

May 11, 2006

Contact – Bennett M. Yalartai

**Workgroup Recommendations and Other Potential Control Measures**  
**Volatile Organic Compounds Workgroup**

**VOC004 – Floating Roof Storage of Petroleum Products**

<p><b>Control Measure Summary</b></p> <ol style="list-style-type: none"> <li>External floating roof tanks (XFRT) legs to be equipped with slotted guide poles, or leg socks</li> <li>95% control eff. for floating roof tank degassing (FRTDG) emissions</li> <li>95% control eff. for floating tank cleaning (FRTC) emissions</li> </ol>	<p align="center"><b>Emissions (tons/year) in New Jersey</b></p>	
<p><b>2002 existing measures in New Jersey: 2002 Total Uncontrolled VOC emissions (335.2 tpy):</b></p> <p>Currently, there are no control measures for VOC emissions from the following storage operations: external floating roof legs or sleeves, floating roof tank degassing and tank cleaning operations in New Jersey.</p>	<p align="center"><b>VOC</b>                  Uncontrolled:                  2002 XFRT                  2002 FRTDG                  2000 FRTC</p>	<p>320 tpy (0.87 tpd/tank)/ 200 tanks                  8.50 tpy/18 tanks  <u>6.70 tpy/tank</u>                  335.2 tpy</p>
<p><b>Candidate measure 1: Install Slotted Guide Poles or Leg Socks</b></p> <p><i>Measure ID: SS-07 - Slotted Guide Poles Sleeves or Leg Socks<sup>1</sup></i></p> <p>This measure is part of the Bay Area Air Quality Management District (BAAQMD) requirement under Regulation 8, Rule 5 for external floating roof tanks (XFRTs) for petroleum refinery products, which was implemented in 2000 as a control measure for their one-hour ozone attainment SIP. Slotted guide poles sleeves, or leg socks, are designed to significantly reduce emissions from holes or gaps around slotted guide poles legs. Retrofit kits are readily available, and easy to install with no downtime for the tank.</p> <p><i>Emission Reductions: 0.87 tpd or 320 tpy</i></p> <p>Based on BAAQMD 200 product-specific XFRTs. Average emissions from organic storage tanks in the Bay Area were estimated to be 12.6 tons per day (4,599 tpy) in 1999. Emission reductions will probably be greater than 320 tpy for New Jersey, as our storage tanks are not product-specific. For example, NJEMS database lists 260 XFRTs storing refinery products with vapor pressure &lt; 11.0 psia.</p>	<p align="center"><b>VOC</b>                  2002 Base:                  2009                  Reduction:                  2009                  Remaining:</p>	<p align="center">4,599 tpy<sup>2</sup>  <del>-2,560 tpy<sup>3</sup></del>                  2,039 tpy</p>

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<p><i>Estimated cost of control:</i> \$400,000 total one-time cost to industry<sup>4</sup></p> <p><i>Cost effectiveness:</i> \$1250/ton of VOC emission reduced</p> <p><i>Timing of Implementation:</i> 2009?</p> <p><i>Implementation Area:</i> Entire State of New Jersey</p>		
<p><b>Candidate measure 2: Control for Tank Degassing<sup>5</sup></b> <i>Measure ID:</i> Vent headspace vapors to a control device (min. 95% control efficiency)</p> <p>Adopt similar performance standards as the May 19, 2005 proposed amendments of the San Joaquin Valley Air Pollution Control District Rule 4623 proposed changes for VOC storage tanks. The proposal is to install control device (w/min 95% eff) for floating roof-degassing emissions from refinery and petroleum by-products storage tanks. Floating roof degassing is when the roof is lowered to the tank bottom to evacuate all vapors. The Valley did not control degassed emissions until recently, when a study for Rule 4623 Amendments was conducted and found that it was economically feasible to control tank degassing emissions with min 95% efficiency for VOC.</p> <p><i>Emission Reductions:</i> 8.1 tpy of VOC per 18 tanks.</p> <p><i>Estimated cost of control:</i> The study found that almost half a ton of VOC per tank could be controlled for an average tank size of 2.765 million gals or 62,832 bbl. Actually: 944 lbs VOC/tank = (average volume of 62,832 bbl) * (EF of 0.015 lbs VOC/bbl). The annualized Baseline Emissions (with 18 tanks degassed annually) = 8.5 tpy.</p> <p><i>Cost effectiveness:</i> From \$2,288 to \$4,290/ton of VOC emissions reduced per tank.</p> <p><i>Timing of Implementation:</i> 2009?</p>	<p><b>VOC</b></p> <p>2002 Base: Annual Reduction: Remaining:</p>	<p>8.5 tpy <u>-8.1 tpy</u> 0.4 tpy</p>

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<i>Implementation Area:</i> Entire State of New Jersey		
<p><b>Candidate measure 3: Control for VOC storage tank cleaning emissions</b> <i>Measure ID:</i> Vent cleaning vapors to a control device (min. 95% control efficiency)</p> <p><i>Emission Reductions:</i> Uncontrolled total emissions from a single tank cleaning yield about 13,424 lbs (6.712 tons) VOC. The annual reduction will be 6.7 tpy * 95% = 6.4 tpy per tank. Since routine annual emissions from breathing and working losses are about 2,044 lbs (1.022 tpy VOC), then the total emissions from a single cleaning event yields more than 6 years of routine emissions.</p> <p><i>Control Cost:</i> Cost analysis will be conducted for determination of NJ feasibility upon receipt of vendor cost data.</p> <p><i>Timing of Implementation:</i> 2009?</p> <p><i>Implementation Area:</i> Entire State of New Jersey</p>	<b>VOC</b> 2002 Base: Annual Reduction: Remaining:	6.7 tpy <sup>6</sup> - 6.4 tpy 0.3 tpy
<p><b>Policy Recommendation of State/Workgroup Lead:</b> Implementation of these three recommended measures will yield a minimum 95% reduction of VOC by 2009.</p> <p><b>Brief Rationale for Recommended Strategy:</b> First, requiring leg socks on the floating roof legs will significantly reduce associated fugitive emissions. And second, there are no regulatory requirements for reporting emissions from storage tank degassing and cleaning operations under Sub 16, which regulates VOC emissions. Implementing these recommended changes as revisions of Sub 16 will help achieve the ozone attainment goal.</p>		

**References**

1. See BAAQMD staff report and draft rule for additional basis and background at: [http://www.baaqmd.gov/pln/ruledev/8-5/1999/0805\\_board\\_memo\\_111599.thm](http://www.baaqmd.gov/pln/ruledev/8-5/1999/0805_board_memo_111599.thm).

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2. Based on 1999 BAAQMD estimates.
3. Based on EGAS growth factor of 1 for related NJ areas. It is important to note that EGAS lists factors of 1.0 for petroleum storage in floating roof tanks in the areas of NY-LI-NJ and Phil-Wilmington-Trenton. It implies zero growth for the sector in these areas. So if we were to adopt CA reduction of 8.1 tpy VOC starting from 2002 to 2009, then, the total reduction would be about 65 tpy.
4. Based on 1999-dollar figures.
5. See the SJVAPCD Final Draft Staff Report for Proposed Amendments for Rule 4623 for more details at: [http://www.valleyair.org/Air\\_Quality\\_Plans/AQ\\_plans\\_Ozone\\_Final.htm](http://www.valleyair.org/Air_Quality_Plans/AQ_plans_Ozone_Final.htm). Also at: [http://www.valleyair.org/Workshops/public\\_workshops\\_past.htm](http://www.valleyair.org/Workshops/public_workshops_past.htm).
6. Estimated emission reductions are based model presentation, “Air Emissions from the Cleaning of Storage Tanks”, by Rob Ferry of TGB Partnership, Hillsborough, NC, held on April 7, 2005 at the Safe Tank Workshop in Richmond, CA. Bob can be reached at: Rob.Ferry@TGBpartnership.com.

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