

Understanding Air Toxics from a Permitting Perspective

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Overview

- What are TACs and Screening Levels?
- Michigan's Air Toxics Rules
 - Permitting rules
 - Other air toxics rules
- How to do toxics review for a permit application
- Exceptions from the toxics rules

Toxics Rules

- Air Pollution Control Rules
- Part 1 Rules – Definition of a TAC
- Part 2, Rules 224 to 233 – Rules for Air Toxics

What is a TAC?

- Definition in Part 1 of the Rules
- "Toxic air contaminant" or "TAC" is any air contaminant that:
 - Has no national ambient air quality standard (NAAQS) AND
 - which is or may become harmful to public health or the environment
 - List of substances that are NOT TACs

TACs vs HAPs

- TAC = "Toxic Air Contaminant"
 - under MI rules
 - Rules 224 – 230
 - Includes any chemical unless specifically NOT a TAC
- HAP = "Hazardous Air Pollutant"
 - regulated by Federal Gov't
 - 40 CFR Part 61 and 63 – "NESHAP" and "MACT"
 - Defined list of ~188 chemicals

TACs vs HAPs

What are the Screening Levels?

- AQD has developed screening levels for ~1,250 different TACs
- Based on peer-reviewed studies (human and animal), empirically gathered data, scientific literature, workplace safety studies

Carcinogen vs Non-Carcinogen

- Non-carcinogens:
 - screening levels are "thresholds" – above this level, an effect is expected in certain percentage of the exposed population
- Carcinogens:
 - screening levels are based on risk – above a certain level, the risk of developing a cancer goes up by 1 in 1 million (SRSL – 1 in 100,000)

ITSL, IRSL, SRSL

- ITSL = Initial Threshold Screening Level (non-cancerous effect)
- IRSL = Initial Risk Screening Level (cancer risk)
- SRSL = Secondary Risk Screening Level (cancer risk).
 - SRSL = IRSL x 10

Main Toxics Rules Involved in Permitting (overview)

- Rule 224 – T-BACT
- Rule 225 – Health-Based Screening Levels
- Rules 226 & 227 – How to evaluate Rule 225

Other Toxics Rules

- Rule 228 – case-by-case emission limit lower than T-BACT
- Rule 229 – how screening levels shall be determined
- Rule 230 – publishing screening levels and public review process

Rules for AQD Toxicologists

- Rule 231 – how to determine screening levels for carcinogens (IRSL & SRSL)
- Rule 232 – how to determine screening levels for non-carcinogens (ITSL)
- Rule 232 – how to determine screening levels for non-carcinogens (ITSL) based on acute data

Main Toxics Rules Involved In Permitting:Rule 224

- Rule 224: T-BACT:
 - BACT for Air Toxics
- “BACT” means Best Available Control Technology
- Considers technical & economic feasibility
- Google Search: “5-step BACT”

Main Toxics Rules Involved In Permitting:Rule 224

- T-BACT does NOT apply if:
 - There is already an NESHAP with control technology standards for the equipment
 - Example: The engines NESHAP standard requires a catalytic converter controlling HAPs that are VOCs, therefore other TACs that are VOCs will also be controlled.
 - Still need to look at other TACs not controlled by the same technology

Main Toxics Rules Involved In Permitting:Rule 224

- T-BACT does NOT apply if:
- Emission Rate is
 - < 0.1 lb/hr for carcinogen AND
 - < 1.0 lb/hr for non-carcinogen AND
- ITSL > 200, IRSL > 0.1

Main Toxics Rules Involved In Permitting:Rule 224

- T-BACT does NOT apply if:
- Already subject to BACT or LAER
 - e.g. Rule 702(a) BACT for VOCs, PSD BACT
- T-BACT does NOT apply if:
- Burning “clean fuel”

- natural gas, diesel, or biodiesel, AND
- up to 100 MMBtu/hr, AND
- stack height at least 1.5 x building height, AND
- at least 100 ft from property line

Rule 225

- Emissions must result in impacts less than the applicable ITSLs and ISRLs
- Alternative to meeting IRSL: SRSL
 - Must include ALL emissions of that TAC at the facility
- For carcinogens, can go 10x higher if impact is on industrial property or roadway

Rule 227

3 options for showing compliance:

1. Allowable Emission Rate (AER)
2. Ambient Impact Ratio (AIR) Matrix
3. Modeling (determine the Predicted Ambient Impact, PAI)

Toxics Emission Calcs

- Before even looking at toxics rules, need to know:
- WHAT TACS will be emitted?
- HOW MUCH will be emitted?
- Potential (Maximum possible) Emission Calculations needed for:
- Max Hourly Rate (lb/hr)
- Max Annual Rate (tpy)
- TAC screening levels can be on a 1-hr, 8-hr, 24-hr, or annual basis.

Example Calculation – Coating

- Max lb/hr emissions
- Applicator can apply 8 gal / hr
- Coating density is 7 lb / gal
- Coating has the following components: isopropyl alcohol 10% by weight mixed xylenes 15% by weight

Application Rate x Density x wt% component
= lb/hr emitted

Annual limit = 20,000 gal
Annual emissions:

$$\frac{8 \text{ gal coating}}{\text{hour}} \times \frac{7 \text{ lb coating}}{\text{gal coating}} \times \frac{10 \text{ lb isopropyl}}{100 \text{ lb coating}} = \frac{5.6 \text{ lb IPA}}{\text{hour}}$$

$$\frac{20,000 \text{ gal}}{\text{year}} \times \frac{7 \text{ lb coating}}{\text{gal coating}} \times \frac{10 \text{ lb isopropyl}}{100 \text{ lb coating}} = \frac{14,000 \text{ lb IPA}}{\text{year}}$$

Annual Average lb/hr:

$$\frac{14,000 \text{ lb IPA}}{\text{year}} \times \frac{\text{year}}{8760 \text{ hours}} = \frac{1.60 \text{ lbs IPA}}{\text{hour}}$$

Max lb/hr emission rate = 5.6 lb IPA / hr

Example Calculation – Diesel Emergency Engine

- Engine is rated at 755 b-hp (max)
- Max fuel usage rate supplied by the engine vendor = 35.9 gal/hr
- Chapter 3: Stationary Internal Combustion Sources
- 3.4 Large Stationary Diesel and All Stationary Dual-fuel Engines
- First sentence: ... large stationary diesel engines (greater than 600 horsepower [hp])

$$\frac{19,300 \text{ Btu}}{\text{lb}} \times \frac{7.1 \text{ lb}}{\text{gal}} = \frac{137,030 \text{ Btu}}{\text{gal}}$$

Example calculation for benzene:

$$\frac{7.76 \times 10^{-4} \text{ lb}}{\text{MMBtu}} \times \frac{35.9 \text{ gal}}{\text{hr}} \times \frac{137,030 \text{ Btu}}{\text{gal}} \times \frac{1 \text{ MMBtu}}{10^6 \text{ Btu}} = 0.0038 \text{ lb/hr}$$



- Diesel heating value = 19,300 Btu/lb
- Diesel density = 7.1 lb/gal

Emergency Engine

Annual limit = 500 hours per year
Annual emissions:

$$\frac{500 \text{ hr}}{\text{year}} \times \frac{0.0038 \text{ lb}}{\text{hr}} = \frac{1.9 \text{ lb benzene}}{\text{year}}$$

Annual Average lb/hr:

$$\frac{1.9 \text{ lb benzene}}{\text{year}} \times \frac{1 \text{ year}}{8760 \text{ hours}} = \frac{0.00022 \text{ lbs benzene}}{\text{hour}}$$

Rule 227: How to show compliance with Rule 225

- Rule 227 Excel Spreadsheet - demonstration

Rule 226: Exemptions from Rule 225

- Less than 10 lb/month and 0.14 lb/hr AND not a carcinogen or TAC of high concern

Rule 226: Exemptions from Rule 225

- There is a NESHAP standard AND a risk and technology review has been finished_ <http://www3.epa.gov/airtoxics/risk/rtrpg.html>

Rule 226: Exemptions from Rule 225

- Burning a “clean fuel”:
 - natural gas, diesel, or biodiesel, AND
 - up to 100 MMBtu/hr, AND
 - stack height at least 1.5 times the building height, AND
 - At least 100 ft from property line