Thursday, July 21, 2022
10:30 a.m. – Noon
Workshop J

Air Permitting & Compliance: Practical Tips and Best Practices...Calculating Emissions and Applying Best Available Technology

Presented by
Heather Brandon – Anomatic Corporation
Ron Hansen – GT Environmental, Inc.
Mike Hopkins – Ohio EPA
Derek Kirkbride – GT Environmental, Inc.

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Major Topics

- Who, When, Why, and How to Conduct a Facility-wide Emissions Inventory
- Techniques/Considerations for Calculating Air Emissions
- When to Include Fugitive Emissions
- When to Include Condensable Particulate Emissions
- How to Conduct De Minimis Emission Calculations
- Ohio EPA and US EPA Guidance

Who Should Conduct a Facility-wide Emissions Inventory

- Almost Everyone
- Facilities with Synthetic Minor Permits
- Title V facilities
- Facilities with PSD or NNSR permits

When to Conduct a Facility-wide Emissions Inventory

- Prior to construction of a new facility
- Prior to a modification of an existing facility
- Prior to a modification of an existing facility that has synthetic minor limits
- Prior to a modification of an existing facility that may trigger major New Source Review (PSD & NNSR)

Why Conduct a Facility-wide Emissions Inventory

- Demonstrate whether your facility is subject to Title V permitting requirements
- Demonstrate whether your facility is a major source for PSD and NNSR permitting requirements
- Demonstrate whether your facility is a major source or an area source of HAPs for purposes of determining MACT/GACT applicability
- Demonstrate whether your facility is subject to the Greenhouse Gas Reporting rule
- In support of air permit applications
- Fee Emission Reports
- Toxic Release Inventory Reporting

How to Conduct a Facility-wide Emissions Inventory – Emission Factors

- Stack Tests
- Mass Balance calculations
- AP-42 - https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors
- WebFIRE - https://cfpub.epa.gov/webfire/
- Ohio EPA's Reasonably Available Control Measures for Fugitive Dust Sources (RACM Guide) - http://wwwapp.epa.ohio.gov/dapc/RACMfugitivedust.pdf
- Greenhouse Gas Reporting Rule (40 CFR 98)
- Equipment Vendors
- Trade Associations

Emission Factors (continued)

- Competitor permits and permit applications
- State and Federal Rules (e.g., Reinforced Plastic Composites Production MACT)
- Other State Agencies (California, Texas, Ohio, etc.)
- US EPA's RACT/BACT/LAER Clearinghouse (RBLC) - https://cfpub.epa.gov/rblc/index.cfm?action=Search.BasicSearch&lang=en
- LandGEM - https://www.epa.gov/catc/clean-air-technology-center-products#software
- TANKS 4.09D - https://www.epa.gov/air-emissions-factors-and-quantification/tanks-emissions-estimation-software-version-409d

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How to Conduct a Facility-wide Emissions Inventory – Pollutants

- Include all regulated pollutants
  - Criteria Pollutants (NO_x, SO_2, PM_{10}, $PM_{2.5}$, Pb, VOC, CO)
  - Total Suspended Particulate (TSP) (i.e., PM, PE, PM_{30})
  - Hazardous Air Pollutants
  - Ammonia
  - Fluorides (excluding hydrogen fluoride)
  - Sulfuric acid mist
  - Hydrogen sulfide
  - Total Reduced Sulfur (TRS) – hydrogen sulfide, methyl mercaptan, dimethyl sulfide and dimethyl disulfide
  - Reduced Sulfur Compounds (RSCs) – hydrogen sulfide, carbonyl sulfide and carbon disulfide
  - Non-Methane Organic Compounds (NMOC) from municipal waste landfills
  - Greenhouse Gases (CO_{2e}, CO_2, Methane, etc.) – See Table A-1 of 40 CFR 98
- Toxic Air Contaminants (See OAC rule 3745-114)

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How to Conduct a Facility-wide Emissions Inventory – Emissions Breakdown

- If possible, start with uncontrolled emission factors
- Maximum Uncontrolled Emissions (stack and fugitives):
  - Lbs/hr
  - Lbs/day
  - Tons/yr
- Maximum Controlled Emissions (stack and fugitives):
  - Lbs/hr
  - Lbs/day
  - Tons/yr

Emissions Breakdown (continued)

- Synthetic Minor Limits (stack and fugitive):
  - Lbs/hr
  - Lbs/day
  - Tons/yr

Permit Application Requirements

- Minor Sources
  - Uncontrolled emissions (lbs/hr)
  - Predicted actual emissions (lbs/hr and tpy)
  - Proposed emissions (lbs/hr and tpy) (normally PTE)
- Synthetic Minor
  - Uncontrolled emissions (lbs/hr)
  - Predicted actual emissions (lbs/hr and tpy)
  - Potential-to-Emit (tpy)
  - Proposed emissions (lbs/hr and tpy)

Permit Application Requirements (continued)

- PSD
  - Uncontrolled emissions (lbs/hr)
  - Predicted actual emissions (lbs/hr and tpy)
  - Potential-to-Emit (tpy)
  - Proposed emissions (lbs/hr and tpy)
  - Actual-to-projected actual demonstration (tpy)
  - Netting demonstration (tpy)

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Permit Application Requirements (continued)

- NNSR
  - Uncontrolled emissions (lbs/hr)
  - Predicted actual emissions (lbs/hr and tpy)
  - Potential-to-Emit (tpy)
  - Proposed emissions (lbs/hr and tpy)
  - Actual-to-projected actual demonstration (tpy)
  - Netting demonstration (tpy)
  - Offset demonstration (tpy)

How to Conduct a Facility-wide Emissions Inventory – Special Considerations

- "Fugitive emissions" means those emissions that cannot reasonably pass through a stack, chimney, vent or other functionally equivalent opening (OAC rule 3745-31-01(UU))
- Fugitive emissions – Does your capture/control system have 100% capture?
- Storage Piles (July 9, 1999 Ohio EPA Memo "Guidance Regarding Aggregate Processing Plants").
- Flash emissions from storage tanks.
- Landing and cleaning losses from storage tanks.

Special Considerations (continued)

- Title V applicability for inorganic HAP compounds is triggered by the weight of the full compound (CrO_5) and not just the weight of the element (Cr). https://www.epa.gov/sites/default/files/2015-08/documents/agghaps.pdf
- PTE is based on maximum hourly production x 8,760 hrs/yr
- PTE can be restricted by inherent physical limitations (bottlenecks).
- PTE can be restricted by federally enforceable requirements (state rules, NSPS, MACT).

Special Considerations (continued)

- Is your control device actually a product collector?
- Burning fossil fuels using pure oxygen as combustion air could produce unusually high NOx emissions.
- Processes involving raw materials containing nitrogen compounds could generate NOx emissions.
- Processes involving nitric acid often generate NOx emissions.
- Processes involving raw materials containing sulfur compounds could generate RSC, TRS, SO_2, or sulfuric acid.
- For modeling purposes you may need to separate NOx emissions into NO and NO_2.

Special Considerations (continued)

- Condensable Particulate Emissions – Does your process subject raw materials containing nitrogen compounds, sulfur compounds or organics to high temperatures?
- Condensable Particulate Emissions are likely if you combust fossil fuels.
- It is a good practice to display PM, PM_{10} and $PM_{2.5}$ emissions as follows: PM (F-Only), PM (Condensables), and PM (F+C), etc.
- Condensables are defined as emissions measured by Method 202.
- Potential PM emission greater than 100 tpy does not trigger Title V permitting. Only PM_{10} and $PM_{2.5}$ can trigger Title V permitting.

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Special Considerations (continued)

- Compounds like formaldehyde in urea-formaldehyde resin; MDI in coatings and adhesives; and styrene in styrene resins normally polymerize and therefore don’t all get emitted.

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De Minimis Rule
OAC rule 3745-15-05
- Calculations

- PTE must be based on maximum rated capacity and on an uncontrolled basis unless the control device is integral to the operation (e.g., product collector).
- Air contaminant source (source) with PTE less than 10 lbs/day of any air contaminant are exempt from air permitting requirements.
- This permit exemption does not apply if a federally enforceable regulation limits emissions to less than 10 lbs/day.
- This permit exemption does not apply if the source emits more than 1 tpy of any HAP or a combination of HAP.
- This permit exemption does not apply if this source alone or in combination with similar sources at the facility would result in potential emissions of any air contaminant in excess of 25 tpy. In determining the total emissions from a group of similar sources, an enforceable permit emission limit shall be used in lieu of the potential to emit for such source or sources.

Ohio EPA Guidance Documents

- Engineering Guide #61 – Policy on limiting PTE of a facility to avoid Title V permit applicability. https://epa.ohio.gov/static/Portals/27/engineer/eguides/guide61.pdf?ver=7qKzG6S2Zog01onVAipPvw%3d%3d
- Engineering Guide #80 – How should PTE be calculated for determining the applicability of De Minimis Status, BAT, Senate Bill 265 BAT Exemption, Title V, MACT, PSD, and NNSR https://epa.ohio.gov/static/Portals/27/engineer/eguides/guide80.pdf
- February 16, 1998 Ohio EPA Memorandum of Understanding with the Ohio Cast Metals Association

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US EPA Guidance Documents

- Accounting for Emergency Generators in the Estimate of PTE - https://www.epa.gov/sites/default/files/2015-07/documents/generator.pdf
- PTE Guidance for Specific Source Categories - https://www.epa.gov/sites/default/files/2015-08/documents/lowmarch.pdf
- Clarification of Methodology for Calculating PTE for Batch Chemical Production Operations - https://www.epa.gov/sites/default/files/2015-08/documents/socma820.pdf
- Calculating PTE and Other Guidance for Grain Handling Facilities - https://www.epa.gov/sites/default/files/2015-08/documents/grainfnl.pdf
- Calculating PTE for Emergency Generators - https://www.epa.gov/sites/default/files/2015-08/documents/emgen.pdf

US EPA Guidance Documents (continued)

- Methods for Estimating Air Emissions from Chemical Manufacturing Facilities - https://www.epa.gov/sites/default/files/2015-08/documents/ii16_aug2007final.pdf
- Methods for Estimating Air Emissions from Paint, Ink, and Other Coating Manufacturing Facilities - https://dep.wv.gov/daq/planning/inventory/Documents/EIIP%20V02%20Ch08%20Paint%20and%20Ink%20Manufacturing.pdf

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BAT/Synthetic Minors

Workshop J

July 21, 2022

Michael Hopkins, P.E.
Assistant Chief, Permitting
Division of Air Pollution Control
614-644-3611
Mike.hopkins@epa.ohio.gov

Protection Agency

Topics

- Determining Best Available Technology (BAT)
- BAT Cost-Effectiveness Studies
- Understanding Synthetic Minors

BEST AVAILABLE TECHNOLOGY

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What is BAT?

- Ohio Administrative Code (ORC) 3745-31-05
- Required new or modified sources to install Best Available Technology to control emissions
- Idea is to install controls on new sources – more cost effective than to retrofit old
- Requires installation of state-of-the-art controls taking into account costs
- Does not apply to <10 ton/yr sources

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What is BAT?

- A combination of work practices, raw material specifications, throughput limitations, source design characteristics, or add-on controls
- Control technique must have been used in Ohio or other similar states
- Costs are taken into account
- Definition:

"Best available technology" or "BAT" means any combination of work practices, raw material specifications, throughput limitations, source design characteristics, an evaluation of the annualized cost per ton of air pollutant removed, and air pollution control devices that have been previously demonstrated to the director of environmental protection to operate satisfactorily in this state or other states with similar air quality on substantially similar air pollution sources.

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Practical Selection Advice

- Look at recently issued permits for similar sources.
- Exclude “serious” non-attainment areas like California, some east coast
- Permit contact can help you find permits
- If no control is required – BAT is typically based on equipment design

Practical Selection Advice

Emissions Range (Ton/yr)*	Practical BAT Approach
<10 ton/yr	No BAT required
10 ton/yr to about 80 ton/yr	BAT most frequently based on similar sources. Cost effectiveness not typically needed. Ohio EPA most often looks at similar sources to determine if your requested BAT is acceptable.
> 80 ton/yr	Similar sources give good direction but sometimes need case-by-case analysis/cost effectiveness. See Engineering Guide #89. Check w permit writer. BACT or LAER apply? Then BAT is equivalent to BACT/LAER.

*There is no hard and fast rule on these ranges except for the <10 ton/yr no BAT needed rule. So, take these with a grain of salt.

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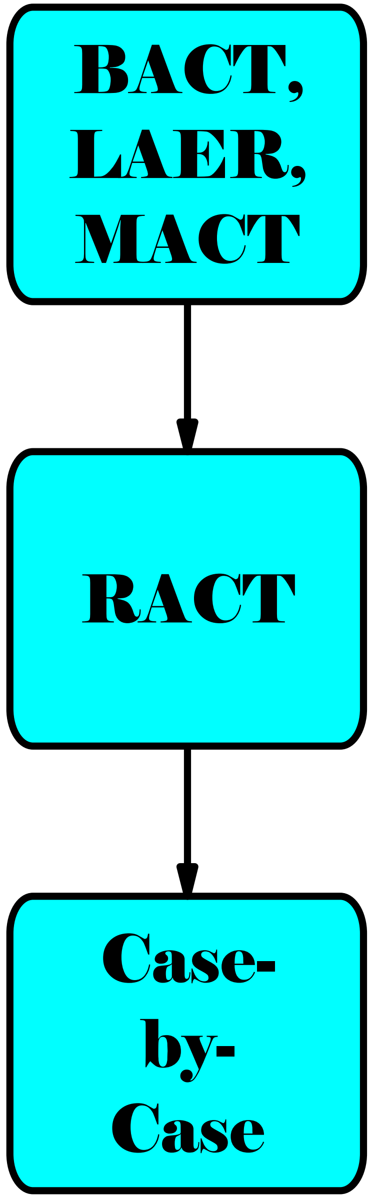
What Does the Law Say?

- Guidance on selecting BAT
- Issued revised guidance February 7, 2014
- http://epa.ohio.gov/dapc/sb265.aspx
- Significant changes for new or modified after August 3, 2009

Determining BAT

- Follows 2006 SB 265 approach
- BAT = MACT, GACT, BACT or LAER
- If not, then BAT = RACT…
- If not, then case-by-case BAT



Note: Does not include NSPS requirements.

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How do you determine BAT?

- Check each pollutant separately
- Check to see if MACT, GACT, BACT, LAER applies
- If so, then establish BAT
- If not, then review RACT rules

BACT, LAER, MACT

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RACT Rule Review for VOC

- Review 01/01/06 version of Chapter 21 for VOC limits
- VOC limits apply anywhere in the state to the same size and type of source?
- If so, then find most stringent, establish limit as BAT floor for VOC
- Then move on to case-by-case approach for VOC

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Case-by-Case BAT

- Step one – complete case-by-case analysis for BAT
  - Review similar sources
  - Complete cost-effectiveness
  - Each criteria pollutant and each operating scenario
- Determine control level/emission level for BAT
- More stringent than RACT floor?

Case-
by-
Case

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Case-by-Case BAT

- Step two – determine how BAT should be ***expressed***

Case-by-Case

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SB 265 Expression Options

- Must express BAT using one of the four options:
  - Work Practice
  - Source Design Characteristic/Design Efficiency
  - Raw Material/Throughput
  - Monthly Allowable

Work Practices

- Most will be description of work practice or implementation of a work practice plan
- No opacity, no ton/yr
- Few will be traditional opacity – only if company wants

Source Design/Design Efficiency

- Applies when source/control was designed to limit a particular pollutant
- Short term appropriate but:
  - No emission limit in permit
  - Only "designed for" approach
- BAT = "Install a baghouse designed to meet 0.03"

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Source Design/Design Efficiency

- Larger sources… can do initial test
- No ongoing emission limit obligation
- Will need to maintain per manufacture’s recommendations
- Will need to maintain records on maintenance
- OAC/other rules provide short-term backup
- U.S. EPA has concerns…

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Raw Material Specifications or Throughput Limitations

- Typical of part of synthetic minor limitations
- "45.6 tons of steel processed per rolling twelve-month period"
- No lb/hr, ppm, etc. for BAT… may need these for synthetic minor, however
- This format not used too often for BAT

Monthly Allowable

- Similar to synthetic minor limitations
- "3.2 tons VOC/**month** averaged over a 12-month rolling period"
- Old way: 38.4 tons VOC/rolling 12-month period
- Overall restriction ends up the same but just described differently

Monthly Allowable

- Will need monitoring, recordkeeping and reporting
- No lb/hr, ppm etc. short-term limits
- OAC/other rules provide short-term

BAT COST-EFFECTIVENESS STUDY

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What is BAT Cost-Effectiveness?

- Cost analysis to determine which control technique is appropriate
- Looks at available control techniques
- Looks at control efficiency, cost of each technique
- Results in annualized $/ton of pollutant reduced
- $/ton too high? – technique eliminated

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Cost-Effectiveness for BAT

- Engineering Guide #89 describes approach
  - https://epa.ohio.gov/static/Portals/27/engineer/eguides/89BATCostEffectivenessStudy.pdf
- Before you do the work, check with permit contact to see if it is needed
- For many sources control requirement is "obvious" based on other permits

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Cost-Effectiveness for BAT

- Must look at each pollutant separately
- Guide has a long list of situations where cost-effectiveness analysis is not needed
  - PSD, NNSR, Case-by-case MACT, MACT, GACT, NESHAPS and recent NSPS.
  - Emissions <1.2 (Lead) to 200 (CO) ton thresholds (double major mod thresholds)
  - Identical source to recent BAT
  - Control w/in 12% of best controlled
  - Control w/in average of the top 5 controlled
  - DO/LAA contact and CO NSR contact agree not needed

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Cost-Effectiveness for BAT

- Guide narrows down needed cost-effective studies
- Practically means larger sources that don’t trip other regs
- Guide also has cost-effectiveness study checklist – identifies information needed

What $/ton is too high?

- No set value
- Value can be different depending upon the type and size of source, the type of pollutant.
- We look at similar size and type of source
- Look at U.S. EPA's RACT/BACT/LAER database for costs of similar sources. See:
  - https://www.epa.gov/catc/ractbactlaer-clearinghouse-rblc-basic-information

SYNTHETIC MINORS

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What the Heck is a Synthetic Minor???

- Synthetic minors are restrictions put in permits to keep you below rule applicability thresholds.
- Typical rule threshold based on ton/year potential to emit value
- Synthetic minor restrictions are designed to limit the potential emissions, so you are below the rule threshold.

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Synthetic Minor

- Legally and practically enforceable
- Must have appropriate limit, monitoring, record keeping, reporting and testing
- Must limit some process, not just emissions
- U.S. EPA 1989 guidance on limiting potential to emit: https://www3.epa.gov/airtoxics/pte/june13_89.pdf

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Simple Example

- Painting, Inc.
- Wants to install new paint booth.
- Actual emissions 20 tons VOC/yr
- Potential emissions 50 tons VOC/yr
- PSD threshold 40 tons VOC/yr
- Because potential >40 tons VOC/yr, PSD applies

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Synthetic Minor Example

- Painting, Inc. agrees to restrict their emissions to <35 tons VOC/yr
- How do you set up the synthetic minor?
  - Must restrict process variable – use gallons of paint, VOC content (3.5 lbs VOC/gallon paint)
  - 35 tons VOC/yr *2000 lbs/ton = 70,000 lbs VOC/yr
  - 70,000 lbs VOC/yr * 1 gallon paint/3.5 lbs VOC = 20,000 gallons paint/yr

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Synthetic Minor Example

- Can't have an annual restriction
- U.S. EPA says waiting a year to see if you are in compliance is too long.
- Instead, daily or monthly is ok.
- So, limits are typically set up as monthly limits or rolling 12-month limits where compliance is checked each month.

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Synthetic Minor Example

- 20,000 gallons/yr * 1/12 = 1667 gallons/month
- 35 tons VOC/yr * 1/12= 2.92 tons VOC/month
- Synthetic minor limit:
  - 1667 gallons paint/month; 2.92 tons VOC/month; 3.5 lbs VOC/gallon
  - These will be put in the permit

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Synthetic Minor Example

- Could be a rolling 12-month limit
- 20,000 gallons per rolling 12-months
- Each month must calculate last 12 months
- Need an initial table:

Months	Gallons Allowed
1	1667 gallons
1-2	3334 gallons
1-3	5001 gallons
Etc…	

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Synthetic Minor Example

- Permit includes:
  - Syn Minor limits
  - Monthly records on amount of paint used, VOC content
  - Submit report monthly, quarterly, semi-annual or, perhaps, annual

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When Not to Get a Synthetic Minor

- Synthetic minors add restrictions, monitoring, record keeping, reporting and testing
- These restrictions better or worse that just complying w the rule?
- Don’t accept synthetic minors that restrict production too much.
- Relaxing synthetic minors need permit actions and time

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What Rule Cites will you See?

- OAC rule 3745-31-05 (D), (E), and (F)

Paragraph	Purpose
(D) Synthetic Minors	Standard rule cite for synthetic minors. Rule describes when it can be used and describes what needs to be in a synthetic minor. Can also be used to establish restrictions to support federally enforceable requirements.
(E) State-only enforceable limitations	Designed to establish a limitation on a State-only requirement. For instance, air toxics requirements are State-only enforceable. Want to avoid air toxics modeling? Establish a State-only restriction <1.0 ton/yr for toxic. May not need fully synthetic minor terms.
(F) Voluntary limits on allowable emissions	Non-synthetic minor restrictions the company wants. For instance, company agrees to some restriction through orders w U.S. EPA but not required by rule.

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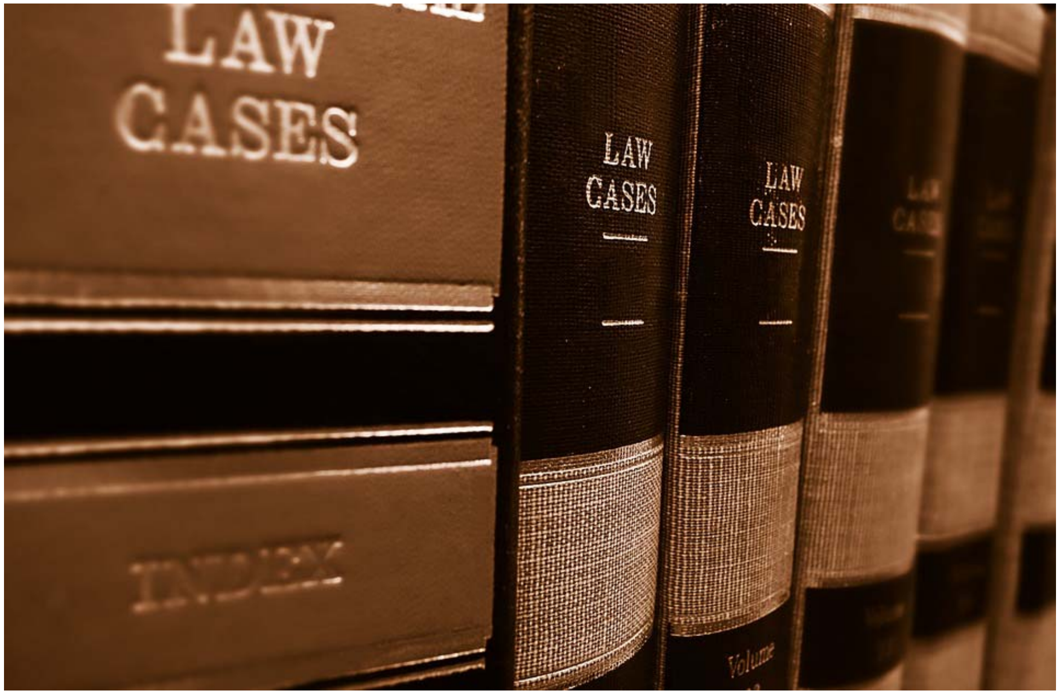
What Rule Cites will you See?

- EG #86 talks about the use of each rule cite.
- If you are not sure why a particular cite was used, talk to your permit writer.



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Wrap-up

- U.S. EPA limiting PTE - https://www3.epa.gov/airtoxics/pte/june13_89.pdf
- Ohio EPA EG #80 - https://epa.ohio.gov/static/Portals/27/engineer/eguides/guide80.pdf
- DAPC Web - https://epa.ohio.gov/divisions-and-offices/air-pollution-control
- Questions?

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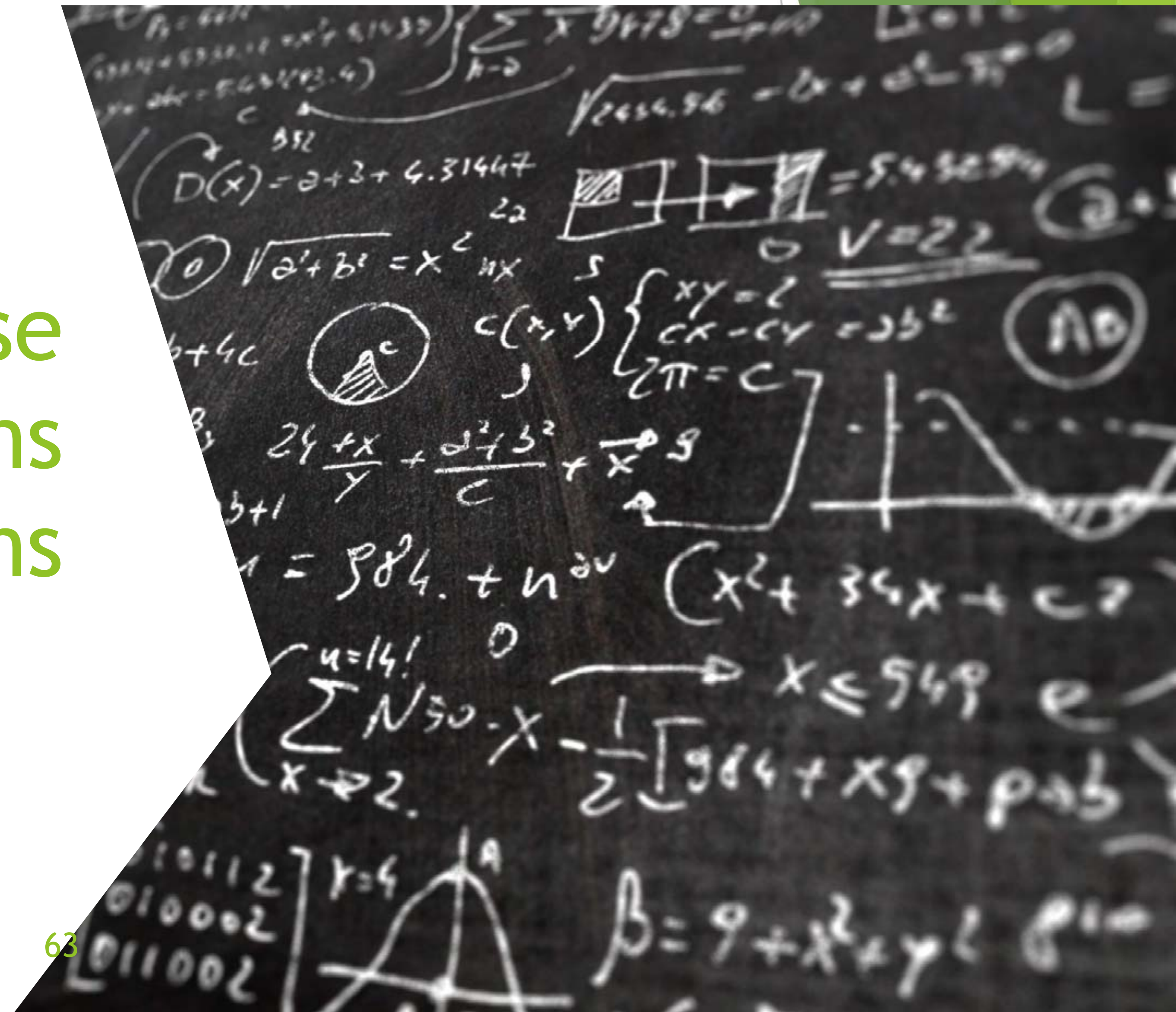
Overview

- Greenhouse Gas Emissions Calculations
- Reinforced Plastic Composites Production MACT Calculations
- Hot Dip Galvanizing Calculations
- Landfill Gas Calculations
- Storage Tank Calculations
- Toxic Release Inventory Calculations

Greenhouse Gas Emissions Calculations



Greenhouse Gas Rule (40 CFR 98)

- Requires facilities to report their emissions of CO_{2e}
  - CO_{2e} = "Carbon Dioxide Equivalent"
  - Includes Methane (CH_4), Nitrous Oxide (N_2O), and others
- Reports due annually on March 31^{st}.
- Submitted via e-GGRT.

Facilities Regulated by GHG Rule

Facilities that must submit a GHG Report regardless of quantity of emissions:

- Electric Generating Units
- Adipic Acid Production
- Aluminum Production
- Ammonia Manufacturing
- Cement Production
- HCFS-22 Production
- HFC-23 Destruction Process
- Lime Manufacturing
- Nitric Acid Production
- Petrochemical Production
- Petroleum Refineries
- Phosphoric Acid Production
- Silicon Carbide Production
- Soda Ash Production
- Titanium Dioxide Production
- Municipal Solid Waste Landfills (≥25,000 metric tons)
- Manure Management Systems (≥25,000 metric tons)

Facilities Regulated by GHG Rule (cont.)

Facilities that must submit a GHG Report if they emit ≥ 25,000 metric tons of CO_{2e}

- Ferroalloy Production
- Glass Production
- Hydrogen Production
- Iron and Steel Production
- Lead Production
- Pulp and Paper Manufacturing
- Zinc Production

Facilities Regulated by GHG Rule (cont.)

- Facilities that meet all the following criteria must submit a GHG Report:
  - The aggregate maximum rated heat input capacity of the stationary fuel combustion units at the facility is 30 MMBtu/hour or greater, and
  - The facility emits ≥ 25,000 metric tons of CO_{2e} in combined emissions from all stationary fuel combustion sources.

Calculating Greenhouse Gas Emissions at a Facility

1. Calculate the annual emissions of CO_2, CH_4, N_2O, and each fluorinated GHG (Table A-1) in metric tons from all applicable source categories.
2. For each general stationary fuel combustion unit, calculate the annual CO_2 emissions in metric tons. Calculate the annual CH_4 and N_2O emissions from stationary fuel combustion sources.
   - Exclude carbon dioxide emissions from the combustion of biomass, but include emissions of CH_4 and N_2O from biomass combustion
3. For miscellaneous uses of carbonate, calculate the annual CO_2 emissions in metric tons using the procedures specified.
4. Sum the emissions estimates from #1-#3 above using Equation A-1.
5. For the purpose of determining if an emission threshold has been exceeded, include in the emissions calculation any CO_2 that is captured for transfer off-site.

Calculating Greenhouse Gas Emissions at a Facility (cont.)

$$CO_2e = \sum_{i=1}^{n} GHG_i \times GWP_i \qquad \text{(Eq. A-1)}$$

- where:
  - CO_{2e} = Carbon dioxide equivalent, metric tons/yr
  - GHG_i = Mass emissions of each GHG, metric tons/yr
  - GWP_i = Global warming potential for each GHG from Table A-1
  - n = number of GHG emitted

Calculating Greenhouse Gas Emissions for Importers/Exporters

- For importers and exporters:
  1. Calculate the mass in metric tons per year of CO_2, N_2O, and each fluorinated GHG that is imported and/or exported during the year.
  2. Convert the mass of each imported and each GHG exported to metric tons of CO_{2e} using Equation A-1.
  3. Sum the total annual metric tons of CO_{2e} for all imported GHGs.
  4. Sum the total annual metric tons of CO_{2e} for all exported GHGs.

Calculating Carbon Dioxide Emissions from Fuel Combustion

$$CO_2 = 1x\,10^{-3} * Fuel * HHV * EF \qquad \text{(Eq. C-1)}$$

- where:
  - CO_2 = Annual CO_2 mass emissions for the specific fuel type (metric tons)
  - Fuel = Mass or volume of fuel combusted per year (tons, ft^3, or gal)
  - HHV = Default high heat value of the fuel, from Table C-1 (MMBtu/mass or MMBtu/volume)
  - EF = Fuel-specific default CO_2 emission factor, from Table C-1 (kg CO_2/MMBtu)
  - 1×10^{-3} = Conversion factor from kilograms to metric tons

Calculating Methane & Nitrous Oxide Emissions from Fuel Combustion

- Must be calculated for fuels listed in Table C-2
  - Same methodology as CO_2 calculations:

$$CH_4 \; or \; N_2O = 1 \, x \, 10^{-3} * Fuel * HHV * EF \qquad \text{(Eq. C-8)}$$

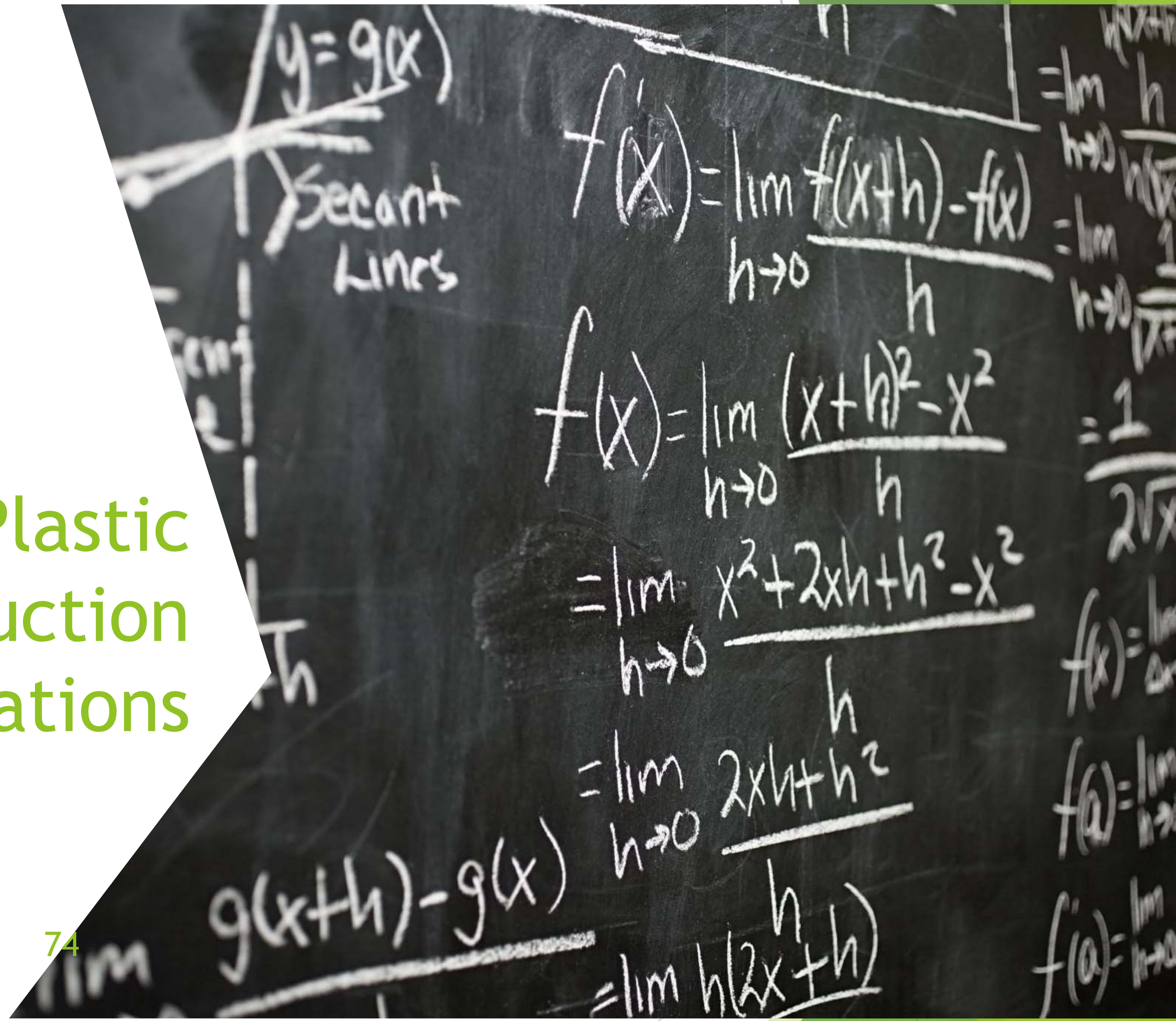
- where:
  - CH_4 … type of fuel (metric tons)
  - Fuel = Mass or volume of the fuel combusted (mass or volume per year)
  - HHV = Default high heat value of the fuel from Table C-1 (MMBtu/mass or MMBtu/volume)
  - EF = Fuel-specific default emission factor for CH_4 or N_2O, from Table C-2 (kg CH_4/MMBtu or kg N_2O/MMBtu)
  - 1×10^{-3} = Conversion factor from kilograms to metric tons.

Calculating Carbon Dioxide from Sorbent

$$CO_2 = 0.91 * S * R * \left(\frac{MW_{CO2}}{MW_S}\right) \qquad \text{(Eq. C-11)}$$

- CO_2 = CO_2 emitted from sorbent for the reporting year (metric tons)
- S = Limestone or other sorbent used in the reporting year, from company records (short tons)
- R = The number of moles of CO_2 released upon capture of one mole of the acid gas species being removed (R=1.00 when sorbent is $CaCO_3$ and the targeted acid gas is SO_2)
- MW_{CO2} = Molecular weight of carbon dioxide (44)
- MW_S = Molecular weight of sorbent (100 if calcium carbonate)
- 0.91 = Conversion factor from short tons to metric tons

Reinforced Plastic Composites Production MACT Calculations



Calculating Emission Factors

- Equations for calculating emission factors are provided by the rule in Table 1.
  - Based on HAP content of materials and type of operation
- If your operation is not covered in Table 1, an emissions test can be performed to create a site-specific emission factor.

Options for Meeting Standards

- Demonstrate that an individual resin or gel coat, as applied, meets the applicable emission limit.
- Demonstrate that, on average, you meet the individual organic HAP emissions limits for each combination of operation type and resin application method or gel coat type.
- Demonstrate compliance with a weighted average emission limit.
- Meet the organic HAP emissions limit for one application method and use the same resin(s) for all application methods of that resin type.

Hot Dip Galvanizing Calculations

Found in the *Texas Commission on Environmental Quality Calculations Guidance Package – Hot Dip Galvanizing*

Calculating HCl Emissions from Hot Dip Galvanizing

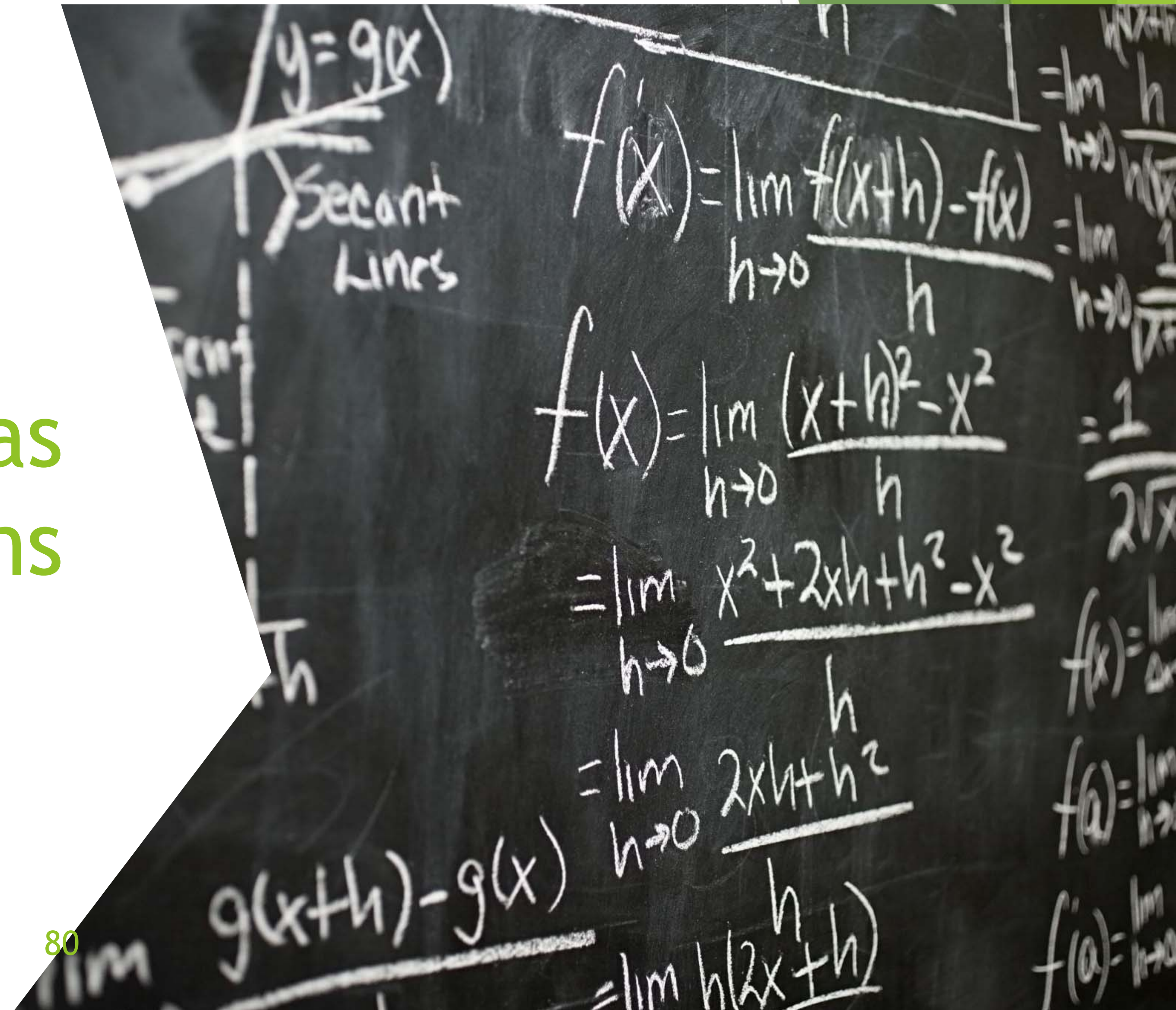
- Determine emission factor from tank and liquid properties:
- $E\ (lb/hr\text{-}ft^2) = 25 \times [0.46 + 0.117(V)] \times \log[760/(760 - P_v)]$
  - Where:
    - V = Air velocity across surface of tank (fps)
    - P_v = Vapor pressure of HCl (mmHg)
- Multiply by surface area of tank to find lbs/hr.
- Apply a control efficiency if using a suppressant (foam, fume, mechanical)

Calculating Zinc Emissions from Hot Dip Galvanizing

- Determined as a percentage of particulate emissions.

- Particulate emission factor = 0.52 lbs/ton production
  - ZnO = 16%
  - $ZnCl_2$ = 4%
  - Zn = 5%
  - NH_4Cl = 68%
  - NH_3 = 1%

Landfill Gas Calculations



Calculating Landfill Gas Emissions

- Municipal Solid Waste Landfills covered in AP-42 Chapter 2.4.
- Must create an emissions estimation model based on the following equation:

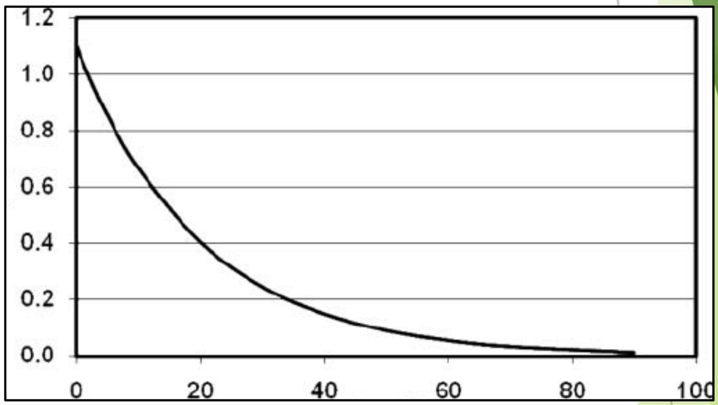
- whe

$$Q_{CH_4} = L_o R (e^{-kc} - e^{-kt}) \quad (1)$$

  - Q_{CH4} = Methane generation rate at time t (m^3/yr)
  - L_O = Methane generation potential (m^3 CH_4/Mg refuse)
  - R = Average annual refuse acceptance rate during active life (Mg/yr)
  - e = Base log
  - k = Methane generation rate constant (yr^{-1})
  - c = Time since landfill closure (yrs)
  - t = Time since the initial refuse placement (yrs)

Landfill Gas Modeling

- Forecast of gas generation and recovery based on past and future waste disposal histories and estimates of collection system efficiency.
- EPA's Landfill Gas Emissions Model (LandGEM)
  - Uses the first-order decay equation to estimate methane generation.
  - Required user inputs:
    - Mass of solid waste disposed in the i^{th} year (Mg or tons)
    - Potential methane generation capacity (m^3 per Mg or ft^3 per ton)
    - Methane generation rate (1/year)



Storage Tank Calculations

Estimating Emissions from Storage Tanks

- Computer programs
  - Terminal Emissions Tracking System (TETS)
  - Tanks 4.0.9d
- Manual Calculations
  - AP-42 Chapter 7: Liquid Storage Tanks

- Both methods require certain storage tank information, material properties, material throughput, and meteorological data.

Tank Information Needed for Storage Tanks Calculations

- All tank properties must be entered manually by the user.
- Tank Properties needed (as applicable):
  - Tank type (Horizontal, Vertical Fixed Roof, Internal Floating Roof, External Floating Roof, Domed External Floating Roof)
  - Diameter
  - Volume
  - Number of columns and column diameter
  - Shell condition/color
  - Roof condition/color
  - Primary and Secondary Seals
  - Deck types and fitting categories

Material Information Needed for Storage Tanks Calculations

- Many common chemicals and their properties are included in AP-42 Table 7.1-3 or in computer programs.
- Material Properties needed:
  - Molecular weight
  - Liquid Density (lbs/gal)
  - True Vapor Pressure at 60 ºF (psia)
  - Antoine’s Equation Constants: *A*, *B*, *C*

TRI Calculations

Toxic Release Inventory (TRI)

- Summarizes releases of toxic chemicals to air, water, and land, as well as disposal, treatment, recycling, and energy recovery.
- Over 700 chemicals and chemical categories listed.
- Reports due annually on July 1st.
- Submitted via TRI-MEweb; accessed through EPA's Central Data Exchange (CDX)

Facilities Subject to TRI Reporting

- Facilities that meet all the following must submit a TRI Report:
  - 10 or more employees (equivalent of 20,000 hours or greater)
  - Conduct operations in a covered North American Industry Classification (NAICS) code.
  - Manufacture, process, or otherwise use a TRI chemical in quantities greater than the established threshold
    - Manufacture or process > 25,000 pounds/year
    - Otherwise use > 10,000 pounds/yr
    - Certain chemicals (i.e., PBTs, lead) subject to lower reporting thresholds

TRI Threshold Determinations

3. Composition/information on ingredients

Mixture of synthetic resins, pigments, and solvents

Components

CAS-No.	Chemical Name	Concentration	GHS Hazardous
No information available.	Acrylic polymer	40 - 50%	
1330-20-7	Xylene	26%	√
100-41-4	Ethylbenzene	6.4%	√
51274-00-1	Yellow iron oxide	5 - 10%	
123-86-4	Butyl acetate	4 - 15%	√

OSHA Hazardous: Yes

15. Regulatory information

Regulatory information

		EPCRA					CERCLA	CAA
CAS #	Ingredient	302	TPQ	RQ	311 - 312	313	RQ(lbs)	HAP
No information available.	Acrylic polymer	N	NR	NR	NA	N	NR	N
1330-20-7	Xylene	N	NR	NR	A,C,F	Y	100	Y
100-41-4	Ethylbenzene	N	NR	NR	A,C,F	Y	1,000	Y
51274-00-1	Yellow iron oxide	N	NR	NR	NA	N	NR	N
123-86-4	Butyl acetate	N	NR	NR	A,C,F	N	NR	N

- A threshold determination must be conducted for each TRI chemical Processed, Manufactured, or Otherwise Used at the facility.
- Only use the amount of the TRI chemical for threshold determinations, not the entire mixture.

Types of Releases and Waste Management

- On-site Releases
  - Air
    - Fugitive/non-point air emissions.
    - Stack/point air emissions.
  - Water
    - Discharges to receiving streams or water bodies.
    - Stormwater
  - Land
    - Underground injection
    - Disposal to land on-site

- Transfers Off-site
  - Discharges to Publicly Owned Treatment Works (POTW)
  - Transfers to other off-site locations
    - Municipal and Hazardous Waste Landfills
    - Waste treatment, energy recovery, recycling.
- On-Site Waste Management
  - Waste Treatment
  - Energy Recovery
  - Recycling

Derek Kirkbride

dkirkbride@gtenvironmental.com

614-964-7281

Biographical Information

Ron Hansen, Owner/Principal Consultant
GT Environmental, Inc., 2400 Corporate Exchange Dr. Suite 150, Columbus, OH 43231
Phone: (614) 794-3570 ext. 121   Fax: (614) 899-9255
rhansen@gtenvironmental.com

Ron Hansen has over thirty-five years of air permitting, regulatory and stack testing consulting experience. Ron is an owner and Principal Consultant with GT Environmental, Inc. (GT). Ron graduated from the University of Cincinnati with a B.S. in Civil Engineering. Ron is a member of the Air and Waste Management Association (AWMA).

Ron has extensive experience in preparing Title V permit applications, PSD permit applications, non-attainment NSR permit applications, minor source permit applications, negotiating permit terms and conditions with state agencies, performance testing programs and assisting clients with enforcement resolution. Ron has prepared permit applications for utilities, steel mills, chemical plants, wood cabinet manufacturers, animal feed manufacturers, municipal solid waste landfills, aggregate mining and processing facilities, and bulk gasoline terminals. Ron has prepared air permit applications for clients located in Ohio, Michigan, Missouri, Kentucky, Indiana, Tennessee, West Virginia, Pennsylvania and Rhode Island.

Derek Kirkbride, Project Manager
GT Environmental, Inc., 2400 Corporate Exchange Dr. Suite 150, Columbus, OH 43231
Phone: (614) 794-3570 ext. 114   Fax: (614) 899-9255
dkirkbride@gtenvironmental.com

Derek Kirkbride has over 6 years of environmental consulting experience. Derek is a Project Manager with GT Environmental, Inc. (GT). Derek is a graduate of the University of Cincinnati with a B.S in Chemical Engineering.

Derek's primary focus is on preparing Title V permit applications, non-Title V permit applications, emissions inventories, air quality modeling analyses, NSPS/MACT evaluations, annual compliance certifications, Title V deviation reports, fee emissions reports, TRI reports, and SARA 311/312 Tier II reports.

Derek has worked on projects in the following industries: chemical manufacturing, steam generating heating plants, electricity generating plants, steel manufacturing, bulk gasoline terminals, painting and surface coating operations, food production, automobile accessories manufacturing, lightweight aggregate processing, animal feed manufacturing, municipal solid waste landfills, brick manufacturing, mulch production, foam production, and hospitals and medical facilities. Derek has worked with clients in Ohio, Michigan, Kentucky, Indiana, and Nevada.

Derek's prior experience includes co-ops with Cincinnati Thermal Spray and Ecosil Technologies. During these co-ops, Derek had several responsibilities, including maintaining operation sheets and computer databases, conducting lab tests, developing quotes, and designing and implementing processes for new customers.

Derek is a member of the Air & Waste Management Association (AWMA).

Biographical Information

Michael E. Hopkins, P.E., Assistant Chief, Permitting
Ohio EPA, P.O. Box 1049, Columbus, OH 43216
Phone: (614) 644-2270 Fax: (614) 644-3681
mike.hopkins@epa.ohio.gov

Michael Hopkins has been with the Ohio EPA since 1980. He is currently the Assistant Chief, Permitting within the Division of Air Pollution Control of the Ohio EPA. His duties include the review and final approval for all air pollution permit-to-install, permit-to-install and operate, and Title V permits in the State, the development of technical support for air pollution control regulations, litigation support, MACT program support, Tax Program support and general air pollution planning activities. He has been in this position since April 2003. Before this assignment, he was in charge of the Air Quality Modeling and Planning Section with similar duties as above from August 1993 through April 2003. Prior to that assignment, he was in charge of the engineering section of the Ohio EPA Central District Office air program. The engineering section is responsible for reviewing air pollution permit-to-install and permit-to-operate applications for compliance with air pollution regulations, facility inspections, complaint investigations, enforcement case development, policy and rule development, the Emissions Inventory Program, and other related duties in the central Ohio area.

Mr. Hopkins earned his bachelor's degree in environmental engineering from the Pennsylvania State University. He is a licensed Professional Engineer in the State of Ohio. He is a member of the Air and Waste Management Association, the National Society of Professional Engineers, and the Ohio Society of Professional Engineers.

Heather Brandon, Environmental Manager
Anomatic Corporation, 8880 Innovation Campus Way, New Albany, OH 43054
Phone: (740) 522-2202 ext. 2282
heather@anomatic.com

Heather Brandon has over 16 years of employment with Anomatic Corporation in multiple leadership roles. Anomatic is a manufacturer of anodized aluminum and plastic packaging for the Beauty, Personal Care, and Pharmaceutical markets. Over the years, the corporation has vertically integrated to become a leading global supplier of eco-friendly & sustainable packaging solutions to some of the world's most recognizable brands. With four manufacturing facilities in the U.S. – 3 in Ohio, 1 in Connecticut – Anomatic employs over 750 full-time employees.

Since 2019, Heather has managed the implementation and continuous improvement of Anomatic environmental policies and processes. She leads compliance and sustainability efforts for the New Albany and Newark manufacturing facilities. Her responsibilities are to develop and execute initiatives designed to identify, evaluate, prevent, and control environmental hazards to ensure total compliance with federal, state, and local regulations.

Heather graduated from The Ohio State University with a Bachelor of Science in Geological Sciences. She is a Registered Environmental Manager® certified by the National Registry of Environmental Professionals®. Heather is also a member of the National Association for EHS&S Management (NAEM) and the Air & Waste Management Association (AWMA).