

Missouri
Department of
Natural Resources

HAP Permitting

Kathi Jantz

Construction Permits Engineer
Air Pollution Control Program

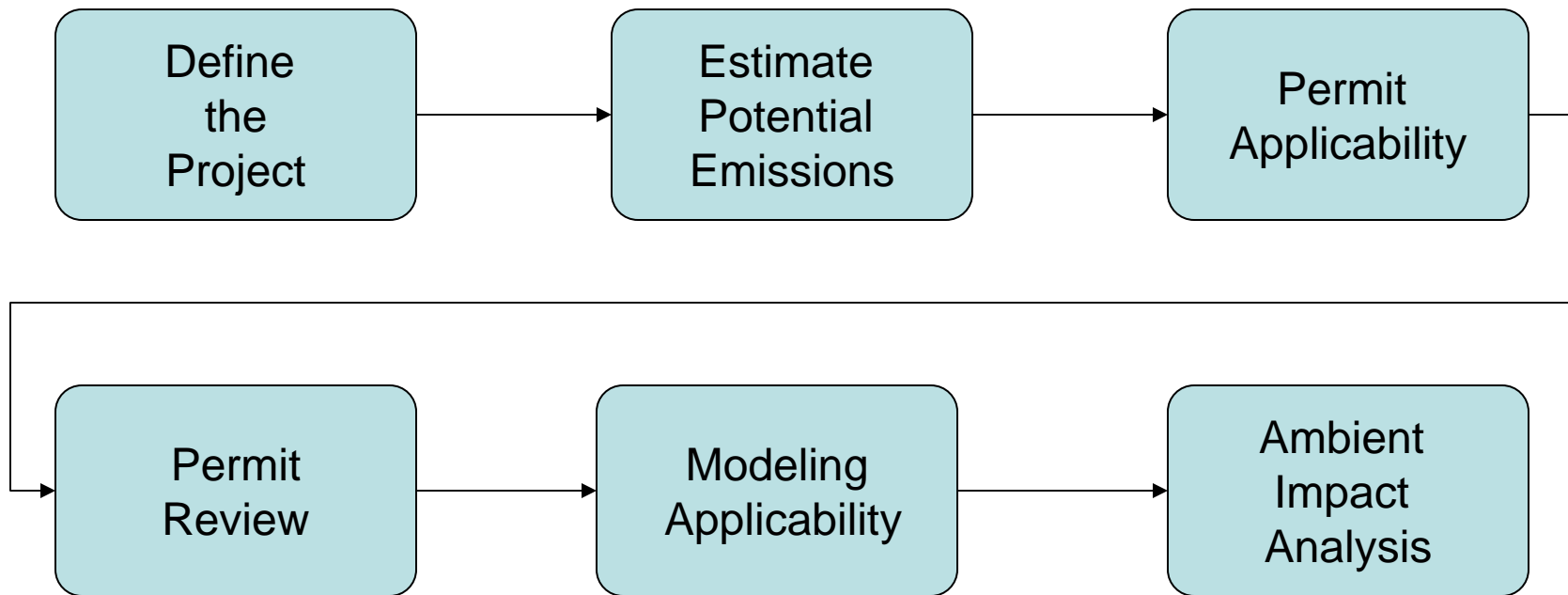
Background

- Hazardous air pollutants (HAPs) are pollutants known or suspected to cause cancer and other serious health effects
- HAPs are also known as Air Toxics
- The Missouri Air Pollution Control Program (APCP) has a HAP permitting process intended to prevent ambient Air Toxic problems
- New and existing sources are regulated by federal MACT standards to achieve emissions reductions
- New sources are also regulated by the construction permits rule to assess the ambient impact of potential HAP emissions
- The objective of this presentation is to give a high level overview of the HAP permitting process and highlight some of the unique aspects of the potential HAP emissions calculations

Example: Air Toxic Problem

- The following example occurred in another state within the last five years...
- A large chemical manufacturing plant was located 1600 feet from an elementary school serving pre-K through second grade students
- In three separate events within a six month time period, the facility experienced accidental releases totaling 1,800 lbs of acrylonitrile, 400 lbs of styrene, and 800 lbs of 1,3-butadiene. One of these events was visible and observed by parents at a school festival
- In response to the accidental releases, the state required the facility to take action to prevent future accidental releases and to install an air toxic monitor at the nearby school
- With just 7 months of air monitoring data, it was determined that long-term exposure levels posed an unacceptable health risk and the school was immediately closed
- In response to the monitoring results, a community cancer assessment was ordered and concluded that a significantly higher number of cancer cases was observed than expected
- The state and EPA fined the source \$3.1 million dollars for releasing cancer-causing chemicals into the air
- This situation is an example of an air toxic problem the Air Pollution Control Program would like to prevent

HAP Permitting Process



Step One: Define the Project

- Characterize the emission units
 - Explain maximum hourly design rates and bottlenecked rates
 - List all intended fuels
 - Provide Material Safety Data Sheets (MSDS) for all raw materials
 - Identify all products and by-products of chemical reactions
 - Submit a detailed process flow diagram
- Identify HAPs emitted, permit engineers use...
 - HAP table created by the Air Pollution Control Program
 - EPA's National Emissions Inventory table of hazardous air pollutants
 - <http://www.epa.gov/oar/data/help/hneihaps.html#pages>
 - <http://www.epa.gov/ttn/atw/glycol2000.pdf>

Step Two: Estimate Potential Emissions

- Estimate both **controlled** and **uncontrolled** potential emissions for each HAP individually
- Some individual HAPs are part of an aggregate group as indicated in EPA guidance
 - <http://www.epa.gov/ttn/atw/agghapsmemo3.html>
 - Common examples include xylenes (all isomers), glycol ethers, polycyclic organic matter compounds, chromium compounds
- Aggregate group emissions are combined but are still considered an individual HAP
 - Combined aggregate group emissions are compared to the 10 ton individual major source level for both Permit and MACT applicability
- Aggregate group emissions are not the same as Total Combined HAPs which are compared to the 25 ton major source threshold

Aggregate Groups Complete List

1. Asbestos
2. Cresols/Cresylic Acid (isomers and mixtures)
3. 2,4 - D, Salts and Esters
4. Dibenzofurans, Dibenzodioxins
5. 4, 6 Dinitro-o-cresol, and Salts
6. Lindane (all isomers)
7. Xylenes (all isomers and mixtures)
8. Antimony Compounds
9. Arsenic Compounds
10. Beryllium Compounds
11. Cadmium Compounds
12. Chromium Compounds
13. Cobalt Compounds
14. Coke Oven Emissions
15. Cyanide Compounds
16. Glycol Ethers
17. Lead Compounds (except elemental Lead)
18. Manganese Compounds
19. Mercury Compounds
20. Fine Mineral Fibers
21. Nickel Compounds
22. Polycyclic Organic Matter
23. Selenium Compounds
24. Polychlorinated Biphenyls (Aroclors)
25. Radionuclides

Step Two: Estimate Potential Emissions (Cont.)

- ****Note**** The total mass of the compound is always used to determine the potential emissions
- This guidance is particularly important for the inorganic HAPS where sometimes confusion exists whether the total mass should be counted or just the HAP portion
- EPA guidance is clear that the total mass of the compounds should be used in comparing the potential emissions to the major source levels for both permit and MACT applicability
- EPA also advises that when the specific inorganic HAP compounds are unknown, a particular HAP compound should be assumed in order to avoid underestimating potential HAP emissions
 - For example testing may measure the metal portion of a HAP and not the total mass of the compound. In this event a likely HAP compound should be assumed to estimate an appropriate emission rate or emission factor
 - Note: This adjustment is only required when the potential emissions of the aggregate group would exceed 50% of the major source level (or 5 tons per year)

Step Three: Permit Applicability

- For new or existing de minimis installations, a permit is required if the **uncontrolled** potential **annual** emissions exceed....
 - the major source levels for HAPs
 - 10 tons per year individual (or aggregate group)
 - 25 tons per year for all HAPs combined
- For all other sources, a permit is required if....
 - the **uncontrolled** potential **maximum 1-hour** emissions exceed...
 - 0.5 pounds per hour for HAPs, or
 - the **uncontrolled** potential **annual** emissions exceed...
 - the screening model action levels (SMALs) for HAPs
 - where the SMALs are emission threshold levels determined by the APCP for modeling applicability

Step Four: Determine Permit Review

- For projects with **controlled** potential **annual** emissions exceeding major source levels for HAPs
 - A Section (6) permit review is required **if a MACT applies**
 - A Section (9) permit review (Case-by-Case MACT) is required **when a MACT does not apply**
- For MACT applicability, controlled potential emissions are compared to major source levels because the control device will be required by the permit
 - Major source levels for MACT are the same as major source levels for permit applicability
 - 10 tons per year individual (or aggregate group)
 - 25 tons per year for all HAPs combined
- For projects with controlled (or limited) potential annual emissions less than major source levels
 - A section (5) permit review is required
 - Area source MACT standards may still apply
 - HAP Modeling may still be required

Step Five: Modeling Applicability

- If a project requires a construction permit review under any section, the **controlled** potential **annual** emissions of the individual HAP (or aggregate group) are compared to the SMALs
- If the potential emissions exceed the SMALs, then an ambient impact analysis (modeling) is required
 - However, a source may choose to avoid modeling for an individual HAP by taking a voluntary limit to emit less than the SMAL
- ****Note**** Determining modeling applicability and appropriate emission rates for the Aggregate group HAPs is challenging
 - The Air Pollution Control Program is currently working on guidance for modeling the HAPs in aggregate groups
 - At this time, if project emissions exceed the SMAL for a HAP that is part of an Aggregate group, a source should contact the Air Pollution Control Program for current guidance

Step Six: Ambient Impact Analysis

- For simple projects, the SCREEN3 screening model may be used; however, results will be conservative and may overestimate the ambient impact
- For complex projects or projects that have not passed the screening model, AERMOD is the recommended model
- The model results are compared to the Risk Assessment Levels (RALs)
 - RALs are health based levels determined by the Air Pollution Control Program and the Department of Health and Senior Services
- The modeled emission rate is the maximum emission rate for the averaging period for the RAL
- If the maximum ambient impact exceeds the RAL, the source must....
 - limit the potential emissions
 - redesign the process or add controls, or
 - perform testing to develop site-specific emission factors

APCP HAP Table

Chemical	CAS #	SMAL (tons/yr)	8-HR RAL (µg/m ³)	24-HR RAL (µg/m ³)	Annual RAL (µg/m ³)	10x Annual RAL (µg/m ³)	Group ID	VOC	PM	Synonyms
BIS(CHLOROETHYL)ETHER (Note 5)	111-44-4	0.06		6.9	0.03	0.3		Y	N	DICHLOROETHYL ETHER, DICHLOROETHER, DICHLOROETHYL OXIDE, BCEE
BIS(CHLOROMETHYL)ETHER	542-88-1	0.0003	0.000667					Y	N	BCME, SYM-DICHLOROMETHYL ETHER, DICHLOROMETHYL ETHER, OXYBIS-(CHLOROMETHANE)
BROMOFORM	75-25-2	10	0.889					Y	N	TRIBROMOMETHANE, METHYL TRIBROMIDE
BROMOMETHANE	74-83-9	10		5.28	2.64			Y	N	METHYL BROMIDE
BUTADIENE, [1,3-]	106-99-0	0.07		1.2	0.003	0.03		Y	N	BIETHYLENE, BIVINYL, BUTADIENE MONOMER, DIVINYLYL ERYTHRENE, VINYLETHYLENE
BUTOXYETHANOL ACETATE, [2-]	112-07-2	5		790	79		P	Y	N	2-BUTOXYETHYL ACETATE, BUTYL CELLOSOLVE ACETATE, BUTYL GLYCOL ACETATE
BUTYLENE OXIDE, [1,2-]	106-88-7	1						Y	N	1,2-EPOXYBUTANE, 1-BUTENE OXIDE, 1,2-BUTENE OXIDE
CADMIUM	7440-43-9	0.01		0.006	0.001	0.01	K	N	Y	C.I. 77180
CADMIUM COMPOUNDS		0.01	0.00889				K	N	Y	CADMIUM(DUST, FUME, ACETATE, CHLORATE, CHLORIDE, FLUORIDE, OXIDE, SULFATE, SULFIDE)
CALCIUM CHROMATE (ANHYDROUS)	13765-19-0	0.002		0.003	0.0001	0.001	L	N	Y	CHROMIC ACID CALCIUM SALT, CALCIUM CHROME YELLOW, CI.PIGMENT YELLOW 33, GELBIN
CALCIUM CYANAMIDE	156-62-7	10	0.0889				O	Y	Y	NITROLIME, CALCIUM CARBIMIDE, CYANAMIDE
CAPROLACTAM (Delisted)	105-60-2									HEXAHYDRO-2H-AZEPIN-2-ONE, AMINOCAPROIC LACTAM, EPSILON-CAPROLACTAM
CAPTAN	133-06-2									1-(2-CHLOROMETHYL)MERCAPTO-4-CYCLOHEXENE-1,2-DIOL
CARBARYL	133-06-2									1-(2-CHLOROMETHYL)MERCAPTO-4-CYCLOHEXENE-1,2-DIOL
CARBON DISULFIDE										THIOCARBONIC ANHYDRIDE
CARBON TETRACHLORIDE										PERCHLOROMETHANE
CARBONYL SULFIDE										SULFIDE, CARBOXYLSULFIDE
CATECHOL	120-80-9									PRO-CATECHOL, O-DIHYDROXYBENZENE
CHLORAMBEN	133-90-4	1		46.8				Y	Y	3-AMINO-2,5-DICHLOROBENZOIC ACID, AMBEN, AMIBEN*, VEGIBEN* (*TRADEMARK)
CHLORDANE	57-74-9	0.01		0.14	0.03	0.3		Y	Y	ENT9932, OCTACHLOR

The table identifies HAPs by name, CAS number, and common synonyms

APCP HAP Table

Chemical	CAS #	SMAL (tons/yr)	8-HR RAL (µg/m ³)	24-HR RAL (µg/m ³)	Annual RAL (µg/m ³)	10x Annual RAL (µg/m ³)	Group ID	VOC	PM	Synonyms
BIS(CHLOROETHYL)ETHER (Note 5)	111-44-4	0.06		6.9	0.03	0.3		Y	N	DICHLOROETHYL ETHER, DICHLOROETHER, DICHLOROETHYL OXIDE, BCEE
BIS(CHLOROMETHYL)ETHER	542-88-1	0.0003	0.000667					Y	N	BCME, SYM-DICHLOROMETHYL ETHER, DICHLOROMETHYL ETHER, OXYBIS-(CHLOROMETHANE)
BROMOFORM	75-25-2	10	0.889					Y	N	TRIBROMOMETHANE, METHYL TRIBROMIDE
BROMOMETHANE	74-83-9	10		5.28	2.64			Y	N	METHYL BROMIDE
BUTADIENE, [1,3-]	106-99-0	0.07				0.03		Y	N	BIETHYLENE, BIVINYL, BUTADIENE MONOMER, DIVINYLYL ERYTHRENE, VINYLETHYLENE
BUTOXYETHANOL ACETATE, [2-]	112-92-5							Y	N	2-BUTOXYETHYL ACETATE, BUTYL CELLOSOLVE ACETATE, BUTYL GLYCOL ACETATE
BUTYLENE OXIDE, [1,2-]								N	N	1,2-EPOXYBUTANE, 1-BUTENE OXIDE, 1,2-BUTENE OXIDE
CADMIUM								Y	Y	C.I. 77180
CADMIUM COMPOUNDS									Y	CADMIUM(DUST, FUME, ACETATE, CHLORATE, CHLORIDE, FLUORIDE, OXIDE, SULFATE, SULFIDE)
CALCIUM CHROMATE (ANHYDROUS)									Y	CHROMIC ACID CALCIUM SALT, CALCIUM CHROME YELLOW, CI.PIGMENT YELLOW 33, GELBIN
CALCIUM CYANAMIDE								Y	Y	NITROLIME, CALCIUM CARBIMIDE, CYANAMIDE
CAPROIC ACID									Y	HEXAHYDRO-2H-AZEPIN-2-ONE, AMINOCAPROIC LACTAM, EPSILON-CAPROLACTAM
CHLOROBENZENE								Y	Y	N-TRICHLOROMETHYLMERCAPTO-4-CYCLOHEXENE-1,2-DICARBOXIMIDE
CHLOROPHENOL								V	Y	1-NAPHTHYL-N-METHYLCARBAMATE
CHLOROSULFONIC ACID				740	700			Y	N	CARBON BISULFIDE, DITHIOCARBONIC ANHYDRIDE
CHLOROTRIFLUOROMETHANE				3	0.07	0.7		Y	N	TETRACHLOROMETHANE, PERCHLOROMETHANE
CHLORINE				0.1	0.1			Y	N	CARBON OXIDE SULFIDE, CARBOXYLSULFIDE
CHLORINE DIOXIDE			3.56					Y	N	PYROCATECHOL, O-DIHYDROXYBENZENE
CHLORINE TRIOXIDE				46.8				Y	Y	3-AMINO-2,5-DICHLORO BENZOIC ACID, AMBEN, AMIBEN*, VEGIBEN* (*TRADEMARK)
CHLORINE TRIOXIDE	74-90-9	0.01		0.14	0.03	0.3		Y	Y	ENT9932, OCTACHLOR

Emissions of compounds that are in the **same** aggregate group must be counted together and are considered an individual HAP

Group ID
A value in this column indicates that the compound is classified as an aggregate group HAP.

APCP HAP Table

Chemical	CAS #	SMAL (tons/yr)	8-HR RAL (µg/m ³)	24-HR RAL (µg/m ³)	Annual RAL (µg/m ³)	10x Annual RAL (µg/m ³)	Group ID	VOC	PM	Synonyms
BIS(CHLOROETHYL)ETHER (Note 5)	111-44-4	0.06		6.9	0.03	0.3		Y	N	DICHLOROETHYL ETHER, DICHLOROETHER, DICHLOROETHYL OXIDE, BCEE
BIS(CHLOROMETHYL)ETHER	542-88-1	0.0003	0.000667					Y	N	BCME, SYM-DICHLOROMETHYL ETHER, DICHLOROMETHYL ETHER, OXYBIS-(CHLOROMETHANE)
BROMOFORM	75-25-2	10	0.889					Y	N	TRIBROMOMETHANE, METHYL TRIBROMIDE
BROMOMETHANE	74-83-9	10		5.28	2.64			Y	N	METHYL BROMIDE
BUTADIENE, [1,3-]	106-99-0							Y	N	BIETHYLENE, BIVINYL, BUTADIENE MONOMER, DIVINYLYL ERYTHRENE, VINYLETHYLENE
BUTOXYETHANOL ACETATE, [2-]	111-86-1							Y	N	2-BUTOXYETHYL ACETATE, BUTYL CELLOSOLVE ACETATE, BUTYL GLYCOL ACETATE
BUTYLENE OXIDE, [1,2-]	106-88-8							Y	N	ETHYLENE OXIDE, OXYBUTANE, 1-BUTENE OXIDE, 1,2-BUTENE OXIDE
CADMIUM	7440-50-8									
CADMIUM COMPOUNDS										ACETATE, CHLORATE, CHLORIDE, FLUORIDE, FUMATE, SULFIDE)
CALCIUM CHROMATE (ANHYDROUS)	13458-06-0									CHROMATE, CALCIUM SALT, CALCIUM CHROME PIGMENT YELLOW 33, GELBIN
CALCIUM CYANAMIDE	12012-02-5									CYANAMIDE, CALCIUM CARBIMIDE, CYANAMIDE
CAPROLACTAM (Delisted)	141-76-2									ε-CAPROLACTAM, 6-AMINO-2-HAZEPIN-2-ONE, AMINOCAPROIC LACTAM, EPSILON-CAPROLACTAM
CAPTAN	133-06-2							Y	Y	N-TRICHLOROMETHYLMERCAPTO-4-CYCLOHEXENE-1,2-DICARBOXIMIDE
CARBARYL	63-25-2	10	0.889				V	Y	Y	1-NAPHTHYL-N-METHYLCARBAMATE
CARBON DISULFIDE	75-15-0	1		740	700			Y	N	CARBON BISULFIDE, DITHIOCARBONIC ANHYDRIDE
CARBON TETRACHLORIDE	56-23-5	1		3	0.07	0.7		Y	N	TETRACHLOROMETHANE, PERCHLOROMETHANE
CARBONYL SULFIDE	463-58-1	5		0.1	0.1			Y	N	CARBON OXIDE SULFIDE, CARBOXYLSULFIDE
CATECHOL	120-80-9	5	3.56					Y	N	PYROCATECHOL, O-DIHYDROXYBENZENE
CHLORAMBEN	133-90-4	1		46.8				Y	Y	3-AMINO-2,5-DICHLOROBENZOIC ACID, AMBEN, AMIBEN, VEGIBEN* (*TRADEMARK)
CHLORDANE	57-74-9	0.01		0.14	0.03	0.3		Y	Y	ENT9932, OCTACHLOR

Most HAPs are also considered criteria pollutants and potential emissions should be counted as both HAPs and VOC or PM₁₀

HAP Table Legend

Group ID	SMAL (tons)	Aggregate Group Name
N	0.03	Coke Oven Emissions
O	5	Cyanide Compounds
P	5	Glycol Ethers
Q	0.01	Lead Compounds (except elemental Lead)
R	0.8	Manganese Compounds
S	0.01	Mercury Compounds
T	0	Fine Mineral Fibers
U	1	Nickel Compounds
V	0.01	Polycyclic Organic Matter

The Legend is located within the HAP table and contains the Aggregate Group Name which corresponds to the Aggregate Group ID



HAP Table Legend

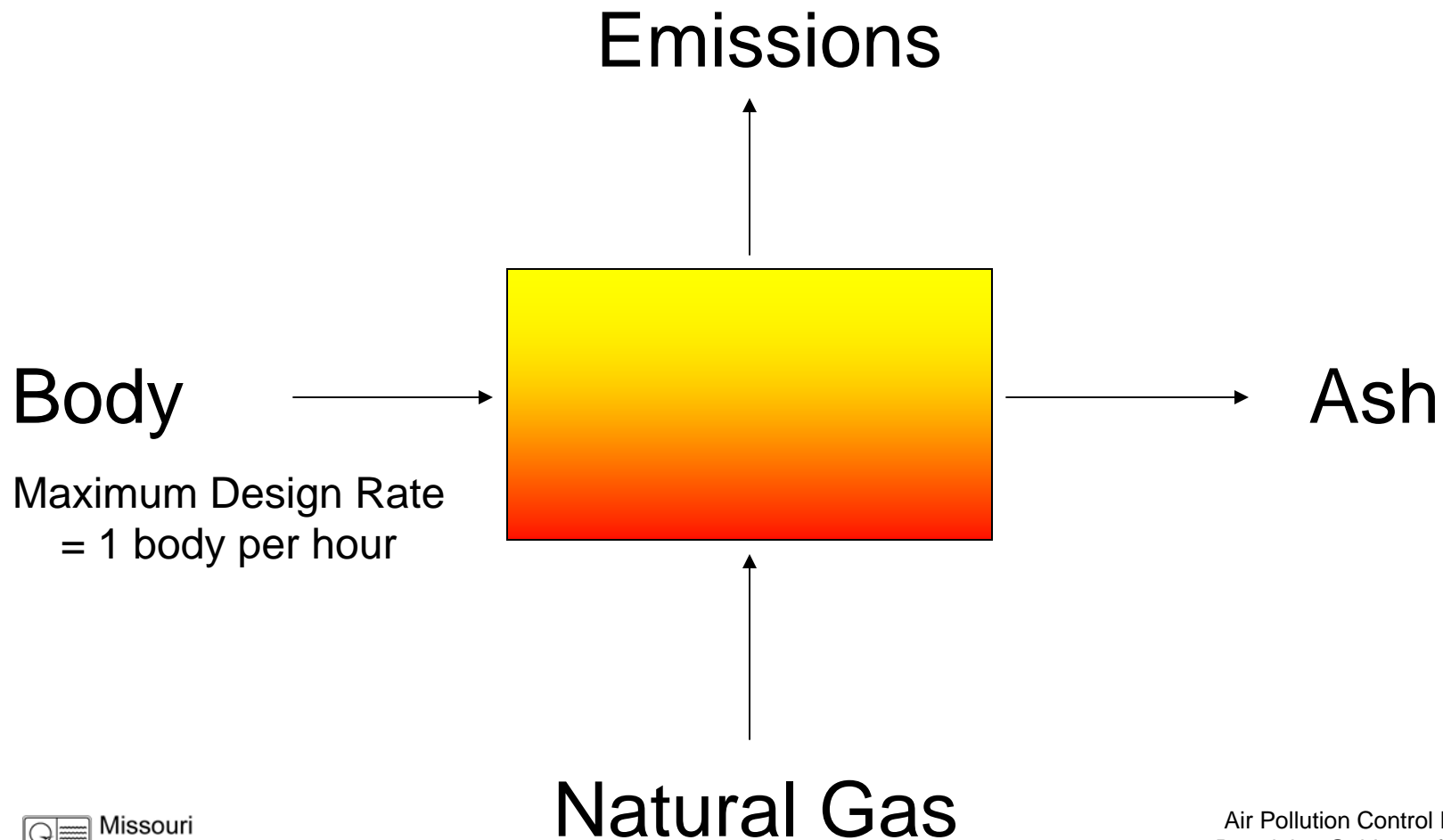
Group ID	SMAL (tons)	Aggregate Group Name
N	0.03	Coke Oven Emissions
O	5	Cyanide Compounds
P	5	Glycol Ethers
Q	0.01	Lead Compounds
R	0.8	Manganese Compounds
S	0.01	Mercury Compounds
T	0	Fine Mineral Fibers
U	1	Nickel Compounds
V	0.01	Polycyclic Organic Matter

when the potential emissions of a project exceed the SMAL for an aggregate group HAP, contact the APCP for current guidance



Example: Human Crematory

Step One: Process Flow Diagram



Example: Human Crematory

Step Two: Potential Emissions

- Maximum hourly design rate is one body burned per hour
- Emission factors for crematories are available in the Factor Information Retrieval (FIRE) Data System Version 6.24
- Emission factors are in units of pound pollutant per body burned
- There are no add-on emission control devices used for crematories
- Almost all of the potential HAP emissions are a part of an aggregate group of HAPs

HAP	CAS #	Aggregate Group	Emission Factor (lb/Body Burned)
Acenaphthene	83-32-9	V	1.11E-07
Acenaphthylene	208-96-8	V	1.22E-07
Anthracene	120-12-7	V	3.24E-07
Antimony	7440-36-0	H	3.02E-05
Arsenic	7440-38-2	I	3.00E-05
Benzo (a) anthracene	56-55-3	V	9.76E-09
Benzo (a) pyrene	50-32-8	V	2.91E-08
Benzo (b) fluoranthene	205-99-2	V	1.59E-08
Benzo (g,h,i) perylene	191-24-2	V	2.91E-08
Benzo (k) fluoranthene	207-08-9	V	1.42E-08
Beryllium	7440-41-7	J	1.37E-06
Cadmium	7440-43-9	K	1.11E-05
Chromium	7440-47-3	L	2.99E-05
Chromium (VI)	18540-29-9	L	1.35E-05
Chrysene	218-01-9	V	5.40E-08
Cobalt	7440-48-4	M	1.75E-06
Dibenzo(a,h) anthracene	53-70-3	V	1.27E-08
Fluoranthene	206-44-0	V	2.05E-07
Fluorene	86-73-7	V	4.17E-07
Heptachlorodibenzo-p-dioxins, total		V & D	8.14E-09
Heptachlorodibenzofurans, total		V & D	5.41E-09
Hexachlorodibenzo-p-dioxins, total	34465-46-8	V & D	5.66E-09
Hexachlorodibenzofurans, total		V & D	1.09E-08
Hydrogen chloride	7647-01-0		7.20E-02
Hydrogen fluoride	7664-39-3		6.55E-04
Indeno(1,2,3-cd)pyrene	193-39-5	V	1.54E-08
Lead	7439-92-1	N	6.62E-05
Mercury	7439-97-6	S	3.29E-03
Nickel	7440-02-0	U	3.82E-05
Octachlorodibenzo-p-dioxins, total	3268-87-9	V & D	6.07E-09
Octachlorodibenzofurans, total	39001-02-0	V & D	1.62E-09
Pentachlorodibenzo-p-dioxins, total		V & D	2.17E-09
Pentachlorodibenzofurans, total		V & D	6.44E-09
Phenanthrene	85-01-8	V	2.29E-06
Polychlorinated dibenzo-p-dioxins, total		V & D	2.35E-08
Polychlorinated dibenzofurans, total		V & D	3.53E-08
Polycyclic aromatic hydrocarbons (PAH)		V	3.76E-06
Pyrene	129-00-0	V	1.62E-07
Selenium	7782-49-2	W	4.36E-05
Tetrachlorodibenzo-p-dioxins, total		V & D	1.41E-09
Tetrachlorodibenzofurans, total		V & D	1.10E-08



Example: Human Crematory

Step Two: Potential Emissions (Cont.)

HAP	SMAL (tons/yr)	Aggregate Group	Potential Emissions (tons/yr)
Polycyclic Organic Matter	0.01	V	0.0000
Dioxins/Furans	6.00E-07	V & D	5.2E-07
Chromium Compunds	5	L	0.0002
Chromium (IV) Compunds	0.002	L	0.0001
Antimony Compounds	5	H	0.0001
Arsenic Compounds	0.005	I	0.0001
Beryllium Compounds	0.008	J	0.0000
Cadmium Compounds	0.01	K	0.0000
Cobalt Compounds	0.1	M	0.0000
Lead Compounds	0.01	N	0.0000
Mercury Compounds	0.01	S	0.0144
Nickel Compounds	1	U	0.0002
Selenium Compounds	0.1	W	0.0002
Hydrogen chloride (7647-01-0)	10		0.3154
Hydrogen fluoride (7664-39-3)	0.1		0.0029
All HAPs combined			0.3336

- The aggregate groups are combined to determine the individual aggregate group emission rate
- Potential emissions are less than major source levels for individual HAPs and All HAPs combined

Example: Human Crematory

Steps Three : Permit Applicability

Emissions Summary (tons per year)

Pollutant	Regulatory <i>De Minimis</i> Levels ^[1]	Existing Potential Emissions	Potential Emissions of the Application
PM ₁₀	15.0	N/A	1.16
SO _x	40.0	N/A	0.04
NO _x	40.0	N/A	0.66
VOC	40.0	N/A	0.99
CO	100.0	N/A	0.17
Hg	0.01	N/A	0.014
Total HAPs	25.0	N/A	0.33

¹For individual HAPs, value is the Screening Model Action Level

- Source is new
- Potential emissions of criteria pollutants are less than de minimis levels
- Potential emissions of HAPs are less than major source levels
- The APCP requires all incinerators to obtain a construction permit

Example: Human Crematory

Steps Four: Permit Review

Emissions Summary (tons per year)

Pollutant	Regulatory <i>De Minimis</i> Levels ^[1]	Existing Potential Emissions	Potential Emissions of the Application
PM ₁₀	15.0	N/A	1.16
SO _x	40.0	N/A	0.04
NO _x	40.0	N/A	0.66
VOC	40.0	N/A	0.99
CO	100.0	N/A	0.17
Hg	0.01	N/A	0.014
Total HAPs	25.0	N/A	0.33

¹For individual HAPs, value is the Screening Model Action Level

- Permit Determination: A Section (5) permit review is required because a human crematory meets the definition of an incinerator

Example: Human Crematory

Steps Five: Modeling Applicability

HAP	SMAL (tons/yr)	Aggregate Group	Potential Emissions (tons/yr)
Polycyclic Organic Matter	0.01	V	0.0000
Dioxins/Furans	6.00E-07	V & D	5.2E-07
Chromium Compunds	5	L	0.0002
Chromium (IV) Compunds	0.002	L	0.0001
Antimony Compounds	5	H	0.0001
Arsenic Compounds	0.005	I	0.0001
Beryllium Compounds	0.008	J	0.0000
Cadmium Compounds	0.01	K	0.0000
Cobalt Compounds	0.1	M	0.0000
Lead Compounds	0.01	N	0.0000
Mercury Compounds	0.01	S	0.0144
Nickel Compounds	1	U	0.0002
Selenium Compounds	0.1	W	0.0002
Hydrogen chloride (7647-01-0)	10		0.3154
Hydrogen fluoride (7664-39-3)	0.1		0.0029
All HAPs combined			0.3336

- As the maximum potential emissions of mercury exceeds the SMAL for mercury compounds, an ambient impact analysis is required
- Mercury Compounds is an aggregate group HAP, current APCP guidance for modeling Mercury emissions from a human crematory is to assume all mercury is emitted as elemental mercury

Example: Human Crematory

Steps Six: Ambient Impact Analysis

Ambient Impact Analysis of Elemental Mercury

Averaging Time	Risk Assessment Level ($\mu\text{g}/\text{m}^3$)	Modeled Impact ($\mu\text{g}/\text{m}^3$)	Conditioned Impact ($\mu\text{g}/\text{m}^3$)
24-hour	0.14	0.15	0.14
Annual	0.07	0.03	0.03

- In this case, the maximum 1-hour emission rate is the same as the potential annual emission rate
- A human crematory is a simple process, so the SCREEN3 screening model was used to assess the ambient impact of elemental mercury
- Results show that the modeled impact of elemental mercury exceeds the 24-hour Risk Assessment Level
- Although the results of a screening model are conservative, the applicant chose to avoid a refined modeling analysis by taking a voluntary limit on the maximum amount of mercury emissions for a 24-hour period

Questions?

