Storage Tanks

Jamie Godbold
PPM Consultants, Inc.
Overview

- Tank Types
- Emission Mechanisms
  - Normal Operations
  - Roof Landings
  - Tank Cleanings
- Controls
  - Physical Controls
  - Operational Controls
Tank Types
Fixed Roof Tanks
Fixed Roof Tanks

- Horizontal Fixed Roof Tanks
- Vertical Fixed Roof Tanks
Floating Roof Tanks
Floating Roof Tanks

- External Floating Roof Tanks
- Internal Floating Roof Tanks
- Domed External Floating Roof Tanks
Emissions Mechanisms

- Normal Operations
- Floating Roof Landings
- Tank Cleaning Activities
Normal Operations

- When product is stored inside the tank
- Is not when a tank is landed (floaters only)
- Is not when the tank is clean and empty
Normal Operations

Emissions during normal operations result from:

- Working losses
- Breathing losses:
  - Deck seam losses
  - Rim seal losses
  - Fitting losses
- Can be modeled using the EPA’s TANKS program version 4.09d
Normal Operations – Data Needs

- Type of Tank
- Dimensions, Capacity, Other Physical Attributes of the Tank
- Contents
- Throughput
Normal Operations: Data Needs for VFRT
Normal Operations: Data Needs for IFRT
Tank Landings

- Occur when the liquid level becomes low enough that the floating roof lands on its legs at which point breather vents are activated to equalize pressure
- Calculated using methodologies in API 2567 (Evaporative Losses from Storage Tank Floating Roof Landings, April 2005) and EPA’s AP-42, 7.1 (Organic Liquid Storage Tanks, November 2006)
- Sum of standing idle losses and filling losses
Tank Landings – Data Needs

- Emission calculations are based on tank type and whether a heel is present upon landing.
Tank Landings – Data Needs

- Physical conditions during landings:
  - Height of liquid in tank
  - Volume of vapor space below landed roof
- Contents being removed, contents being introduced
- Number of days standing idle
Tank Cleanings

- Tank Cleanings occur when a tank is landed, degassed (vapor space purge), sludge is removed, and the tank is refilled.
- Emission calculations calculated based on methodologies in API 2568 (Evaporative Loss from Cleaning of Storage Tanks, Nov 2007)
Tank Cleanings

- Also applies to fixed roof tanks
- Emissions vary by tank type and heel type (drain dry, partial heel, or full heel)
- Emissions are affected by the process that a company uses
Tank Cleanings – Data Needs

- Tank type
- Heel type
- Process used (timing of events)
- Height/Volume of vapor space
- Slope of tank bottom
- Ventilation rates
- LEL readings
Controls to Reduce Emissions

- Physical Controls
- Operational Controls
Physical Controls

- Install floating roof (deck) on fixed roof tanks
- Dome external floating roof tanks
- Weld decks
- Socks on legs
- Wipers, floats, and/or sleeves on guide/gauge poles
Physical Controls

- Reduce leg heights or replace legs with cable suspended roofs
- Equip with new or better primary and secondary seals
- Combustion and recovery devices
Physical Controls

Figure 7.1-11. Slotted and unslotted guidepoles.\(^{20}\)
## Physical Controls

### Table 7.1-12. DECK-FITTING LOSS FACTORS, $K_{pf}$, $K_{mb}$, AND m, AND TYPICAL NUMBER OF DECK FITTINGS, $N_p^a$

<table>
<thead>
<tr>
<th>Fitting Type And Construction Details</th>
<th>Loss Factors</th>
<th>$K_{pf}$ (lb-mole/yr)</th>
<th>$K_{mb}$ (lb-mole/(mph)^m-yr)</th>
<th>m (dimensionless)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access hatch (24-inch diameter well)</td>
<td></td>
<td>1.6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Bolted cover, gasketed</td>
<td></td>
<td>36^a</td>
<td>5.9</td>
<td>1.2</td>
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<tr>
<td>Unbolted cover, ungasketed</td>
<td></td>
<td>31</td>
<td>5.2</td>
<td>1.3</td>
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<tr>
<td>Fixed roof support column wall^g</td>
<td>Round pipe, ungasketed sliding cover</td>
<td>31</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Round pipe, gasketed sliding cover</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Round pipe, flexible fabric sleeve seal</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Built-up column, ungasketed sliding cover</td>
<td>31</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Built-up column, gasketed sliding cover</td>
<td>33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unslotted guide-pole and well (8-inch diameter unslotted pole, 21-inch diameter well)</td>
<td>Unslotted guide-pole</td>
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<td>150</td>
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<tr>
<td></td>
<td>Ungasketed sliding cover^b</td>
<td>25</td>
<td>2.2</td>
<td>2.1</td>
</tr>
<tr>
<td></td>
<td>Ungasketed sliding cover w/pole sleeve</td>
<td>25</td>
<td>13</td>
<td>2.2</td>
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<tr>
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<td>Gasketed sliding cover w/pole wiper</td>
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<tr>
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<td>Gasketed sliding cover w/pole sleeve</td>
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<td>12</td>
<td>0.81</td>
</tr>
<tr>
<td>Slotted guide-pole/sample well (8-inch diameter slotted pole, 21-inch diameter well)^a</td>
<td>Ungasketed or gasketed sliding cover</td>
<td>43</td>
<td>270</td>
<td>1.4</td>
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<tr>
<td></td>
<td>Ungasketed or gasketed sliding cover, with float^a</td>
<td>31</td>
<td>36</td>
<td>2.0</td>
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<tr>
<td></td>
<td>Gasketed sliding cover, with pole wiper</td>
<td>41</td>
<td>48</td>
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<td></td>
<td>Gasketed sliding cover, with pole sleeve</td>
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<td>46</td>
<td>1.4</td>
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<td></td>
<td>Gasketed sliding cover, with pole sleeve and pole wiper</td>
<td>8.3</td>
<td>4.4</td>
<td>1.6</td>
</tr>
<tr>
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<td>Gasketed sliding cover, with float and pole wiper^a</td>
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<td>7.9</td>
<td>1.8</td>
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<tr>
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<td>Gasketed sliding cover, with float, pole sleeve, and pole wiper^a</td>
<td>11</td>
<td>9.9</td>
<td>0.89</td>
</tr>
</tbody>
</table>
Operational Controls

- Avoid or reduce the number of landings per year
- Reduce the number of cleanings per year
- Minimize the time that the tank stands idle (time between landing and degassing or landing and refilling)
- Always drain product completely when landing (if drain dry conditions are possible)
Operational Controls

- During tank cleanings, run ventilation fans continuously to avoid vapor build-up and subsequent vapor space purges.
Thanks For Staying Awake!

Questions?