TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Basic Web-based Emissions Inventory Reporting (Web-EI)

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Overview

- What is Web-EI?
- Terminology Review
- Web-EI benefits
- Who is using Web-EI?
- Items to make using Web-EI easier
- Web-EI Tutorial Sessions

What is Web-EI?

STEERS: the Framework

- State of Texas Environmental Electronic Reporting System (STEERS)
- Web portal for reporting numerous types of environmental data electronically to the Texas Commission on Environmental Quality (TCEQ)
  - Manages items such as:
    - User accounts
    - Security settings
  - Different program areas have specific application or reporting functions within STEERS.
    - Air, water, waste
    - Various registration and permit functions
    - Web-EI is one of these programs

What is Web-EI (cont.)?

AEIR: the Program

- Annual Emissions Inventory Report system (AEIR) in STEERS
  - Official program name for Web-EI
- Two-pronged system allows for:
  - Direct entry of EI data (manual/EIQ entry option)
  - Upload of data in a single text file (file upload option)
    - Often referred to as electronic or delta file method
- Document attachment function allows for submission of non-confidential information

What is Web-EI (cont.)?

AEIR: the Program (cont.)

- Web-EI can be used to submit an initial EI.
  - The site must already have a regulated entity reference number (RN) assigned.
  - Basic RN, site, and contact information must exist in the State of Texas Air Reporting System (STARS).
    - STARS stores all point source EI data.
- Before starting an initial EI, contact the Emissions Assessment Section to ensure all necessary data is in STARS and all EI processing has been completed.
  - This process may require a site to submit either a Core Data Form or EI Account Information and Contact Information forms.

Terminology Review

- STEERS
  - The system for accessing various TCEQ reporting programs
- AEIR
  - The EI reporting program within STEERS, also called Web-EI
- Web entry
  - A reporting option in Web-EI, also called manual entry or EIQ entry
- File upload
  - A reporting option in Web-EI, also called:
    - electronic reporting
    - text file upload
    - delta file method

Web-EI Benefits

- Quicker reporting turnaround
  - No waiting weeks/months for processing paper EIQ
- Immediate access from anywhere
  - No interoffice/interstate/international mailing
  - No waiting for wet-ink signatures
- Quick feedback on errors or missing data
  - Immediate feedback during manual entry
  - Electronic file upload feedback within minutes
    - For a large file, feedback may take an hour or two.
- Can be accessed by multiple people
  - Manual entry or review can be done by multiple staff jointly
    - Data stored in a common "work area"

Web-EI Benefits (cont.)

- Criteria totals automatically calculated
  - Assists with identifying potential emissions errors
- Save paper and printing costs
- Confirmation of submission
  - STEERS Copy of Record (COR)
  - E-mail notification provided
    - Status updates
    - Next steps (if any)
- No more "interpreting" handwriting
  - 1's and I's
  - 0's and O's

Who is Using Web-EI?

- Since 2010, more than 800 companies have submitted nearly 6,000 EIs through the Web.
- Numerous industry sectors from all parts of the state use Web-EI.
  - Refineries (89%)
  - Oil and gas sectors (71%, previously 56%)
  - Power utilities (81%, previously 66%)
  - Cement (91%)
  - Malt beverage production (**100%**)
- In 2015, over 70% of the EIs were submitted through Web-EI.
  - The remaining 30% will be required to use it this year.

Items to Make Web-EI Easier

- Start early
  - Set-up STEERS accounts first.
  - Set-up can be completed anytime, not just during 90-day EI reporting window.
- STEERS accounts are assigned to individuals

  A STEERS account is not the same as an RN or air account number.
- Keep staff access up-to-date
  - When personnel change, STEERS access can be updated/changed/added at same time.
  - Assign back-up staff STEERS access in case it becomes necessary.

Items to Make Web-EI Easier (cont.)

- Understand the different STEERS levels of authority.
  - Read: Can only view data
  - Edit: Can enter or edit within STEERS-AEIR only
  - Submit: Same as "Edit" but can also certify and submit STEERS-AEIR data
- Ensure the right person has the right level of authority.
  - Read: Not relevant for Web-EI
  - Edit: Anyone that will be entering, updating, or uploading EI data
  - Submit: should only be given to person with "signature authority" for the EI (no consultants)

    For Title V sites, this is the responsible official or the duly authorized representative

Items to Make Web-EI Easier (cont.)

- STEERS participation agreement (SPA)
  - All **NEW** STEERS accounts and **ANY CHANGES** to existing accounts require a signed SPA.
  - The account will be on probation until a SPA is submitted.
- SPA can be completed online and submitted in one of two ways:
  - Electronically: Use "E-sign" option with valid Texas driver license.
  - Print the SPA and mail it to the TCEQ.

    STEERS staff may take three days to process.
- Forgotten passwords or accounts can be:
  - reset from the STEERS home page or
  - reset by STEERS staff.

Items to Make Web-EI Easier (cont.)

- Keep EI contact information updated.
  - The EI contact is the person listed in STARS for EI-related items.
  - Updates can be made at any time within STEERS-AEIR, not just during the 90-day EI reporting window.
- Contact changes are a separate submission from EI data.

  Submitting EI data does not trigger submission of contact changes and vice-versa.
- Only a user with submit authority can submit contact changes.

And Don't Forget

CLICK THE SUBMIT BUTTON

- Entering or loading data into STEERS-AEIR work area is just one step in the process.
- Data must be submitted from STEERS-AEIR to meet 30 Texas Administrative Code (TAC) Section (§) 101.10 reporting requirements.
- Whether it's contact or EI data, nothing is "official" and no data will be updated until it is submitted.

And Also Don't Forget

SUBMIT SUPPORTING DOCUMENTATION

- Required per 30 TAC §101.10(c)

  Used to verify calculation methodology and reported emissions
- System allows attachments to Web-EI submission

  The primary option for sending supporting data
- Alternatively, supporting documentation can be
  - e-mailed to: psdocument@tceq.texas.gov
  - or sent via regular mail.

A Note About Confidential Information

- Do not submit confidential information through Web-EI or by e-mail.
  - No method to designate supporting documentation as confidential in STEERS
  - No way to appropriately handle confidential information in STEERS
  - Confidentiality cannot be ensured across multiple e-mail servers
- Confidential information should only be mailed.
  - Can be on paper or CD
  - Each confidential item should be clearly marked as such
- If any part of your supporting documentation is confidential, consider mailing all of it.

Web-EI Tutorial Sessions

- Four sessions today and four tomorrow
  - Longhorn room
  - Check with registration to see if seats are still available
- Will cover four main topics
  - TCEQ processing of inventories for STEERS access
  - STEERS account set-up
  - Manual Entry of EI data
  - File Upload and text file items

Questions?

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Emissions Assessment Section Help Line:
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STEERS (non-AEIR items):
(512) 239-6925
steers@tceq.texas.gov

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Emissions Inventory: Rule Applicability and What's New?

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Presented to the 2015 Emissions Inventory Workshop
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Overview

- 30 Texas Administrative Code (TAC) Section (§) 101.10
- Applicability
- Emissions inventory (EI) types
- EI Guidelines updates, clarifications, and reminders
- EI publications

30 TAC §101.10

EI rule organization

(a) Applicability
(b) Types of inventories
(c) Calculations
(d) Certifying statements
(e) Reporting requirements
(f) Enforcement

Applicability Requirements: Do You Need to Submit an EI?

- Major stationary source defined under 30 TAC §116.12, Nonattainment and Prevention of Significant Deterioration Definitions
  - The rule defines potential to emit (PTE) thresholds.
  - The major source classification changes based on the attainment status of county.
- Need to know:
  - PTE and actual emissions thresholds for regulated pollutants
  - PTE and actual emissions thresholds for hazardous air pollutants (HAPs)
  - Site location and attainment status of county

Applicability Requirements: Do You Need to Submit an EI? (cont.)

- Any account located in an ozone nonattainment area emitting 10 tons per year (tpy) or more of volatile organic compounds (VOC), 25 tpy or more of nitrogen oxides (NO_X), or 100 tpy or more of any other contaminant subject to National Ambient Air Quality Standards
- Any account that emits or has the potential to emit 100 tpy or more of any contaminant except for greenhouse gases
- Any account that emits or has the potential to emit 10 tons of any single or 25 tons of aggregate hazardous air pollutants as defined in Federal Clean Air Act, §112(a)(1)
- Any source of emissions subject to special inventories under 30 TAC §101.10(b)(3)

Summary of Reporting Thresholds

Summary of Reporting Requirements in Tons per Year (TPY) for 30 TAC §101.10

Note: For ozone nonattainment areas, the more stringent or severe classification (where applicable) between the 1997 and 2008 ozone standards is used to determine reporting requirements for ozone precursor potential emissions.

County	Volatile Organic Compounds (VOC)		Nitrogen Oxides (NO_x)		Other		Individual HAPs		Aggregate HAPs	
	Actual	PTE	Actual	PTE	Actual	PTE	Actual	PTE	Actual	PTE
Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, Waller SEVERE/OZONE	10	25	25	25	100	100	10	10	25	25
Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwall, Tarrant, SERIOUS/OZONE	10	50	25	50	100	100	10	10	25	25
Wise MODERATE/OZONE	10	100	25	100	100	100	10	10	25	25
All Other Counties	100	100	100	100	100	100	10	10	25	25

Applicability Requirements: Example

- Important: If an account (site) meets any of the EI reporting requirements at any time during the calendar year, an updated EI must be submitted.
- Remember, regardless of authorization type or status, this includes:
  - actual emissions and/or
  - potential emissions.
- Most common scenario:

  An operational major source voided the site's applicable permits in June 2015.
  - The site met 30 TAC §101.10 PTE reporting thresholds.
  - The site must submit a 2015 EI.
  - The 2016 EI may not be required if none of the 30 TAC §101.10 reporting requirements are met.

Applicability Summary: What Does This Mean to You?

- What is the attainment status of the county where the site is located?
- What are the site's actual emissions for regulated pollutants and HAPs (single and aggregate)?
- What are the site's PTE limits for regulated pollutants and HAPs (single and aggregate)?

EI Types

- Initial
- Annual update
- Special

Initial EI

- Sites that have never submitted an inventory
- Data collected using the Web-based system
- *2015 Emissions Inventory Guidelines* (RG-360/15)
  - Chapter 2: "Creating an Initial Emissions Inventory"
  - Chapter 5: "Example Initial Emissions Inventory"
- Due by March 31st

Annual EI Update

- Required every year the reporting criteria are met
- Guidance for annual update
  - *2015 Emissions Inventory Guidelines*, Chapter 6: "Updating an Emissions Inventory Questionnaire"
  - *2015 Emissions Inventory Guidelines:* "Emissions Inventory Checklist"
- Due March 31st unless otherwise directed in writing by the Texas Commission on Environmental Quality (TCEQ)

Special EI

- Regulated entities that receive a written request from the TCEQ

  Respond to the letter even if site does not meet reporting thresholds.
- Current special emissions inventories

  Lead
  - Any regulated entity that emits ≥ 0.5 tpy of lead emissions during normal operations.
  - Any regulated entity that has the PTE 5 tpy or more of lead emissions.

Special EI (cont.)

Current special emissions inventories (cont.)

Ozone precursors

Regulated entities that had at least 10 tpy of VOC or 25 tpy of NO_X emissions during normal operation and that are located in one of the counties specified below.

Bastrop	Gregg	Henderson	Orange	Upshur
Bexar	Guadalupe	Hood	Rusk	Victoria
Caldwell	Hardin	Jefferson	San Patricio	Williamson
Comal	Harrison	McLennan	Smith	Wilson
El Paso	Hays	Nueces	Travis	

Inapplicability Notification Letter

- If you receive a notification letter from the TCEQ but the site does not meet any of the reporting thresholds in 30 TAC §101.10 or special inventory requirements, a certifying letter instead of a full EI update is acceptable.
- The sample letter provided in the *2015 Emissions Inventory Guidelines*, Appendix B is recommended.

  Similarly worded letter can be provided.
- No option currently to submit through the Web.
- The sample letter provides two options:
  - remain on the mailing list or
  - removal from the mailing list.

Inapplicability Notification Letter (cont.)

To be removed from the mailing list, the following are **required**:

- The most recently reported emissions in the State of Texas Air Reporting System (STARS) database cannot exceed the applicability requirements.

  Must submit a current updated EI and calculations if the last reported emissions in STARS exceed the applicability requirements.

- The site does not meet any special inventory reporting requirements.

Insignificant Change Notification Letter

If changes in emissions for **each** pollutant do not exceed 5% or 5 tpy, whichever is greater, a letter can be submitted.

- The changes can be either increases or decreases.
- The 5% or 5 tpy criteria are based upon 2015 emissions compared to the most recently submitted EI entered into the STARS database.
- If a letter is submitted several years in a row, the EI may need to be updated if the change for a pollutant exceeded 5% or 5 tpy from last submitted EI.
- The emissions from the last submitted EI are copied to current year.
- Sample letter provided in *2015 Emissions Inventory Guidelines*, Appendix B.

Insignificant Change Notification Letter (cont.)

In addition to the Insignificant Change Notification Letter, the following must be provided:

- account information and EI contact information on page 2 of the EI;
- criteria emissions totals and site quantifiable event totals on page 3 of the EI;
- signature of the legally responsible party on page 4 of the EI; and
- updates to information about emissions events and/or scheduled maintenance, startup, and shutdown activities (EE/SMSS).
  - If the site experienced no EE, then the EE certification statement on page 4 of the EI must be signed.
  - If the site experienced EE, then provide EE updates on the applicable paths emissions pages of the EI.

Who's Responsible and When Is the EI Due?

- The owner or operator of the site at the time the inventory is due is responsible for submitting the EI.
- The due date for sites that submitted an EI the previous year is March 31st unless otherwise directed in writing by the TCEQ.
- The due date for sites that did not submit an EI the previous year but are applicable to reporting requirements is March 31st.

Revising EI Data

When is a revision necessary?

- To correct EI data previously reported in error
- Do not use new methodology or data retroactively
- For example, if NO_X emissions from an engine were stack tested in calendar year 2016; those test results can be used starting with the 2016 EI. The stack test results cannot be used to report NO_X emissions in the 2015 EI, or revise any EI submitted for a year prior to 2016

Revising EI Data (cont.)

Company-Initiated Revisions Submitted During the 2015 Inventory Year	
Inventory Year Revision Requested	Can the revisions be entered in STARS?*
2015	Yes
2014	Yes
2013	Case-by-case
2012	Case-by-case
2011	Case-by-case
2010 and prior	No. Filed only and noted in the STARS tracking system.

***Subject to TCEQ review and approval**

Revising EI Data (cont.)

- What should be included with the emissions inventory revision request?
  - Signed cover letter describing the nature and reason for the revisions
  - Revised applicable EI pages
  - Updated criteria emissions total for the site (found on page 3 of the EI)
  - Detailed calculations and supporting documentation for the revised emissions
- All company-initiated revisions requests are subject to the TCEQ's review and approval.
- Revisions are processed as time permits.

  Typically after all EIs for the current reporting year have been processed

Using EI Data

- Required reporting to the national emissions inventory
- Auditing for air emissions fee
  The fees group compares the EI to the fee basis form.
- Public information and internal data requests
- State implementation plan development
- Photochemical and dispersion modeling
- Emissions trends
- Emissions reduction credits

EI Guidance Updates, Clarifications and Reminders

Emissions inventories must be submitted using the State of Texas Electronic Emissions Reporting System (STEERS), Annual Emissions Inventory Reporting (AEIR) system

- New Path Deactivation Form available
  - Cannot deactivate paths through the STEERS-AEIR system
  - Complete the form and attach as part of the supporting documentation
- Paper submissions are only allowed on a case-by-case basis and prior approval must be obtained

EI Guidance Updates, Clarifications and Reminders (cont.)

Chapters 1 and 2

- Clarification: The Insignificant Change Letter language 5% or 5 tpy, whichever is greater, pertains to **each** pollutant.
- Reminder: Submit non-confidential sample calculations and supporting documentation using the document attachment function in STEERS-AEIR system.
- Reminder: Do NOT submit confidential sample calculations and supporting documentation by email or using the STEERS-AEIR document attachment function.
  Please appropriately label each page as confidential and print or burn onto a CD labeled confidential and mail to the EAS.

EI Guidance Updates, Clarifications and Reminders (cont.)

Chapters 1 and 2 (cont.)

- After submitting the EI, the user will receive two e-mails:
  - the first email confirms that the data has been placed in queue for validation processing; and
  - the second e-mail will state whether the validation process passed or failed
- If the validation process passed, the EI is considered received in accordance with 30 TAC §101.10.
- If the validation process failed, the user must correct the errors and submit the data again before the due date.

EI Guidance Updates, Clarifications and Reminders (cont.)

Chapters 1 and 2 (cont.)

- The EI will not be assigned a received date until the EI passes the validation process.
- Reminder: Inapplicability letters, insignificant change notification letters, and pre-approved paper submissions must be postmarked by the due date.

EI Guidance Updates, Clarifications and Reminders (cont.)

Chapter 4

- VOC speciation requirement clarification
  90% VOC speciation required for non-combustion sources, undestroyed VOC from flares, and other combustion abatement devices.
- Use the correct determination methodology when half the detection limit is used to determine emissions.
- Contact the EAS when averaging stack test for HAPs from power utility sources.
- Clarification that the determination methodology for process simulators that use engineering principles should be coded as "S" for scientifically calculated.

EI Guidance Updates, Clarifications and Reminders (cont.)

- Appendix A, Technical Supplement 4: Flares
  - Flare emission factors clarification
- Appendix A, Technical Supplements 1: Internal and External combustion
  - If unit burns only pipeline grade sweet natural gas, AP-42 and vendor data are acceptable to determine sulfur dioxide emissions (if a higher order method is not available)
- Appendix B, Inapplicability Letter
  - Removed requirement for annual reporting of the number of EE and SMSS activities and emissions for sites that are not required to submit an EI

EI Publications

- EI guidelines book (RG-360/15) provides:
  - Step-by-step instructions for completing an EI
  - Yearly updates with current reporting requirements
  - Technical supplements for common emissions sources
- Web-based EI reporting instructions
  http://www.tceq.state.tx.us/airquality/point-source-ei/psei.html
- All EI documents available at:
  - www.tceq.texas.gov/goto/ieas
  - Call TCEQ publication for your one free hard copy of the *2015 EI Guidelines:* (512) 239-0028

Contact Information

Mary Facundo:
(512) 239-1182
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Emissions Assessment Section Help Line:
(512) 239-1773
psinvent@tceq.texas.gov

Point Source Emissions Inventory Web site:
http://www.tceq.texas.gov/airquality/point-source-ei/psei.html

Questions

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Common Emissions Inventory (EI) Reporting Challenges

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Presented to the 2015 Emissions Inventory Workshop
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Overview

Part 1: Structure

- Basic EI structure terms
- When to add sources
- Shutting down a facility versus deactivating a path
- What can and cannot be updated in the State of Texas Electronic Emissions Reporting System (STEERS)
- Representing combustion abatement devices

Overview (cont.)

Part 2: Emissions Determination and Reporting

- Using the best available data
- Speciation
- Using the correct contaminant code
- Ozone season calculations
- Maintenance, startup, and shutdown (MSS) and emissions events (EE) reporting

Part 1: Structure

Basic EI Structure Terms

- **Structure:** The relationship of emissions sources, emissions points, abatement devices, and related emissions data
- **Facility:** A stationary source capable of generating emissions

  FIN: Facility Identification Number – an alphanumeric label for the facility
- **Emissions Point:** The physical location where emissions are released into the atmosphere

  EPN: Emissions Point Number – an alphanumeric label for the emissions point

Basic EI Structure Terms (cont.)

- **Abatement Device:** A device or activity used to reduce emissions
  - **CIN:** Control Identification Number – an alphanumeric label for the abatement device
  - Include all abatement devices at the appropriate paths
- **Emissions Path:** The route a pollutant takes from its origin, through its abatement device (if applicable), to its release into the atmosphere

  The association of one FIN, any applicable CIN(s), and one EPN

When to Add Sources

Each emissions source must be added with associated emissions if it meets any of the following criteria:

- It emits 1 ton per year (tpy) or more of any regulated pollutant.
- It emits 0.1 tpy or more of any toxic chemical or hazardous air pollutant (HAP).
- It emits 0.001 tpy or more of mercury or lead, or any individual HAP or aggregate HAP listed in any Texas Commission on Environmental Quality (TCEQ)-enforceable document such as a permit, regulation, or commission order.
- It is listed in any TCEQ-enforceable document such as a permit, regulation, or commission order.

Note: "TCEQ-enforceable document" includes permits by rule that have federally enforceable emissions limits.

When to Add Sources (cont.)

- Small emissions sources must be reported in the EI if the sum of the emissions meets or exceeds 5 tpy of regulated pollutants or 1 tpy of aggregate HAPs.
- These sources may be added individually or as a group.

When to Add Sources (cont.)

Small emissions sources can be grouped as a collective source if they meet all of the following criteria:

- Have similar source classification codes (SCC).
- Each emitted < 1 tpy of each regulated pollutant.
- Each emitted < 0.1 tpy or more of any toxic chemical or hazardous air pollutant.
- Each emitted < 0.001 tpy or more of mercury or lead.

Note: If small sources or small facilities are grouped in the regulated entity's air permits, group these sources as collective FINs in a similar manner when adding them to the EI.

When to Add Sources (cont.)

Do not use existing structure to add brand new sources.

- Create new structure (FIN, EPN, or CIN) for new equipment.

Shutting Down a FIN

FIN is no longer operating and will never operate again

- If the equipment still exists: change the FIN status to shutdown (S) with the effective date.
- If the equipment has been completely removed from the site: change the FIN status to demolished (D) with the effective date.
- Note: if a FIN is only temporarily shut down, change its status to idle (I).

Deactivating a Path

FIN is still operating, but the emissions will no longer vent through the current emissions point

- For example, a tank was vented to the atmosphere but was routed to a flare half-way through the year.
- Create path FIN: TANK / EPN: FLARE / CIN: FLARE
- Path FIN: TANK / EPN: TANK must be deactivated

Shutting Down a FIN Versus Deactivating a Path

Remember:

- If the FIN was active for any part of the reporting year, the FIN status must be marked as active (A), and any emissions must be reported.
- If a path will be deactivated part-way through the year, any emissions until that deactivation date must be reported at that path.
- If a FIN is shut down or a path is deactivated for the entire year, the emissions must be set to zero.

Path Deactivation Form

Path Deactivation Request
TCEQ Emissions Inventory Year ___

TCEQ Air Emissions Inventory

Page ___ of ___ Path Deactivation Request pages

Company Name:[1]	Site Name:[2]	TCEQ Air Account Number:[3]	RN:[4]

PATH DEACTIVATION REQUEST LIST

Facility Identification Number (FIN)[5]	Emission Point Number (EPN)[6]	Control Identification Number (CIN)[7]	Path Deactivation Date[8] (MM/DD/YYYY)

PATH COMMENTS: REASON(S) FOR PATH DEACTIVATION REQUEST(S)[9]

What Can & Can't Be Updated in STEERS

Can update or add:

- Emissions
- Methodology codes
- Facility, emission point, and control device parameters
- Coordinates
- Facility operating schedules and status
- New sources and emissions paths

What Can & Can't Be Updated in STEERS (cont.)

- Cannot update:
  - Facility, emission point, and control device labels and names (ex: FIN & FIN name)
  - Standard industrial classification (SIC) and SCC
  - FIN Group / Profile
  - Historical emissions data
- Cannot delete existing sources or structure
- Cannot deactivate paths

Representing Combustion Abatement Devices

- Devices that generate emissions while burning contaminants
- Examples: flares, thermal oxidizers, vapor combustors, etc.
- Must be represented as both an emissions source and an abatement device

Representing Combustion Abatement Devices (cont.)

There should be a <u>minimum of two paths</u> in the inventory.

1. Process path(s) - for reporting undestroyed emissions from the controlled source(s)
   - Common contaminants: volatile organic compounds (VOC) or hydrogen sulfide
   - FIN: SOURCE / EPN: FLARE / CIN: FLARE
   - Potential for multiple process paths
2. Combustion path - for reporting pilot and secondary combustion emissions
   - Products of combustion: nitrogen oxides (NO_X), carbon monoxide (CO), and sulfur dioxide (SO_2).
   - Contaminants from pilot: NO_X, CO, SO_2, and VOC
   - FIN: FLARE / EPN: FLARE

Part 2: Emissions Determination and Reporting

Using the Best Available Data

General Ranking for Emissions Determination Methods (in Descending Order):	
D	Continuous emissions monitoring systems (CEMS)*
H	Highly reactive volatile organic compounds monitoring systems
F	Predictive emissions monitoring systems
M	Measured (stack sampling) data
Q	Portable analyzer measurement data
V	Vendor-supplied emissions factors
A	AP-42 and other factors approved by the United States Environmental Protection Agency or TCEQ
B	Material Balance
S	Scientific Calculation
E	Estimation
O	Other

*Note: if properly operated and calibrated CEMS data is available, it must be used to determine emissions per 30 Texas Administrative Code Section 101.10(c).

Using the Best Available Data: Models

Any model is only as good as its inputted data.

- Site-specific inputs are always preferred over default or outdated values.
- Sometimes representative data can be used if certain criteria (found in source-specific TCEQ guidance) are met.

Using the Best Available Data: Models (cont.)

When is an extended gas or liquid analysis necessary? Examples include:

- Gas Research Institute's GLYCalc software program for glycol dehydrators
  - Note: The sample should be taken at inlet to dehydration process.
- American Petroleum Institute Exploration and Production TANK software program for vertical fixed roof tanks
- Gas/oil ratio method for flash emissions from tanks
- Any time the VOC percentage by weight is needed in calculations

Using the Best Available Data: Permit Factors

- Do not list a permit as a factor's source.
  - Provide the origin of the factor.
- Sometimes the emissions factor used to obtain a permit must <u>not</u> be used in the EI. Examples include:
  - Permitted emissions are based on outdated or unapproved emissions factors.
  - CEMS installed or stack testing was conducted after the permit was issued.
  - The permit no longer reflects the conditions of actual operations.

Speciation: Hazardous Air Pollutants (HAPs)

- Report emissions of any HAP ≥ 0.1 tpy at an emissions path.
  - Includes all kinds of HAPs, not just VOC
- Report emissions of mercury and lead ≥ 0.001 tpy at a path.
- Benzene is a high profile compound. It is often present in:
  - Upstream oil and gas operations, especially uncontrolled glycol dehydration operations
  - Gasoline and mid-range distillates
  - Loading and cleaning

Speciation: VOC

- Contaminant code 50001, VOC-unclassified (VOC-u), represents all VOC components that have not been speciated.

  (Total VOC) minus (all speciated VOCs) = VOC-u
- Example:
  - An engine emits 5 tpy of VOC, and 1 ton of that total is formaldehyde.
  - Report 1 tpy formaldehyde and 4 tpy VOC-u.
- VOC-u is <u>not</u> total VOC.

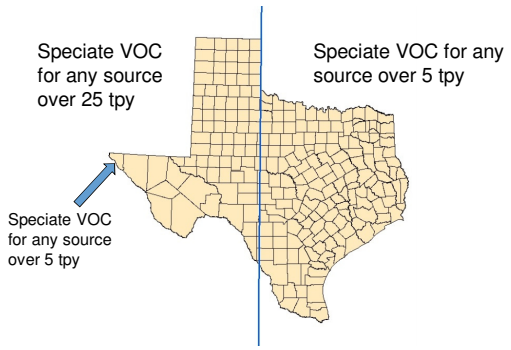
  Exception: if no VOCs are speciated at a path, then VOC-u = total VOC.

Speciation: VOC (cont.)

Reporting requirements for VOC speciation:

- If the site is in El Paso County or is located east of the 100º longitude line, speciate VOCs to at least 90% for each source that emits at least **5 tpy** of total VOCs.
- If the site is west of the 100º longitude line, speciate VOCs to at least 90% for each source that emits at least **25 tpy** of VOCs.
- Note: This may not be possible for combustion sources.

Speciation: VOC (cont.)



Using the Correct Contaminant Code

- Common areas of confusion:
  - NOx
    - 70400, 70401, and 70402 are NO_x criteria pollutant
    - 70403 is nitrous oxide
  - SOx
    - Report SO_2 (70510) for combustion and amine units
  - Hydrocarbons that are not VOCs
    As defined by 40 CFR 50.100(s)(1)

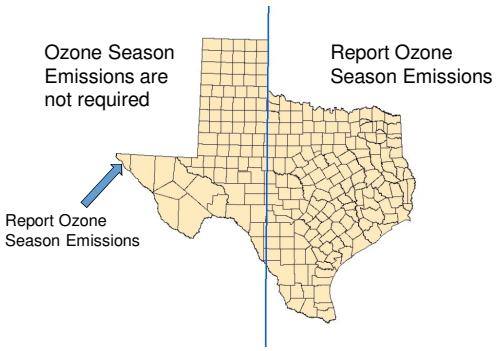
Using the Correct Contaminant Code (cont.)

- Common areas of confusion (cont.):
  - Particulates vs. Vapors
    - Particulates: 10000, 20000, and 30000 series
    - Vapors: 50000 and 70000 series
  - Metals & Oxides
  - N-Hexane (56730 and 56600)
    vs. non-HAP Hexanes (56595)
- Contaminant codes list on Emissions Assessment Section website

Ozone Season Calculations

- "Ozone Season Emissions" = the average daily rate of emissions during the ozone season in pounds per day (ppd)
- For emissions inventory purposes, the ozone season is May through September (153 days).
- Ozone season emissions are reported from sites in El Paso County and counties east of 100º longitude.

Ozone Season Calculations (cont.)



Ozone Season Calculations (cont.)

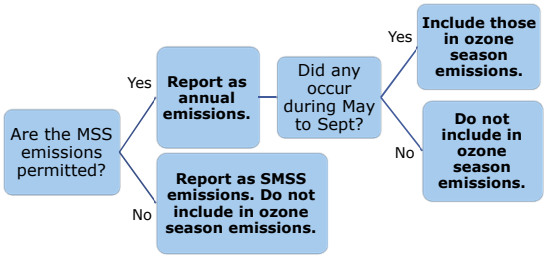
Ozone season emissions (ppd) = total lbs emissions in May-Sept / 153 days

- Use a denominator of 153 days, regardless of how many days it actually operated.
- Account for parameters that are variable.
- Update operation hours and seasonal operating percentages in EI every year.

MSS and EE Reporting

- Always report the number of reportable, non-reportable, and excess opacity events in the Site Quantifiable Events section of the inventory.
- If emissions from MSS activities or EE should be reported, ensure these emissions are reported both at the path level and in the Criteria Emissions Totals section of the inventory.

Reporting MSS Emissions

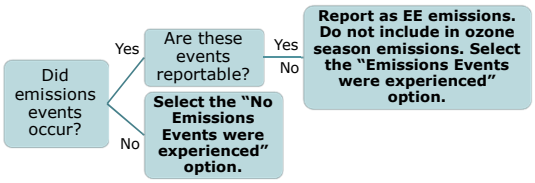


EE Certification and Reporting EE Emissions

Submit Emissions Inventory

- Emissions Events were experienced at RN
- No Emissions Events were experienced at RN

Submit



Emissions Inventory Guidelines: References and Resources

- "Inventory Checklist"
  - Before Chapter 1
  - Assists in completing EI
- These sections in Chapter 3:
  - "General Structure"
  - "Sources that Must Be Added to the EI and that May Be Grouped as Collective Sources"
  - "Collective Sources (Collective Facilities)"
  - "Representing Combustive Abatement Devices"

Emissions Inventory Guidelines: References and Resources (cont.)

- These sections in Chapter 4:
  - "Acceptable Determination Methodologies"
  - "Using Factors from a Permit"
  - "Speciating Emissions"
    Table 4-4. Summary of Speciation Criteria
  - "Ozone Season Emissions"
  - "Emissions Events"
  - "Scheduled Maintenance Startup, and Shutdown (SMSS) Activities"
- Appendix A
  - Technical Supplement 1: "Selected Combustion Sources"
  - Technical Supplement 4: "Flares"

Emissions Inventory Guidelines: References and Resources (cont.)

Point Source Emissions Inventory Website

Completing and Submitting a Point Source Emissions Inventory

- Emissions Inventory Guidelines
- Web-based EI Reporting Instructions (PDF)
- Electronic Emissions Inventory File Specifications & Appendices (PDFs)
- Electronic Emissions Inventory File Specifications Reference Tables
  Abatement Codes, Contaminant Codes, SIC, SCC

Questions and Contact Information

Ellen Reyes:
(512) 239-1462
ellen.reyes@tceq.texas.gov

Emissions Assessment Section Help Line:
(512) 239-1773
psinvent@tceq.texas.gov

Point Source Emissions Inventory Web site:
http://www.tceq.texas.gov/airquality/point-source-ei/psei.html

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Representing Permitted Maintenance, Startup, and Shutdown Emissions in the Emissions Inventory

Jill Dickey-Hull
Team Leader
Air Quality Division

Presented to the 2016 Emissions Inventory Workshop
January 27, 2016

Overview

- Common terms
- Permitted maintenance, start-up, and shutdown (MSS) Emissions
- Emissions inventory (EI) structure
- MSS permit structure
- Case study
- Options for representing permitted MSS emissions in EI Structure

Common Terms

- What are **permitted MSS** emissions?
  - Emissions that are authorized through either a New Source Review permit or permit-by-rule
  - Emissions are reported in the annual emissions category in the EI.
- What are **scheduled** maintained start-up and shutdown (SMSS) emissions?
  - Emissions as defined in 30 Texas Administrative Code (TAC) Section (§) 101.211
  - These are **not permitted emissions**, but affirmative defensive under 30 TAC §101.211 can be claimed.
  - Emissions are reported in the SMSS emissions category in the EI.

Air Permits Division (APD) Permitted MSS

- APD has processed or is processing MSS applications
- How many of your sites have a MSS permit already in place?
- APD Web page: http://www.tceq.state.tx.us/permitting
- APD MSS Web page: http://www.tceq.state.tx.us/permitting/air/mss.html

EI Basic Structure Terms

- **Structure:** The relationship of emissions sources, emissions points, abatement devices, and related emissions data
- **Facility:** A stationary source capable of generating emissions
  - **FIN**: Facility Identification Number – an alphanumeric label for the facility
  - For EI purposes, FINs are assigned a **Group and Profile** based on the type of source

    Example: Flare has FIN Group/Profile of Combustion/Flare with various characteristics provided about that flare

EI Basic Structure Terms (cont.)

Emissions Point: The physical location where emissions are released into the atmosphere

- **EPN:** Emissions Point Number – an alphanumeric label for the emissions point
- For EI purposes, EPNs have either **stack, fugitive, or flare profiles**

  Example: An engine EPN would have a stack profile with various characteristics provided about that stack

EI Basic Structure Terms (cont.)

- **Abatement Device:** A device or activity used to control emissions
  - **CIN:** Control Identification Number – an alphanumeric label for the abatement device
  - For EI purposes, CINs are assigned a specific abatement code to define the type of control device

    Example: "512" is a flare abatement code for Flares-Waste Gas, Elevated >30 feet, smokeless
- **Emissions Path:** The route a pollutant takes from its origin, through its abatement device (if applicable), to its release into the atmosphere

  The association of one FIN, any applicable CIN(s), and one EPN

EI Basic Structure Terms (cont.)

FIN	CIN	EPN
TANK1	FLARE	FLARE
TANK1	--	TANK1STK
TANK2	--	TANK2STK
FLARE	--	FLARE
CAT345	--	CAT345STK1
CAT345	--	CAT345STK2

- How many tanks?
- How many flares?
- How many engines?

  Bonus question: Why doesn't the flare/flare path have a CIN?

EI Structure

- EI structure should ideally match the actual configuration of the site as closely as possible.
- Two flares are located at a site. How are those represented in the EI structure?

FIN	FIN Group/Profile	EPN	EPN Profile
FLARE1	COMBUSTION/FLARE	FLARE1	FLARE
VOCPROCESS1	VOC PROCESS/OTHER	FLARE1	FLARE
TANK	TANK/INTERNAL FLOATING ROOF	FLARE1	FLARE
FLARE2	COMBUSTION/FLARE	FLARE2	FLARE
VOCPROCESS2	VOC PROCESS/OTHER	FLARE2	FLARE

EI Structure and Emissions

Four emissions categories in the EI:

- Annual emissions in tons per year (tpy)
  Report all routine and permitted emissions (including permitted MSS emissions)
- Ozone emissions in pounds per day
  Counties East of the 100 Longitude Line and El Paso County
- SMSS emissions in tpy
  Not permitted, meets requirements of 30 TAC §101.211
- Emissions events in tpy
  Not permitted, unplanned, not scheduled

Structure of MSS Permits

- MSS can be represented in a variety of configurations in a permit, including but not limited to:
  - New MSS EPN(s);
  - Grouped MSS EPN(s) for common source types;
  - Grouped site-wide MSS EPN; and/or
  - New MSS FIN(s).
- Why can't the **permitted MSS** emissions be reported in the **SMSS** emissions category in the EI?

  All permitted emissions must be reported as annual emissions in the EI.

MSS Permits Structure vs. EI Structure Duplication Issues

Case Study: MSS permit action added a MSS EPN

- There is only one flare located at this site.
- **Routine** emissions from the flare were <u>already permitted</u> as EPN FLARE1
- The same flare is represented in the EI as EPN FLARE1 to report those routine emissions.
  - (FIN) FLARE1 / (EPN) FLARE1
  - FIN Group/Profile is Combustion/Flare
  - EPN Profile is Flare
  - Combustion emissions from routine operations reported as annual tpy

MSS Permits Structure vs. EI Structure Duplication Issues (cont.)

Case Study: MSS permit action added a MSS EPN (cont.)

- A MSS permit authorizes the MSS emissions from the same flare as EPN FLARE1MSS
- Company adds the new path (FIN and EPN) to their EI to report their permitted MSS emissions
  - (FIN) FLARE1MSS / (EPN) FLARE1MSS
  - FIN Group/Profile is Combustion/Flare
  - EPN Profile is Flare
  - Permitted MSS emissions are reported as annual tpy
- So, what's the problem?

MSS Permits Structure vs. EI Structure Duplication Issues (cont.)

Case Study: MSS permit action added a MSS EPN (cont.)

According to the EI, how many flares are at this site?

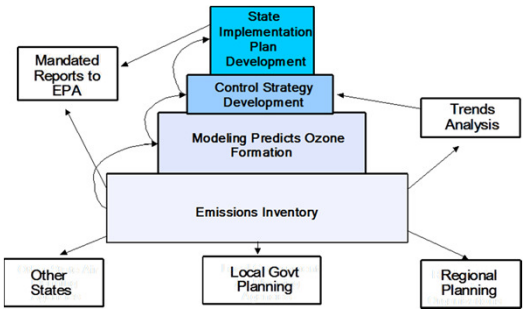
- Based on the EI structure, there are 2 flares at this site:

FIN	FIN GROUP/PROFILE	EPN	EPN GROUP/PROFILE
FLARE1	COMBUSTION/FLARE	FLARE1	FLARE
FLARE1MSS	COMBUSTION/FLARE	FLARE1MSS	FLARE

- Is that correct? No. There is only one flare at the site.

The EI Structure Inaccurately Represents the Number of Sources at a Site

How Inventories Are Used in State Implementation Plan Development



MSS Permits Structure vs. EI Structure

How can EI duplication issues be remedied while still representing the permitted MSS emissions in the EI?

Emissions Assessment Section (EAS) has developed **five options** for representing permitted MSS structure in the EI.

- The option you chose will be based on how your MSS permit is structured.
- Some duplication issues will continue to exist until a more permanent database solution can be implemented.
- **The goal is to maintain some consistency on how permitted MSS structure is represented in the EI.**

Which Option Is Right for My Site?

Ask yourself the following questions:

- Do the permitted MSS sources exist in the EI already?
- How were the MSS emissions represented in the permit?
  - MSS EPN?
  - Common sources grouped by MSS EPN?
  - Site-wide MSS path?
  - MSS FIN and EPN?
  - Other?
- Is a structure change to the EI necessary?
- Can I group the permitted MSS structure in the EI (either by common source type or site-wide)?
- Can I add a new MSS EPN to the EI and link to an existing FIN?

Which Option Is Right for My Site? (cont.)

- Because every site is different and MSS permits can vary, please call the EAS helpline or one of the Quality Assurance (QA) staff directly BEFORE adding new MSS structure to your EI.
- Have some details ready before you call:
  - Copy of your MSS permit to email to the QA staff
  - Ideas of how you would like to structure the permitted MSS in the EI
  - Find out if your site is okay with simply reporting routine and permitted MSS at the same path in the EI.
    - Maybe adding new MSS structure isn't necessary.

MSS Permits Structure vs. EI Structure Duplication Solutions

Five options for representing permitted MSS emissions in the EI:

1. No structure change
2. New MSS EPN
3. Grouped MSS EPN for common source types
4. Site-wide MSS EPN
5. New MSS FIN

Important to note: For these options, it's assumed that the MSS sources were already represented in the EI.

Option 1: No Structure Change

- Permitted MSS emissions are reported in the annual tpy column of the existing path
- The emissions from routine and MSS are added together and reported at the same path

Existing or New EI Path	FIN	EPN	Emissions
Existing Path	VOCPROCESS1	FLARESTK	Report routine and permitted MSS emissions from undestroyed VOC as annual tpy
Existing Path	FLARE	FLARESTK	Continue to report flare combustion emissions as annual tpy

Option 2: New MSS EPN

- Create a new path by adding a new MSS EPN to the existing source (FIN)
  - Report permitted MSS emissions at this path
- Routine emissions will continue to be reported at the existing path
- In the EPN Name (limited to 50 alpha numeric characters), include "MSS for EPN X"
  - Helps EI staff identify this path as a duplicate of an existing source that represents only permitted MSS emissions

Option 2: New MSS EPN (cont.)

Existing or New EI Path	FIN	EPN	Emissions
Existing Path	VOCPROCESS1	FLARESTK	Continue to report routine emissions from undestroyed VOC as annual tpy
Existing Path	TANK1	FLARESTK	
Existing Path	FLARE	FLARESTK	Continue to report flare combustion emissions as annual tpy
*New Path: *Existing FIN linked to new EPN	FLARE	FLARSTKMSS EPN NAME: "MSS for FLARESTK"	Report permitted MSS emissions from the VOC sources as annual tpy

Option 2: New MSS EPN (cont.)

What is the most preferred EPN Profile for EPN FLARESTKMSS?

A. Stack
B. Fugitive
C. Flare

Option 3: New MSS Group FIN and EPN

- Create a new path by grouping common source types into a new path
  - Never group flares
- New path will have a new grouped FIN and new grouped EPN
  - Grouped FIN should have a generic Group/Profile and Source Classification Code
  - Grouped EPN should have either a fugitive or stack profile
  - Use representative information for the characteristics
- Routine emissions will continue to be reported at the existing paths

Option 3: New MSS Group FIN and EPN (cont.)

Existing or New EI Path	FIN	EPN	Emissions
Existing Path	TANK1	TANK1	Continue to report routine VOC emissions generated by each tank as annual tpy
Existing Path	TANK2	TANK2	
Existing Path	TANK3	TANK3	
*New Path *New FIN linked to new EPN	MSSTANKGRP FIN Name: "MSS for Tanks 1-3"	MSSTANKGRP EPN Name: "MSS for Tanks 1-3"	Report permitted MSS emissions for tanks 1, 2, and 3 as annual tpy

Option 3: New MSS Group FIN and EPN (cont.)

- What is the most preferred FIN Group/Profile for FIN MSSTANKGRP?
  A. OTHER/OTHER
  B. TANKS/OTHER
  C. VOC PROCESS/OTHER
- What is the most preferred EPN Profile for EPN MSSTANKGRP?
  A. Stack
  B. Fugitive
  C. Flare

Option 4: Site-Wide MSS Path

- Create a new path to report all permitted MSS emissions from the entire site
- New path will have a new grouped FIN and new grouped EPN
  - Grouped FIN should have a generic Group and Profile and source classification code
  - Grouped EPN should have either a fugitive or stack profile
  - Use representative information for the characteristics
- Routine emissions will continue to be reported at the existing paths

Option 4: Site-wide MSS Path

Existing or New EI Path	FIN	EPN	Emissions
*New Path *New FIN linked to new EPN	SITEMSS FIN Name: "MSS for site"	SITEMSS EPN Name: "MSS for site"	Report permitted MSS emissions for the entire site as annual tpy

Option 5: New MSS FIN

NOT PREFERRED—LAST RESORT

- Create a new path by adding a new MSS FIN to the existing EPN

  Report permitted MSS emissions at this path
- Routine emissions will continue to be reported at the existing path
- In the FIN Name (limited to 50 alpha numeric characters), include "MSS for FIN X"

  Helps EI staff identify this path as a duplicate of an existing source that represents only permitted MSS emissions
- Why is this option the least preferred?

  Because of how the EI database is structured and how data is retrieved, it's more likely to incorrectly duplicate EI structure.

Option 5: New MSS FIN (cont.)

Existing or New EI Path	FIN	EPN	Emissions
Existing Path	FLARE	FLARESTK	Continue to report combustion emissions as annual tpy
*New Path *New FIN linked to existing EPN	FLAREMSS FIN NAME: "MSS for FLARE"	FLARESTK	Report permitted MSS emissions as annual tpy

Option 5: New MSS FIN (cont.)

- What is the preferred FIN Group/Profile for FIN FLAREMSS?
  A. Combustion/Flare
  B. Combustion/Other
  C. Other/Other
- Why is that the preferred Group/Profile for the MSS FIN?
  - The EAS can more easily identify the correct number of flares at this site.
  - If both FINs had a Combustion/Flare profile, then it would appear, on paper, that there were 2 different flares at the site.
- Doesn't adding a new MSS EPN also create the same duplicate problem?

Contact Information

Jill Dickey-Hull:
(512) 239-5912
jill.dickey@tceq.texas.gov

Emissions Assessment Section Help Line:
(512) 239-1773
psinvent@tceq.texas.gov

Questions

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Supporting Documentation

Susan Wampler
Emissions Inventory Specialist
Air Quality Division

Presented to the 2016 Emissions Inventory Workshop
January 27, 2016

Overview

- Part 1 – Types of supporting documentation
- Part 2 – Guidance for specific source types
- Part 3 – Confidentiality
- Part 4 – General guidance
  - What to provide
  - What to avoid
  - Additional notes and Emissions Assessment Section (EAS) preferences

Part 1

Types of Supporting Documentation

What Supporting Documents Should Be Submitted with the Emissions Inventory (EI)?

- Information about the site and its processes
- Sample calculations that support the emissions as reported in the current year's EI
- Documentation to verify the sample calculation inputs

Information About the Site and Its Processes

- Plot plan showing the geographic locations of the emissions points
- Process information
  - Written description of the site's operations
  - Process flow diagram(s) that illustrate the connections between the facilities/sources and the emissions points

Sample Calculations

- Sample calculations are required by 30 Texas Administrative Code Section 101.10(c).
- Calculations should be site-specific and use the current inventory year's data.
- Update sample calculations with each EI submittal.
- Reporting the permit limits rather than calculating current totals is not acceptable.

Sample Calculations (cont.)

- Submit sample calculations for each different process type.
- Provide sufficient data so the results can be reasonably verified. Sufficient data includes but is not limited to:
  - process rates;
  - operating hours; and/or
  - emissions factors and their sources.

Sample Calculations (cont.)

Carbon monoxide emissions from an engine:

$$\frac{3.09\ grams\ (g)}{horsepower(hp)-hour(hr)} \times \frac{7655\ hr}{year} \times \frac{1380hp}{} \times \frac{\frac{pounds}{(lb)}}{453\ g} \times \frac{ton}{2000\ lb} = 36.03\frac{ton}{year}$$

vendor factor

current operating hours

actual load

Documentation to Verify the Sample Calculation Inputs

- Extended gas analysis
- Material throughput
- Emissions factors
- Summary reports
- Vendor specifications

Extended Gas Analysis

- Most current analysis available
- Applicable to the site being reviewed
- Particularly important for:
  - volatile organic compound (VOC) speciation
  - correct glycol emission calculations
  - E&P Tank calculations

Material throughput forms

- These forms are used to report fuel, feed, and/or production rate for a unit.
- Forms for six specific facility types are located on the EAS Web page: http://www.tceq.texas.gov/airquality/point-source-ei/psei.html.
- A single form may be used to report throughput data for similar source types.
- Company spreadsheets may be submitted in lieu of the form(s).

Emissions Factors

- Identify the source of the factor(s)
  Examples include:
  - Stack test
  - Vendor/manufacturer data
  - AP-42 (which table or chapter)
  - American Petroleum Institute (API) factors
  - Chemical manufacturing average factors
  - Portable analyzer data
- Please do not list a permit as the source of an emission factor.

Summary Reports

All summary reports should include:

- identification of the site;
- identification of the facility/source; and
- report date.

Summary Reports (cont.)

- Relative accuracy test audits (RATA) for Continuous Emissions Monitoring Systems and Predictive Emissions Monitoring Systems
  - Hourly output readings
  - Material throughput
  - Dates the readings were taken
- Stack test
  - Results summary page with factors and units
  - Date of the test
  - Process rate during the test
- Aggregate Summary Emissions Report

  Gas Research Institute GLYCalc software

Vendor Specifications

Vendor data

- Include summary page of equipment information (specifications) that supports the emissions factor.
- The unit should be operating according to the vendor's specifications.

Supporting Documentation Summary

- **GOAL: Submit current and complete supporting data so that the emissions can be verified.**
- Supporting documentation includes:
  - equations;
  - specific sample calculations;
  - activity data;
  - emissions factors;
  - reference sources; and
  - assumptions.

Part 2

Guidance for Specific Source Types

Guidance for Specific Source Types

Common facility/source types:

- Flares
- Storage tanks
- Loading
- Coating and printing
- Glycol dehydrators
- Fugitives (equipment leaks)

Flares

Provide sample calculations for the pilot gas and waste gas, and include the following data:

- Heat inputs
- Emissions factors and sources
- Molecular weights
- VOC composition
- Mole fractions
- Flow rates
- Destruction efficiencies

Storage Tanks

- If emissions were determined using a software program, provide the detailed reports.
  - EPA TANKS 4.09D
  - API Exploration and Production TANKS
  - TANK ESP
- If emissions were determined using AP-42, Chapter 7 equations, provide the Excel spreadsheet with formulas and all input data.

Storage Tanks (cont.)

Floating roof tanks:

- Include fitting types (do not use program defaults)
- For external floating roof tanks, note the type of guide pole used
- Include landing loss calculations
- Verify the type of tank bottom used

Storage Tanks (cont.)

Flash or separator tanks:

Provide all the site-specific input data, which includes but is not limited to:

- Separator oil or gas composition
- API gravity
- Separator pressure and temperature
- Separator gas gravity at initial conditions
- Throughput (barrels of condensate per day)
- Stock tank gas molecular weight
- VOC content
- Gas/oil ratio
- Flash gas analysis

Truck Loading

Provide the following:

- Throughput
- Vapor pressure
- Molecular weight
- Temperature, especially for heated materials
- Equation used to determine emissions
- Speciation profile (not from flash gas analysis)
- Collection or destruction efficiency of a control device, if one is used, and the basis for the collection or destruction efficiency

Coating and Printing

Provide the following:

- Material throughput including the type and amount of material used, and VOC content
- Material balance formulas used to determine VOC and particulate matter emissions
- Material safety data sheets for the materials most frequently used
- Controls such as filter efficiencies

Glycol Dehydrators

Provide the following input values:

- Actual glycol flow rate and actual gas throughput for current year (not permitted values)
- Regenerator control device information
- Extended wet gas analysis (composition upstream of absorber) through octanes+/C8+ (minimum), speciated to include benzene, toluene, ethylbenzene, xylene, and other applicable hazardous air pollutants

  Do not use a sales gas analysis

Fugitives (Equipment Leaks)

Provide the following:

- Completed fugitive data form for sources that emitted more than 5 tpy of VOC
- VOC content of the gas/vapor and/or light liquid stream
- Breakdown of emissions between monitored and non-monitored components
- For monitored components include:
  - Sample calculations for one leaking and one pegged component for each component type
  - Concentration readings throughout the year, the dates of the readings, and the calculated emissions

Part 3

Confidentiality

Confidentiality

The following items may be marked confidential:

- Material throughputs
- Process flow diagrams
- Process rates
- Production
- Trade secrets (information that reveals secret process or methods of manufacture or production)

Confidentiality (cont.)

- Clearly label each page or compact disc (CD) "confidential"
- Provide confidential information as a paper hard-copy or on CD through the mail
- Do not send confidential information through e-mail or using the web reporting document attachment function

Confidentiality (cont.)

- Emissions data cannot be marked confidential.
- Examples:
  - Emissions rates (actual, ozone, emissions events, or maintenance, startup, or shutdown events)
  - Emissions factors
  - Emissions control equipment type and associated control efficiencies
  - Determination methods
  - Release point location
- Note: The data contained in the EI is public.

How to Submit Non-Confidential Supporting Documentation

- Attach documents to the State of Texas Electronic Emissions Reporting System (STEERS) submission

  Note that submission of supporting documents using STEERS is not possible after the EI itself has been submitted. The documents are part of the submission.

- Email documents to: psdocument@tceq.texas.gov

How to Submit Non-Confidential Supporting Documentation (cont.)

- United States Postal Service

  Emissions Inventory Data, MC 166
  Texas Commission on Environmental Quality
  P.O. Box 13087
  Austin, TX 78711-3087

- Overnight service (FedEx, UPS, courier, or hand delivery)

  Emissions Inventory Data, MC 166
  Texas Commission on Environmental Quality
  12100 Park 35 Circle, Bldg. E., Third Floor
  Austin, TX 78753

How to Submit Confidential Supporting Documentation

- United States Postal Service

  Emissions Inventory Data, MC 166
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  Emissions Inventory Data, MC 166
  Texas Commission on Environmental Quality
  12100 Park 35 Circle, Bldg. E., Third Floor
  Austin, TX 78753

Part 4

General Guidance:

What to Provide

What to Avoid

Additional Notes and EAS Preferences

Provide:

Review of items already mentioned:

- Detailed sample calculations for the current year
- Relevant summary reports from software programs, testing data, vendor data, etc.
- All equations and input data

Provide:

Additional items to provide

- Summary spreadsheets listing emissions totals per path
- Explanations for significant changes (increases and/or decreases) in emissions
- Legible documents:
  - Font size of at least 10 when using paper
  - Verify that scanned and e-mailed PDFs are readable

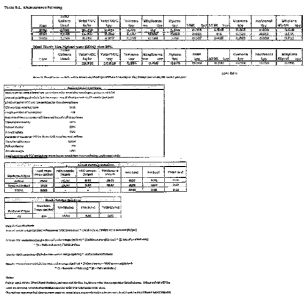
Provide: (cont.)

When using software programs:

- Send reports that list all input parameters and values
- Explain equations/calculations used
- Remember any other relevant data necessary to reproduce final emissions estimates

Avoid:

Submitting illegible paperwork



Avoid: (cont.)

- Providing only emission point numbers on the supporting documentation pages
  - Provide both facility information numbers (FIN) and EPNs
- Mixing confidential and non-confidential materials
  - Separate and clearly label confidential documents

Avoid: (cont.)

Using internal labels for FINs and/or EPNs that do not match the FINs and EPNs in the EI

- Caterpillar Engine 3616TALE = FIN:ENG3616 in the EI
- Internally, Caterpillar 3616TALE is referred to as "Unit 3"
- Do not refer to "FIN:Unit 3" in the supporting documents, instead, refer to "FIN:ENG3616"

Avoid: (cont.)

- Listing the permit as the source of an emissions factor

  Instead, provide the origin of the factor used for the permit

- Using average annual data instead of actual ozone season data when calculating ozone season emissions

- Including supporting documentation for other sites

  Only provide site-specific data

Additional Notes & Preferences

Available Resources:

- Sample calculation templates for common sources are available on the EAS Web page: http://www.tceq.texas.gov/airquality/point-source-ei/psei.html.

- The "Emissions Inventory Checklist" is located at the front of the *2015 Emissions Inventory Guidelines*.

Additional Notes & Preferences

EAS staff preferences (things that are appreciated but not required):

- Organize documents with a table of contents and page numbers.
- Send one electronic document with multiple pages rather than multiple individual PDFs.
- Provide non-confidential Excel spreadsheets electronically so that formulas can be easily reviewed. Excel spreadsheets are preferred over PDFs.
- Provide the requested material and/or information within the requested time frame.

Contact Information

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Questions

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Storage Tank Emissions Determination Challenges

Russ Nettles
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Presented to the 2016 Emissions Inventory Workshop
January 27, 2016

Overview

- Heated and hot product storage tanks
  - United States (US) Environmental Protection Agency (EPA) TANKS 4.09D (TANKS) software concerns
- Cutter stock and number six (#6) fuel oil vapor pressure
- American Petroleum Institute (API) heavy petroleum product testing
- Breathing losses from heated tanks
- Mixing losses
- Potential thermal cracking occurring inside heated tanks

Overview (cont.)

- EPA tank screening procedure
- EPA Section 114 letters
- Compressor drip
- Crude oil tanks
- Screening tool to help identify potential tank issues

Heated Tanks: Potential Emissions Determination Issues

- Qualitative evidence

  Emissions from heated tanks are routinely identified with forward looking infrared (FLIR) camera technology.
- EPA initiated formal information collection request (ICR) for all US petroleum refineries in spring 2011
  - ICR purpose was to gather data to reevaluate emissions standards for this source category.
  - The EPA issued *Emission Estimation Protocol for Petroleum Refineries*, an ICR guidance document that identified emissions estimation problems with the EPA TANKS software program.

Specific Tank Type Concerns

- Heated tanks that are located at refineries and terminals.
- Hot product storage tanks are intermediate process tanks receiving "warm products" that are higher than ambient temperature, but are not directly heated.

FLIR Video of Heated Tanks

Heated Tanks and Hot Product Storage Tanks

- The TANKS software does not apply AP-42, Chapter 7 equations accurately when determining emissions from heated and hot product storage tanks.
- For emissions inventory (EI) purposes, TANKS emissions estimates stopped being accepted for heated tanks or hot product storage tanks with the 2011 reporting year.

For these tanks, TANKS contains several defaults that prevent the AP-42 equations from being properly applied, including:

- determining emissions for some high molecular weight petroleum distillates if storage temperature is above 100 degrees Fahrenheit (°F); and
- not properly computing the vapor space and liquid temperature ranges for heated tanks.

Heated Tanks and Hot Product Storage Tanks (cont.)

- TANKS will underestimate emissions from intermediate process tanks with floating roofs that store material at warmer-than-ambient temperature.
- **Use AP-42, Chapter 7 equations.**

Reminder

- **Use vapor pressure at the actual bulk and surface temperatures of the liquid.**
- **Do not use AP-42 defaults or other default values** for vapor pressure, liquid composition, and other relevant parameters unless representative of the stored liquid.
- Per AP-42 Chapter 7, American Society for Testing and Materials (ASTM) method D2879 is suitable for determining vapor pressure for heavy liquids at the actual storage temperature.

ASTM D2879

- Does not have a precision statement
- Limited lab resources
- Requires boiling the sample to drive off water that may result in boiling off any light ends that may be present in the sample
- Survived a 2015 delisting vote by ASTM
- Not a highly regarded ASTM method
- For now, it is a method identified to determine the vapor pressure of a heavy liquid

Cutter Stock

Reminder

- If a stored product is "cut" with another material, the "cutter stock" must be accounted for in emissions determinations.
  - Cutter stock will impact the liquid's:
    - composition and
    - vapor pressure at the stored temperature.
  - Process records should indicate the amount and type of cutter stock added.
- Cutter stock emissions must be accounted for when estimating emissions.
  - Process records should provide detail about the cutter stock composition.
  - Hazardous air pollutants, air toxics and volatile organic compounds (VOC) must be speciated according to EI guidelines.

Number Six Fuel Oil Vapor Pressure Concerns

- Limited data on #6 fuel oil vapor pressures shows the potential for extremely large ranges of vapor pressures.
- Elevated vapor pressures from #6 fuel oil tanks were identified during an EPA investigation, including:
  - Vapor pressure of 0.32 pounds per square inch (psi) at 130°F
  - Vapor pressure of 0.21 psi at 116°F
- AP-42, Chapter 7 default vapor pressure for #6 fuel oil at 100°F is 0.00019 psi.

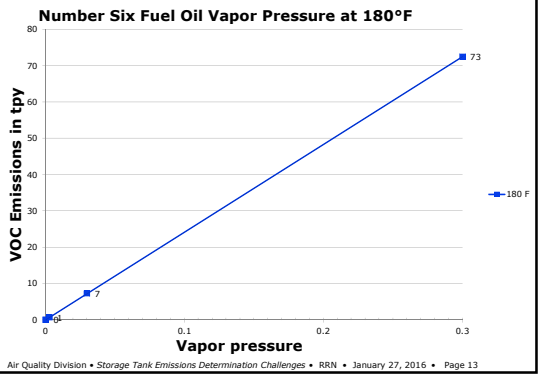
Number Six Fuel Oil Working Emissions Versus Vapor Pressure

Vapor Pressure (psi absolute)	*VOC Emissions at 180°F
0.0003	0.0725 tons per year (tpy)
0.003	0.7252 tpy
0.03	7.2522 tpy
0.3	72.5221 tpy

*Some parameters were assumed.

- Emissions were estimated using TankESP software.
- Note: tank working emissions are **directly proportional** to the magnitude increase in vapor pressure.

Number Six Fuel Oil Working Emissions Versus Vapor Pressure (cont.)



API Heavy Petroleum Product Testing

- API *Manual of Petroleum Measurement Standards,* Chapter 19.4: "Evaporative Loss Reference Information and Speciation Methodology"
  - Third edition, October 2012
  - Addendum 1, November 2013
- Performed heavy liquid vapor pressure testing on samples of vacuum residual oil, blended #6 fuel oil, and cutter stock
  - Very limited sample set
  - Four refineries provided samples

API Measurement Approaches

Three approaches were used to measure vapor pressure:

1. Maxwell-Bonnell correlations
2. Heavy Oil Storage Tank (HOST) Committee test method

   The HOST method was designed for heavy crude oil (API gravity 12-14) testing.
3. ASTM D2879
   - One concern about this method is its lack of a precision statement.
   - The Emissions Assessment Section is unaware if the two methods above also have method validation concerns.

API Testing Results

- Test results showed samples had vapor pressures that were 2-3 orders of magnitude higher than the AP-42 default vapor pressures for residual oil and #6 fuel oil.
- The cutter stock contributed to the vapor pressure of the #6 fuel oil samples.
  - Potentially had the most significant impact on vapor pressure measurements

API Recommendations for Vapor Pressure Determination

For #6 fuel oil and related products, API recommends the following methods to determine vapor pressure, in order of preference:

1. ASTM D2879;
2. Determine the blend ratio and properties of the cutter stock and calculate the vapor pressure as a corresponding percentage of the vapor pressure; or
3. If specific information on the cutter stock is unavailable, assume 20% kerosene or 25% diesel as cutter stock using:
   - 10.781 as the dimensionless constant A in AP-42 Chapter 7 equations
   - 8933 as the dimensionless constant B in AP-42 Chapter 7 equations.

Breathing Losses From Insulated Shell Tanks

- Historically, only working losses were considered from insulated tanks
- Tanks with insulated shells and **uninsulated roofs** have potential for breathing losses
- Significant heat exchange occurs between the vapor space and ambient air through the uninsulated roof resulting in breathing losses
- Preferred approach: determine breathing loss emissions as if the tank were uninsulated using AP-42, Chapter 7 equations.
  - Use the actual liquid temperatures of the stored liquid
  - Use the daily ambient temperature range

Breathing Losses From Fully Insulated Tanks

- Tanks with an insulated shell and **insulated** roof may have potential for breathing losses due to tank heating cycles.
- The amount of breathing losses depends on the heating cycle's:
  - temperature range,
  - frequency and
  - duration.

Breathing Losses From Fully Insulated Tanks (cont.)

To determine emissions from fully insulated storage tanks, the preferred approach would be to modify the breathing loss equations in AP-42, Chapter 7.

- Replace 365 days with the number of annual heating cycles
- Replace the daily temperature range with the temperature range of the tank liquid surface

Emissions From Tank Mixing Operations

- Heavy liquid products can be mixed with compressed air sparging.
- AP-42, Chapter 7 equations do not account for emissions generated by mixing (stirring or blending) tank contents.
- If tank contents are mixed, emissions need to be estimated from:
  - mechanical mixing,
  - **air injection or air sparging** and
  - other means of mixing.
- Estimate emissions using engineering calculations that account for air flow and volatility of the stored liquid, including cutter stock.

Is Thermal Cracking Occurring Inside Heated Tanks?

- Recent heated storage tank testing projects and research suggest thermal cracking may occur within heated tanks.
- Unexpected light-end compounds are being seen in vapor samples.
  - Methane, propylene, water and carbon monoxide
  - These compounds are not present in the liquids entering the tanks
- Suggest trying to estimate cracking losses if the site believes thermal cracking is occurring inside a heated tank.
- Currently, there is no estimation guidance available.

EPA Storage Tank Survey Procedure

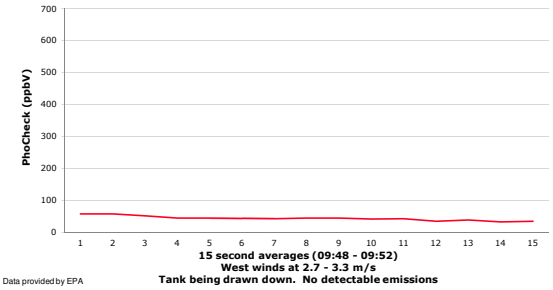
- The EPA has developed a downwind photoionization detector (PID) procedure to screen storage tanks.
- The procedure establishes a concentration baseline around the perimeter of the tank from the top of the tank berm.
- The expected VOC concentrations are less than 100 parts per billion by volume (ppbv) downwind of a tank at the berm from a properly operating tank.

EPA Storage Tank Survey Procedure (cont.)

- Winds between 4 and 13 miles per hour are required for this procedure.
  - Airflow at this speed moves the tank emissions plume near ground-level for PID detection.
- The EPA has trained their staff and local organization's staff on this procedure.
- When PID concentrations are above 100 ppbv, the tank is further inspected with a FLIR camera.
  - Hydrocarbon plumes are easily visualized by the FLIR camera.

Fixed Roof Diesel Tank PID Survey

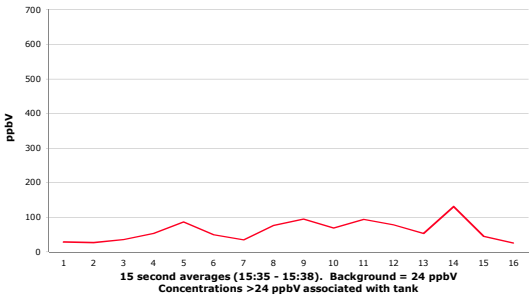
Tank being drained. No visible emissions observed with a FLIR camera.



Data provided by EPA

Internal Floating Benzene Tank PID Survey

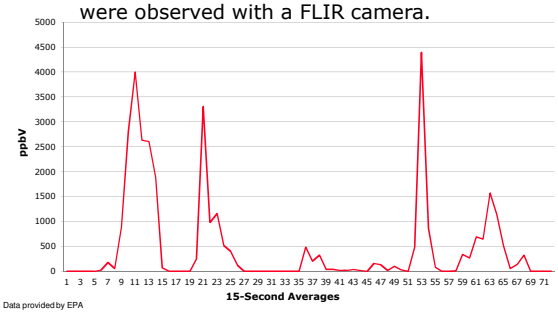
No visible emissions observed with a FLIR camera.



Data provided by EPA

Internal Floating Crude Oil Tank PID Survey

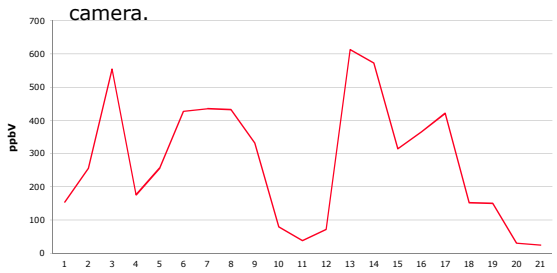
Further inspection found crude oil on top of the internal floating roof. Visible emissions were observed with a FLIR camera.



Data provided by EPA

Fixed Roof #6 Fuel Oil PID Survey

Visible emissions were observed with a FLIR camera.



15 second averages (15:30 - 15:35) Background: 18 ppbV
North winds 1.5 3.0 m/s
Concentrations above 18 ppbV associated with tank

Data provided by EPA

EPA Section 114 Request for Information

- Requests information from a person who owns or operates an emission source or manufacturers an emission control device
- Requests information from anyone that the EPA believes can assist the Agency in achieving its objectives under the Clean Air Act
- **EPA has sent out seven 114 Request for Information letters to facilities that store heated liquids.**

Compressor Drip From Upstream Oil & Gas Tanks

- "Compressor drip" liquids are being sent to storage tanks.
- Liquids formed from compressing wet gas in reciprocating compressors.
- Compressor drip immediately flashes to atmosphere.
- Compressor drip is likely not accounted for in a pressurized liquid samples used to estimate emissions.

Crude Oil Tanks

- Use accurate vapor pressure for emissions estimation.
- EPA TANKS vapor pressure defaults are likely not applicable to most crude oil tanks.

Accurate Data and Parameter Inputs

- Accurate data is critical for estimating all types of storage tank emissions.
- Use accurate and representative data inputs when using AP-42, Chapter 7 equations or tank estimation software that properly applies Chapter 7 equations.
- Accurate vapor pressure at the storage temperature is critical to determine an accurate emissions rate.

Permitted or default vapor pressure values can only be used if these parameters are representative of the stored liquid.

Specialized Infrared Camera

- Good screening tool to determine if a storage tank is operating properly.
- If hydrocarbon plumes can be seen from storage tanks with an infrared camera or similar technology, then the tank is potentially not operating as designed.
  - Plumes from a floating roof tanks may be due to a mechanical malfunction or rim seal problem.
  - Plumes from fixed roof tanks may potentially be due to elevated vapor pressure of the stored liquid.

Summary

- **EPA TANKS 4.09D (or any earlier version) is not accepted to determine emissions from heated tanks or hot product storage tanks for EI purposes.**
- Use accurate input data when estimating emissions from heated and hot product storage tanks.
- Do not use default parameters unless these parameters are representative of the stored product.

Summary (cont.)

- Account for breathing, mixing and potential thermal cracking losses.
- Suggest using a specialized infrared camera to ensure a tank is maintained and operating properly.
- Any emission plume identified should be investigated to determine the cause of the plume.
- Strong odors from a tank should be investigated to determine the cause of the odor.

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TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Calculating Volatile Organic Compounds (VOC) Emissions for Common Sources

Steve O'Neal
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Presented to the 2016 Emissions Inventory Workshop
January 27, 2016

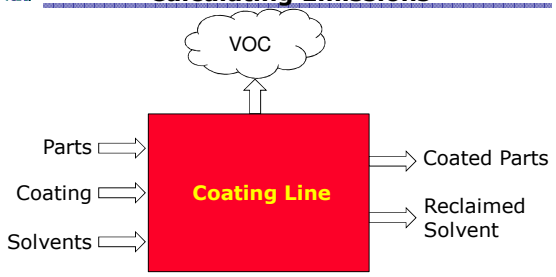
Overview

- Coating operations
- Flare waste gas calculations
- Marine loading
- Fugitive emissions

Coating Operation Terms

- **Coating –** A material applied onto or impregnated into a substrate for protective, decorative, or functional purposes.
- **Coating application system** – Devices or equipment designed for the purpose of applying a coating material to a surface.
- **Coating line** – An operation consisting of a series of one or more coating application systems and including associated flash-off area(s), drying area(s), and oven(s) where a surface coating is applied, dried, or cured.

Coating Operations: Calculating Emissions

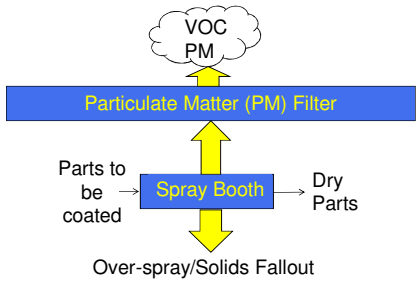


Coating Operation Types

DIP COATING

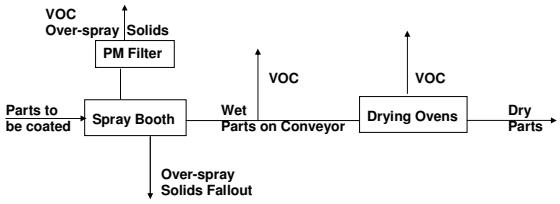
Coating Operation Types

SPRAY COATING: PARTS DRY IN BOOTH



Coating Operation Types (cont.)

SPRAY COATING: PARTS ARE DRIED OUTSIDE THE BOOTH OR IN AN OVEN



Coating Operations: Collect Data

- Collect data required for emissions calculations
  - Coating throughput
  - VOC content (total and speciated)
  - Material safety data sheets
  - Transfer efficiency
  - Collection efficiency
  - Filter efficiency (for particulate)
  - VOC control efficiency
- Consider what happens to the solids and solvent in the coating during the process

Coating Operations: Collect Data (cont.)

Gather specific data to calculate VOC emissions rates for parts that dry in the spray booth:

Required Data Element	Value
Coating VOC Content	*3.5 pound (lb) VOC/gallon (gal)
Annual Coating Consumption	4750 gallons/year

*Most MSDS sheets provide the density of the coating in terms of lb/gal this needs to be converted to VOC lbs/Gal using the following formula:

$$VOC\ lb/gal = \frac{VOC\ \%\ weight}{100\%} \times Density\ \frac{lb}{gal}$$

Coating Operations: Calculating Emissions

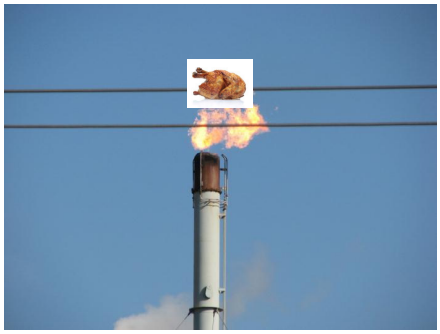
- For VOC emissions, use a material balance approach (sample calculation below):

$$\frac{3.5\ lbs\ VOC}{gal\ of\ coating} \times \frac{4{,}750\ gal\ of\ coating}{year} \times \frac{ton}{2000\ lbs} = \frac{8.3125\ tons}{year}$$

- For PM emissions calculations, refer to the sample calculations in this guidance document:

  www.tceq.texas.gov/assets/public/permitting/air/Guidance/NewSourceReview/sample_paint_emcalc.doc

Flares



Estimating Flared VOC Emissions

Required Data

- Flow Rate
- Waste Gas Composition
- Destruction Efficiency
- Determination Methodology

Estimating Flared VOC Emissions (cont.)

- Use the actual flare waste gas flow rate and composition.
- Hierarchy of preferred methods:

  Flares subject to 30 Texas Administrative Code (TAC), Chapter 115, Subchapter H relating to highly reactive VOC (HRVOC):
  - Valid flow rate and composition required by 30 TAC Sections 115.725–115.726
  - Required to determine emissions if HRVOC monitors were installed and operational during inventory year
  - Reminder: Code emissions determination method as "H"

Estimating Flared VOC Emissions (cont.)

Hierarchy of preferred methods (cont.):
- Continuous monitoring with quality-assured instruments: code emissions determination method as "B" for material balance.
- Continuous monitoring with instruments that may not meet all quality-assurance tests: code emissions determination method as "B."
- Periodic testing with instruments and laboratory analysis: code emissions determination method as "B."
- Engineering determination based on process knowledge: code emissions determination method as "S."
- One time performance test <u>during inventory year</u>: code emissions determination method as "E."

Estimating Flared VOC Emissions (cont.)

Destruction Efficiency Choices

- Flare operations consistent with 30 TAC Chapter 115 may use destruction efficiencies specified in 30 TAC Section 115.725
- Applicable permit
- *2015 Emissions Inventory Guidelines,* Technical Supplement 4*,* Table A-8:

Waste Stream Compounds (where C# = number of carbons)	**Destruction and Removal Efficiency (DRE)**
VOC, C1–C3	98% (Only use 99% if specifically authorized in permit conditions).
VOC, C3 or higher	98% or DRE specifically authorized in permit conditions.

Flared VOC Emissions: Sample Calculation

- Multi-step process for calculating flared VOC emissions:
  - Calculate annual mass flow rate for waste gas stream routed to the flare
  - Apply appropriate DRE to mass flow rates to determine VOC emissions from flare
- Sample parameters:
  - Operating hours: 8,760
  - Flow rate: 105.12 thousand standard cubic feet per year

VOC Composition Data	Percent by Volume (Mole %)
Xylene	60
Toluene	20
Propane	10
Other VOC	10

Flared VOC Emissions: Sample Calculation (cont.)

- Determine mass flow rate:
  - Calculate average stream molecular weight
  - Convert flow rate units to standard cubic feet per year (scf/yr)
  - Use ideal gas law to determine total mass flow rate
- Calculate average stream molecular weight:
  - Mole percent divided by 100 = mole fraction
  - Multiply the mole fraction for an individual compound by the compound's molecular weight
  - Repeat for each compound in the stream
  - Sum results to determine average molecular weight
  - Example calculation on next slide

Flared VOC Emissions: Sample Calculation (cont.)

Calculate average stream molecular weight (cont.):

COMPOUND	MOLECULAR WEIGHT OF COMPOUND (MWi)	MOLE FRACTION OF COMPOUND (Xi)	MWi*Xi	WEIGHT PERCENT
PROPANE	44.1	0.1	4.41	4.75
OTHER VOC	63.8	0.1	6.38	6.87
TOLUENE	92.14	0.2	18.428	19.83
XYLENE	106.16	0.6	63.696	68.55
AVERAGE MOLECULAR WEIGHT			**92.914**	

Flared VOC Emissions: Sample Calculation (cont.)

Convert flow rate to units of scfm:

- Flow rate: 105.12 thousand standard cubic feet per year (Mscf)
- $(105.12\ \frac{Mscf}{year}\ x\ 1{,}000\ \frac{scf}{Mscf})$
- = 105,120 scf/yr

Flared VOC Emissions: Sample Calculation (cont.)

- Next, assume an ideal gas mixture.
- Use the ideal gas law to convert the total volumetric flow rate to total mass flow rate.
- Ideal gas law: $$m = \frac{(MW)PV}{RT}$$
- Where:
  - m = mass flow rate in pounds (lb) per year;
  - MW = molecular weight in lb per lb-mole (lbmol);
  - P = standard pressure, 14.7 pounds per square inch absolute (psia);
  - V = flow rate (scf/yr);
  - T = standard temperature, 528 degrees Rankine (°R); and
  - R = gas constant, 10.73 psia-cubic feet (ft^3)/lbmol-°R.

Flared VOC Emissions: Sample Calculation (cont.)

Total Waste Gas Flow Rate Sample Calculation

$$m = \frac{(MW)PV}{RT}$$

$$m = \frac{\left(92.914\ \frac{\text{lb}}{\text{lbmol}} * 14.7\ \text{psia} * 105{,}120\ \text{scf/yr}\right)}{[(10.73\ \text{psia}-\text{ft}^3/\text{lbmol}-°\text{R}) * (528\ °\text{R})]}$$

$m =$ 25,343 lb/year total VOC waste gas routed to the flare

$m =$ 12.67 tons per year (tpy) total VOC waste gas routed to the flare

Flared VOC Emissions: Sample Calculation (cont.)

- After calculating the total mass flow rate, apply weight percent (NOT mole percent) to determine individual compound speciated mass rates.
- Xylene routed to flare:

  $12.67\ tpy\ VOC\ *0.6855\ weight\ \%\ \ xylene = 8.69\ tpy$
- Toluene routed to flare:

  $12.67\ tpy\ VOC\ *0.1983\ weight\ \%\ \ toluene = 2.51\ tpy$
- Propane routed to flare:

  $12.67\ tpy\ VOC\ *0.0475\ weight\ \%\ \ propane = 0.60\ tpy$
- Other VOC routed to flare:

  $12.67\ tpy\ VOC\ *0.0687\ weight\ \%\ \ other\ VOC = 0.87\ tpy$

Flared VOC Emissions: Sample Calculation (cont.)

- Finally, apply the appropriate, authorized DRE to speciated compounds to arrive at flared VOC emissions.
- Report these compounds at the correct path in the emissions inventory.
- Xylene emitted from flare:

  $8.69\ tpy\ \times (1 - 0.98) = 0.1738\ tpy\ xylene$
- Toluene emitted from flare:

  $2.51\ tpy\ \times (1 - 0.98) = 0.0502\ tpy\ toluene$
- Propane emitted from flare:

  $0.60\ tpy\ \times (1 - 0.98) = 0.012\ tpy\ propane$
- Other VOC emitted from flare:

  $0.87\ tpy\ \times (1 - 0.98) = 0.0174\ tpy\ other\ VOC$

Marine Facilities

Marine VOC Sources

- VOC emissions sources may include:
  - Dock VOC emissions from equipment leak fugitives
  - Dockside marine vessel VOC emissions from loading and unloading of liquid bulk or liquefied gaseous material
  - Liquid vessel compartment degassing and cleaning
- Marine vessels may have reportable emissions if connected to the shore in any manner.

Marine Vessel Loading Calculations Template

Company Name:	**Site Name:**	**RN:**
FIN:	**EPN:**	**CIN:**
	Data Inputs	
Cargo Carrier type (ship or barge):		
Product Type Loaded/Unloaded:		
Previous Cargo (indicate one): • volatile • nonvolatile		
Barge/Ocean Tank Condition (indicate one): • Uncleaned • Ballasted • Cleaned or gas freed		
Saturation factor (S) used in loading emission calculations:		
Arrival factor (CA) used in loading emission calculations:		

Marine Facility Emissions Determination Methodologies

- Reference: *2015 Emissions Inventory Guidelines,* Technical Supplement 5: "Marine Facilities"
- Emissions determination methodologies for:

  Loading and unloading bulk liquid materials:
  - Dock fugitive component emissions

    2015 Emissions Inventory Guidelines, Technical Supplement 3: code emissions determination method as "A."
  - Liquid material loading and unloading
    - AP-42, Chapter 5, Tables 5.2-2 and 5.2-3: code emissions determination method as "A."
    - Material balance method: code emissions determination method as "B."

Marine Crude Loading Loss

Deriving the Emissions Factor

- $C_L = C_A + C_G$ (Equation 2)
- Where:
  - C_L = total loading loss, lb VOC/1000 gallons of crude oil loaded (emissions factor)
  - C_A = arrival emissions factor, contributed by vapors in an empty tank compartment before loading. Reference AP-42, Section 5.2, Table 5.2-3 (see next slide).
  - C_G = generated emissions factor, contributed by evaporation during loading. Reference AP-42, Section 5.2, Equation 3.

Marine Crude Loading Loss (cont.)

Determining C_A

AP-42, Section 5.2, Table 5.2-3

Condition	Previous Cargo	C_A - lb/1000 gal Total hydrocarbon factor
Uncleaned	**Volatile (True Vapor Pressure > 1.5 psia)**	**<u>0.86</u>** Example Pick
Ballasted	Volatile	0.46
Cleaned or gas-freed	Volatile	0.33
Any condition	Nonvolatile	0.33

Marine Crude Loading Loss (cont.)

Determining C_A (cont.)

- Convert total hydrocarbon (THC) emissions factor to a VOC factor using one of the following applicable choices:
  - **Crude vapor composition is known:** Apply the crude oil vapor weight percent VOC (approximately 55 – 100%) to the THC factor.
  - **Crude vapor composition is <u>NOT</u> known:** Estimate the VOC emissions factor by applying 85 weight percent VOC to the THC factor.
- Example: determining the VOC emissions factor
  - C_A = 0.86 lb THC/1000 gal x 0.85 (weight percent VOC)
  - C_A = 0.731 lb VOC/1000 gal

Marine Crude Loading Loss (cont.)

Determining C_G

- $C_G = 1.84\,(0.44\,P - 0.42)\,\frac{MG}{T}$

  (AP-42, Section 5.2, Equation 3)
- Where:
  - P = true vapor pressure of loaded crude oil, psia
  - M = molecular weight of vapors, lb/lb-mole
  - G = vapor growth factor = 1.02 (dimensionless)
  - T = temperature of vapors, °R (°Fahrenheit + 460)

Marine Crude Loading Loss (cont.)

Determining C_G (cont.)

- $C_G = 1.84\,[(0.44 \text{ x } 4) - 0.42]\,\frac{50*1.02}{538}$ (Equation 3)
- C_G = 0.2337 lb VOC/1000 gal

- **Total Loading Emissions Factor**
- $C_L = C_A + C_G$
- $C_L = 0.731 \text{ lb VOC/1000 gal} + 0.2337 \text{ lb VOC/1000 gal}$
- $C_L = 0.9647 \text{ lb VOC/1000 gal}$

Marine Crude Loading: Example Calculation

Input Data	
C_L	0.9647 lb VOC/1000 gal
Annual Loading Throughput	1,260,000 Mgal (1 Mgal=1000 gal)
Vapor Recovery Unit	Collects loading vapors and sends to vapor combustor
Vapor Combustor/Incinerator	95% destruction efficiency

- Total emissions, tpy = $\frac{0.9647\,\frac{lb\ VOC}{1000\ gal} * 1{,}260{,}000\ Mgal * (1 - .95)}{2000 lb/ton}$
- Total emissions, tpy = 30.39 tpy VOC

Fugitive Emissions

www.fugitiveemissions.com

Fugitive Terms

- Traditional components
- Nontraditional components
- Leak Detection and Repair Program (LDAR)
- Synthetic Organic Chemical Manufacturing Industry (SOCMI)

Emission Determination Methodologies

- United States Environmental Protection Agency (EPA) industry average factors (Code as "A")

  Four categories: SOCMI, oil and gas production, refinery, and petroleum marketing terminals

- EPA correlation equations (Code as "A")

  Note: Uses screening values from LDAR program

- Unit specific equations (Code as "M")

  Note: Developed using bagging data in accordance with EPA guidelines

- Audio/Visual/Olfactory (Code as "A")

Fugitive Data Form
TCEQ Emissions Inventory Year_____

TCEQ Air Account Number: | FIN:

COMPONENT COUNTS

	Service	Unmonitored Number of components	Monitored Number of components	Leak definition (ppm)	Monitored Number of leakers	Number pegged	Monitoring frequency
Valves	Gas/Vapor						
	Light liquid						
	Heavy liquid						
	H_2O/Light oil						
Pumps	Gas/Vapor						
	Light liquid						
	Heavy liquid						
	H_2O/Light oil						
Flanges	Gas/Vapor						
	Light liquid						
	Heavy liquid						
	H_2O/Light oil						
Open-Ended Lines	Gas/Vapor						
	Light liquid						
	Heavy liquid						
	H_2O/Light oil						
Connectors	Gas/Vapor						
	Light liquid						
	Heavy liquid						
	H_2O/Light oil						
Relief Valves	Gas/Vapor						
	Light liquid						
	Heavy liquid						
	H_2O/Light oil						
Compressor Seals	Gas/Vapor						
	Light liquid						
	Heavy liquid						
	H_2O/Light oil						
Other	Gas/Vapor						
	Light liquid						
	Heavy liquid						
	H_2O/Light oil						

VOC PERCENTAGES | MONITORING EQUIPMENT DATA

Gas/vapor stream: _____%
Light liquid stream: _____%

Pegged Component Screening Value: _____ppm
Calibration Range: _____min _____max

EMISSIONS DETERMINATION METHODOLOGY OR LDAR PROGRAM USED

☐ Oil and Gas Factors ☐ SOCMI Average Factors ☐ SOCMI without Ethylene Factors
☐ Refinery Factors ☐ SOCMI with Ethylene Factors ☐ Correlation Equations
☐ Petroleum Marketing Terminal Factors ☐ Other (explain)
LDAR PROGRAM: ☐ None ☐ 28M ☐ 28RCT ☐ 28VHP ☐ 28MID ☐ 28LAER
☐ AVO ☐ 28CNTA ☐ 28CNTQ ☐ HRVOC ☐ Other: _____

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Fugitive Data Form
TCEQ Emissions Inventory Year 2016

TCEQ Air Account Number: HG/XXXX | FIN: OLD-LEAKY

COMPONENT COUNTS

	Service	Unmonitored Number of components	Monitored Number of components	Leak definition (ppm)	Monitored Number of leakers	Number pegged	Monitoring frequency
Valves	Gas/Vapor						
	Light liquid						
	Heavy liquid						
	H_2O/Light oil						
Pumps	Gas/Vapor						
	Light liquid						
	Heavy liquid						
	H_2O/Light oil						
Flanges	Gas/Vapor	100					
	Light liquid						
	Heavy liquid						
	H_2O/Light oil						
Open-Ended Lines	Gas/Vapor						
	Light liquid						
	Heavy liquid						
	H_2O/Light oil						
Connectors	Gas/Vapor						
	Light liquid						
	Heavy liquid						
	H_2O/Light oil						
Relief Valves	Gas/Vapor						
	Light liquid						
	heavy liquid						
	H_2O/Light oil						
Compressor Seals	Gas/Vapor						
	Light liquid						
	Heavy liquid						
	H_2O/Light oil						
Other	Gas/Vapor						
	Light liquid						
	Heavy liquid						
	H_2O/Light oil						

VOC PERCENTAGES | MONITORING EQUIPMENT DATA

Gas/vapor stream: 100 %
Light liquid stream: 100 %

Pegged Component Screening Value: ____ppm
Calibration Range: min max

EMISSIONS DETERMINATION METHODOLOGY OR LDAR PROGRAM USED

Oil and Gas Factors SOCMI Average Factors SOCMI without Ethylene Factors
Refinery Factors SOCMI with Ethylene Factors Correlation Equations
Petroleum Marketing Terminal Factors Other (explain) _____
LDAR PROGRAM: x None 28M 28RCT 28VHP 28MID 28LAER
AVO 28CNTA 28CNTQ HRVOC Other: _____

Oil and Gas Average Factors Addendum to RG-360A, Table 4

Equipment/ Service	Petroleum Marketing Terminal a	Oil and Gas Production Operations: Gas	Heavy Oil <20° API	Light Oil	Water/L ight Oil	Refinery a
Valves		0.00992	0.0000185	0.0055	0.000216	
Gas/Va						0.059
Light L						0.024
Heavy Liquid	0.0000948					0.00051
Pumps		0.00529	0.00113 a		0.000052	
Light Liquid	0.00119					0.251
Heavy Liquid	0.00119					0.046
Flanges/Connectors		0.00086	0.00000086	0.000243	0.000006	0.00055
Gas/Vapor	0.000092604					
Light Liquid	0.00001762					
Heavy Liquid	0.0000176					
Compressors		0.0194	0.0000683	0.0165	0.0309	1.399
Relief Valve		0.0194	0.0000683	0.0165	0.0309	0.35
Open-ended Lines c		0.00441	0.000309	0.00309	0.00055	0.0051
Sampling						0.033
Connectors		0.00044	0.0000165	0.000463	0.000243	
Other e		0.0194	0.0000683	0.0165	0.0309	
Gas/Vapor	0.000265					
Light/Heavy Liquid	0.000287					
Process Drains		0.0194	0.0000683	0.0165	0.0309	0.07

Flanges/Connectors

0.00086

Fugitive Sample Calculation

Scenario: Oil and Gas site with no monitored components. The data below is one component from the fugitive data form. Oil and gas average factors used.

Flanges	Count	Hours	EF	VOC%	%Reduction	TPY
Gas/Vapor	100	8760	0.00086	100	0	0.3767

Calculation

$$\mathbf{TPY} = \mathbf{Count} * \mathbf{Hours} * \mathbf{EF} * \left(\frac{VOC\ \%}{100}\right) * \frac{100 - \%Reduction}{100} / 2000 lbs$$

Contact Information

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Point Source Emissions Inventory Web site:
http://www.tceq.texas.gov/airquality/point-source-ei/psei.html

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Combustion Sources: Reporting Challenges

Monique De Vries
Emissions Inventory Specialist
Air Quality Division

Presented to the 2016 Emissions Inventory Workshop
January 27, 2016

Overview

- Combustion reporting challenges
  - Continuous emissions monitoring systems (CEMS)
  - Stack tests
  - Portable analyzers
  - Vendor factors
  - AP-42 factors
- Particulate matter (PM) challenges
- Volatile organic compounds (VOC) speciation challenges
- Flares and thermal oxidizers

Combustion Reporting Challenges

- Was the annual aggregate heat input in million British thermal units per year (MMBtu/yr) provided in the emissions inventory (EI)?
- Was the nitrogen oxides (NO_X) emissions factor and methodology provided in the EI?
  - Process rate-based emissions factor
  - Other emissions factors are optional to provide in the EI, include in the supporting documentation
- Are abatement devices to control combustion-related emissions represented in the EI?

Combustion Reporting Challenges (cont.)

- Are the emissions determined using best available methodology?
- Combustion sources methodologies in order of preference (method code in quotes):
  - CEMS: "D"
  - Predictive emissions monitoring system: "F"
  - Stack test data (measured): "M"
  - Material Balance (Sulfur dioxide [SO_2] only): "B"
  - Portable analyzer data: "Q"
  - Vendor-supplied data: "V"
  - AP-42 factors or Texas Commission on Environmental Quality (TCEQ) factors: "A"
  - Scientifically calculated: "S"
  - Estimated: "E"

Combustion Reporting Challenges (cont.)

Avoid a space-time continuum debate

- Data from a current year must not be used to revise emissions for any previous year's EI
- Methodologies are applicable
  - Forward in time
  - Not back in time

Combustion Reporting Challenges (cont.)

Were products of combustion reported?

- NO_X
- Carbon monoxide (CO)
- SO_2
- PM unclassified diameter
- Particulate matter less than 10 microns in diameter (PM_{10})
- Particulate matter less than 2.5 microns in diameter ($PM_{2.5}$)
- VOC
- Hazardous air pollutants
  - Reporting threshold ≥0.1 tons per year (tpy)
  - Example: Formaldehyde from engines
- Note: water and carbon dioxide are **not** required to be reported in the EI.

Combustion Emissions Determination Method Challenges: CEMS

- Must be operated according to United States Environmental Protection Agency (EPA) or TCEQ standards
- Representative set of summary sheets from relative accuracy test audits
- Account for emissions during CEMS downtime
- CEMS versus continuous monitoring system (CMS)
  - CEMS (method code "D"): generates real-time emissions data 24 hours (hr) a day.
  - CMS (method code "B"): measures the gas composition of a process stream and does not quantify emissions released to the atmosphere.

Combustion Emissions Determination Method Challenges: Stack Test

- Provide stack test summary pages from the stack testing company.
  - Review staff may request the full stack test report on a case-by-case basis.
  - Ensure summary pages clearly identify the Facility Identification Number (FIN) or Emissions Point Number (EPN).
- Ensure that the correct units are used when calculating emissions.
- Use process-based emissions factor (pound [lb]/MMBtu and not lb/hr).

Combustion Emissions Determination Method Challenges: Stack Test (cont.)

- Averaging stack tests performed in the same calendar year is allowed.
- Typically you do NOT average stack tests from multiple years.
- If an identical unit's stack test was used, then code as "E" in the EI.

  This method is preferred if no CEMS, PEMS, or stack test exist.
- For hazardous air pollutants stack tested from electric generating units, please call the Emissions Assessment Section (EAS) for guidance.

Combustion Emissions Determination Method Challenges: Portable Analyzer

- The EAS considers properly calibrated and operated portable analyzer data to be a better methodology than vendor data or AP-42 factors.
- Ensure portable analyzer data reflects actual routine operations and are not used retroactively.
- Provide quarterly reports and identify combustion source by FIN and EPN.
- If combustion source is tested quarterly, apply quarterly results to determine emissions for each quarter.
- Averaging may or may not be appropriate, depending on the source operation.

Combustion Emissions Determination Method Challenges: Vendor and AP-42

- Provide vendor sheets as supporting documentation
- No major modification to the equipment that would invalidate the vendor factors or significant changes in fuel characteristics
- AP-42 reflects the most recent update

Section	Combustion	Fuel type	Last Updated
1.4	External	Natural gas-fired	July 1998
3.1	Internal	Gas turbines	April 2000
3.2	Internal	Natural gas-fired engines	August 2000
3.3	Internal	Gasoline or diesel engines	October 1996 CO note March 2009

PM: Official Definition

30 Texas Administrative Code Section 101.1 (76) defines PM emissions as: "All finely-divided solid or liquid material, other than uncombined water, emitted to the ambient air as measured by United States Environmental Protection Agency Reference Method 5, as specified at 40 Code of Federal Regulations (CFR) Part 60, Appendix A, modified to include particulate caught by an impinger train; by an equivalent or alternative method, as specified at 40 CFR Part 51; or by a test method specified in an approved state implementation plan."

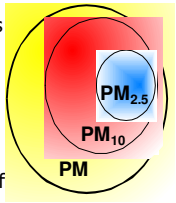
PM: Official Definition Since 1989

PM: Filterable + Condensable

- What does the definition mean for EI reporting?
  - Both the filterable (front-half) and condensable (back-half) emissions must be summed and reported as PM, PM_{10}, and $PM_{2.5}$ emissions.
  - If condensable emissions were not tested, then an alternative method must be used to determine condensable PM emissions.
- Specific PM, PM_{10}, and $PM_{2.5}$ reporting guidance in *2015 Emissions Inventory Guidelines:*
  - Chapter 4, "Determining and Reporting Emissions"
  - Technical Supplement 1, "Selected Combustion Sources"

PM, PM_{10}, and $PM_{2.5}$

- PM total is PM filterable (front-half) + PM condensable (back-half)
- PM_{10} is a subset of PM - Most PM is composed of a certain percentage of PM_{10}
- $PM_{2.5}$ is subset of PM and PM_{10}
- PM_{10} and $PM_{2.5}$ are subsets of PM, so representing them as the same does not result in triple counting of the emissions.



Combustion Reporting Challenges: PM and Natural Gas Combustion

For natural gas combustion, all particulate matter is <1 micron in diameter, so $PM_{2.5}$ = PM_{10} = PM-unclassified.

- Natural gas-fired combustion engines
  Sum the filterable and condensable emissions factors using AP-42 Section 3.1, 3.2, or 3.3 emissions factors to determine a total PM factor.
- External combustion sources
  AP-42 Section 1.4 already sums the filterable and condensable factors to provide a total PM factor.
- Using the total PM factor, report the resulting emissions for each contaminant code, $PM_{2.5}$ (39999), PM_{10} (20000), PM-unclassified (10000).

Combustion Reporting Challenges: PM Natural Gas Combustion (cont.)

- Example: Determine PM emissions from a 4-cycle rich burn (4CRB) engine using the following AP-42, Section 3.2 emissions factors:
  - PM (condensable) = 0.00991 lb/MMBtu
  - PM_{10} (filterable) = 0.0095 lb/MMBtu
  - $PM_{2.5}$ (filterable) = 0.0095 lb/MMBtu
- Add PM condensable to PM_{10} filterable or $PM_{2.5}$ filterable to achieve a cumulative factor.
  - 0.00991 + 0.0095 = 0.01941 lb/MMBtu
  - 0.01941 lb/MMBtu will be the emissions factor used to determine PM, PM_{10}, and $PM_{2.5}$ from the 4CRB engine.

Combustion Reporting Challenges: VOC Emissions

- Stack test data or vendor data that provides total hydrocarbons (THC) or Total Organic Compounds (TOC) instead of VOC
  - Determine VOC emissions by multiplying the THC or TOC emissions factor by the following ratio:
    - AP-42 VOC emissions factor/ AP-42 TOC emissions factor
    - Code as "S" for scientifically calculated
  - Do not apply the inlet gas VOC percentage to the THC factor to obtain a VOC factor
- AP-42 combustion emissions factors
  - Must use the VOC emissions factor
  - Do not use the TOC emissions factor unless using in ratio method

Combustion Reporting Challenges: VOC Emissions (cont.)

Example: Stack test measured 10 tons of TOC for a 4CRB engine.

- **Must use the AP-42 ratio method to report VOC.**
- 4CRB AP-42, Section 3.2 VOC factor ÷ 4CRB AP-42, Section 3.2 TOC factor = ratio
  - 0.12 ÷1.64 = 0.0732
- AP-42 ratio * stack test TOC = VOC
  - 0.0732 × 10 tpy of TOC = 0.732 tpy of VOC
- Code as "S" for scientifically calculated in the EI
- Use contaminant code for VOC-u, 50001

Combustion Reporting Challenges: VOC Speciation

Stack test or vendor data exists for VOC but not for VOC species.

- Use AP-42 "trace organic compounds" emissions factors rated "C" or better (i.e., "A", "B", or "C").
- Divide each trace organic factor by AP-42's VOC emissions factor to obtain the contaminant's speciation ratio.
- Multiply the source's VOC-total emissions by each ratio to obtain that compounds emissions rate.
- Code the speciated contaminant as "S" for scientifically calculated.
- Code VOC-u as either "M" for stack test or "V" for vendor.

Combustion Reporting Challenges: VOC Speciation (cont.)

Example: 4-cycle lean burn (4CLB) engine with vendor data VOC results of 11.2 tpy

- No vendor or stack test results for speciated contaminants, so AP-42, Section 3.2 emissions factors must be used
- Formaldehyde is rated "A" for 4CLB
- Determine the AP-42 formaldehyde ratio:

$$0.0528\,\frac{lb}{MMBtu} \div 0.118\,\frac{lb}{MMBtu} = 0.44746$$

- Multiply the ratio by the total VOC vendor data results

$$11.2 \text{ tpy of VOC } \times 0.44746 = 5.0115 \text{ tpy of formaldehyde}$$

(coded as "S")

Watch Out

Does the vendor data **exclude** or **include** formaldehyde?

Combustion Reporting Challenges: NO_X Emissions

Example: Must use the EPA defined NO_X molecular weight of 46.01 lb/lb-mole when converting from parts per million to report the mass emissions rate.

$$\frac{73\ ppm \times 46.01\ \frac{lb}{lb-mole} \times 155{,}000\ \frac{*scf}{hr}}{385.5\ \frac{scf}{lb-mole} \times 10^6} = 1.35\ \frac{lb}{hr}$$

$$\frac{1.35\ \frac{lb}{hr}\ x\ 8760\ operating\ hour}{2000\ \frac{lb}{ton}} = 5.9\ \text{tpy NO}_\text{X}$$

*scf=standard cubic feet

Combustion Reporting Challenges: NO_X Emissions (cont.)

Watch your units

These are not $\frac{lb}{lb-mole}$

Combustion Reporting Challenges: SO_2 Emissions

- If higher order methods such as CEMS or stack testing are not available, emissions can be determined using material balance from the sulfur content of the fuel.
- Use material balance and destruction removal efficiency (DRE) of the flare to determine emissions.
- Code as "B" for material balance.
- If the unit burns only pipeline quality sweet natural gas, AP-42 or vendor factors can be used.

Combustion Reporting Challenges: SO_2 Emissions (cont.)

- **Example:** How much SO_2 is generated from hydrogen sulfide (H_2S) if 100 pounds lb/hr of flared gas composed of 20% percent H_2S is burned in an unassisted flare with a 98% DRE?

$$20\ \frac{lb\ H_2S}{hour} x\ \frac{lb-mole}{34\ lb\ H_2S} x\ 64\ \frac{lb\ SO_2}{lb-mole} x\ (0.98) = 36.9 \frac{lb\ SO_2}{hr}$$

- H_2S emitted:

$$20\ \frac{lb\ H_2S}{hour} x\ (0.02\ ) = 0.4\ \ \frac{lb\ H_2S}{hr}$$

Flare Reporting Challenges: NO_X and CO Emissions

- Must know the net heating value of the flared gas
- NO_X and CO flare emissions factors found in Technical Supplement 4 of the *2015 Emissions Inventory Guidelines*
  - Choose factor based on the assist type and the waste gas stream net heating value.
  - Code as "A" for TCEQ emissions factors.
- Since the TCEQ flare factors are based on flare type, they are preferred to AP-42 Chapter 13.5 flare factors.

Review

- Remember to update the EI every year
- Use best available methodology for the source and contaminant
- Don't retroactively use determination methodologies
- Reference for specific methodology, contaminant, and flare challenges
  - Chapter 4, "Determining and Reporting Emissions"
  - Technical Supplement 1, "Selected Combustion Sources"
  - Technical Supplement 4, "Flares"

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http://www.tceq.texas.gov/goto/ieas

Questions

Thank you for your attention.

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Flare Operation

Russ Nettles
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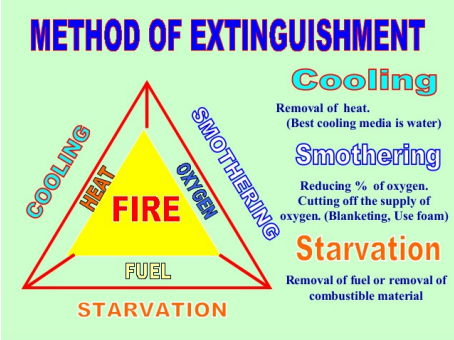
Presented to the 2016 Emissions Inventory Workshop
January 27, 2016

Overview

- Federal flare requirements
- Upstream oil and gas flares
- Air-assisted flares
- Steam-assisted flares
- Texas Commission on Environmental Quality (TCEQ) Supplemental Flare Operations Training

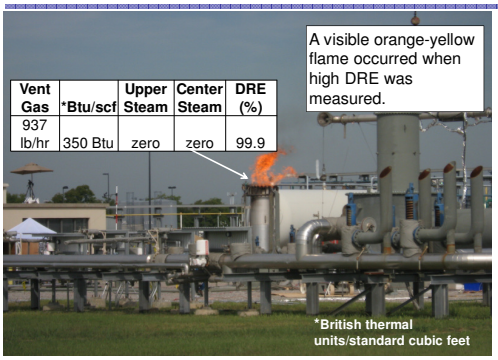
Air-Fuel Ratio



Flare Requirements

- Flare requirements in 40 Code of Federal Regulations Section 60.18 (§60.18) are:
  - a pilot that is always lit;
  - waste gas must meet certain criteria, and
  - no visible emissions (e.g. smoke) for more than five minutes during a two-hour period.
- If the §60.18 requirements are met, the flare is **assumed** to be operating at 98% destruction removal efficiency (DRE) or higher.
- There are no operational requirements; such assist limits or maintenance.
- **If over-assisted, a flare can be operated within §60.18 requirements and have a DRE much lower than 98%.**

Unassisted Flare Example



Vent Gas	*Btu/scf	Upper Steam	Center Steam	DRE (%)
937 lb/hr	350 Btu	zero	zero	99.9

Upstream Oil and Gas Flares Flyover Video

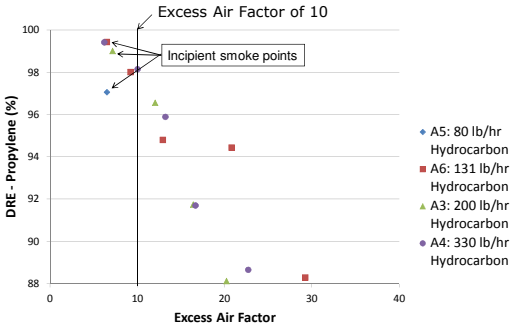
- Unassisted flares with electronic ignition or unlit pilots
  - Infra Red (IR) video shows no heat source at the flare tip
    - Electronic ignition can be problematic
    - Pilots relying on untreated field gas can become clogged as "wet" gas condenses
  - Suggest routine maintenance and the TCEQ flare training for all field staff
- Over-air-assisted flares with lit pilots
  - IR video shows a source of heat from the pilot, but no combustion of the vent gas

    Likely a single speed fan
  - Suggest review flare design or consider a variable air-assisted fan; the TCEQ flare training and use of specialized IR camera to ensure high DRE

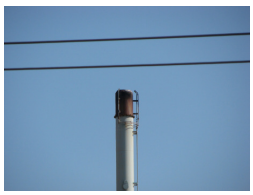
Air-Assisted Flares

- Over-air-assist will result in a low DRE
- Many older dual-service flares equipped with a single speed or dual-speed fan may have a challenge to maintain high DRE at routine conditions.
  - Suggest consulting with flare combustion experts to determine if the flare combustion zone can support high DRE combustion during routine operations with existing equipment.
  - Suggest using a specialized IR camera to identify unburned hydrocarbons
  - Suggest all staff responsible for flaring operations take the TCEQ flare training

DRE Versus Excess Air



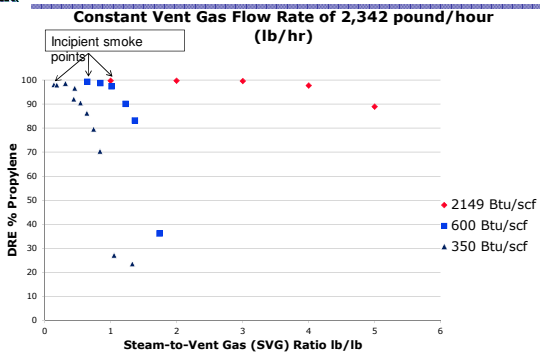
Air-Assisted Flare



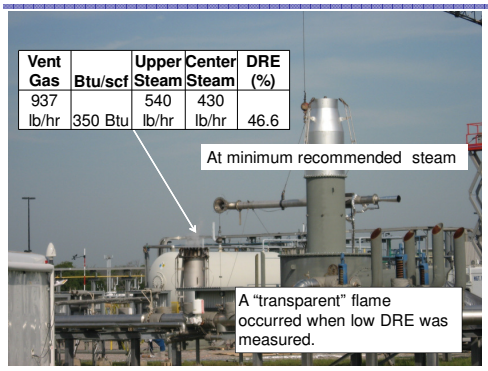
Over-air-assisted flare discovered by the TCEQ Region 12 air investigators. The DRE of the flare appears to be near zero percent.

A flame appeared after the air-assist was decreased. A flame should always be present if any vent gas is being sent to the flare.

Steam-Assisted Flare DRE



Test Point S3.1

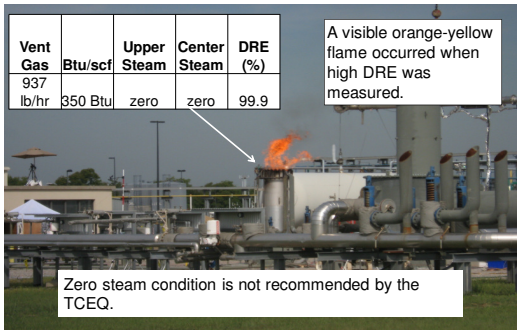


Vent Gas	Btu/scf	Upper Steam	Center Steam	DRE (%)
937 lb/hr	350 Btu	540 lb/hr	430 lb/hr	46.6

At minimum recommended steam

A "transparent" flame occurred when low DRE was measured.

Test Point S3.6



Vent Gas	Btu/scf	Upper Steam	Center Steam	DRE (%)
937 lb/hr	350 Btu	zero	zero	99.9

A visible orange-yellow flame occurred when high DRE was measured.

Zero steam condition is not recommended by the TCEQ.

2010 TCEQ Flare Study

Key Conclusions

A flare can be operated according to §60.18 criteria and not achieve 98% DRE. Flares were easily over-assisted.

Flare DRE **99.2%** at a SVG ratio of 0.29.

As the SVG almost doubles to 0.54, the flare DRE decreases to **90.6%**. Note the flame is disappearing.

As the SVG almost doubles again to 1.05, the flare DRE drops to **27%**. Note the flame has disappeared.

TCEQ Supplemental Flare Operations Training (SFOT)

- The TCEQ and University of Texas at Austin developed a three-hour internet-based flare training.
- The free training is practical and was developed for plant operators responsible for flaring operations, but contains good information for all employees at a site.
- Around 1,200 people have registered for the training to date.
  - 25 states
  - 13 countries

TCEQ SFOT cont.

- A couple of key concepts covered in the training include:
  - visual and audible clues to determine if the flare is being operated at a high DRE; and
  - the theory of using air or steam assist to prevent smoke.
- The training material is available for sites that would like to build an in-house flare training program.
- Available at: https://sfot.ceer.utexas.edu/

Contact Information

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- TCEQ 2010 Flare Study available:
  - The TCEQ's Flare Task Force Stakeholder Group Web page http://www.tceq.texas.gov/airquality/stationary-rules/flare_stakeholder.html
  - Sign up for e-mail updates through the TCEQ's GovDelivery listserver.
    Select "*SIP Hot Topics*" under the "*Air Quality*" heading to receive Flare Task Force updates.

Questions

Thank you for your attention.