New Source Performance Standards (NSPS) 40 CFR 60 Subpart OOOO for Storage Tanks (Part 1)

APPLICABILITY AND COMPLIANCE

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General Applicability

Affected Facilities Applicable to NSPS Subpart OOOO				
Affected Facilities	**Production Facility (Well Site)**	**Gathering Facility**	**Onshore Gas Processing Facility**	**Transmission Facility**
Natural Gas Well (hydraulically fractured or refractured)	X			
Centrifugal Compressor (using wet seal)		X	X	
Reciprocating Compressor		X	X	
Natural Gas Driven Pneumatic Controller (continuous bleed)	X	X	X	
Storage Vessels	**X**	**X**	**X**	**X**
Equipment (pump, valve, flange, etc. in VOC/wet service) within a process unit			X	
Sweetening units located at onshore natural gas processing plants			X	

Final Rule Compliance Schedule

NSPS OOOO Affected Facility	Standard	Compliance Date
Hydraulically fractured wildcat and delineation wells	Complete combustion	October 15, 2012
Hydraulically fractured low pressure non-wildcat and non-delineation wells	Complete combustion	October 15, 2012
Other hydraulically fractured wells	Complete combustion	Before 1/1/2015
Other hydraulically fractured wells	REC and complete combustion	After 1/1/2015
Centrifugal compressors with wet seals	95% reduction	October 15, 2012
Reciprocating compressors	Charge rod packing	October 15, 2012
Pneumatic controllers at NG processing plants	Zero bleed rate	October 15, 2012
Pneumatic controllers between wellhead and NG processing plants	6 scfh bleed rate	October 15, 2013
Group 2 and 1 Storage Vessels	*95% reduction*	*April 15, 2014/2015*
Equipment Leaks	LDAR program	October 15, 2012
Sweetening Units	Reduce SO2 as calculated	October 15, 2012

Kentucky Division of Air Quality Meeting

- Tuesday, November 5th, 2013 meeting
- Next meeting: December 3rd, 2013
- State will seek primacy over NSPS 0000
- In order to obtain primacy, Kentucky must file regs. Should be filed in early 2014
- EPA is scheduling a fact-finding meeting in KY in Nov/Dec 2013 with KDAQ
- DAQ is interested in a general air permit for tanks, based on product through-put
- DAQ's general permit and their PTE spreadsheet calculations **MAY** look similar to the TX program (www.tceq.texas.gov/assistance/industry/oilgas_air.html)
- Sampling methodology is to be discussed in the Dec. 3rd meeting

What is a Storage Vessel:

Storage Vessel is a tank containing

- Crude Oil,

- Condensate,

- Intermediate hydrocarbon liquids, or

- Produced Water

What does **VOC** and **PTE** Mean?

- VOC = Volatile organic compound
  - Defined by EPA and are generally organic chemical compounds whose composition makes it possible for them to evaporate under normal atmospheric conditions of temperature and pressure.

- PTE = Potential to emit
  - Maximum or worse-case potential air emissions from a source based on maximum daily throughput (a.k.a. barrels/day or gal/day of production)

Tanks in the Program

- Each single Storage Vessel with a PTE > or = 6 TPY of VOCs and located in the:
  - Oil and natural gas production segment
  - Oil and natural gas gathering segment
  - Natural gas processing segment
  - Natural gas transmission and storage segment

Tanks **Not** In The Program

Storage Vessels do not include:

- **Skid-mounted or permanently attached** to something that is mobile and on-site for < 180 consecutive days. Trucks, railcars, barges, etc.

- **Process vessels**-Typically: Used to complete process. Separating or combining 2 or more products. Examples: Surge control vessels, bottoms receivers or knock out vessel.

- **Pressure vessels**-Designed to operate in excess of 29.7 psi w/o emissions to atmosphere.

Storage Vessel Affected Facility

- **Affected Storage Vessels Threshold**
  - PTE of VOC emissions > than or = **6 TPY**
    - PTE calculated using a generally accepted model or calculation methodology
    - Based on the maximum daily throughput
    - Can rely on enforceable limitations to < 6 TPY VOC
    - PTE based on VOC emissions after any vapor recovery unit (VRU)
- **Group 1 Storage Vessels**
  - Constructed/Modified/Reconstructed after **Aug 23, 2011 and before April 12, 2013**
- **Group 2 Storage Vessels**
  - Constructed/Modified/Reconstructed **after April 12, 2013**

Reconstruction Definition

- The replacement of components of an existing facility… to such an extent that the fixed capital cost of the new components exceeds **50% of the fixed capital cost that would be required to construct a comparable entirely new facility,**

- **Fixed Capitol Costs**-capital needed to provide all the depreciable components…and it is technologically and economically feasible to meet applicable standards.

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PTE Calculations

- PTE for each tank requires evaluation to determine if = or > 6 tons/year

- The total VOC PTE for each tank needs to be evaluated that will **generally include three components**:
  - flash emissions,
  - working losses and
  - breathing losses.

Guidelines for Compliance

- Develop an inventory of storage tanks installed, modified, or reconstructed after August 23, 2011.
- Perform emission calculations for applicable storage tanks
  - Accuracy
  - Parameters/inputs to be collected
  - "Compliance margin" (if any)
  - Evaluate control measures if PTE $> = 6$ TPY
  - Group 1 storage tanks in first annual report
  - Install Group 2 storage tank controls by April 15, 2014 and Group 1 storage tank controls by April 15, 2015

PTE Summary from EPA

- ## Condensate Storage Vessels

Throughput Cutoff (BOPD)	Equivalent Emissions Cutoff (tons/year) [a]	Emission Reduction (tons/year) [b]	
0.5	3.0	2.89	
1	6.1	5.77	
2	12.2	11.55	
5	30.4	28.87	

a. Tables from EPA's Oil and Natural Gas Sector: Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution (EPA-453/R-11-002 dated July 2011) and emissions based on the Texas Environmental Research Consortium revised 4/2/2009.

b. Calculated using 95 percent reduction.

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PTE Summary from EPA

- Crude Oil Storage Vessels

Throughput Cutoff (BOPD)	Equivalent Emissions Cutoff (tons/year) [a]	Emission Reduction (tons/year) [b]	
1	0.3	0.28	
5	1.5	1.4	
20	5.8	5.55	
50	14.6	13.87	

a. Tables from EPA's Oil and Natural Gas Sector: Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution (EPA-453/R-11-002 dated July 2011) and emissions based on the Texas Environmental Research Consortium revised 4/2/2009.

b. Calculated using 95 percent reduction.

- >=20 BOPD generally accepted threshold for 6 tpy VOC.

- Please note that the threshold could be < 20 BOPD.

PTE Calculations - Methods

- ## Some Methods used to determine PTE:
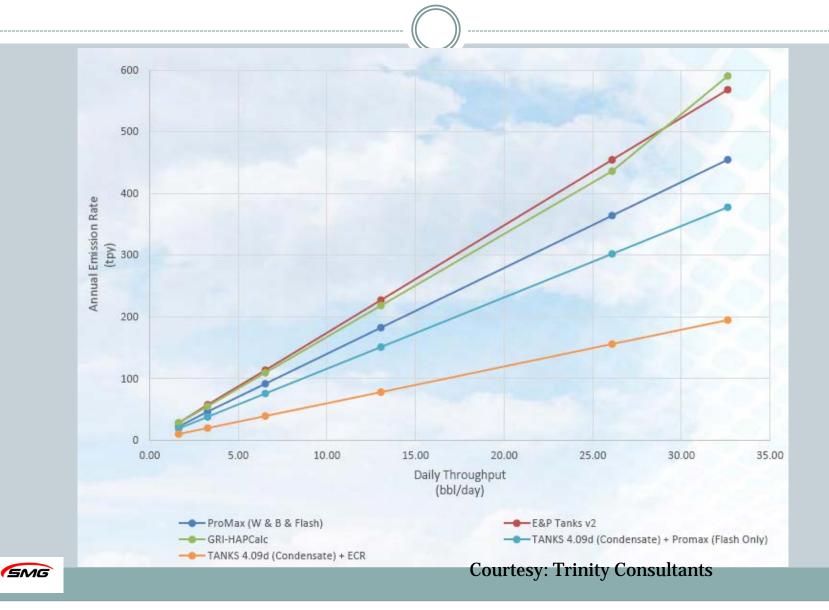
  - Direct Measurement (working, breathing, flash)

  - Process Simulator Software (HYSIM, HYSIS, VMG, WinSIM Designed II and PROMAX) (flash losses only)

  - E&P Tanks Software designed by American Petroleum Institute (API) (working, breathing, flash)

    - Use option that requires sampling
    - Use geographical database option

  - Vasquez-Beggs Equation (VBE) (flash losses only)

  - EPA Tanks Program Version 4.0.9d developed by API (working and breathing losses) from AP-42.

Method Comparison

Courtesy: Trinity Consultants

PTE Calculations - Methods

- To save time and perform an initial estimate of PTE we recommend using the following methods:
  - Vasquez-Beggs Equation (VBE) for **flash losses**
  - EPA Tanks Program Version 4.0.9d for **working and breathing losses**
- Please note that we are still anticipating some guidance from Kentucky DAQ on their approved calculation methods.

PTE Calculations - Methods

- Vasquez-Beggs Equation (VBE) Required Input Data for <u>Flashing </u>Losses:
    - Stock Tank API Gravity (Default 78)
    - **Separator Pressure (psig), if any, or inlet pressure**
    - Separator Temperature (ºF) (Default 60ºF)
    - Separator Gas Gravity at Initial Condition (Default 0.90)
    - **Stock Tank Barrels of Oil per day (BOPD)**
    - Stock Tank Gas Molecular Weight (Default 49)
    - Fraction VOC (C3+) of Stock Tank Gas (Default 0.8)
    - Atmospheric Pressure (psia) (Default 14.7)

PTE Calculations - Methods

- EPA Tanks Program Version 4.0.9d Required Input Data for <u>Working</u> and <u>Breathing</u> Losses (annual):
  - Tank Location (City and State)
  - Type of Tank (vertical/horizontal, fixed roof/floating roof, etc.)
  - Tank Dimensions
    - Shell Height
    - Diameter
    - Liquid Height
    - Average Liquid Height
    - Net Annual Throughput
    - Is tank heated?
  - Paint Characteristics:
    - Shell Color/Shade and Shell Condition
    - Roof Color/Shade and Roof Condition
  - Roof Characteristics (if vertical tank):
    - Type (Cone or Dome)
    - Height
    - Slope (cone roof)
  - Breather Vent Settings
    - Vacuum Settings (psig)
    - Pressure Settings (psig)
  - Tanks Contents (Organic Liquids, Petroleum Distillates, Crude Oil) including speciation and any available information on vapor pressure, liquid molecular weight, vapor molecular weight

Example PTE Calculations – Flashing Losses

- Vasquez-Beggs Equation (VBE) Required Input Data:
    - Stock Tank API Gravity: 29.99ºAPI
    - **Separator Pressure (psig): 285.3 psig**
    - Separator Temperature (ºF): 200ºF)
    - Separator Gas Gravity at Initial Condition: 0.75
    - **Stock Tank Barrels of Oil per day (BOPD): 20 BOPD**
    - Stock Tank Gas Molecular Weight: 50 lb/lb-mole
    - Fraction VOC (C3+) of Stock Tank Gas: 0.9
    - Atmospheric Pressure (psia): Default 14.7 psia
- Results: PTE (Flash Emissions) = <u>**21.9 tpy VOC**</u>

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Example PTE Calculations – Working/Breathing Losses

- **EPA Tanks Program Version 4.0.9d Required Input Data:**
  - Tank Location (City and State): **Louisville, KY**
  - Type of Tank (vertical/horizontal, fixed roof/floating roof, etc.): **Oil and Gas – Vertical Fixed Roof Storage Tank**
  - Tank Dimensions
    - Shell Height: **20 feet**
    - Diameter: **15.00 feet**
    - Liquid Height: **19 feet**
    - Average Liquid Height: **15 feet**
    - Net Annual Throughput: **306,600.00 gal/year (= 20 BOPD)**
    - Is tank heated? **No**
  - Paint Characteristics:
    - Shell Color/Shade: **Gray/Light** and Shell Condition: **Good**
    - Roof Color/Shade: **Gray/Light** and Roof Condition: **Good**
  - Roof Characteristics (if vertical tank):
    - Type (Cone or Dome): **Cone**
    - Height: **3 feet**
    - Slope (cone roof): **0.4 ft/ft**
  - Breather Vent Settings:
    - Vacuum Settings (psig): **-0.03 psig**
    - Pressure Settings (psig): **0.03 psig**
  - Contents: **Crude oil (RVP 5),** multiple component liquid using vapor molecular weight of 50 lbs/lb-mole

- **Results:**
  - Working Losses: 832.91 lbs/year or 0.416 tons/year
  - Breathing Losses: 791.34 lbs/year or 0.395 tons/year
  - Total VOC PTE: **1,624.25 lbs/year or 0.81 tons/year**

Example PTE Calculations

- Flash emissions = 21.9 tpy VOC
- Working/Breathing Loss Emissions = 0.81 tpy VOC
- Total PTE = 22.7 tpy VOC
- Therefore, if this was a condensate/oil tank that was equipped with a three phase separator upstream then the tank is applicable to NSPS Subpart OOOO.
- If this was only an atmospheric storage tank with no pressurized separator or other equipment upstream then you would only consider the Working and Breathing loss emissions and the tank would **not** be applicable to **NSPS Subpart OOOO** since you are < 6 tpy VOC.
- Flash emissions do not occur if temperature and pressure differences are 0.

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Group 1 Storage Vessel
Initial Compliance

- **Determine VOC PTE** by <u>**October 15, 2013**</u>

- **Initial Notification** identifying location of <u>each Group 1 vessel</u> along with <u>Initial report</u> by <u>**January 15, 2014**</u>

- **Comply** (install capture and controls) by <u>**April 15, 2015**</u>

Group 2 Storage Vessel
Initial Compliance

- **Determine VOC PTE** <u>by the later of April 15, 2014 or 30 days after start-up</u>

- **Reduce VOC emissions by 95%** the later of <u>by April 15, 2014 or within 60 days after start up</u>

- **Comply** (install capture and controls) by the <u>later of April 15, 2014 or 60 days after start-up</u>

Group 1 Storage Vessel Continuous Compliance

- Reduce VOC emissions by 95% by April 15, 2015 through the use of control device or floating roof

or

- May remove control device* and maintain uncontrolled VOC to < 4 TPY after demonstrating that uncontrolled VOC emissions have been < 4 TPY for 12 consecutive months

  - Uncontrolled VOC emissions determined on a monthly basis thereafter using average throughput for the month

Group 2 Storage Vessel Continuous Compliance

- May remove control device* and maintain uncontrolled VOC to < 4 TPY after demonstrating that uncontrolled VOC emissions have been < 4 TPY for 12 consecutive months
  - Uncontrolled VOC emissions determined on a monthly basis thereafter using average throughput for the month

Continuous Compliance (Group 1 & 2)

- ***Control device must be reinstalled if :**
  - Well feeding the storage vessel undergoes fracturing or re-fracturing:
    - Reduce VOC emissions by 95% as soon as liquids from the well are routed to the storage vessel
  - If VOC emissions increase to > 4 TPY without fracturing or re-fracturing
    - Reduce VOC emissions by 95% within 30 days of the determination

Continuous Compliance (Group 1 & 2)

- **If storage vessels have controls, they must**
  - Reduce emissions by 95%
  - Be covered, and have closed vent system
  - Meet prescriptive performance testing requirements
  - Meet prescriptive continuous monitoring requirements