STAR Program
Implementation Workshops

1st Workshop

November 10, 2005

STAR Program

Strategic Toxic Air Reduction

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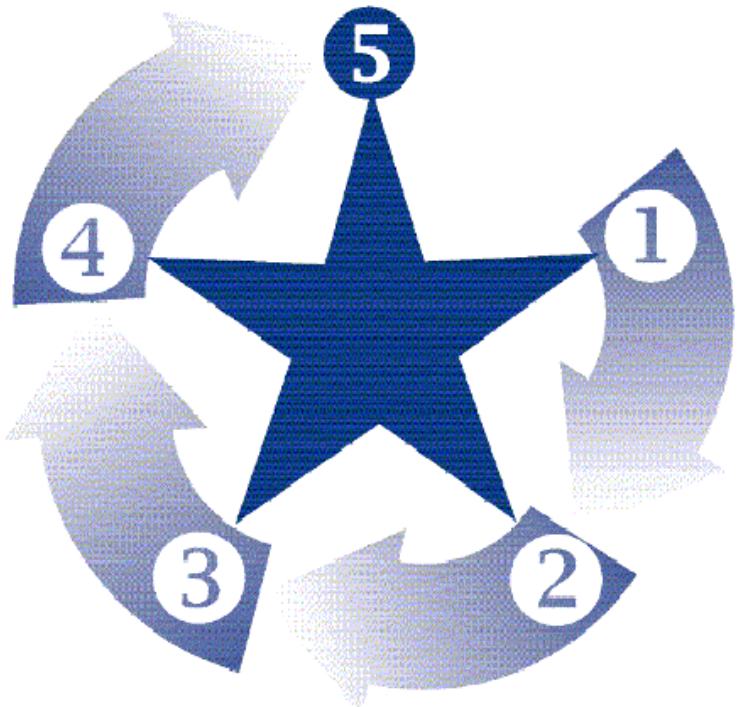
Strategic Toxic Air Reduction



1. Emissions levels
2. Release points
3. Modeling
4. Reduction plan
5. Compliance

Agenda

- Deriving Benchmark Ambient Concentration (BAC)
- Calculating toxicity-based de minimis
- Categories of Toxic Air Contaminants (TACs)
- Requirements for New and Modified Processes and Process Equipment
- De minimis – 6 different ways

Agenda (Continued)

- Useful conversion equations
- Using the Tier 1 table to calculate risk
- Using the Tier 2 table to calculate risk
- Introduction to SCREEN3 modeling
- Questions
- Suggested topics for 2nd STAR Workshop

Agenda

- Deriving Benchmark Ambient Concentration (BAC)
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BAC and De Minimis List

- www.apcd.org/star
  - pdf file
  - Excel file
- List of recent additions, revisions, and corrections

Deriving a BAC

- Regulation 5.20
  - Section 2 – Determination that a TAC is a Carcinogen
  - Section 3 – Cancer Risk Benchmark Determination Method
  - Section 4 – Chronic Noncancer Risk Benchmark Determination Method

What is a BAC?

- Concentration ($\mu g/m^3$) and Averaging Period used for determining environmental acceptability
- BAC_C
  - One-in-one million risk
  - Annual averaging period
- BAC_{NC}
  - Hazard Quotient of 1.0
  - Annual averaging period except:
    - Michigan – as specified
    - Occupational Exposure Level – 8-Hour

Determination that a TAC is a Carcinogen

- **"Unit risk estimate"** (**URE**) developed by
  - EPA – Integrated Risk Information System (**IRIS**)
  - California Office of Environmental Health Hazard Assessment
  - Michigan Air Quality Division
- National Toxicology Program (**NTP**)
- International Agency for Research on Cancer (**IARC**)
- Agency for Toxic Substances and Disease Registry (ATSDR)
- Determination by the District (after public review)

Cancer Risk Benchmark Determination Methodology

$$BAC_C = \frac{1 \times 10^{-6}}{URE}$$

BAC_C is in units of $\mu g/m^3$

URE (Unit Risk Estimate) is the lifetime risk from exposure to a concentration of 1 $\mu g/m^3$ in air

Cancer Risk Benchmark Determination Methodology

- 1. Is a cancer risk number established by:
  - EPA – Published in IRIS?
  - California?
  - Michigan?

Cancer Risk Benchmark Determination Methodology

- 2. Is the TAC determined to be a carcinogen by:
  - NTP?
  - IARC?
  - ATSDR?
  - District?
- 3. If yes:
  - **Develop URE** by methodology in section 3.3.4
  - Use **Default** value of 0.0004 µg/m^3

Chronic Noncancer Risk Benchmark Determination Methodology

- 1. Chronic noncancer risk number established by:
  - **RfC**: EPA – Published in IRIS
  - **REL**: California
  - **RfD**: EPA – Published in IRIS (determined appropriate)
  - **ITSL**: Michigan
  - 1% of **O**ccupational **E**xposure **L**evel (e.g. TLV)
  - Based on animal studies, various methods (oral studies determined appropriate)
  - Use **Default** value of 0.04 $\mu g/m^3$

Deriving a BAC_C and BAC_{NC} Example: Ethylene Oxide

- BAC_C
  - IRIS: No
  - California: URE = 8.8×10^{-5}

    $BAC_C = 10^{-6} / 8.8 \times 10^{-5} = 0.011\ \mu g/m^3$
- BAC_{NC}
  - IRIS: No
  - California: REL = $BAC_{NC} = 30\ \mu g/m^3$

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Toxicity-Based De Minimis

- Regulation 5.01
  - Section 1.6

    Definition of “de minimis emission”
    - Section 1.6.4

      Toxicity-based de minimis calculation methodology

BAC-based De Minimis Calculation Methodology

The emission of a TAC from a **process or process equipment** that is equal to or less than the amounts calculated by using the following method:

Step 1 Determine BAC_{NC} and, if a carcinogen, BAC_C

Step 2 Multiply the BAC_{NC} by the Tier 1 factors

Step 3 Multiply the BAC_C by the Tier 1 factors

Step 4 An emission of that TAC that is less than **both** the smaller pound-per-hour de minimis value and the corresponding applicable averaging time period de minimis value is deemed to be a de minimis emission

Tier 1 - Table 1

Simple Factor for Determining Maximum Ambient Concentration (Regulation 5.22 Section 2)

BAC Averaging Time	Annual Factor	24-Hour Factor	8-Hour Factor	1-Hour Factor
Annual	480			0.54
24 Hours		0.12		0.05
8 Hours			0.02	0.02
1 Hour				0.001

BAC-Based De Minimis
Example: Ethylene Oxide

- BAC_C = 0.011 µg/m^3
  - Annual averaging period
- BAC_{NC} = 30 µg/m^3
  - Annual averaging period

Tier 1 - Table 1

Simple Factor for Determining Maximum Ambient Concentration

BAC Averaging Time	Annual Factor	24-Hour Factor	8-Hour Factor	1-Hour Factor
Annual	**480**			**0.54**
24 Hours		0.12		0.05
8 Hours			0.02	0.02
1 Hour				0.001

BAC-Based De Minimis
Example: Ethylene Oxide

- BAC_C

  0.011 µg/m^3 x 0.54 = 0.006 lb/hour ◄◄◄

  0.011 µg/m^3 x 480 = 5.3 lb/year ◄◄

- BAC_{NC}

  30 µg/m^3 x 0.54 = 16 lb/hour ◄

  30 µg/m^3 x 480 = 14,000 lb/year

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Categories of TACs

- Regulation 5.23
  - Category 1 TACs – Section 1 – 18
  - Category 2 TACs – Section 2 – 19
  - Category 3 TACs – Section 3 – 17
  - Category 4 TACs – Section 4 – 137

    191

Category 1 TACs

… the 18 compounds monitored in the 2000 to 2001 *West Louisville Air Toxics Study* at a concentration representative of a cancer risk greater than 1.0×10^{-6} or a non-cancer Hazard Quotient (HQ) greater than 1.0

Category 2 TACs

… the 19 compounds with 2002 Toxics Release Inventory (TRI) reported air emissions for Jefferson County, Kentucky, with an EPA Risk-Screening Environmental Indicators (RSEI) Full Model Relative Risk Score equal to or greater than 500 that are not Category 1 TACs

Category 3 TACs

… the 17 compounds identified by the EPA pursuant to Section 112(k) of the Clean Air Act as presenting significant risks to public health in urban areas that are not Category 1 or 2 TACs

"The 33 Urban Air Toxics"

Category 4 TACs

… the 137 Hazardous Air Pollutants (HAPs) listed by the EPA pursuant to Section 112(b) of the Clean Air Act that are not Category 1, 2, or 3 TACs

"The 188 HAPs"

TAC Groups

- Metal and compounds that include the metal, e.g., arsenic and arsenic compounds
- Diisocyanates – Use EPA TRI list*
- Glycol ethers – Use EPA TRI document*
  - Based on ethylene, not propylene, glycol
  - Includes 2 chemicals reported individually:
    - Ethylene glycol ethyl ether (CAS 110-80-5)
    - Ethylene glycol methyl ether (CAS 109-86-4)

* Linked from www.apcd.org/star

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A BAC is ...

- Concentration ($\mu g/m^3$) and Averaging Period used for determining environmental acceptability
- BAC_C
  - One-in-one million risk
- BAC_{NC}
  - Hazard Quotient of 1.0

What is Environmental Acceptability?

- **Environmental Acceptability (EA) means the risk meets the established goals**

- **Risk can be:**
  - **Cancer risk – how many in one million**
    e.g., 1×10^{-6} or 10×10^{-6}
  - **Noncancer risk – Hazard Quotient**
    e.g., 1.0 HQ

How is Risk Determined?

- $\text{Risk} = \dfrac{\text{Maximum Concentration } (\mu g/m^3)}{\text{BAC } (\mu g/m^3)}$

Construction Permit Requirements of STAR Program

- Regulation 5.21 Section 3
  - Demonstrate environmental acceptability
  - If appropriate, emission or parametric monitoring, recordkeeping, reporting
- Regulation 5.21 section 2.2
  - Environmental acceptability (EA) goals

Construction Permit Requirements
STAR Program Applicability

- Stationary Sources
  - Group 1 stationary sources (Title V)
  - Group 2 stationary sources (FEDOOP, 25 tpy)
- Categories of TACs
  - Category 1 and 2 TACs
    - Existing processes and process equipment (P/PE)
    - New and modified P/PE
  - Category 3 and 4 TACs
    - New and modified P/PE

Consideration of Multiple Pollutants

- Carcinogens – Accumulate risk from all "applicable" carcinogens
- Noncancer risk – Does NOT accumulate HQ from similar adverse-effect TACs

What are the EA Goals?

- Carcinogens – Cancer Risk Goals
  - ► **1×10^{-6} – single process/single TAC**
  - ► **3.8×10^{-6} – new or modified processes/ all TACs/single company**
  - 7.5×10^{-6} – all processes/all TACs/single company
  - 10×10^{-6} – all processes/all TACs/multiple companies

What are the EA Goals?

- Noncancer risk – Hazard Quotient (HQ) Goals

  - **► 1.0 HQ – single process/single TAC**
  - **► 1.0 HQ – new or modified processes/ single TAC/single company**
  - 1.0 HQ – all processes/single TAC/single company
  - 1.0 HQ – all processes/single TAC/multiple companies

Category 3 and 4 TACs
Alternative for Demonstrating EA

- Regulation 5.21 section 3.1.2.2
- Demonstrate compliance with Reg. 5.01 Section 3

  ... shall not emit a TAC in a quantity or duration as to be harmful to the health and welfare of humans, animals, and plants

- Requires opportunity for public review and comment

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De Minimis #1

Regulation 5.01 section 1.6.1

- **IF** information of a purchased material is from an **MSDS** (Material Safety Data Sheet)
  - Carcinogen: <0.1% by weight
  - Noncarcinogen: <1.0% by weight
- Does NOT apply to mixture of several purchased materials
- Does NOT apply to purchased materials w/o MSDS that are independently analyzed
- Does NOT apply to materials manufactured by the process or process equipment

De Minimis #2

Regulation 5.01 section 1.6.2

- Process or process equipment or activity is on District's **Trivial Activity** list

- www.apcd.org/permit/t5/trivial.pdf

De Minimis #3

Regulation 5.01 section 1.6.3

- Process or process equipment or activity is on District's **Insignificant Activity** list
- www.apcd.org/permit/t5/insignificant.pdf
- Process added for case-by-case approval for Group 2 stationary sources

De Minimis #4

Regulation 5.01 section 1.6.4

- Toxicity-based amounts, developed from BACs
- www.apcd.org/star/
- Send e-mail to starfaq@apcd.org if needed for construction permit but is not already posted

De Minimis #5

Regulation 5.01 section 1.6.5

- New or modified surface coating process or process equipment, including coating change
- Potential volatile organic compound (VOC) emissions are < 5.0 tons per year
- No longer de minimis 18 months after beginning operation or process/coating change

De Minimis #6

Regulation 5.01 section 1.6.6

- Motor vehicle fueling or refueling process and process equipment for gasoline and other liquid fuels

- All fueling/refueling of gasoline and other liquid fuels will be reviewed by the District pursuant to Regulation 5.30

Exempt Stationary Source

Regulation 5.01 section 1.7

- Gasoline dispensing facility (may have cold cleaner)
- Motor vehicle refinishing operations (may have cold cleaner)
- Perchloroethylene dry cleaner
- Cold cleaner is only permitted process
- Not exempted if have other permitted processes or process equipment

Agenda

- Useful conversion equations
- Using the Tier 1 table to calculate risk
- Using the Tier 2 table to calculate risk
- Introduction to SCREEN3 modeling
- Questions
- Suggested topics for 2nd STAR Workshop

Lb/hr and $\mu g/m^3$

- Lb/hr x 2.67×10^8 / SCFM = $\mu g/m^3$
- $\mu g/m^3$ x SCFM / 2.67×10^8 = Lb/hr

ppm & ppb and mg/m^3 & µg/m^3

- ppm x 0.04088 x mol. wt. = mg/m^3
- mg/m^3 x 24.4638 / mol. wt. = ppm
- mg/m^3 x 1000 = µg/m^3
- µg/m^3 / 1000 = mg/m^3
- ppb x 0.04088 x mol wt. = µg/m^3
- µg/m^3 x 24.4638 / mol. wt. = ppb

(ppm & ppb equations @ 77 °F)

Lb/hr and g/sec

- __Lb/hr x 0.126 = __g/sec
- __g/sec x 7.93 = __Lb/hr

Thus, 1 g/sec = 7.93 Lb/hr

Feet, Inches, and Meters

- feet x 0.3048 = meters
- inches x 0.0254 = meters

- meters x 3.281 = feet
- meters x 39.37 = inches

Lb/hr and T/yr

Potential @ “24-7” full operation

- Lb/hr x 4.38 = T/yr
- Lb/hr x 8760 = Lb/yr

Temperature

- [(°F + 40) x 5/9] – 40 = °C
- [(°C + 40) x 9/5] – 40 = °F
- (°F + 460) x 5/9 = °K
- °C + 273 = °K

Agenda

- Useful conversion equations
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Modeling

- Tier 1 – Simple look-up table (SCREEN3)
  - 25’ building, 1.25 SH/BH, 100’ distance
- Tier 2 – Look-up table (SCREEN3)
  - Actual Building height, Stack height, Distance
- Tier 3 – SCREEN3 or TSCREEN
- Tier 4 – ISC3ST, AERMOD, or other EPA Model

4-TAC Mixture

Compound	BAC_{NC} µg/m³	Ave. Period	BAC_C µg/m³	Ave. Period
Toluene	5,000	Annual	--	--
1,2,4-Trimethylbenzene	1,230	8-hour	--	--
DGBE	20	24-hour	--	--
Methylene chloride	400	Annual	2.1	Annual

Toluene, 1,2,4-Trimethylbenzene, and Diethylene glycol monobutyl ether (DGBE) are not carcinogens (BAC_{NC})

Methylene chloride is a carcinogen (BAC_C, also has BAC_{NC})

4-TAC Mixture
Maximum Usage

- 6 gallons / hour
- 7 hours / 8-hour shift (42 gal / 8-hr) (48▼)
- 2 shifts / day (84 gal / day) (144▼)
- 5 days / week (420 gal / week) (1,008▼)
- 50 weeks / year (21,000 gal / yr) (52,560▼)

▼ (Gallons) Potential usage if not limited

4-TAC Mixture Emissions

Compound	lb/gal	Emissions				
		lb/hr	lb/8 hr	lb/24 hr	lb/yr	ton/yr
Toluene	**0.50**	**3**	21.0	42.0	**10,500**	5.25
1,2,4-Trimethylbenzene	**1.00**	**6**	**42.0**	84.0	21,000	10.50
DGBE	**0.25**	**1.5**	10.5.0	**21.0**	5,250	2.63
Methylene chloride	**0.50**	**3**	21.0	42.0	**10,500**	5.25
Total	**2.25**	13.5	94.5	189	47,250	23.63

“Tier 0”

BAC-based
De Minimis Emissions

Regulation 5.01 section 1.6.4

“Tier 0” – De Minimis Emissions Information Required

- TACs
- BAC for each TAC (averaging period)
- Emissions: lb/hr

  lb/averaging period

De Minimis Values

Compound	De Minimis			
	lb/hr	lb/8 hr	lb/24 hr	lb/year
Toluene	2,700			2,400,000
1,2,4-Trimethylbenzene	24.6	24.6		
DGBE	1.0		2.4	
Methylene chloride	1.13			1,008

De Minimis Demonstration

Compound	lb/hr		lb/ave. period	
	Maximum	de minimis	Maximum	de minimis
Toluene	► 3	2,700	► 10,500	2,400,000
1,2,4-Trimethylbenzene	► 6	24.6	X 42	24.6
DGBE	X 1.5	1.0	X 21	2.4
Methylene chloride	X 3	1.13	X 10,500	1,008

Tier 1

Simple Factor Table

Regulation 5.22 Section 2

Tier 1 - Table 1

Simple Factor for Determining Maximum Ambient Concentration

BAC Averaging Time	Annual Factor F_A	24-Hour Factor F_{24}	8-Hour Factor F_8	1-Hour Factor F_1
Annual	480			0.54
24 Hours		0.12		0.05
8 Hours			0.02	0.02
1 Hour				0.001

Tier 1 – Table 1: Simple Factor Procedure

- Step 1: Determine maximum concentration
- Step 2: If Table 1 has two factors for the averaging period, use the factor that results in the greater calculated maximum concentration
- Step 3: Determine environmental acceptability (EA) pursuant to Reg. 5.21

Tier 1 – Table 1: Simple Factor Information Required

- TACs
- BAC for each TAC (averaging period)
- Emissions: lb/hr

  lb/Averaging Period

Tier 1 – Table 1: Simple Factor

Step 1: Determine maximum concentration

$$\text{Maximum Concentration } (\mu g/m^3) = \frac{\text{Allowed emission (lb/A.P.)}}{\text{Applicable Table 1 Factor } (\text{lb/A.P.} / \mu g/m^3)}$$

Example Calculation - DGBE

Tier 1 - Table 1

BAC Averaging Time	Annual Factor F_A	24-Hour Factor F_{24}	8-Hour Factor F_8	1-Hour Factor F_1
Annual	480			0.54
24 Hours		**0.12**		**0.05**
8 Hours			0.02	0.02
1 Hour				0.001

The Math for DGBE

Step 1: Maximum concentration

- 1.5 lb/hr ÷ 0.05 = 30 µg/m^3
- 21 lb/24hr ÷ 0.12 = **175 µg/m^3**

Step 2: Greater concentration

175 µg/m^3 > 30 µg/m^3

The Math for All Four TACs

Compound	Max lb/hr	Max lb/ave P	(lb/hr) ÷ Factor = µg/m³	(lb/ave P) ÷ Factor = µg/m³
Toluene	3	10,500	3 ÷ 0.54 = 5.6	10,500 ÷ 480 = **21.9**
1,2,4-Trimethylbenzene	6	42.0	6 ÷ 0.02 = 300	42 ÷ 0.02 = **2100**
DGBE	1.5	21.0	1.5÷0.05 = 30	21.0 ÷ 0.12 = **175**
Methylene chloride	3	10,500	3 ÷ 0.54 = 5.6	10,500 ÷ 480 = **21.9**

The Math for DGBE

Step 3: Demonstrate EA

- $$\text{Risk} = \frac{\text{Maximum Concentration } (\mu g/m^3)}{\text{BAC } (\mu g/m^3)}$$

$$= 175\ \mu g/m^3 \div 20\ \mu g/m^3$$

$$= 8.75 \text{ (Hazard Quotient)}$$

Step 3
Environmental Acceptability

Compound	Max. Conc. µg/m³	BAC µg/m³	Hazard Quotient (HQ) or Risk (in 1 million) *
Toluene	21.9	5,000	21.9 ÷ 5,000 = ►**0.004**
1,2,4-Trimethylbenzene	2100	1230	2100 ÷ 1230 = **1.71**
DGBE	175	20	175 ÷ 20 = **8.75**
Methylene chloride	21.9	2.1	21.9 ÷ 2.1 = **10.43**

* EA goal for methylene chloride is 1.0 (x 10^{-6}), for other TACs EA is 1.0 HQ

Agenda

- Useful conversion equations
- Using the Tier 1 table to calculate risk
- Using the Tier 2 table to calculate risk
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Tier 2

Annual Factor Table

Regulation 5.22 Section 3

Tier 2 – Table 2: Annual Factor

- Step 1: Determine annual factor from Table 2
- Step 2: Determine maximum concentration
- Step 3: Determine environmental acceptability (EA) pursuant to Reg. 5.21

Tier 2 – Table 2: Annual Factor Information Required

- TACs
- BAC for each TAC (averaging period)
- Emissions: lb/hr, lb/Averaging Period
- Stack height
- Building height
- Distance to property line

Tier 2 – Table 2: Annual Factor Information Required

- TACs
- BAC for each TAC (averaging period)
- Emissions: lb/hr, lb/Averaging Period
- Stack height 52.5 Feet (1.75 Hs:Hb)
- Building height 30 Feet
- Distance to property line 250 Feet

Tier 2 – Table 2: Annual Factor

Step 1: Determine annual factor from Table 2

- Determine stack height (Hs), building height (Hb), and Hs/Hb ratio
- Determine annual factor from Table 2
  - If building height is between two columns, use lower height or interpolate
  - If Hs/Hb ratio is between two columns, use lower Hs/Hb ratio or interpolate
  - If distance to property line is between two rows, use lower distance row or interpolate

Tier 2 – Table 2: Annual Factor

- Stack height (Hs) = 52.5 ft
- Building height (Hb) = 30 ft
- Hs/Hb ratio = 52.5/30 = 1.75
- Distance to property line = 250 ft
- Annual factor from Table 2 = 0.220

  (at 200 ft ... at 300 ft it is 0.221)

How about that interpolation part?

Interpolate 1st for **Hs/Hb** ratio, 2nd for **Hb**, 3rd for **Distance**

If Hb = 28 ft, Hs = 45 ft, Hs/Hb = 1.607, Distance = 200 ft

Distance 200 ft	**20 ft Hb**		**30 ft Hb**	
	1.25	**1.75**	**1.25**	**1.75**
	0.042	0.084	0.082	0.220

0.072 0.181

0.159

0.042+{(0.084-0.042)*[(1.607-1.25)/(1.75-1.25)]} = 0.072

0.082+{(0.220-0.082)*[(1.607-1.25)/(1.75-1.25)]} = 0.181

0.072+{(0.181-0.072)*[(28-20)/(30-20)]} = 0.159

Tier 2– Table 2: Annual Factor

Step 2: Determine maximum concentration

$$\text{Max Concentration} = \frac{\text{Allowed 1-hr emission (lb/hr)}}{\text{Table 2 Factor}^{*}\ (\text{lb/hr} / \mu g/m^3)}$$

($\mu g/m^3$)

*** Must adjust if BAC averaging period is not annual**

Annual Factor Adjustment Factors

Averaging Period	Multiply by Annual Factor:	Adjustment Factor
24-Hour	X	0.091
8-Hour	X	0.046
1-Hour	X	0.02

Adjusted Table 2 Factor

Averaging Period	Annual Factor from Table 2	Adjustment	Adjusted Factor
Annual	0.220	n/a	0.220
24-Hour	0.220	x 0.091	0.020
8-Hour	0.220	x 0.046	0.010

Allowed 1-Hour Emission Adjustment for Intermittent Emissions

- Reg. 5.22 Section 1.2 allows adjustment for average emission rate if intermittent criteria is enforceable
- Adjust 1-hour emission rate to average emission over averaging period for the BAC (assumes limitation is enforceable)

Allowed 1-Hour Emission Adjustment for Intermittent Emissions

Compound	Ave Period	Allowed lb/hr	Allowed lb/Ave P	Potential lb/Ave P	Allowed/ Potential	Adj. lb/hr
Toluene	Annual	3	10,500	26,280	0.40	1.2
1,2,4-Trimethylbenzene	8-hr	6	42	48	0.88	5.25
DGBE	24-hr	1.5	21	36	0.58	0.88
Methylene chloride	Annual	3	10,500	26,280	0.40	1.2

Tier 2– Table 2: Annual Factor

Step 2: Determine maximum concentration

$$\text{Max Concentration } (\mu g/m^3) = \frac{\text{Allowed 1-hr emission (lb/hr)}^*}{\text{Table 2 Factor (lb/hr / } \mu g/m^3)^*}$$

* Adjusted

Maximum Ambient Concentration

Compound	Ambient Concentration ÷ Factor	µg/m³
Toluene	1.2 ÷ 0.220 =	5.5
1,2,4-Trimethylbenzene	5.25 ÷ 0.010 =	525.0
DGBE	0.88 ÷ 0.020 =	44.0
Methylene chloride	1.2 ÷ 0.220 =	5.4

Tier 2– Table 2: Annual Factor

Step 3: Demonstrate EA

$$\text{Risk} = \frac{\text{Maximum Concentration } (\mu g/m^3)}{\text{BAC } (\mu g/m^3)}$$

Environmental Acceptability Demonstration

Compound	Ambient Conc. µg/m³	BAC µg/m³	HQ or Risk*
Toluene	5.5	5,000	▶ 0.001
1,2,4-Trimethylbenzene	525	1230	▶ 0.43
DGBE	44	20	2.20
Methylene chloride	5.4	2.1	2.57

* EA goal for methylene chloride is 1.0 (x 10^{-6}), for other TACs EA is 1.0 HQ

Agenda

- Useful conversion equations
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Tier 3

Screening Models

Regulation 5.22 Section 4

http://www.epa.gov/scram001/dispersion_screening.htm

Tier 3 – Screening Models
Information Required

- TACs
- BAC for each TAC (averaging period)
- Emissions: lb/hr, lb/Averaging Period
- Stack height
- Building height
- Distance to property line
- Stack airflow in acfm
- Stack gas temperature
- Stack diameter
- Building dimensions

Tier 3 – Screening Models
Information Required

- TACs
- BAC for each TAC (averaging period)
- Emissions: lb/hr, lb/Averaging Period
- Stack height
- Building height
- Distance to property line
- Stack airflow in acfm
  20,000 acfm
- Stack gas temperature
  70°F
- Stack diameter
  45 inches
- Building dimensions
  100 ft by 100 ft

Tier 3 Results – SCREEN3

Compound	Ave Period	Adj. lb/hr	Ave. Period Dilutions	Stack conc µg/m³	Amb conc µg/m³	BAC µg/m³	HQ or Risk *
Toluene	Annual	1.2	34,825	16,020	0.46	5,000	► 0.0001
1,2,4-Trimethylbenzene	8-hr	5.25	1,570	70,090	44.6	1230	► 0.036
DGBE	24-hr	0.88	3,140	11,750	3.74	20	► 0.19
Methylene chloride	annual	1.2	34,825	16,020	0.46	2.1	► 0.22

* EA goal for methylene chloride is 1.0 (x 10^{-6}), for other TACs EA is 1.0 HQ

Tier 4

EPA-Approved Dispersion Models

Tier 4
EPA-Approved Dispersion Models
Information Required

- TACs
- BAC for each TAC (averaging period)
- Emissions: lb/hr, lb/Averaging Period
- Stack height
- Building height
- Distance to property line
- Stack airflow in acfm
- Stack gas temperature
- Stack diameter
- Building dimensions
- Detailed plot plan
- Detailed building dimensions

Comparison of Outcomes

Compound	De Minimis	Tier 1 HQ/Risk *	Tier 2 HQ/Risk *	Tier 3 HQ/Risk *
Toluene	**Yes**	**0.004**	**0.001**	**0.0001**
1,2,4-Trimethylbenzene	No	1.71	**0.43**	**0.036**
DGBE	No	8.75	2.20	**0.19**
Methylene chloride	No	10.43	2.57	**0.22**

* EA goal for methylene chloride is 1.0 (x 10^{-6}), for other TACs EA is 1.0 HQ

Agenda

- Useful conversion equations
- Using the Tier 1 table to calculate risk
- Using the Tier 2 table to calculate risk
- Introduction to SCREEN3 modeling
- Questions
- Suggested topics for 2nd STAR Workshop

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