

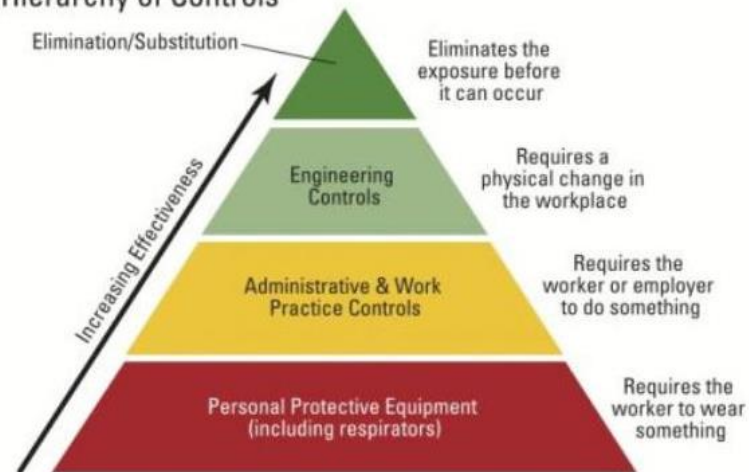


# AXPC – Manual Tank Gauging

Presented by Chad Hyman

- The current and primary method used for tank gauging is remote gauging

OSHA's Steps for Fume-Exposure Reduction:  
"The Hierarchy of Controls"



- Evaluate protective methods for production operators when the operational process requires opening the hatch of the holding tank (tank battery)

- Evaluate potential risk of production operator without engineering/administrative controls
- Evaluate risk reduction of current controls
- Correlate 4 gas monitoring data with potential BTEX and Naphthalene exposures
- Correlate data variations based on well product compositions



- MultiRae (NDIR) - % Methane, %LEL, Oxygen, CO
  - Breathing zone on chest
- ToxiRae (WB) - % LEL
  - Breathing zone on chest
- Photoionization Detector (PID) – 10.6 eV lamp
  - Midsection of individual
  - Used primarily as a reference when collecting BTEX samples
- Flame Ionization Detector - TVA 1000
  - Evaluate the breathing zone of the individual
- Grab Sample at Source (1' above hatch) - VeriAir Flex
  - GC analysis for Total VOC
  - Compare to FID BZ sample
  - BTEX
- Charcoal Tube with Pump – BTEX & Naphthalene
  - 1 LPM for various range (3-8 minutes)

- Appointed locations based on risk evaluation
  - Product composition, natural air movement, equipment setup
  - Three locations identified
- Monitoring conducted over a two day period
  - Two days were used to limit the variability in data collection
    - Limit change in pressure, evaporation, ect.
    - Time and temperature were correlated to limit variability
  - Day 1 - No controls in place
    - During initial venting and purging of the system
  - Day 2 – Controls in place
    - Initial venting, following SOP, and altered SOP
- Same instruments and sampling media were used for each sampling event

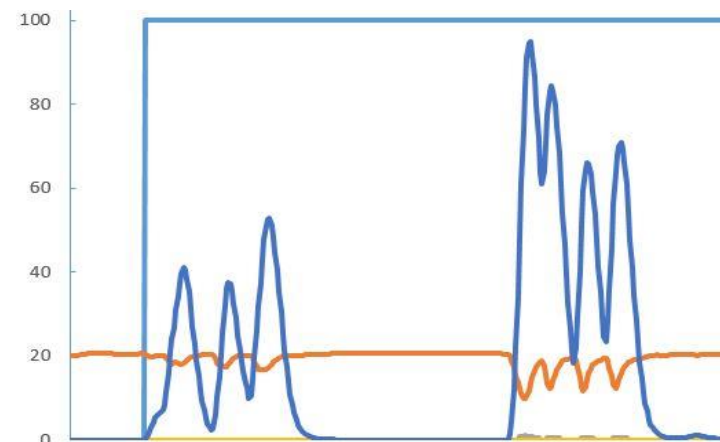
- Atmospheric testing during the initial opening of the hatch
  - Source grab sample (VOC, BTEX)
  - FID in BZ
  - PID
  - LEL, Methane, Oxygen
- Atmospheric testing during plunger run/separator dump
  - Equipment setup did not allow this represented sampling at the facility with wet gas collection
    - Source grab sample (VOC, BTEX)
    - FID in BZ
    - PID
    - BTEX, Naphthalene in BZ
    - LEL, Methane, Oxygen

- **Initial**

- Total VOC – 76,000 ppm
- FID – >50,000 ppm
- PID – 124 ppm
- BTEX (BZ) – (not taken)
- LEL – 100 %
- Methane – ~ 5.0 %
- Oxygen – 19.0 %

- **Purging**

- Total VOC – 600,000 ppm
- FID – >50,000 ppm
- PID – 308 ppm
- BTEX (BZ) – >55 ppm
- LEL – 100 %
- Methane – 94.80 %
- Oxygen – 9.80 %



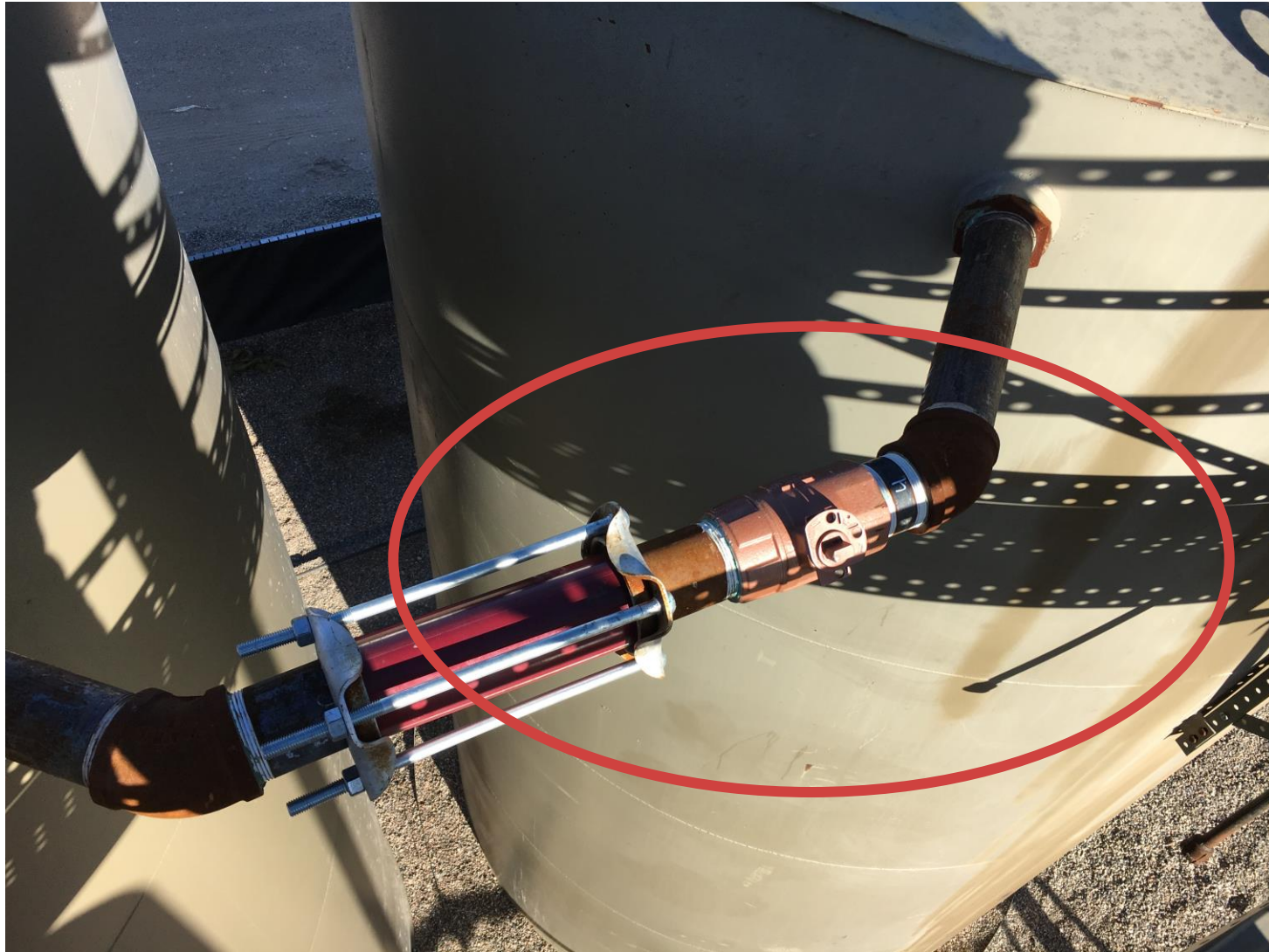
- Data was collected per potential exposure to the employee
  - With the exception of the grab samples and BTEX, sample collection was noted at its peak and during the performed task
    - Source grab sample (VOC, BTEX)
    - FID in BZ
    - PID
    - BTEX, Naphthalene in BZ
    - LEL, Methane, Oxygen
- Alterations to the SOP
  - With the exception of the grab samples and BTEX, sample collection was noted at its peak and during the performed task
  - Alterations were made to the SOP between each sampling event for comparative purposes
    - Source grab sample (VOC, BTEX)
    - FID in BZ
    - PID
    - BTEX, Naphthalene in BZ
    - LEL, Methane, Oxygen



# Evaluation Method – Day 2 – Example of Engineering Controls



# Evaluation Method – Day 2 – Example of Engineering Controls



- **1 Minute Ventilation**

*Opening*

- FID – 300 ppm (Opening)
- LEL – 6.0 % (Opening)

*Gauging*

- Total VOC – 4,000 ppm
- FID – 40 ppm (Gauging)
- LEL – 0.0% (Gauging)
- BTEX - <0.1 ppm

- **2 Minute Ventilation**

*Opening*

- FID – 400 ppm (Opening)
- LEL – 6.0 % (Opening)

*Gauging*

- Total VOC – 0 ppm
- FID – 0.8 ppm (Gauging)
- LEL – 0.0% (Gauging)
- BTEX - <0.1 ppm

- **Purging**

- Total VOC – 600,000 ppm
- FID – >50,000 ppm
- PID – 308 ppm
- BTEX (BZ) – >55 ppm
- LEL – 100 %
- Methane – 94.80 %
- Oxygen – 9.80 %

- **Isolation with 2 Minute Ventilation**

- Total VOC – 0 ppm
- FID – 0.8 ppm
- PID – 54.6 ppm
- BTEX - <0.10 ppm
- LEL – 0.0 %
- Methane – 0.00 %
- Oxygen – ambient

- Correlating the %LEL values with collected BTEX data suggests that a threshold of 10% LEL is adequate in controlling the BTEX levels to below the health standard
  - 4.0 - 6.0 % LEL resulted in a BTEX exposure of less 0.10 ppm in three different cases
- Potential exposure at:
  - Gas Process Unit (GPU)
  - Drip Tanks