Manual Tank Gauging Operations, Hazards, and BLM

Neutral Grounds Meeting
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By
J.D. Danni – Oil and Gas Specialist
OSHA Region VIII
Overview

• Fatalities
• Hazards & Recommendations
• Hazard Alerts
• BLM Meeting
  – New Standard
• API 18.2
• API 77
Media Interest and Articles

• **Wall Street Journal** 4-21-15
  - *Why Did These Oil Workers Die?*
    - Natural causes were blamed, but the focus has shifted to hydrocarbon chemicals.

• **Denver Post** 5-19-15
  - Toxic vapors suspected in deaths of three Colorado oil and gas workers

• **High Country News** 5-22-15
  - Hydrocarbon inhalation added to long list of oil & gas perils
Identification of Fatalities

• In 2013, NIOSH was contacted by occupational health physician regarding two recent oilfield deaths-inhalation of VOCs was suspected

• NIOSH and OSHA reviewed fatalities (2010-2014) of internal O&G fatality database and monitored deaths closely

• NOISH Published 1st Science Blog in May 2014 about 4 fatalities
Fatality Case Definition

- Working in proximity to a known and concentrated source of hydrocarbon gases and vapors
- Hydrogen Sulfide (H$_2$S) was ruled out
- Not confined space
- Not fires/explosions
- Case by Case Review conducted by OSHA/NIOSH
2010-2014 Fatalities (N=9)

- 9 worker deaths where inhalation of petroleum hydrocarbons a likely factor
- All occurred at production tanks.
- North Dakota (3), Colorado (3), Oklahoma (1), Texas (1), and Montana (1).
- 2010 (1), 2012 (1), 2013 (1), 2014 (6)
Fatalities

- 5 fatalities occurred during thieving (collecting a sample) by fluid haulers.
- 4 fatalities occurred while manual tank gauging.
- All employees were working alone or not being observed.
- One employee was wearing 4-gas monitor, reported oxygen deficiency.
- One had sought medical evaluation for dizziness, etc. a few weeks prior.
Manual Tank Gauging (cont.)
Gauging Video
Hazards to Workers

• Asphyxiation – Oxygen deficient atmosphere
• Narcotic Effects Resulting in
  – Disorientation
  – Dizziness
  – Light-headedness
  – Cardiac arrhythmia (irregular heartbeat),
  – Hypoxia (a state of insufficient oxygen supply)
  – Respiratory depression (reduced breathing rate and inadequate ventilation of the lungs)
• Flammability/Explosive
Manual Tank Gauging

• Recommendations
  – Implement alternative tank gauging
    • Remote Gauging
    • Closed Loop System
    • Auto Gauging
    • Sight Glasses/Gauges
    • Remote Venting
  • Where remote gauging is not feasible or as an interim measure, establish administrative controls that reduce the number of times throughout a shift a worker is required to manually gauge tanks.
MonDaks STEP Network

SAFETY BULLETIN

Hydrocarbon Atmospheres may be present when performing the tasks listed below & could contain very high levels of Volatile Organic Compounds (VOC’s) that may include Methane, Propane, Butane, and Benzene amongst other petroleum distillates that can cause fires, Explosions, Low Oxygen Levels and Toxic Exposures.

- Tank Gauging
- Fluid Transfer
- Product Hauling
- Flow Back Operations
- Maintenance Activities
- Any Open Vessel, Tank or Pipeline that contains/has contained product

Acute Symptoms of Exposures:
- Dizziness/Drowsiness
- Eye irritation
- Nausea
- Trouble Breathing
- Irregular Heartbeat
- Headache

Breathing high concentrations may take away your ability to escape!
Explosions can start by static sparks!

Protect Yourself!

- Complete applicable safety training – Hazard Communication, Respiratory Protection, Benzene, Hydrogen Sulfide, PPE, Confined Space Entry, JSA among others that may be required
- Conduct a site risk assessment • Ask supervisor about potential hazards relating to task & how to protect yourself
- Look for windsock • Know wind direction • Stay up-wind from vapors • Stand away from tank opening
- Keep head away from opening • Be aware during foggy times, or days with little wind, vapors may linger
- Utilize Respiratory Protection for applicable tasks based on risk assessment
- Wear required Flame Resistant Clothing (FRC) • Keep FRC clean in accordance with manufacturer's instructions
- Use all required PPE for specific task
- Use appropriate atmospheric monitor • Keep monitor clean • Charge/Calibrate/Bump Test monitor per manufacturer’s instructions • TURN MONITOR ON • Wear monitor in breathing zone • Read monitor frequently
- If monitor alarms IMMEDIATELY move crosswind & upwind to a safe muster location
- Vent tank prior to gauging • Wait until vapors have subsided prior to starting work • Bond equipment and tape to tank
- STOP WORK and address the concern if you see an unsafe act or condition that may cause injury or damage

Hess Corporation Safety Bulletin brought to you in conjunction with
Tank Gauging (cont.)

• Working with the National STEPS Network

TANK HAZARD ALERT

Tank Gauging, thieving, fluid handling: how to recognize and avoid hazards

Opening the hatches of storage tanks can lead to the rapid release of high concentrations of hydrocarbon gases and vapors. These may result in very low oxygen levels and toxic and flammable conditions around and over the hatch. Recent reports have documented fires or explosions, and described workers experiencing dizziness, fainting, headache, nausea, and, in some cases, death while gauging tanks, collecting samples, or transferring fluids. Tank gauging, thieving, and fluid handling can be performed safely with proper precautions.

EMPLOYERS:

Must Conduct Exposure and Hazard Assessments at Worksites to determine needs for:
- Engineering Controls
- Respiratory Protection
- PPE
- Monitoring Device such as:
  - Multi-gas meter
  - Other direct-reading toxic gas meter (benzene)

Must Provide Training to Workers:
- Hazard Communication
- Lone Worker Policy
- Proper use of PPE and respiratory protection
- Types, uses, and limits of respiratory protection equipment as appropriate
- Recognizing ignition sources

Should Implement Engineering Controls such as:
- Remote Gauging
- Closed Loop Systems
- Auto Gauging
- Sight Glasses/Goggles
- Remote Venting

Verify sub-contractors are following work practices/procedures

PPE protect your body

Wear PPE as required/provided

Workers:

Your employer has established safety procedures for your protection including a Hazard Assessment and Work Practice/Procedures

Follow your employer’s Hazard Assessment and Established Work Practices/Procedures
- Use toxic or multi-gas meter provided by your employer as per your training
- Avoid all alarms
- Stop flow into tanks prior to gauging, when possible
- Minimize leaning over open hatches – stand away/upwind/crosswind when possible
- Inversion/high humidity/lack of wind could increase danger

- Follow your employer’s “lone worker” policy
- Allow tanks to ventilate after opening hatch
- Evacuate unsafe work areas and report immediately
- Know the limits of your respiratory protection as provided during employer training
- Immediately report any health symptoms

Attending Hazard Communication Training

Be Aware of Potential Ignition Sources:
- Static
- Cell phones
- Sparks from tools or metal objects
- Open flames
- Non-approved electrical equipment/devices

If you are not sure, STOP the job and ask!

Everyone has the right to STOP work that is unsafe.
OSHA/NIOSH Manual Tank Gauging Hazard Alert

NIOSH-Osha HAZARD ALERT

Health and Safety Risks for Workers Involved in Manual Tank Gauging and Sampling at Oil and Gas Extraction Sites

The National Institute for Occupational Safety and Health (NIOSH) and the Occupational Safety and Health Administration (OSHA) have identified health and safety risks to workers who manually gauge or sample fluids on production and flowback tanks from exposure to hydrocarbon gases and vapors, exposure to oxygen-deficient atmospheres, and the potential for fires and explosions.

Introduction

Workers at oil and gas extraction sites could be exposed to hydrocarbon gases and vapors, oxygen-deficient atmospheres, and fires and explosions when they open tank hatches to manually gauge or collect fluid samples on production, flowback, or other tanks (e.g., drip pots) that contain process fluids. Opening tank hatches, often referred to as “thief hatches,” can result in the release of high concentrations of hydrocarbon gases and vapors. These exposures can have immediate health effects, including loss of consciousness and death.

Recent NIOSH and OSHA research showed that workers could be exposed to hydrocarbon gases and vapors when they work on or near production and flowback tanks. These findings mean workers can face significant health and safety risks when they manually gauge or sample tanks [Esswein et al. 2014; Jordan 2013]. These risks are in addition to the risk of exposure to hydrogen sulfide (H2S), a well-recognized chemical exposure hazard for those who work in the oil and gas extraction and production industry [OSHA].

NIOSH and OSHA also identified nine worker fatalities that occurred while workers manually gauged or sampled production tanks from 2010–2014 (NIOSH 2015). Exposures to hydrocarbon gases and vapors and/or oxygen-deficient atmospheres are believed to be primary or contributory factors to the workers’ deaths [Harrison et al. 2016].

Working on or near oil and gas production tanks is of particular concern because these tanks may contain concentrated hydrocarbon gases and vapors that are under pressure. When the thief hatch is opened, the release of these pressurized gases and vapors can expose workers. Second, the gases and vapors can displace

What’s in this Alert?

This Hazard Alert describes the safety and health hazards when workers manually gauge or sample fluids from production, flowback, or other tanks. It recommends ways to protect workers by eliminating or reducing exposures to hazardous atmospheres, and actions employers should take to ensure that workers are properly aware of the hazards and protected from exposure to hydrocarbon gases and vapors. This alert is a supplement to the OSHA Alliance Tank Gauge Alert released in 2015 (National STEPS Network 2014).
NIOSH & OSHA Recommendations for Manual Tank Gauging and Fluid Sample Collection

1. Implement alternative tank gauging and sampling procedures that enable workers to monitor tank fluid levels and take samples without opening the tank hatch.

2. Retrofit existing tanks with dedicated sampling ports (i.e., tank sampling taps [American Petroleum Institute 2013]) that minimize worker exposures to hydrocarbon gases and vapors, thereby eliminating the need to routinely open thief hatches to sample. These sampling taps should minimize the magnitude of hydrocarbon plumes and should limit the need for workers to access the top of tanks.

3. Install thief hatch pressure indicators to provide an immediate visual indicator of tank pressures and potential hazards. Pressure indicators can show workers the pressure in the tank and allow a trained worker to follow appropriate procedures, such as actuating a blowdown valve, venting gas to a flare, or using appropriate respiratory protection, such as a self-contained breathing apparatus or an air-line respirator.

4. Conduct worker exposure assessments to determine exposure risks to volatile hydrocarbons and other contaminants. Employers may consult an occupational safety and health professional trained and certified in industrial hygiene and who has knowledge and experience with combined flammable gas and vapor exposures to ensure that an appropriate air-sampling strategy is used.

5. Provide hazard communication training in a language that employees understand to ensure that general site workers, tank gaugers and samplers, water haulers, drivers, and others who open tank hatches understand the hazards associated with opening tanks and the precautions necessary to conduct this work safely. These hazards include reduced oxygen environments, flammability hazards and possible ignition sources, and the potential for concentrations of hydrocarbons that can approach or exceed IDLH concentrations. Post hazard signage at access stairs, catwalks, and/or tanks to alert workers about the hazards associated with opening thief hatches and precautions that must be taken.

6. Ensure that workers are trained on—and correctly and consistently use—calibrated multi-gas and oxygen monitors that measure percent LEL and oxygen concentration. Workers should understand the limitations of these monitors as well as appropriate actions to take whenever an alarm occurs or they experience health symptoms (e.g., leave the hazard area, report symptoms to supervisors).

7. Do not permit employees to work alone when tank gauging or working around tanks, thief hatches, or other areas where they may encounter process fluids. Observers should be trained on proper rescue procedures and be stationed outside potentially hazardous areas.

8. As an interim measure, where remote gauging or sampling is not feasible or engineering controls are not implemented, (a) train workers in proper work practices, such as tank-opening procedures, that can minimize risks for exposures, (b) ensure intrinsic safety by proper grounding and prohibiting the use of spark producing devices or equipment, (c) establish administrative controls to reduce the number of times throughout a shift a worker is required to manually gauge tanks, (d) safely reduce tank pressure prior to gauging, and (e) use appropriate respiratory protection, including a supplied air respirator (SAR) and/or self-contained breathing apparatus (SCBA) in areas where IDLH VOC exposures may occur (i.e., during manual tank gauging/sampling). Employers should consult with a trained occupational safety and health professional to determine the appropriate respirator to be used. NIOSH guidance for selecting respirators is at: http://www.cdc.gov/nioshdocs/2005-100/default.html.

9. Wear flame-resistant clothing to protect against burns from fires and explosions. Also, use appropriate impermeable clothing to limit risks for skin exposures to chemicals (e.g., benzene).

10. Establish and practice emergency procedures to provide on-scene, immediate medical response in the event of an incident, such as a collapsed worker, or workers experiencing symptoms of chemical overexposures or exposure to an oxygen-deficient atmosphere.
Manual Tank Gauging

• Employers must
  – Conduct Exposure and Hazard Assessments at worksites
    • Respiratory Protection
    • Personal Protective Equipment (PPE)
    • Monitoring Devices
      – Multi-gas meters or other toxic gas meters
Manual Tank Gauging

• Employers must
  – Train Employees on
    • Hazard Assessment
    • Hazard Communications
    • Standard Operating Procedures for Tank Gauging
    • Proper use of PPE & Respiratory
    • Emergency Response Plan
    • Lone Worker Policy
    • Monitoring Devices
      – Toxic gas or Multi-gas meter for O2, H2S, LEL, CO
    • Potential Ignition Sources
      – Static, Cell phone, Open flame, sparks from tools
      – Ensure proper grounding/bonding
Manual Tank Gauging Hazards Alerts

• MonDak STEPS Network:
  – www.mondakssafety.org

• National STEPS Network:
  – www.nationalstepsnetwork.org/

• NIOSH Website:
  – http://www.cdc.gov/niosh/topics/FOG/

• OSHA/NIOSH Hazard Alert:
BLM’s Involvement in Manual Tank Gauging

- OSHA/NOISH/MonDak/Associations/Enerplus met with BLM on 5/28/15 to discuss
  - BLM’s requirements on Manual Tank Gauging - OnShore Order #4
  - Hazards related to manual tank gauging.
- Requesting Comments to update OnShore Order #4 – Proposed Rule Sept 2015
- Public Hearings in Dec 2015
  - The BLM received at total of 106 unique and detailed comment letters.
- Final Rule Posted Nov 2016
BLM - 43 CFR 3174: Oil Measurement

- Incorporates proven industry standards developed by oil measurement experts from industry;
- Formally authorizes the use of Coriolis Measurement Systems (CMSs);
- Establishes a process to recognize and approve the use of new measurement technology and methods through the Production Measurement Team, without the BLM having to amend its regulations;
- It also incorporates recently published API standard governing tank measurement by Alternative Methods. (e.g. API 18.2)
- BLM’s Website: https://www.blm.gov/wo/st/en.html
Industry and API

• Industry had started to develop an API practice “Alternate Measurement Methods” – API 18.2
  – Started June 2015
  – Final in July 2016

• Industry/API developing a safety RP for Manual Tank Gauging – API 77
  – Started May 2016
  – Projected March 2017
Thank You

Any Questions

J.D. Danni
OSHA Region VIII
Safety and Health Specialist (Oil & Gas)
720-264-6581
danni.jd@dol.gov