EVENT INVESTIGATION REPORT

241-T-201 Primary Tank Video Vapor Event
EIR-2014-008

[Diagram with labels: Approximate Location of Hazardous Waste Storage Container, Herbicide Application Area, Approximate Location of Camera Van, Approximate Location of Supply Van]

[Signatures and dates: 4/14/14, 4/15/14]

PER No. WRPS-PER-2014-0554
241-T-201 Primary Tank Video Vapor Event

Investigation Summary

Tank Farm Projects Field Crew was in the process of performing a primary tank video inspection at single-shell tank 241-T-201 when workers reported smelling vapors and two (2) workers reported symptoms. Personnel were directed to leave the tank farm. Notifications were made and the Central Shift Office entered into TF-AOP-015, Response to Reported Odors or Unexpected Changes to Vapor Conditions, for T farm. Three (3) tank farm personnel were initially taken to the site medical provider (HPMC). Two (2) were subsequently transported to the hospital by ambulance with the third being redirected to HPMC (South). All were returned to work.

The 241-T-201 primary tank video inspection was the thirteenth single-shell tank (SST) video performed this fiscal year. The work package in use was TFC-WO-13-6117, T-201 Video Riser 7 Inspection.

Close proximity work included the loading of a waste box in T farm and herbicide spraying outside of the tank farm by Mission Support Alliance (MSA) resources. A MSA Boilermaker from the waste box crew also reported to HPMC on the day of the event after reporting the smell of vapors and was returned to work without restriction.

An event investigation Fact Finding meeting was held on March 31, 2014.

On April 1, 2014, another support worker from the video crew also reported to HPMC for evaluation and was returned to work.

[See the sketch of the 241-T-201 work area. The waste box was located to the north of the T-201 primary video work area and herbicide was being applied to an area northwest of the work location.]

Event Timeline

March 26, 2014

0745 Pre-job briefing was held for work package TFC-WO-13-6117, T-201 Video Riser 7 Inspection. T Farm was closed (not routinely surveyed) and the Field Work Supervisor (FWS) obtained permission from the Radiological Control and Area Team management to enter the tank farm and perform the video.

0900 Equipment pickup by work crew. The camera used was from 272-S.

0930 The crew entered the T farm. Radiological Control Health Physics Technicians (HPTs) surveyed the crew into the work area. The crew entered from the north gate and south change trailer.

Setup included installing ropes/chains, applying ground cover, and posting the work area. The Riser 7 flange bolts, except for one, were removed before posting the work area. Initial setup did not breach the tank system. There was both Industrial Hygiene
Technician (IHT) and HPT coverage. Flammable gas reading taken at the Enraf was less than detectable and the oxygen reading was 20.9%.

The camera supply van entered T farm.

The IHT monitored the posted work area from the outside with a wand, ahead of the HPT entering the area. One HPT entered the work area after posting to survey for hard to detect (HTD) radionuclides. When the riser was breached a source sample was taken from inside of the riser, the IHT readings were 5 ppb for volatile organic compounds (VOCs) and 0 ppm for ammonia. The weather conditions were calm and cold. The wind direction was reportedly from the south. [The goal for the morning was to setup and obtain HTD samples.] [Hanford Metrological Data: average temperature 53.5 degrees F, peak wind speed 9.8 mph from the southwest blowing northeast.]

Since all of the flange bolts except for one were removed, the riser flange was then swung open and the HPT reached inside the 12 inch riser to obtain HTD samples. The riser was subsequently closed by swinging the flange back over the riser and securing it with a second bolt. The riser was open for approximately 30 minutes.

The area was then exited. No easy to detect contamination (ETD) radionuclides were detected. In addition, no ETD contamination was detected on the IHT’s wand.

The IHT was monitoring the entire time and was very close to the riser opening.

[Also in the tank farm, another work crew was adding waste to a waste box all morning.]

The work crew exited the farm. No odors were detected by any personnel prior to stopping for lunch.

A NCO checked the entire boundary and detected no odors.

The work crew returned to the tank farm work area. The radiological survey results were 140 dpm/100cm² alpha, with no beta was detected in the field. HTD results were 180 dpm/100 cm². A decision was made to take a minimum number of workers into the Airborne Radiation Area (ARA) as a result of the HTD.

Three (3) workers, a Nuclear Chemical Operator (NCO), a HPT, and a Pipefitter, entered the work area wearing powered air purifying respirators (PAPRs) with hoods.

The outside support crew inside of the tank farm consisted of an additional eighteen (18) workers. The majority of the crew was in the farm west of work area near the supply van. Three (3) workers were in the camera van directly west of the work area outside of the tank farm.

The riser was breached. A top hat and camera were installed. The IHT reported general readings of less than detectable. Everyone reported smelling something. Reported smells included: an NCO reporting both paint and glue type smells, a Pipefitter smelled a musty vapor smell – like rotten apples, another NCO reported a metallic smell, and the
Radiological First Line reported a sweet musty smell. A HPT located directly downwind of the work area (west) at the survey table reported not feeling well.

Workers observed the herbicide being applied and a waste box being filled.

An HPT moved to a slightly elevated area southeast of the riser. The wind was blowing toward the work area (west) at approximately 7 mph. The HPT encouraged workers to move upwind, having used a talcum bottle to check wind direction. A NCO noticed the wind sock blowing south. [The wind appeared to shift several times.] The weather was reported to be much warmer than the morning, with a couple of rain sprinkles. [Hanford Metrological Data: average temperature 57.2 degrees F, peak wind speed 14.4 mph from the southwest blowing northeast.]

Symptoms were experienced by two (2) workers within several minutes. A HPT felt nauseous and a NCO experience headache symptoms.

Workers were directed to leave the tank farm. [A discussion was held on how to get people out of the zone with HTD present.]

Since housekeeping work was also occurring in the tank farm, the FWS also told the crew loading the waste box to exit the tank farm.

1320 The attending Radiological Control First Line Supervisor, upon exiting the tank farm, drove his truck toward the weed abatement (herbicide) truck to tell the Mission Support Alliance (MSA) workers to stop spraying. The First Line Supervisor reported smelling similar orders at the herbicide location.

1347 The primary tank video was started from outside of the tank farm.

1350 The Central Shift Office was notified of vapor reports in T farm and that two (2) workers (HPT and NCO) were reporting symptoms while performing video inspection at T-201. FWS reported a truck spraying weeds between T farm and T-Plant. See Attachment A for Shift Logbook entries.

1355 Central Shift Manager contacted MSA to stop spraying. MSA reported to Central Shift Manager that herbicide is non-toxic and forwards a copy of the Material Safety Data Sheet (MSDS).

1358 Central Shift Office entered TF-AOP-015, Response to Reported Odors or Unexpected Changes to Vapor Conditions, for T farm.

1403 Shift Office Event Notification (SOEN) and radio announcement sent for TF-AOP-015 entry for T farm. T farm access restricted. ST Area Day Shift Manager sent to implement SWIMS (stop work, warn others, isolate the area, and minimize exposure).

1410 ST Area Day Shift Manager reported to Central Shift Manager that T farm was evacuated and SWIMS completed.

[Everyone was out before the video was done. The video took 36 minutes to complete.]
FWS reported to the Central Shift Manager that two (2) workers were being taken to the site medical provider (HPMC). All other members of the work crew were offered medical surveillance and declined.

The Radiological First Line escorting the workers to HPMC reported symptoms on the ride over to HPMC in West Area.

The NCO and the Radiological First line were turned away by HPMC in West Area and told to report to HPMC in town on Snyder (HPMC South).

- The NCO returned to T farm to retrieve his government vehicle and then reported to his supervisor. His supervisor transported him to HPMC South.
- The Radiological First Line returned to HPMC in West Area, after dropping off the NCO at T farm.

Primary tank video was completed.

The Radiological First Line reported to the Central Shift Manager that he was experiencing symptoms.

Herbicide MSDS was faxed to HPMC by the ST Area Day Shift Manager.

Radiological Control manager reported to ST Area Day Shift Manager that HTD radionuclide surveys were not performed and no barriers were erected due to TF-AOP-015 entry. Access to T farm restricted until surveys can be performed. Central Shift Manager notified.

The HPT, seen by HPMC in West Area upon arrival, was transported by ambulance to the hospital. Emergency Operations Center (EOC) notified of ambulance transport by the Central Shift Manager.

Radiological First Line was transported to hospital by ambulance. The Tank Farm Projects Radiological Control Manager was reporting to the hospital as the management representative.

The EOC was notified of second ambulance run.

The ST Area Day Shift Manager reported to Central Shift Manager that the MSA Boilermaker from waste box activity was taken to HPMC by his management for evaluation after reporting smelling vapors in T farm.

MSA Boilermaker was released to return to work.

The Central Shift Manager was notified by the Safety Manager that the individuals taken to the hospital have been released and returned to work without restriction.
March 27, 2014

0529 Field Crew Manager reported that the NCO was evaluated at HPMC South and returned to work without restriction.

1331 Exit TF-AOP-015 for T farm. T farm remained restricted access due to HTD surveys not being complete.

1400 Safety Stand Down – AOP-015 Events initiated (T farm event one of four (4) discussed). Briefings commenced for all of Washington River Protection Solutions (WRPS).

March 31, 2014

0800 Fact Finding meeting held. See Attachment B for attendees.

1000 Pictures of the work area taken from outside of the tank farm. Access to the tank farm was still restricted. See Attachment C.

April 1, 2014 (update)

0854 An additional HPT reported to HPMC for evaluation. The HPT was from the support crew inside of T farm. No symptoms were reported. The HPT was returned to work without restriction.

Compensatory Measures

- Entered TF-AOP-015 for T farm.
- Restricted access to T farm.
- Safety Stand Down – AOP-15 Events initiated (T farm event one of four (4) discussed). Briefings commence for all of Washington River Protection Solutions (WRPS).

Preliminary Extent of Condition Review

A review of the close proximity work included discussion with the FWS for the ST Area Team work crew also working in T farm who were disposing of guzzler hoses into the waste box. An overview of the work being performed included setup occurring in the morning (box preparations and staging of the forklift), with work to fill the box in the afternoon. The work crew consisted of a FWS, one (1) Boilermaker, two (2) HPTs, and two (2) NCOs. As discussed in the timeline, the MSA Boilermaker reported to HPMC following his return to his duty station at the completion of work. The FWS reported no vapor smells (the waste box did not smell of paint, nor did the glue adhesive used on the waste box gasket smell), but the FWS did point out that the T Farm Interim Barrier does smell. This could account for the paint smell reported by the video crew.

Other vapor events are also being reviewed separately.

Discussion of Potential Causes

As discussed above, vapors could have been emanating from the open tank riser, the waste box, and/or the vegetation spraying operation occurring outside of the tank farm.
Discussion of Barriers That Could Have Impacted the Cause

The engineering and administrative barriers in place that could have impacted the cause include:

1. Pre-job Briefing. Review of close proximity work may have heightened awareness of hazards outside of the work area.
2. Project Planning/Review/Approval. The project team may have failed to fully recognize the vapor potential from the tank and/or the impact of close proximity work on the work activity.

Recommendations/Proposed Corrective Actions

1. Evaluate better ways to communicate/integrate work to avoid potential impacts from close proximity work.
2. Evaluate the use of upwind setup actions. Determine the predominant wind direction prior to setup of the work area.
3. Evaluate the use of combination cartridges, instead of P100 (particulate) cartridges.
4. Conduct an ALARA review of support personnel.

Lessons Learned

To be addressed, if required, by the causal analysis via a corrective action under WRPS-PER-2014-0554.

Ideas captured at the fact finding meeting included:

- Multiple jobs in a farm should be evaluated for compatibility.
- Stop spraying during planned work. Notices use to be sent out notifying of spraying.
- Work in closed (not routinely surveyed) farms is a bad practice. This condition does not provide an operating personnel contamination monitor (PCM) or bench monitors/instruments.
- Allow sufficient time for gathering supplies and setup. HTD preparations influenced setup. HTD surveys took longer. HTD surveys should have their own work package.
- Some tank farms need wind socks.
- Personnel should get upwind promptly as soon as odors are detected. Olfactory senses can be overloaded.
- Evaluate the report of strong paint odors from waste boxes.
- Do barometric conditions impact or correlate to the smell of vapors?
- Does internal tank temperature contribute to the smell of vapors?
- Evaluate reusable valves for re-performing videos.
- More IHT's required on the job for second readings or taking a real time bag sample at the time of the event.

Attachments

A. Shift Manager’s Logbook Entries
B. Interviewed/Attendance Rosters
C. Photographs of T Farm Work Area
Attachment A
Shift Manager’s Logbook Entries

1300 - [Name] reports that [Name], Fleet Services supervisor, reports that [Name] and [Name] were supposing work at 3:106 on 3/28/14 at the time of the AOP-015 entry. [Name] reported that sometime after executing the form, he developed a metallic taste in his mouth, reported this to his manager today. [Name] and [Name] are being taken to APMC for evaluation. Notified [Name], ORP, and On Call SR. OSA and [Name] complete.

1315 - Environmental notified WDOH of the AOP Form. VR unplanned shutdown that occurred on 3/28/14. SOER complete.

1350 - [Name] reports that 2 members of her work crew are reporting symptoms (headache and nausea) while performing video inspection at T-204. Also reported that there is a track spraying weeds between T-Form and T-Plant.

1355 - Contracted [Name] MSA Biological Control to have weed spraying stopped. [Name] indicated that the herbicide is non-toxic and will forward a copy of the MDS.

1358 - Entering AOP-015 for T-Form. SOER and radio announcement complete. STADM notified to restrict access to T-Form. Assigned [Name] as field lead to implement Swims at T-Form.

1407 - [Name] ORP, On Call SR, and [Name] notified of 1358 entry.

1410 - [Name] reports that T-Form has been executed and Swims is complete.

1417 - [Name] American Electric Heavy Equip. Operator, reported that when exiting T-Form yesterday, at the time of the AOP-015 entry, he experienced a metallic taste in his mouth. [Name] notified.
B-Shift

11:54 Gun-M: Indicates that ignition controls were not satisfied.

This is a SAC 5-82, Flare Gas control for waste-

Introducing Equipment, violation.

1200: Delayed TIA event as a Group 3A (5) 5C-3, 75R

Violation, Occurrence.

155: ORP On-Call FB, notified of 1729 & 1740 entries.

1600: ORP On-Call Senior Manager, notified of 1729 & 1740 entries.

1600: ORP, shifted office, notified of 1729 & 1740 entries.

170, 1749, 1753, and 1800 entries.

826: SCEN complete for TIA violation, occurrence report.

1800: Rehearsal as CSM by [Redacted].

1844: Assumed CSM duties acting RED.

1938: Notified by [Redacted] (Safety) that individual taken.

to KMCDF from 5C83-15/Radios have been

released and release to work with restrictions.

0504: ORP, notified of 1938 entry, SCEN out.

A-Shift

0500: Rehearsal as CSM by [Redacted].

0500: Assumed duties as CSM.

0641: [Redacted] reports that [Redacted] was evaluated

at home yesterday and released to return to work.

0539: SCEN complete for 0529 entry. ORP On-Call FB;

notified.

0533: [Redacted] reported having respiratory congestion and

believed this is a result of the BLEVE odor event that

occurred on 7/28. [Redacted] is taking [Redacted]

to HMC for evaluation. [Redacted] ORP On-Call FB;

[Redacted] On-Call Senior Manager safety;

SCEN complete.

0529: [Redacted] was evaluated at HMC and referred to

an outside medical provider. He was not released to return

to work. SCEN complete. [Redacted] notified.
1/25/2014 5:07 P.M.

0949. NOTIFIED EMU FAC, REP. THAT OPERATOR
FILTER ISOLATION VALVES, ON 24-HR 103,
103, 105, 106, 108 AND 112, WILL BE CLOSED
DURING THE DAY TO SUPPORT AHABS.

1025. RESPONDED TO PERSONAL ANGER AT
24-X. CHANGE PEDAL. TWO EMPLOYEES
SHOWED STRONG SYMPTOMS OF VAPOR
EXPOSURE. NIELO SURVEYED CONCRETE
COVER BLOCK. FERRO AT POSTAL, ALSO CALLED
911, BOTH EMPLOYEES TRANSPORTED BY
AMBULANCE TO KELEC. ENTERED A0135
FOR 24/5 AM 24-HR. ACCESS RESTRICTED
TO FORMS VIA WORK AND IAEA CONTROL.
CSM NOTIFIED.

1449. NOTIFIED EMU FAC, REP. THAT ALL ISOLATION
VALVES CLOSED ON 24-HR. NAME REMOVED
RECREATED AS #4.103, WAS NOT REASSIGNED
REPLACED AS A RAG HAS BEEN DROPPED INTO
THE TESTER PORT OF THE G/P ASSAY.
REP: 0250 ENTRY.

1630. REASSIGNED BY CSM.

0339. ASSUMED DUTY OF HMI.

0320. FORKLOFT ENTERED 24-HR.
1007. CAMERA VAN ENTERED 24-HR.
1008. INFORMED CSM THAT RESTRICTED
ACCESS BEYOND APPROXIMATELY
30 FEET BY 30 FEET HAS BEEN ENSA-
LISHED AROUND COVER BLOCKS 490-95'S
THAT WAS SOURCE OF UNUSUAL ODORS
ON 01/25/2014, C025 ENTRY. CSM EXTRAS
A0135 FOR 24-HR. AND 24-HR 5.
Attachment B
Interviewed/Attendance Rosters

1. Field Work Supervisors (3) [ST Team, Biological Controls, MSA Support Services]
2. Nuclear Chemical Operators (2)
3. Health Physics Technician
4. Boilermaker
## WRPS ATTENDANCE ROSTER

**Subject:** 
ACR-015 CONCERNS T-201 VIDEO INSPECTION

**Date:** 3/31/2014

**Location:** 2704HV/6133

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Attachment C
Photographs of T Farm Work Area

Photograph 1. From the West Looking toward 241-T-201 Work Area – from Location of Camera Van.
Photograph 2. Looking West toward 241-T-201 Work Area – from Location of Herbide Spraying.