



# Control of VOC Flash Emissions from Oil and Condensate Storage Tanks in East Texas

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# Project Objectives

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- Determine the volatile organic compounds (VOC) emission reductions resulting from the implementation of 30 Texas Administrative Code (TAC) §115.112(d)(5).
- Determine potential VOC emission reductions if the rule is extended to other areas.



# Study Areas

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- Houston-Galveston-Brazoria (HGB) area
  - Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties
- Beaumont-Port Arthur (BPA) area
  - Hardin, Jefferson, and Orange Counties
- Haynesville Shale area
  - Gregg, Harrison, Marion, Nacogdoches, Panola, Rusk, San Augustine, Smith, Shelby, and Upshur Counties
- Other counties of interest
  - Bexar, Travis, and Williamson Counties
    - Low production, no analysis provided for this study



## Summary of §115.112(d)(5)

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- Applies to the HGB area starting January 1, 2009.
- Flash emissions from oil or condensate storage tanks or tank battery must be controlled if they have the potential to emit equal or greater than 25 tons per year (tpy) on a rolling 12-month basis.



# Environ Survey Questionnaire

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- General information
- Type of tank (oil or condensate)
- Tank counts
- Storage capacity for each tank
- Production equipment available
- Annual production or throughput rate
- Tank contents and its true vapor pressure
- Emission control implemented and installation date
- Plan to install control measures



# Survey Recipient Selection

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- Used Railroad Commission of Texas database
- 2009 Production data
- All owners or operators associated with producing the majority of the production (greater than 50%) in the study area



# Region 12 Survey

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- Texas Commission on Environmental Quality (TCEQ) Region 12 sent out a survey about the same time as the Environ survey and both gave 30 days to respond.
- All oil and condensate producers in the HGB area
- Information requested by Region 12 included:
  - general information;
  - total condensate or oil throughput for 2009;
  - estimated uncontrolled VOC emissions in 2009;
  - emission calculation methodology; and
  - VOC control equipment and date first operational.



# HGB Area Survey Data

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- Combined responses from Environ survey and TCEQ Region 12 survey
- 61% response rate from the TCEQ Region 12 survey
- Environ and TCEQ Region 12 data showed good agreement
- TCEQ Region 12 data supplemented Environ data, especially on the VOC controls





# Survey Responses

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Geographic Area	Sent	Received	Response Rate (%)
HGB (Environ)	14	4	29
HGB (TCEQ)	104	63	61
BPA	14	5	36
Haynesville Shale	20	8	40



# Tank Battery Vapor Controls

Geographic Area	Tank Battery Vapor Controls				Type of Control		
	Status Reported	No Control <sup>1</sup>	With Control	% with Control <sup>1</sup>	VRU	Flare	VRU and Flare
HGB - Environ	71	50	21	29.6	7	14	0
HGB - TCEQ	245	157	88	35.9	33	52	3
BPA	40	31	9	22.5	0	5	4
Haynesville Shale	1,584	1,573	11	0.7	3	7	1

VRU: vapor recovery unit

1. Not all tank batteries in the survey are subject to control requirements.



# Tank Batteries with Emissions Over 25 tpy in HGB Area

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<b>Tank Battery Type</b>	<b>No. of Tank Batteries with Reported Emissions<sup>1</sup> Over 25 tpy* or More</b>	<b>No. of Tank Batteries with Calculated Emissions<sup>2</sup> Over 25 tpy or More</b>
Oil	8	28
Condensate	26	122
Total	34	150

\* tpy: tons per year

1. Data Source: TCEQ Region 12 Survey
2. Calculation using default emission factors from the rule. Rather than using this assumed default value, the rule allows company to use specific test data for reporting purposes.



# HGB Area Control Effectiveness

<b>Tank Type</b>	<b>No. of Tank Batteries in Survey<sup>1</sup></b>	<b>Total No. of Tank Batteries Controlled</b>	<b>No. of Tank Batteries Controlled as a Result of Rule<sup>2</sup></b>
Oil	65	16 <sup>3</sup>	16
Condensate	180	77	37
Total	245	93	53

1. The total number of tank batteries included in the survey but not all these tank batteries are over 25 tpy and subject to the control requirement.
2. Control device installed between 1/1/2007 through 7/31/2010.
3. Five tank batteries did not response to the TCEQ survey.



# Flash Emission Reduction

Study Area	VOC Emissions (tpy) <sup>1</sup>					
	Condensate			Oil		
	Un-controlled	Controlled	VOC Emission Reduction (%)	Un-controlled	Controlled	VOC Emission Reduction (%)
HGB	57,581	48,332	16.1	7,145	5,711	20.1
BPA <sup>2</sup>	90,541	57,946	36.0	2,054	1,371	33.2
Haynesville Shale <sup>2</sup>	90,175	82,230	8.8	5,379	5,379	0.0*

- \* No control device installed for the oil tank batteries in the Haynesville Shale area.
- 1. Assumed 90% control efficiency for control device.
- 2. No emission control required currently and applied 80% rule penetration factor for the BPA and Haynesville Shale areas.



# VOC Emissions with Statistical Certainty

Study Area	VOC Emissions from Condensate (tpy)			VOC Emissions from Oil (tpy)		
	Calculated w/Rule	Upper Bound	Lower Bound	Calculated w/Rule	Upper Bound	Lower Bound
HGB <sup>1</sup>	48,332	54,499	45,165	5,711	6,643	4,708
BPA <sup>2</sup>	57,946	90,541	9,054	1,371	1,971	771
Haynesville Shale <sup>3</sup>	82,230	90,175	70,427	5,379	NA	NA

1. High to moderate certainty (condensate and oil, respectively)
  2. Highly uncertain – tank batteries sample size
  3. Moderate certainty
- NA. Small sample size and lack of tank batteries eligible for control



# Conclusions

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- The number of tank batteries with VOC emissions of 25 tpy or more vary significantly depending on using the actual testing data or default emission factors in the rule.
  - Actual emission factors vary significantly depending on the well location.
  - Using measured data for a specific area versus the rule assumed emission factor can greatly impact whether a tank battery is subject to the control requirement.
  - Production rates also affect whether a tank battery could exceed the 25 tpy threshold.



# Conclusions

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- In the HGB area:
  - 36% of tank batteries have installed control devices.
  - 22% of tank batteries installed control devices as a result of §115.112(d)(5).
  - 14% of tank batteries in the HGB area installed control devices voluntarily before January 2007.
  - Not all of the tank batteries were required to install control device.
  - 59% of the control devices identified in the study areas are flares.
  
- Other areas:
  - 23% and 0.7% of tank batteries have installed control devices in the BPA and Haynesville Shale areas, respectively.





# Conclusions

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- Based on 2009 emissions, an estimated 10,683 tpy of VOC emissions were reduced from oil and condensate tank batteries in the HGB area.
- Based on 2009 emissions, an estimated 32,595 tpy of VOC emissions might be reduced from oil and condensate tank batteries in the BPA area by implementing §115.112(d)(5).
- Based on 2009 emissions, an estimated 7,945 tpy of VOC emissions might be reduced from oil and condensate tank batteries in the Haynesville Shale area by implementing §115.112(d)(5).



# Questions

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