EVENT INVESTIGATION REPORT

AOP-015 Unusual Odor Detected in 241-AP, Along the West Fence Line, Inside and Outside of the Farm

Event Investigation Report Number EIR-2014-017

Event Investigation Team Lead

PERK Responsible Manager

6-9-2014
Date

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AOP-015 Unusual Odor Detected in 241-AP, Along the West Fence Line, Inside and Outside of the Farm, Investigation Summary

On May 29, 2014, while preparing to execute a job task, four employees experienced odors in AP-farm described as a burned, metallic odor or dirty socks. The four employees also described a metallic taste. One employee reported a symptom of a headache. These four employees were taken to the medical provider for evaluation. A fifth employee was present but had no symptoms and elected to not seek medical attention.

A waste transfer had occurred on May 28, 2014, between AN-farm and AP-farm. The work team was tasked to flush the transfer lines. At the start of the work evolution, a first Nuclear Chemical Operator (NCO-1) walked outside the perimeter of the farm on the west side headed north. At the northwest corner, NCO-1 reported encountering a brief odor described as the “familiar dirty sock smell” that they normally encounter within the Tank Farms. NCO-1 then walked east along the northern boundary of AP-farm where he met a second NCO (NCO-2) in a vehicle near the AP-farm change trailer. At this point, both NCOs reported a brief odor once again. Wind was blowing from the east toward the west but oscillating north to south. Wind speed was estimated to be between 8 and 12 miles per hour.

Upon entering AP-farm, NCO-1 walked a diagonal path from the northeast toward the southwest to the work location near the 241AP Valve Pit. NCO-1 reported encountering the odor in two more locations. NCO-2 was beginning to set up for work outside the fence line near the valve pit. NCO-2 was joined by a pipefitter. As the three workers gathered, they discussed the odor and strength of the smell. A third NCO, the Material Balance Discrepancy (MBD) NCO, was called in to consult with the work team. The work team decided that the odor was not what was normally experienced, and seemed to be stronger than normal.

NCO-2 called in to the Central Shift Office (CSO) Manager and reported the Odor. The CSO Manager questioned the employees then initiated actions to institute Abnormal Operating Procedure TF-AOP-015 Response to Reported Odors or Unexpected Changes to Vapor Conditions.

Three NCOs and the pipefitter were taken to West Area Medical facility for evaluation. The Health Physics technician, covering the job, did not request a medical evaluation. All employees returned to work without medical restriction. Blood sample analysis is pending.

The AP-farm was released from restricted access under AOP-015 On June 6, 2014. The detailed analyses were performed late evening on May 29, 2014 and a draft report was issued. The Industrial hygiene (IH) sample report was finalized on June 6, 2014 with no indication of chemicals above Hanford action levels.
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The preliminary information:

- **AP Farm**: Three bags samples were analyzed:

  1. Taken outside the farm from the southwest corner to the north side by the change trailer; ~41 ppb of *chemicals.

  2. Taken upon entry into the farm continuing to the AP Valve Pit and inside the tent at the AP Valve Pit to AP-104 pit; ~45 ppb of *chemicals.

  3. Taken from the primary exhauster; <10 ppm of *chemicals.

Following the release of the farms from AOP-015, a compensatory measure will be initiated with a Red Arrow restricting access to the farms with the required use of respiratory protection until the full Event Investigation information is obtained and appropriate changes to General Industrial Hazards Analysis (GHA) controls are established, if appropriate.

A Fact Finding meeting was held on May 29, 2014.

**Event Timeline**

**05/29/2014**

0800 – 0830 Pre-Job Briefing held.

Went through the GHA and asked if anyone on the crew wanted to upgrade.

0902 First odor was detected in the NW corner outside the AP-farm fence line.

The NCO who detected the first odor was walking toward the east in the direction of the change trailer. Approximately half way between the area where the first odor was detected and the change trailer, the NCO (NCO-1) met another NCO (NCO-2) where the two discussed the odors they were smelling (location described on map as #2)

NCO-1 noted vapor odors at location 3, 4 and 5 walking diagonally from the change trailer AP-102 to AP-103.

Odors were described as “burnt metallic taste, like how burning galvanized steel smells.” It left a taste in their mouth.

Odors seemed to be more concentrated by the Temporary Step-off pad location.

NOTE: “Red X” on map indicates the location of the Ultrasonic Testing (UT) crew.

0907 NCO contacted the MBD Operator.
NCO-2 contacted Central Shift Office (CSO). CSO questioned them about the odor and asked if they were smelling "sewer" smells.

NCO-2 used the radio to call on the CSO channel to notify the personnel located in the change trailer about the odors.

CSO called the NCOs to confirm smells and again asked if it could be "sewer" smells.

CSO entered AOP-015.

Shift Office Event Notification (SOEN) notification issued.

Radio calls sent.

Production Ops (AN Team) IH reported to Shift Office

Pre-Job for Production Operations IH held for sampling plan.

Industrial Hygiene Technicians (IHTs) went to 278-AW to get self-contained breathing apparatus (SCBA) for farm entry.

Production Ops (EV Team) IH called IH Program PhD Analytical Chemist to notify him of AOP-015 entry and prepare for Hapsite Gas chromatograph mass spectrometer (GCMS) analysis.

CSO made Facility Representative and Senior Management notifications.

Three employees were sent to HPMC Occupational Health Services (HPMC) for persistent metallic taste and one employee reported a headache. All four went to HPMC.

Shift supervisor reported that employees initially reported odor outside of the farm in the northwest corner.

Three NCOs and one Pipefitter going to HPMC (reported by Shift Operations Manager).

Production Operations Safety and Health Manager reported that two IHTs were en-route to AP-farm to take bag samples and stack sample (see 1040 entry for locations).

(IH observation) Wind has shifted to NE and picked up speed (1000 meteorological data indicated an 11 mph wind speed, 200°SSW; 0900 meteorological data indicated a 5 mph wind speed from the same direction)

NOTE: wind was described to be swirling in the area of the event.

IHTs arrived and began taking samples at AP-farm perimeter (southwest corner).

IHT described a "cigar" smell near the northwest corner of the AP Farm. IHT encountered an employee smoking a cigar on the northwest side of the tank farm.
Four Washington River Protection Solutions LLC (WRPS) personnel arrived at HPMC for evaluation and blood work.

IHT described the first odors as “stinky sock” at location #1 on the map. (There were no hits on the instrumentation.) Proceeded to the change trailer to don the SCBA.

IHTs entered farm moving towards the Flush Pit.

NOTES:

Went to AP-104, where the transfer occurred the previous day, taking a “Bag Sample” continually.

Attached a direct read instrument to the stack and determined all readings to be below threshold limits.

IHT made the following observation, “Windsock appeared to be hung up and not indicating well.”

NCOs confirmed this observation stating, “they used little indicator flags at ground level to identify the wind was changing directions in the area.”

CSO sent SOEN notification:

“Four employees were taken to HPMC.”

IHTs exited farm through the change trailer.

IHT Supervisor contacted the IHTs for status of sampling evolution in AP-farm and requested them to report to the CSO.

IHTs reported to Cognizant System Manager (CSM) in the Shift Office the results of sampling plan.

IHT left the Shift Office to deliver the bag samples to 2704-HV IH Lab.

IHTs arrived at IH Lab.

WRPS personnel were seen by HPMC provider.

Analytical Chemist called and relayed that preliminary review of the GCMS analysis did not indicate that any constituent is present in higher than normal concentrations.

WRPS personnel blood work was drawn.

NOTE: Other Hanford workers were taken back for “scheduled/routine” physicals at 1255 hrs.

Event Investigation initiated.

Fact Finding Meeting Held.

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AOP-015 restrictions lifted for AP farm

Positives

1. Immediate calls to CSO & MBD
2. Immediate radio notification made to personnel located in change trailer
3. Immediate radio announcements to UT Staff (collocated work team)
4. IH Response

Compensatory Measures

- Entered AOP-015
- Planned and executed IH Sample Plan
- Transported affect personnel (4) to HPMC
- Farm access was restricted by entering AOP-015
- Red Arrow was entered into the CSO Logbook

Preliminary Extent of Condition Review

Extent of condition is the focus of the Chemical Vapor Solution Team (CVST). This report will provide for process improvement and details to the CVST of the incident.

Discussion of Potential Causes

WRPS has several efforts ongoing to address chemical vapors. This report is a synopsis of one response.

Discussion of Barriers That Could Have Impacted the Cause

(This section discusses engineering and administrative barriers that were in place that failed or should have been in place)

Unknown.

Recommendations/Proposed Corrective Actions

(This section provides any recommendations discussed and provided during meeting for further consideration for the responsible manager)

Action 1: Identify isolation boundary around farms during a “vapor” related event.

Actionee: - Complete
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Response: The current isolation boundary (i.e. individual farm fence line) around the tank farms during a vapor (AOP-015) event has been evaluated as the appropriate isolation boundary at this time. It should be noted that the CVST Team has an action to determining if the tank farm boundary (i.e. individual farm fence line) is adequate or if there is technical data that would support extending the distance outside the farm fence line.

Action 2: Communicate to Level 2 management “restrictions” of exposed personnel in order to facilitate adequate job assignments. (NOTE: The issue is that some of the affected workers were not within the farm fence line at the time and the current process to “restrict” personnel is to disallow “ACEing” into certain types of work. If the affected personnel are working “outside” the fence, they potentially are still at risk to exposure to vapors.)

Actionee: Action completed June 2, 2014. A Briefing was provided in the shift turnover meeting to all management.

Action 3: Lift AP-015 based upon the results IH Sample Plan, but in place enter a “Red Arrow” to restrict access to AP farm.

Actionee: Action completed

Action 4: Review the Preventative Maintenance records for the “windsocks” and evaluate whether there is potentially a newer/better sock that can be used.

Actionee: Complete

Response: Met with the COMS Maintenance Manager on May 30, 2014 who identified that the AP-farm wind flag was recently changed out. It is his understanding that the PM that performed an inspection of the tank farm flags had been canceled and the change out of the flags is performed under a corrective maintenance work package. Initiated a PER (WRPS-PER-2014-0999) to evaluate the current flag design vs. a wind sock, number of flags at each farm location and re-activating the PM that would perform an inspection on a set periodicity to inspect the flags.

Action 5: Communicate concerns to HPMC from WRPS personnel how they were triaged and evaluated under HPMC’s care. (NOTE: Personnel were made to wait for “scheduled” patient’s annual blood work before blood work was drawn on exposed personnel.) Two of the employees reported being at HPMC for three hours waiting for blood sampling.

Actionee:

Recommendation from a worker to incorporate personal real time sampling if possible.
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Lessons Learned

None.

Attachments (as they apply):

1. List of personnel contacted
2. Attendance Rosters
3. Photos/Sketches
4. Log Book Entries
5. IH Sample Analysis Reports
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Attachment 1
List of Personnel Contacted

1. Health Physics Technician, AP-farm
## EVENT INVESTIGATION/CRTIQUE ATTENDANCE FORM

**Date:** 6-29-2014  
**Critique Title:** AP-015 RESPONSE AT AP FARM  
**Critique Number:** EIR-2014-01-7

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A-6003-100 (05/01)
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Attachment 3
Area Diagram

Path of travel by NCO 1 indicted with red line, blue numbers indicate locations NCO 1 reported encountering odor. Location 5 noted upon exit from the farm.

Location 6: work team gathered and made notifications

Co-located work team, Ultrasonic Test team.

Reported wind direction: from the east but oscillating north to south at 8-12 mph.
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Attachment 4

Log Book Entries

1355 - Extended Activity. In-lighting within 10 miles of tank farm. SensiNet Notified DEER.

1410 - Employee from entry 1240 released to work with "zone" restrictions. Notified Safety.

Log message Notified DEER.

1547 - PR/AZ Farm V/CZ post maintenance, exhauster running and operational.

1600 - Exited to greater than 10 miles radius.

1631 - R/HT completed flammability readings for PR/AZ.

All readings 0% LFL.

1634 - Next ATV/AZ Farm PR/3, 1 due NET 06/25/14.

1639 - Relieved as CSN.

1659 - Relived as CSN.

1700 - A/O/C farm conditions established.

1700 - Exit to A/O/C farm. Lightning greater than 10 miles.

R/HT announcement & SENI completed.

1722 - T/MACS reports that A/O Farm tank temps are repeatably 200°F. R/HT to inform, complete for A/H/AZ.

2351 - R/HT farm screens complete for HV/AZ.

2352 - R/HT farm screens complete for HV/AZ.

2352 - PR/AS exhauster was discovered shutdown, unable to retrieve.

2354 - R/HT farm screens complete for HV/AZ.

2354 - Notified Em. On Call.

2359 - Notified Em. On Call.

0419 - Notified Em. On Call.

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- Four employees take HPRC for symptoms:
  - All 4 for metallic smell & taste
  - 3 reported nausea, headache, 1 no
  - After notified OSHA, symptomatic

- Individuals reporting to HPRC include:
  - Fifth employee
  - PD no symptoms

- All people involved in prep for transfer route, all taken to HPRC by

- 3:59 P.M.: Radio announcement to stay clear of AR Farm and its perimeter for Z 4:30 PM

- 4:23 P.M.: Report odors in SI Farm, three employees reported metallic smell, no symptoms

- 4:34 P.M.: Radio report SI Farm ppb monitoring
- 4:53 P.M.: AT Farm Environmental equipment DM5
- 4:50 P.M.: STA-LBT-51 channel reported data to ZM 4 PM
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0755: Radio announcement urged to stay clear of AE Farm and its perimeter for 81/2 miles @ 0923.

1046: Report Odors in ST Farm. Three employees reported an intense smell, no symptoms. 2 reported at 5896.

1053: AT Farm Environmental Equipment 921191-121010, channel required date to 7/14 per 1126: External Alarm 9055. No Odors in ST Farm.

10:40 - 2 employees reported smelling a smell at 1046. 2 employees taken to HGR for evaluation. They were with symptoms of dry mouth, second individual with no symptoms, FWS was making people notified.

So night.

2155: Radio announcement modeled 241-AP preferred.

1150: Entry winds out of 31/4 N-16 mph, resulting in blowing across exchanger toward the field crew located at 5610, while perform LOTO for ball valve replacement.

All 4 for metallic smell, one of the 4 reported having headache. 3N05, I feel.

Is there a notification? Someone.

...universals reporting to HPA at 0...
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11:40-11:54 on the avoids SY10-West-UT-1N1, transported the two individuals stayed on
site. HPRC took the HC-20 crew back to work.

11:44-11:44 notified by that the
HPRC notified HPME that personnel medical

for light-headedness. HPME directed him to report
this medical provider. Notified DEFR

11:44-11:44 notified by HPME that the
employee from the SY-Farm AOP-015 was

by HH @ 11:35, being transported

Bandage, Dressing, DEFR

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<td>11:44 Event Investigation initiation for RP and SY</td>
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<tr>
<td>RP-015 site response, Notified DEFR</td>
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<tr>
<td>Seen suit, RP odor Report 2014-017 POC</td>
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<td>ST odor Report 2014-018 POC</td>
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PER source for RP and SY

11:45-11:45 notified by that the employee from

by HH @ 11:35 returned to work no restrictions, but

with one administrative restriction awaiting

blood results. Seen suit

11:47-11:47 notify employee from ST, work,

selected to go to Kadlec for

Blood analysis also notified by

that employee released with no restrictions with

one administrative restriction. Seen suit for entry

and Notified DEFR
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(Cont.) beta / gamma, no alpha contamination

emailed the information for the occurrence report was verbally

notified as well. The contamination and

collection was shipped of

1147 - New action: 54 and AP farms will remain

on restricted access until AOP-015 event

investigations are completed, while

restricted access remains in effect, all work

will be considered low threshold exposure

as defined in the GHA which requires

respiratory protection using the GHA PPE Test 1.

1228 - Notified: (Sr. Manager) and

(Safety). SGEN sent.

1233 -

reports that

head swelling in left muscle, unknown

why it occurred. He was training all

day and was sitting at his desk at

noon when he noticed it.

is transporting him to HMC.

is a project technician for

1400 - Notified:

(Safety) and

(Safety). SGEN sent.

1635 - C Form AEA evaluation is complete, AEA

may be de-posted and normal access restored.

SGEN sent.

1846 - C Form AEA has been de-posted per

1674 - was returned to work from HMC

with no restriction. Non-work related per

and SGEN sent.

1721 - Assigned duties as CSR.

1721: Assumed duties as CSR.
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0001 - Forwarding Red Arrows from previous week:

- Stop Work on entry to Tank Farms post unplanned primary exhauster shut downs without simultaneous IHT and HPT monitoring and clearance of farm per AOP-021. (POC: BOSO-013 pg. 46 @ 1602)
- Stop Work restricting access to all TOC hazardous waste areas for employees awaiting medical lab results associated with potential vapor/chemical exposure incidents. (POC: BOSO-013 pg. 62 @ 1031)
- Do not change to Operation Mode at 242-A until resolution of WRPS-PER-2014-0550 "242-A Credible Fire Scenario Equipment Failure". (POC: BOSO-013 pg. 62 @ 1600)
- AOP-015 response inside tank farm boundaries require respiratory protection (SCBA) pending review and update of the procedure. A copy of the AOP-015 Respiratory Protection Form is located in the Central Shift Office & Mask Station. (POC: BOSO-013 pg. 86 @ 1105)
- Stop Work on disturbance and handling of all lead bricks until Industrial Hygiene can perform hazard evaluation. (POC PER-2014-0635) (BOSO-013 pg. 81 @ 1546)
- Stop Work: IHT monitoring is required for carbon monoxide on occupied vehicles that have auxiliary internal combustion engines operating until hazard assessment is performed. (POC: PER-2014-0689) (BOSO-013, pg 91 @ 1316)
- Stop Work initiated regarding the use of respiratory protection equipment used within arc flash protection boundaries may be used, after the work scope has been evaluated and documented on the work record by the electrical AHJ. Management has committed to have the respiratory protection tested and the results of the test documented and given to the Stop Work POC as per schedule and revise TFC-ESHQ-IH-C-05 to include appropriate respiratory configuration. (POC: PER-2013-1673) (BOSO-013 pg. 75 @ 1510)
- Prior to completion of the evaluation, air purge or air blow activities using compressed air should be restricted to configurations that do not pass through magnetic flow sensing elements (like the ABB flow meter) on waste transfer systems. (POC: BOSO-013 pg. 108 @ 1535)
- Entered LCO 3.1.B on 5/17/14 @ 0505 hours for SY Farm Standby VTP O/S. LCO 3.1.B.1 due 6/07/14 OR LCO 3.1.B.2.1 due 06/17/14 (BOSO-013 pg. 114 @ 1524)
- Transfers into or out of East Area DST's are suspended until additional water hammer calculations on the flush system are completed. The Cold Run of the 242-A Evaporator, AN-101 to AP-104, AN-106 to AP-104 and associated flushers, and C Farm Retrieval, are exempted from this suspension. (POC: BOSO-013 pg. 112 @ 1614)

**SY and AP Farms will remain on restricted access until AOP-015 event investigations are completed. While restricted access remains in effect, all work will be considered low threshold vapors/odors as defined in the CSB PRC Task 1. (BOSO-013 pg. 147 @ 1147)
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Attachment 5
IH Sample Analysis Reports

8 X Expanded Scale
First peaks are Air, Argon, CO2, and N2O all are offscale

5 X Expanded Scale
First peaks are Air, Argon, CO2, and N2O all are offscale