



# EMISSIONS ESTIMATING WORKSHEET

Use this worksheet to do a mass-balance calculation of your annual emissions. This method is used to estimate the amount of chemical in your products, and assumes 100 percent of the chemical is emitted.

Make a separate copy of this worksheet for each product you have identified as containing regulated chemicals (see list of chemicals on back). Write down the product name and the chemicals that are in that product in the appropriate spaces of the table. Then, follow Steps 1-5 to determine how many chemicals, and in what quantities, you use annually.

### Step 1: Calculate Total Annual Usage of Regulated Chemicals

Using invoices, add up the total gallons purchased of a product in one year. Multiply this total by the **weight (lbs./gal.)** of the product and record this figure in the "Total Pounds of Product" column in the table below. (The lbs./gal. is shown in the Physical/Chemical Data section of the MSDS.)

If **specific gravity** is given instead of actual lbs./gal., multiply the specific gravity by 8.34 to get lbs./gal. Multiply this figure by total gallons purchased, and record the total in the "Total Pounds of Product" column.

For example, say you purchased 2,000 gallons of a particular paint product, which weighs 9.17 lbs./gal., or has a specific gravity of 1.1. (To convert specific gravity to lbs./gal., multiply 1.1 by 8.34, which equals 9.17.) Next, multiply 2,000 gallons by 9.17 to calculate the total pounds of the product.

**Example:**  $2,000 \times 9.17 = 18,340$

Enter **18,340** in the "Total Pounds of Product" column.

### Step 2: Calculate the Percentage of Chemical in Product

Section II of the MSDS lists the percentage of each chemical in the product. Often, this is called "Weight Percent." Find this number (if a range is given, use the highest number) and convert it to a decimal (multiply by

0.01). Record the new figure in the "Weight Percent" column in the table below. If weight percent is provided in a decimal, simply record that figure in the "Weight Percent" column.

For example, if Chemical "X" in the paint product you bought has a weight percent of 40, multiply 40 by 0.01 to calculate the weight percent.

**Example:**  $40 \times .01 = 0.4$

Enter **0.4** in the "Weight Percent" column.

### Step 3: Calculate the Total Pounds of Chemical

Multiply the number in the "Weight Percent" column with the quantity in "Total Pounds of Product" column, and record the total in the "Total Pounds of Chemical" column in the table below. Put a check in Column A if you know this chemical is found in other products. This will help remind you to add up the totals for each chemical from other worksheets.

For example, for Chemical "X" you would multiply the weight percent (0.4) by the total pounds of the chemical (18,340) to determine the total pound of the chemical.

**Example:**  $0.4 \times 18,340 = 7,336$

Enter **7,336** in the "Total Pounds of Chemical" column.

### Step 4: Calculate the Total Tons of Chemicals You Use per Year

Add the totals in the Total Pounds

of Chemical column for **each product**, and divide by 2,000. This number is your total tons per year for all chemicals used in your process materials. Next, add the total pounds of **each chemical** (refer to Column A to identify chemicals found in multiple products) and divide by 2,000. This number is your total tons per year for each particular chemical.

For example, if Chemical "X" is found only in one product (i.e. Column A is not checked), you would divide the total pounds of the chemical (7,336) by 2,000 to determine the total tons of Chemical "X" you use in one year.

**Example:**  $7,336 \div 2,000 = 3.67$

Enter **3.67** in the "Total Tons of Chemical" column.

### Step 5: Calculate Grand Total

Add the Total Pounds/Year figures from each worksheet to determine the total pounds of all chemicals you use. Divide this figure by 2,000 to determine Total Tons/Year. Enter this figure in the Grand Total Tons of Chemicals (below the table). Depending on the quantity of chemicals you estimated your business uses, you may need to comply with several environmental regulations.

For more information, contact [Bernard Brady](#), Washington Department of Ecology Small Business Assistance Program, at 360-407-6803.

Product Name: \_\_\_\_\_

Chemical Name	Total Pounds of Product	Weight Percent	Total Pounds of Chemical	Column A
Example: Chemical "X"	18,340 lbs.	0.4	7,336 lbs.	
Total Pounds/Year				
Total Tons/Year				

Grand Total Tons of Chemicals: \_\_\_\_\_

# HAZARDOUS AIR POLLUTANTS

CAS #	Chemical Name	CAS #	Chemical Name	CAS #	Chemical Name
75070	Acetaldehyde	57147	1,1 Dimethylhydrazine	82688	Pentachloronitrobenzene
60355	Acetamide	131113	Dimethyl phthalate		(Quintobenzene)
75058	Acetonitrile	77781	Dimethyl sulfate	87865	Pentachlorophenol
98862	Acetophenone	534521	4,6-Dinitro-o-cresol, and salts	108952	Phenol
53963	2-Acetylaminofluorene	51285	2,4-Dinitrophenol	106503	p-Phenylenediamine
107028	Acrolein	121142	2,4-Dinitrotoluene	75445	Phosgene
79061	Acrylamide	123911	1,4-Dioxane (1,4-Diethyleneoxide)	7803512	Phosphine
79107	Acrylic acid	122667	1,2-Diphenylhydrazine	7723140	Phosphorus
107131	Acrylonitrile	106898	Epichlorohydrin	85449	Phthalic anhydride
8107051	Allyl chloride		(1-Chloro-2,3-epoxypropane)	1336363	Polychlorinated biphenyls (Aroclors)
92671	4-Aminobiphenyl	106887	1,2-Epoxybutane	1120714	1,3-Propane sultone
62533	Aniline	140885	Ethyl acrylate	57578	beta-Propiolactone
90040	o-Anisidine	100414	Ethyl benzene	123386	Propionaldehyde
1332214	Asbestos	51796	Ethyl carbamate (Urethane)	114261	Propoxur (Baygon)
71432	Benzene (including from gasoline)	75003	Ethyl chloride (Chloroethane)	78875	Propylene dichloride
92875	Benzidine	106934	Ethyl enedibromide (Dibromoethane)		(1,2-Dichloropropane)
98077	Benzotrithloride	107062	Ethyl enedichloride	75569	Propylene oxide
100447	Benzyl chloride		(1,2-Dichloroethane)	75558	1,2-Propylenimine
92524	Biphenyl	107211	Ethylene glycol		(2-Methyl aziridine)
117817	Bis (2-ethylhexyl) phthalate (DEHP)	151564	Ethyleneimine (Aziridine)	91225	Quinoline
542881	Bis(chloromethyl) ether	75218	Ethylene oxide	106514	Quinone
75252	Bromoform	96457	Ethylene thiourea	100425	Styrene
106990	1,3-Butadiene	75343	Ethylidene dichloride	96093	Styrene oxide
156627	Calcium cyanamide		(1,1-Dichloroethane)	1746016	2,3,7,8-Tetrachlorodibenzo-p-dioxin
105602	Caprolactam	50000	Formaldehyde	79345	1,1,2,2-Tetrachloroethane
133062	Captan	76448	Heptachlor	127184	Tetrachloroethylene
63252	Carbaryl	118741	Hexachlorobenzene		(Perchloroethylene)
75150	Carbon disulfide	87683	Hexachlorobutadiene	7550450	Titanium tetrachloride
56235	Carbon tetrachloride	77474	Hexachlorocyclopentadiene	108883	Toluene
463581	Carbonyl sulfide	67721	Hexachloroethane	95807	2,4-Toluene diamine
120809	Catechol	822060	Hexamethylene-1,6-diisocyanate	584849	2,4-Toluene diisocyanate
133904	Chloramben	680319	Hexamethylphosphoramide	95534	o-Toluidine
57749	Chlordane	110543	Hexane	8001352	Toxaphene (chlorinated camphene)
7782505	Chlorine	302012	Hydrazine	120821	1,2,4-Trichlorobenzene
79118	Chloroacetic acid	7647010	Hydrochloric acid	79005	1,1,2-Trichloroethane
532274	2-Chloroacetophenone	7664393	Hydrogen fluoride (Hydrofluoric acid)	79016	Trichloroethylene
108907	Chlorobenzene	123319	Hydroquinone	95954	2,4,5-Trichlorophenol
510156	Chlorobenzilate	78591	Isophorone	88062	2,4,6-Trichlorophenol
67663	Chloroform	58899	Lindane (all isomers)	121448	Triethylamine
107302	Chloromethyl methyl ether	108316	Maleic anhydride	1582098	Trifluralin
126998	Chloroprene	67561	Methanol	540841	2,2,4-Trimethylpentane
19773	Cresols/Cresylic acid (isomers and mixture)	72435	Methoxychlor	108054	Vinyl acetate
95487	0-Cresol	74839	Methyl bromide (Bromomethane)	593602	Vinyl bromide
108394	m-Cresol	74873	Methyl chloride (Chloromethane)	75014	Vinyl chloride
106445	p-Cresol	71556	Methyl chloroform	75354	Vinylidene chloride
98828	Cumene		(1,1,1-Trichloroethane)		(1,1-Dichloroethylene)
94757	2,4-D, salts and esters	78933	Methyl ethyl ketone (2-Butanone)	1330207	Xylenes (isomers and mixture)
3547044	DDE	60344	Methyl hydrazine	95476	o-Xylenes
334883	Diazomethane	74884	Methyl iodide (Iodomethane)	108383	m-Xylenes
132649	Dibenzofurans	108101	Methyl isobutyl ketone (Hexone)	106423	p-Xylenes
96128	1,2-Dibromo-3-chloropropane	624839	Methyl isocyanate	0	Antimony compounds
84742	Dibutylphthalate	80626	Methyl methacrylate	0	Arsenic compounds (inorganic, including arsine)
106467	1,4-Dichlorobenzene(p)	1634044	Methyl tert butyl ether	0	Beryllium compounds
91941	3,3'-Dichlorobenzidene	101144	4,4-Methylene bis (2-chloroaniline)	0	Cadmium compounds
111444	Dichloroethyl ether (Bis(2chloroethyl)ether)	75092	Methylene chloride (Dichloromethane)	0	Chromium compounds
542756	1,3-Dichloropropene	101688	Methylene diphenyl diisocyanate (MDI)	0	Cobalt compounds
62737	Dichlorvos	101779	4,4'-Methylenedianiline	0	Coke oven emissions
111422	Diethanolamine	91203	Naphthalene	0	Cyanide compounds <sup>1</sup>
121697	N,N-Diethyl aniline (N,N-Dimethylaniline)	98953	Nitrobenzene	0	Glycol ethers <sup>2</sup>
64675	Diethyl sulfate	92933	4-Nitrobiphenyl	0	Lead compounds
119904	3,3-Dimethoxybenzidine	100027	4-Nitrophenol	0	Manganese compounds
60117	Dimethyl aminoazobenzene	79469	2-Nitropropane	0	Mercury compounds
119937	3,3-Dimethylbenzidine	684935	N-Nitroso-N-methylurea	0	Mineral fibers <sup>3</sup>
79447	Dimethyl carbamoyl chloride	62759	N-Nitrosodimethylamine	0	Nickel compounds
68122	Dimethyl formamide	59892	N-Nitrosomorpholine	0	Polycyclic organic matter <sup>4</sup>
		56382	Parathion	0	Radionuclides (including radon) <sup>5</sup>
				0	Selenium compounds

## NOTE:

For all listings above that contain the word "compounds" and for glycol ethers, the following applies: unless otherwise specified, these listings are defined as including any unique chemical substance that contains the named chemical (i.e., antimony, arsenic, etc.) as part of that chemical's infrastructure.

<sup>1</sup> X'CN where X=H' or any other group where a formal dissociation may occur. For example, KCN or Ca(CN)<sub>2</sub>

<sup>2</sup> Includes mono- and di-ethers of ethylene glycol, diethylene glycol, and triethylene glycol R-(OCH<sub>2</sub>CH<sub>2</sub>)<sub>n</sub>-OR' where n=1, 2, or 3; R=alkyl or aryl groups; R'=R, H, or groups which, when removed, yield glycol ethers with the structure: R-(OCH<sub>2</sub>CH)<sub>n</sub>-OH. Polymers are excluded from the glycol category.

<sup>3</sup> Includes glass, rock, or slag fibers (or other mineral derived fibers) of average diameter 1 micrometer or less.

<sup>4</sup> Includes organic compounds with more than one benzene ring, and which have a boiling point greater than or equal to 100°C.

<sup>5</sup> A type of atom which spontaneously undergoes radioactive decay.



Produced by the Pacific Northwest Pollution Prevention Resource Center, Seattle, Wash.

A joint project of the Small Business Assistance Programs in Alaska, Idaho, Oregon and Washington. Funded by a grant from the U.S. EPA.

This fact sheet is intended for general reference only; it is not a complete statement of the technical or legal requirements associated with the CAA.

Ecology is an equal opportunity agency. If you have special accommodation needs or require this document in an alternative format, please contact Tami Dahlgren at (360) 407-6830 (voice) or (360) 407-6006 (TDD only).

Dec. 1996