.13E-06	2.13E-06
Substituted Naphthalene	91-20-3	1.89E-05			1.89E-05	1.89E-05
Substituted Quinoline	91-22-5			1.23E-04	1.23E-04	1.23E-04
t-Butyl Methyl Ether	01634-04-4	< 2.59E-06	< 8.52E-06	< 1.17E-05	< 7.59E-06	< 1.17E-05
Tetrachloroethene	00127-18-4	< 1.29E-06	< 4.26E-06	< 5.84E-06	< 3.80E-06	< 5.84E-06
Toluene	00108-88-3	2.75E-06	4.37E-06	5.25E-06	4.12E-06	5.25E-06
Trichloroethene	00079-01-6	< 1.29E-06	< 4.26E-06	< 5.84E-06	< 3.80E-06	< 5.84E-06
Trifluralin	1582-09-8	< 1.72E-07	< 1.45E-07	< 3.57E-07	< 2.24E-07	< 3.57E-07
Vinyl Acetate	00108-05-4	< 1.29E-06	< 4.26E-06	< 5.84E-06	< 3.80E-06	< 5.84E-06
Vinyl Chloride	00075-01-4	< 1.29E-06	< 4.26E-06	< 5.84E-06	< 3.80E-06	< 5.84E-06

a Compound 5 was green unextruded rubber. Compounds 8 and 22 were preextruded general products.

b A blank space means that the compound was a Tentatively Identified Compound (TIC) and was not detected in that sample.

c To determine emission factors for compounds not listed in this table, multiply table 6.X-3 VOC data by 7.39, speciated organics by 21.43 and HAPs by 22.64.

TABLE 6.X-11. UNCONTROLLED EMISSION FACTORS FOR GRINDING

Pollutant Category	CAS #	Sidewall Grinding (a) lb/lb-rubber	Carcass Grinding (a) lb/lb-rubber	Belt Grinding (a) lb/lb-rubber	Retread Buffing (b) lb/lb-rubber
TOTAL VOCs		1.57E-02	5.18E-04	1.79E-03	2.40E-04
TOTAL SPECIATED ORGANICS		< 1.02E-02	< 1.64E-02	< 2.63E-03	< 1.13E-05
TOTAL METAL HAPs		7.01E-05	6.52E-06	2.69E-05	5.18E-08
TOTAL ORGANIC HAPs		< 1.26E-03	< 1.39E-02	< 2.04E-03	< 7.09E-07
TOTAL PARTICULATE MATTER (PM) c,d		1.23	0.55	1.19	9.48E-03
TOTAL HAPs		< 1.33E-03	< 1.39E-02	< 2.07E-03	< 7.60E-07
Individual HAPs:					
1,3-Butadiene	106-99-0	< 2.44E-05	2.65E-05	2.41E-05	< 3.00E-10
1,4-Dichlorobenzene	00106-46-7	< 4.64E-06	< 5.70E-07	< 6.27E-07	2.63E-09
2-Butanone	00078-93-3	< 4.63E-05	< 7.04E-07	< 1.16E-05	2.52E-10
4-Methyl-2-pentanone	00108-10-1	< 2.85E-05	1.92E-05	< 6.50E-08	1.41E-08
Acetaldehyde	75-07-0			1.02E-05	
Acetophenone	98-86-2	3.37E-06	< 9.52E-07	5.90E-06	1.39E-08
Acrolein	00107-02-8	< 5.71E-05	< 1.89E-06	< 1.18E-05	7.34E-09
Aniline	62-53-3	4.05E-04	1.97E-05	< 7.17E-07	5.66E-08
Benzene	71-43-2	1.33E-05	< 4.25E-06	< 8.80E-07	1.56E-07
Biphenyl	92-52-4	< 2.56E-06	< 4.90E-07	< 3.81E-07	5.63E-09
bis(2-Ethylhexyl)phthalate	117-81-7	1.84E-05	7.94E-06	5.30E-05	1.99E-08
Carbon Disulfide	00075-15-0	< 2.73E-05	1.40E-06	3.03E-04	1.13E-08
Dibenzofuran	132-64-9	< 2.00E-06	1.59E-07	< 2.84E-07	< 3.64E-09
Di-n-butylphthalate	84-74-2	1.69E-06	< 2.28E-06	3.31E-06	3.87E-08
Ethylbenzene	100-41-4	5.70E-05	< 3.94E-07	< 8.97E-07	< 1.78E-10
Isooctane	540-84-1	1.15E-04	< 1.10E-05	< 9.65E-07	< 1.92E-10
Isophorone	78-59-1	< 2.59E-06	< 5.47E-07	< 4.26E-07	6.46E-09
Methylene Chloride	75-09-2	< 3.36E-05	4.19E-03 e	4.98E-05	2.79E-09
m-Xylene + p-Xylene	108-38-3/106-42-3	< 3.21E-05	< 2.30E-06	8.51E-06	< 9.61E-10
Naphthalene	91-20-3	3.81E-06	5.81E-07	4.02E-06	2.11E-08
n-Hexane	110-54-3	1.24E-04	< 1.60E-05	4.18E-05	< 1.93E-10
o-Toluidine	95-53-4	< 3.93E-06	2.55E-06	< 6.63E-07	< 7.56E-09
o-Xylene	95-47-6	< 1.90E-05	< 3.94E-07	5.40E-06	< 7.62E-10
Phenol	108-95-2	1.57E-05	< 1.79E-06	8.88E-06	3.04E-07
Tetrachloroethene	127-18-4	< 2.35E-05	< 5.70E-07	1.39E-04	< 2.23E-10
Toluene	108-88-3	1.86E-04	9.59E-03 e	1.35E-03	< 6.43E-09
Cadmium		1.36E-06	8.62E-07	2.80E-07	
Chromium		2.54E-05	1.59E-06	5.17E-06	2.53E-08
Lead		2.92E-05	2.04E-06	3.16E-06	
Nickel		1.41E-05	2.03E-06	1.63E-05	1.78E-08
Cobalt					8.74E-09

a Sidewall, Carcass, and Belt Grinding-pounds emitted per pound of rubber removed or ground off (lb/lb rubber removed).
b Retread Buffing-pounds emitted per pound of rubber processed (lb/lb rubber processed).
c Particulate matter control:
sidewall by cyclone 91.9%
carcass by cyclone 97.8%
belt by cyclone and ESP 99.97%
retread by cyclone and baghouse 97.9%
For uncontrolled PM emissions Sidewall, Carcass or Belt Grinding us a factor of 1.0 lb emitted per pound of rubber removed.
e Value exceeds that of total VOC. This discrepancy is being investigated.

RUBBER manufacturers association

1400 K Street, NW • Washington, DC 20005 • tel (202) 682-4800 • fax (202) 682-4854 • www.rma.org

December 14, 1998

William F. Hunt, Jr.
Director
Emissions, Monitoring and Analysis Division
Office of Air Quality Planning and Standards
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

Dear Mr. Hunt:

As you may know, over the last several years, the rubber manufacturing industry has been working with your office to develop and finalize an AP-42 section to address air emissions from rubber processing operations. I would like to request a meeting with you and your staff to discuss the history, development and current status of this project and the next steps required to finalize the draft AP-42 section.

The Rubber Manufacturers Association (RMA) is the national trade association of the rubber products industry, and represents the industry on a variety of technical, legislative and regulatory issues. RMA represents more than 120 companies that manufacture various rubber products, including tires, hoses, belts, seals, molded goods, and other finished rubber products.

The RMA developed emission factors in 1994 and 1995 for use in calculating air emissions from rubber processing operations. RMA kicked off its communications with EPA on the development of the factors with a meeting on June 8, 1994. Since that time, RMA has been working with Ron Ryan of the Emission Inventory and Factors Group to submit and finalize the emission factors for inclusion in the AP-42. The RMA was pleased when the factors were published on the Internet in draft form in December 1997, and noted that EPA received no substantive comments on the draft AP-42 section for rubber manufacturing operations. We were therefore surprised that now, one year after the publication of the draft factors on the Internet, the factors still have not been finalized.

Since the release of the factors in September 1996, RMA members and other rubber manufacturing companies have relied on the RMA emission factors to complete a wealth of state and federal permitting requirements. In addition, rubber processing emissions data submitted to EPA as part of the development of maximum achievable control technology (MACT) standards for rubber tire manufacturing were calculated using the emission factors developed by RMA. In short, the emission factors developed by RMA are crucial to the ability of the rubber manufacturing industry to calculate air emissions.

RMA members are concerned that the draft AP-42 section has not yet been published in final form, particularly now that the MACT standard development process is moving forward quickly and RMA members are discussing the issuance of Title V permits with state agencies. We realize that questions have arisen within EPA about the RMA emission factor development project. We would like this opportunity to provide you and your staff with a comprehensive overview of the project to date, discuss any concerns you may have, and develop a timeline for finalization of the AP-42 section. To that end, we propose a meeting with you during the afternoon of January 12, 1999. This time is convenient for RMA members, since we will be meeting with other OAQPS staff in Durham on January 13, 1999 to discuss the development of the tire manufacturing MACT. I will contact your office in the next few days to discuss scheduling such a meeting.

Thank you for your attention to this important project. If you have any questions about this request, please call me at 202-682-4839. We look forward to meeting with you.

Sincerely,

Tracey J. Norberg
Director, Environmental Affairs

Cc: Ron Ryan
Tony Wayne

RUBBER manufacturers association

GOVERNMENT RELATIONS
MULTIPLE FACSIMILE TRANSMITTAL

NAME: W. Hunt	FAX: 919/541-2357
NAME: R. Ryan	FAX: 919/541-0684
NAME: T. Wayne	FAX: 919/541-0942
NAME:	FAX:
NAME:	FAX:
NAME:	FAX:

☐ URGENT ☐ FOR REVIEW ☐ PLEASE COMMENT ☐ PLEASE REPLY ☐ PLEASE RECYCLE

THIS TRANSMISSION IS FROM:
NAME: Tracey Norberg DATE: 12/14
TOTAL NUMBER OF PAGE(S) 3 (including fax sheet)
If there is a problem with this transaction, please call (202) 682-4833

ADDITIONAL COMMENTS

1400 K Street, NW • Washington, DC 20005 • tel (202) 682-4800 • fax (202) 682-4809 • www.rma.org

mixing EFs - Belt

	2.26 E-4 16/16 rubber	REMOVED
retread carcass	5.45 E-1	"
retread buffing	9.09 E-07	PROCESSED
sidewall/whitewall	1.96 E-04	REMOVED

FOOTNOTE
SAYS FOR UNCONTROLLED
USE 1.0 lb/16 rubber removed

	CONTR 16/16 removed	UNCON	VOL 1 - TABLES 4-13h →
BELT	2.26 E-4	1.0 x 99.97 → 3.0E-4	3.7E-4
Retread CARCASS	5.45 E-1	1.0 x 97.9 → (97.8 → 2.2E-3)	1.23E-03
SIDEWALL	1.96 E-4	1.0 x 91.9% → 8.2E-3	9.9E-03
Retread BUFFING	9.09 E-07 16/16 rubber processed		2.13E-04

1987 Goodyear Test
~~99.86% eff.~~
~90% < 10μ
@ OUTLET of cyclone

GOODYEAR

RUN 1 post-cyclone	Run 2
.073 lbs/hr	.163
42 or 53 lbs for an hour?	100.5 or 118.7 lb

~ .146/100 ~ .0015 lbs/16 removed w/cyclone

~ .0016 lbs/16 removed

1.5E-3

Bill J.
545K in Helms office

~~Fred~~ X5251
.coulter
~~Amy~~ 0107

Bill Johnson
Fred Porter
Amy

-perc Mtce

whitehouse.gov
clear Kics poll of Bank

Steve shedd

rad tank coo
gasoline loading
X5397

CHANGES MADE DURING EDITING:

2/3/02 – PLATEN PRESS – "Total organic HAPS" Line for compds 10 → 18 had been ~~was~~ erroneously shifted to the Left. ~~It~~ The Total org. HAPs actually apply to compds 11 → 19. The "Total HAPS" Line that had appeared above was correct. The Total HAPS Line has been removed in favor of "Total other HAPs" to go along w/ "Total organic ~~HAPS~~", & highlight when Metal (or others) HAPS appear

make it easier to spot