Enclosure

EVENT INVESTIGATION REPORT
EIR-2014-018

SY-Farm Vapor Related Incident on May 29, 2014

Consisting of 18 pages
Including cover sheet
EVENT INVESTIGATION REPORT

SY-Farm Vapor Related Incident on May 29, 2014

Event Investigation Report Number EIR-2014-018

Event Investigation Team Lead

[Redacted]

Date: 6/4/14

Responsible Manager

[Redacted]

Date: 6/4/14

PER No. WRPS-PER-2014-0957 (Trend only as a roll-up to Significant PER WRPS-PER-2014-0602)
Investigation Summary

On May 29, 2014, during lockout/tagout (LOTO) field activities (TSO-14-010) for work package TFC-WO-12-3783, SY-101, Repair Primary Enraf, some of the workers assigned to the SY-101 LOTO (SY101-WST-LIT-101) task indicated they smelled “onion” type odors. Some of the workers indicated it smelled like normal tank farm odors. The work team discussed the presence of odors. The odor was strongest on the change trailer platform and then decreased upon transition down the stairs into SY Farm. At the Enraf, industrial hygiene (IH) surveys were performed with readings of 58 ppb VOCs and 0 ppb ammonia (exposure action limits are 2,000 ppb VOCs and 25 ppm ammonia). Based on wind direction, the odors fluctuated. When the pipefitters (PFs) had completed their work, they exited SY Farm. The PFs reported the odors to the ST Team Area Day Shift Manager. The SY Team Area Day Shift Manager immediately contacted the Field Work Supervisor (FWS) and to ensure all workers had exited the farm and reported to 272WA. The ST Team Area Day Shift Manager contacted the Central Shift Manager (CSM) and TF-AOP-015 “Response to Reported Odors or Unexpected Changes to Vapor Conditions” was entered.

Nine workers were in SY Farm supporting the LOTO: 2 Pipefitters (PF), 1 Health Physics Technicians (HPTs), 2 Electricians, 1 Field Work Supervisor (FWS), 1 Industrial Hygiene Technician (IHT), and 2 Nuclear Chemical Operators (NCOs).

The scope of work being performed was to determine and lock out the electrical power to the Enraf. The work was reviewed against the general hazard analysis (GHA) criteria and the decision was made that no respiratory protection was required. Additionally, none of the 9 workers opted to wear respiratory protection (under the voluntary program). The employees stated they would probably wear respiratory protection for the Enraf repair work that was planned for later. The route the workers took was from SY Change Trailer (MO296) to SY101-WST-LIT-101 and back. About 40 yards into the farm. While in the SY farm one of the pipefitters and the HPT were wearing IH sampling pumps.

At the time of the event, no activities had been implemented that would have created a new vent path to tanks in the area. Preliminary evaluation indicates no liquid level changes that would indicate sudden gas in the tank. The SY Farm A-train exhauster stack is a 19’ stack that was ventilating at a volume of 970 cfm.

Industrial hygiene monitoring results taken at the SY Farm A-train exhauster stack sample port were below exposure limits:
Workers were interviewed, personal statements were obtained, and a Fact Finding Meeting was held on June 2, 2014.

**Event Timeline**

**05/29/2014**

0800  Pre-job briefing held for work package TFC-WO-12-3783, SY-101, Repair Primary Enraf. Personnel in attendance were 2 Pipefitters, 1 HPT, 2 Electricians, 1 FWS, 1 IHT, and 2 NCO’s. The briefing discussed the work into two sections (1) perform electrical LOTO which was to be performed in the morning and (2) Enraf repairs which were to be performed in the afternoon. The GHA was reviewed which included discussion of herbicide application in U Farm and the option to upgrade respiratory equipment. No workers elected to use respiratory protection.

0945  Workers enter SY Farm through SY Change trailer (MO296). Workers indicate an onion type odor. Some of the workers indicated it smelled like normal tank farm odors. The odor was strongest on the step platform outside the change trailer and then dissipated upon transition down the stairs. IH survey indicated 58 ppb VOCs and 0 ppb ammonia. The PFs applied aerokroil to the Enraf flange bolts. (The PFs indicated that aerokroil has a sweet odor.) The PFs also moved lead blankets which were located along the fence line (east of SY-101) closer to the Enraf. The workers were downwind of the A-Train exhauster. No symptoms were reported at this time.

1015  PFs exit SY Farm through SY Change trailer.

1032  PFs report to ST Team Area Day Shift Manager. They inform the ST Team Area Day Shift Manager odors detected. Both PFs return back to 272AW and report to their supervisor. PF-1 displayed symptoms of dry heaves. Both PFs report to HPMC, West Area. ST Team Area Day Shift Manager contacts FWS and advises him to exit SY Farm. The remaining 7 workers in SY Farm exit.

**Additional information:**

At ~0845 a nuclear chemical operator (NCO) had performed routine operator rounds in SY Farm and exited SY Farm prior to the odor event. The NCO indicates onion type odors were smelled. This NCO also performed routine operator rounds at S Farm with no odors detected there.

PF-1 and the HPT wore sample pumps at the time of the event. The data from this sample pump will be analyzed.
The wind was blowing from SSW from 4.7 mph to 8.1 mph with intermittent gusts. See Hanford Weather station report below:

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<tr>
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<td>260.0 7.9 WNW</td>
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<tr>
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<td>310.0 10.9 NW</td>
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1125 IHT assigned to respond to the AOP-015 (IHT that performing monitoring on the LOTO Enraf job was assigned to respond to AOP-015).

1126 ST Team Area Day Shift Manager was notified that PF-1 exhibited symptoms of vapor exposure and was transported to HPMC. ST Team Area Day Shift Manager notified CSM.

CSM entered AOP-015 for 241-SY.

1140 PF-1 was transported from 200 West HPMC to Kadlec via ambulance. PF-2 was instructed by 200 West HPMC to report to HPMC at 1979 Snyder as the West Area office was full. PF-2’s supervisor transported him to 1979 Snyder. At 1979 Snyder, PF-2 went to Kadlec for blood tests. PF-2’s supervisor escorted him to Kadlec.

The affected worker indicated less than adequate evaluation/ processing by the medical provider. This issue to be addressed by the Chemical Vapor Solution Team.

1242 IHTs enter SY Farm for AOP-015 response.

1258 IHTs exit SY Farm and report observations: 52 ppb VOCs at the SY-101 Enraf where aerokroil was sprayed. 16 ppm ammonia and 176 ppb VOCs from SY Farm A-Train primary exhauster.

1517 CSM - Two employees from SY-Farm odor event were released to return to work. SOEN
Compensatory Measures

1. 5/29/2014 Restricted access into SY Farm in accordance with TF-AOP-015 procedure.
2. 5/29/2014 TF-AOP-015 response actions implemented.
3. 5/30/2014 Daily Report - Entered AOP-015 for unexpected odors in AP and SY Farms. Farms were evacuated, access restricted and IHTs collected samples. Awaiting sample results. Access is restricted for all work not required for safe operation.
4. 5/30/2014 1151 New red arrow: 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 GHA which requires respiratory protection using the GHA RPF Task 1. CSM (SOEN)
5. 5/30/2014 1156 Exiting AOP-015 for AP and SY Farms, sample results exhibited typical tank farm background concentrations. Access to AP and SY authorized per red arrow. CSM (SOEN)
6. 5/30/2014 1211 HOT TOPICS issued to all employees

Discussion of Potential Causes

Based on interviews with the workers, the assumed source of the odors is from the SY Farm A-train exhauster stack.

Recommendations/Proposed Corrective Actions

Corrective actions to be addressed by the root cause analysis via WRPS-PER-2014-0602.

The affected worker indicated less than adequate evaluation/processing by the medical provider. This issue to be addressed by the Chemical Vapor Solution Team.

Analyze data from the personal sample pumps worn by the PF-1 and the HPT.
Attachments:

1. List of personnel interviewed/contacted and Fact Finding Meeting Attendance Roster
2. S-Farm Complex
3. Log Book Entries – ST Team Area Day Shift Manager Log and Central Shift Manager Log
4. AOP-15 Vapor Exposure Communication
Attachment 1 - List of personnel interviewed/contacted

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**EVENT INVESTIGATION/CRIQUE ATTENDANCE FORM**

**Critique Title:** SY-Farm Vapor Related Incident on May 29, 2014

**Critique Number:** EIR-2014-018

**Job Title:**

- HAWTC
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- BO
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- F005/180
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A-0025-100 (05/01)
Attachment 2 - S-Farm Complex

Route taken by the workers
Enraf location (approx.)
A train primary exhauster stack - venting
Attachment 3 - Log Book Entries

ST Team Area Day Shift Manager Log

1/238 (continued) Best Management Practice

Cannot obtain level 3 worker due to
Resource constraints. Employee notified and
no notification or action is required for
RPP 97-97 which is currently in place
Due to change in procedure

ULV 262: 4 level obtained. Put in
work area

[Redacted] by CSM [Redacted]

1/4 0556 Assumed duties of area from

1/20 Resigned by CSM [Redacted]

1/01 Assumed area duties

0920 Low voltage to T-con

1025 Low volt out of T-con

1412 Resigned by CSM [Redacted]

[Redacted] of area, performed

1047 Four employees reported smell

- One assumed order for 24H50 but

- Includes no physical symptoms

- Exposure verified Met

- Work area cleared from April to work area. Exposed FES

- Exposed from April. EMT found

- PB BS 120, C PB N.3, CSM notified

- 1045 Lockout (erasure time 14:02 requested to support 8H-100 return report

- 11:26 received report from employee from 10M7 second exposure and

- Symptoms of upper exposure and

- EMT transported to ERC.

- Notified CSM. CSM entered

- ADR 125 for 24H50.
Central Shift Manager Log

5:21:14 A Shift
11:48 a.m. person was taken to home. Notified DOE FR.
13:55 External BLEEDER lighting within 10 feet.
Tank Farm SEFR notified DOE FR.
14:02 Employee from entry area released to work
with zone restrictions. Notified Station.
Left message. Notified DOE FR.
15:47 MAZ Farm VC post maintenance, exhauster
runnings and operations.
16:00 exited 10 miles to greater than 10 miles away.
Sent for lightning strikes within 10 miles crossing scene.
16:31 INR completed, main gas readings for MAZ.
All readings 0% LFL.

16:55 released as normal.

16:59 Relieved 881.

17:41 APLC to API 400 alarm condition established.
17:50 Exiting APLC 400 lightning greater than 10 miles.
Radio announcement. API 400 complete.
19:11 TRACS reports that MAZ farm tank temps are being
20:51 INR & MIT farm sensors complete for API/400
and VC has been decongested.
23:53 external exhaust was
notified. In normal operation.
23:00 D Shift

01:34 Relieved.
01:34 Personal duties.
02:21-External BLEEDER for MAZ Farm.
02:28 Entry point, SEFR activated. Radio announcement.
03:43 Notified DOE FR.

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SY-Farm Vapor Related Incident on May 29, 2014

9:55 - Set 4 employees in SY-Farm, 3 report nausea, 1 report headache.

11:01 - 7 employees in SY-Farm, 3 report nausea, 1 report headache.

11:05 - 2 employees in SY-Farm, 1 report nausea, 1 report headache.

11:08 - 1 employee in SY-Farm, 1 report nausea, 1 report headache.

11:10 - 1 employee in SY-Farm, 1 report nausea, 1 report headache.

11:15 - 1 employee in SY-Farm, 1 report nausea, 1 report headache.

11:20 - 1 employee in SY-Farm, 1 report nausea, 1 report headache.

11:25 - 1 employee in SY-Farm, 1 report nausea, 1 report headache.

11:30 - 1 employee in SY-Farm, 1 report nausea, 1 report headache.

11:35 - 1 employee in SY-Farm, 1 report nausea, 1 report headache.

11:40 - 1 employee in SY-Farm, 1 report nausea, 1 report headache.

11:45 - 1 employee in SY-Farm, 1 report nausea, 1 report headache.

11:50 - 1 employee in SY-Farm, 1 report nausea, 1 report headache.

11:55 - 1 employee in SY-Farm, 1 report nausea, 1 report headache.

12:00 - 1 employee in SY-Farm, 1 report nausea, 1 report headache.
SY-Farm Vapor Related Incident on May 29, 2014

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**WASHINGTON RIVER PROTECTION SOLUTIONS**  
**Industrial Hygiene Program**

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<td>SY Farm A-Train Exhaustor Stack Sample Port</td>
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<td>16.000 ppm</td>
<td>25 ppm OEL/35 ppm STEL</td>
<td>&gt;0 ppm</td>
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<td>176.000 ppb</td>
<td>2,000 ppb AL</td>
<td>&gt;0 ppb</td>
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<td>13.000 mg/m³</td>
<td>25,000 mg/m³ OEL</td>
<td>16 mg/m³</td>
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<td>1.200 ppm</td>
<td>25 ppm AL</td>
<td>&gt;0 ppm</td>
</tr>
</tbody>
</table>

**GC/MS**

<table>
<thead>
<tr>
<th>Agent</th>
<th>@ Odor</th>
<th>@ Source</th>
<th>EXPOSURE LIMIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Analytes</td>
<td>~35 ppb</td>
<td>133.02 ppb</td>
<td>All Analytes</td>
</tr>
<tr>
<td>NPH</td>
<td>52.309 ppb</td>
<td>50 ppm TWA (ACGIH)</td>
<td></td>
</tr>
<tr>
<td>Methyl methacrylate</td>
<td>~0.6 ppb</td>
<td>20 ppm TWA (ACGIH)</td>
<td></td>
</tr>
<tr>
<td>Styrene monomers</td>
<td>~0.17 ppb</td>
<td>20 ppm TWA (ACGIH)</td>
<td></td>
</tr>
</tbody>
</table>

**Comments:**

IN was already at the shift office assisting with the earlier AP-Farm AOP-015 Response.
10:46 Shift office was called: Strong onion odor reported by 3 employees at SY farm, however, said they were not experiencing any symptoms:

- Notes from the SY IHT that was with the work crew during the odor event:
  - Wind SW at 17 mph
  - Work crew was located directly downwind from SY primary exhaust
  - 59 ppb VOCs and no Ammonia found.
  - Work crew was applying AeroKroll to bolts on ENRAP

10:50 HS Manager was briefed by 2 Prod. Ops. IHTs supporting job in SY farm:
2 people (a pipe-fitter and an HPT) were wearing sample pumps at the time that the odor was reported by request during a SEG1 work activity (Air survey #14-0268 and #14-0270).

The SY IHT was performing monitoring at the request of the craft (DRI survey #14-02910).

Prod. Ops. IHT reported smelling both exhaust odor and portable toilet odors.

11:01 IHT supervisor contacted the SY IHT that was supporting the work crew when they had reported smelling odors in SY farm to obtain additional information. IHT stated they were downwind of the SY exhaust and it had smelled like the normal tank farm odors. At the time the odor was noted, there was 0 ppm ammonia and 59 ppb VOCs with the direct reading instruments. Workers were also wearing sample pumps at the time the odor was noted. IHT had mentioned to the workers that they could voluntarily upgrade respiratory protection if they wanted, and the employees stated they probably would for the additional work tasks after lunch.

11:07 SY IHT called the IHT supervisor to clarify the pumps were being flown by the HPT and pipe-fitter at the time the odors were noted. Also, IHT DRI monitoring was not required because it was a SEG 1 work activity, however, the employees had requested monitoring when they were hanging PAR, so that is why the IHT was performing monitoring at that portion of the work activity.

11:25 Prod. Ops. IHT contacted the IN Program PhD Analytical Chemist to notify him of the AOP-015 being entered in SY farm and notify him that personal samples were being flown at the time odors were noted. Asked for confirmation regarding the sample media that should be analyzed due to the short duration work task and minimum sample volume obtained.

11:25 Prod. Ops. IHT Lead and Prod. Ops. Safety and Health Manager contacted the IHT supporting they SY work crew to instruct him to respond to the AOP-015 in SY because he was familiar with the locations they had been at earlier.
SY-Farm Vapor Related Incident on May 29, 2014

**WASHINGTON RIVER PROTECTION SOLUTIONS**

**AOP-15 VAPO RE EXPOSURE**

**COMMUNICATION FORM (CONTINUED)**

<table>
<thead>
<tr>
<th>Event Time</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:20</td>
<td>AOP-015 ENTRY. Shift manager was informed that 1 pipe-fitter reported symptoms (dry heaves).</td>
</tr>
<tr>
<td>11:29</td>
<td>Prod. Ops. IH made decision to analyze sample media taken during the initial odor event for analysis. However, microaamines samples media did not have minimum volume so it could not be analyzed.</td>
</tr>
<tr>
<td>11:32</td>
<td>Shift manager reported to Prod. Ops. IH that 10 people were supporting the ENRAF isolation ball valve replacement job in SY Farm when odors were initially reported. No systems were breached at the time of the event and all people located downwind of the exhauster reported smelling odors.</td>
</tr>
<tr>
<td>11:34</td>
<td>SOEN: &quot;Entering AOP-015 for odors for SY farm. All personnel evacuate SY Farm. CSH&quot;</td>
</tr>
<tr>
<td>11:34</td>
<td>Safety and Health Manager contacted the Prod. Ops. Mask Issuer at 2704 HV to inform that AOP-015 was being entered in SY farm and SCBA would be required for the HST’s to respond. Asked if she would be available to issue mask during lunch hour, she said yes and she would call the 2704 HV mask issuer to inform him that another HST would also need SCBA issuance from the 2704 HV mask station.</td>
</tr>
<tr>
<td>11:39</td>
<td>Prod. Ops. IH received SCBA from 2704 HV mask station.</td>
</tr>
<tr>
<td>11:40</td>
<td>Pipe-fitter manager contacted the Central Shift Manager to inform him that another pipe-fitter was being transported to the 1975 Snyder HPW as a precaution, no symptoms were reported. The 200W HPW was out of room for Patients.</td>
</tr>
<tr>
<td>11:43</td>
<td>Prod. Ops. HST Lead contacted the SY IH and informed him the Prod. Ops. HST’s would be leasing HC-287 and instructed him to get his SCBA from the 2704 HV mask station.</td>
</tr>
<tr>
<td>11:49</td>
<td>HST Lead contacted the responding SY IH to inform him that the CSH said to report to the SY OE to get briefing prior to entering farm to respond to AOP-015.</td>
</tr>
<tr>
<td>12:01</td>
<td>Prod. Ops. IH and HST’s reported to 274 WA area team office.</td>
</tr>
<tr>
<td>12:07</td>
<td>S Team Bay Shift Personnel contacted 200W ACES station to ensure IH and HST’s could get ACED in.</td>
</tr>
<tr>
<td>12:12</td>
<td>to 12:20 1 Prod. Ops. IH and 1 Prod. Ops HST ACED in.</td>
</tr>
<tr>
<td>12:25</td>
<td>Prod. Ops. HST’s and Prod. Ops. IH reported to SY farm change trailer and began preparation of SCBA and sample media, and IH’s got dressed in white.</td>
</tr>
<tr>
<td>12:42</td>
<td>SY IH and Prod. Ops. HST entered SY Farm.</td>
</tr>
<tr>
<td>12:44</td>
<td>HST’s pulled bag sample and conducted DRI monitoring around SY 101 ENRAF.</td>
</tr>
<tr>
<td>12:49</td>
<td>HST’s pulled bag sample and performed monitoring directly from sample port on SY Farm A-Train primary exhauster.</td>
</tr>
<tr>
<td>12:50</td>
<td>FWU for SY Farm isolation ball valve replacement job stated to Prod. Ops. IH that odors were noticed in the parking lot prior to farm entry and that all employees on the job had reported smelling odors.</td>
</tr>
<tr>
<td>12:58</td>
<td>IH’s exited SY Farm and reported observations to Prod. Ops. IH: 52 ppb VOCs at the SY 101 ENRAF where Aerosol was sprayed. 16 ppm ammonia and 176 ppb VOCs from SY Farm A-Train primary exhauster. (Refer to DRI survey #14-02882 and air survey #14-02875 for additional information).</td>
</tr>
<tr>
<td>13:14</td>
<td>HST left SY change trailer with bag samples to 2704 HV for analysis.</td>
</tr>
<tr>
<td>15:25</td>
<td>Bag samples analyzed for Nitrous Oxide and Mercury.</td>
</tr>
</tbody>
</table>

23:40 Ph.D. Analytical Chemist reported interpretation of GC/MS results; observing the chromatogram overlay of the farm area sample and stack sample were identical in identified compounds and relative concentrations.

The Ph.D. Analytical Chemist's conclusion regarding the analysis and interpretation of the SY exhaust source sample: “The stack concentration is very low. A very small amount of methacrylate and styrene monomers were observed. Most of the background is NMF’s (~39% of total VOC’s). No individual toxic material was identified, particularly at any concentrations that might have caused existing symptoms.”
SY-Farm Vapor Related Incident on May 29, 2014

<table>
<thead>
<tr>
<th>WASHINGTON RIVER PROTECTION SOLUTIONS</th>
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<tbody>
<tr>
<td>Industrial Hygiene Program</td>
<td>COMMUNICATION FORM (CONTINUED)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Odor Location</th>
<th>Farm/Site</th>
<th>Source Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5/29/2014</td>
<td>SY 101 ENGRF General Area</td>
<td>SY-Farm</td>
<td>SY-Farm A-Train Exhauster Stack Sample Port</td>
</tr>
</tbody>
</table>

05/30/14

09:50 Prod. Ops. IH emailed Central Shift Manager: "Based upon the analytical results from samples taken in AP and SY Farms on 05/29/2014, which exhibited typical tank farm background concentrations, IH Production Operations recommends exiting AOP-015."

11:51 Received SCEN "Now red arrow: 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 GHA which requires respiratory protection using the GSA RPP Task 1."

11:56 Received SCEN "Exiting AOP-015 for AP and SY Farms, sample results exhibited typical tank farm background concentrations. Access to AP and SY authorized per red arrow."

Prepared by: ____________________________