Improvements to the Occupational Health Program

Upgrades to Engineering Controls, Administrative Controls, Worker Training, Industrial Hygiene Procedures, Occupational Medicine Programs and Oversight

2009-Present

Presented by: Brian Harkins, Acting Assistant Manager of Technical and Regulatory Support and Rich Urie, Industrial Hygiene Program Representative for Tank Farms

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Engineering Controls in Place at the Tank Farms

- Active ventilation, including portable exhausters and increased flow rates
- Stack extensions to displace emissions
- Sealing up emission sources, use of sleaving and glove bags
- Hard-piping CAM (continuous air monitor) cabinets or installing fans
- Radial filters with valves on risers
- Accessible cooling stations for personnel
Administrative Controls, Including Training for Workers

- Vapor control and vapor reduction zones
- Voluntary respiratory protection encouraged, working to ease access
- Chemical Hazard Awareness Training - topics include:
  - Origin of tank farm waste characterization,
  - Health effects,
  - Odors,
  - Exercises and instrument demonstration
- Occupational and Environmental Health Overview, fiscal year (FY) 2014
# Training Tool: Tank Farm Chemical Vapor Odors

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Odor Threshold</th>
<th>Occupational Exposure Limit</th>
<th>Odor Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaldehyde</td>
<td>0.003 ppm</td>
<td>25 ppm</td>
<td>“Fruity odor”</td>
</tr>
<tr>
<td>Ammonia</td>
<td>0.04 ppm</td>
<td>25 ppm</td>
<td>“pungent, sharp”</td>
</tr>
<tr>
<td>Butanal</td>
<td>0.005 ppm</td>
<td>25 ppm</td>
<td>“body odor, sweaty socks, fishy, onions”</td>
</tr>
<tr>
<td>Ethyl Benzene</td>
<td>0.09 ppm</td>
<td>100 ppm</td>
<td>“spray paint”</td>
</tr>
<tr>
<td>n-Pentane</td>
<td>119 ppm</td>
<td>600 ppm</td>
<td>“gasoline”</td>
</tr>
<tr>
<td>Toluene</td>
<td>0.16 ppm</td>
<td>20 ppm</td>
<td>“spray paint”</td>
</tr>
<tr>
<td>Xylenes</td>
<td>0.008 ppm</td>
<td>100 ppm</td>
<td>“spray paint”</td>
</tr>
<tr>
<td>Methylene Chloride</td>
<td>1.2 ppm</td>
<td>25 ppm</td>
<td>“paint stripper”</td>
</tr>
<tr>
<td>Acetone</td>
<td>3.6 ppm</td>
<td>500 ppm</td>
<td>“nail polish remover”</td>
</tr>
<tr>
<td>2-Propanol</td>
<td>1 ppm</td>
<td>200 ppm</td>
<td>“rubbing alcohol”</td>
</tr>
</tbody>
</table>
Programmatic Upgrades

- Acute, short-term sampling protocols, added chemicals
- New technology assessments
- Reporting, data sharing, industrial hygiene/occupational medicine interface
- Data and hazard analysis upgrades
- Chemical as low as reasonably achievable initiatives
- Heat stress initiatives

U.S. Department of Energy (DOE), Office of River Protection (ORP) incentivized Washington River Protection Solutions LLC to seek out innovative ideas for addressing acute odor and symptom concerns. ORP hired summer interns to support evaluations of new technologies in FY 2013 and FY 2014.
Occupational Health Monitoring Involves “Defense in Depth”

**Industrial Hygiene Monitoring**
- Personal sampling
- Real time, mobile
- Real time, area
- Grab samples

**Occupational Medicine**
- Annual exams
- Post event exams
- Annual population studies
- Wellness programs

**Operations**
- Worker health, comfort, and productivity

**Oversight and Audits**
- ORP and DOE enforcement, ongoing
- National Institute for Occupational Safety and Health review of Industrial Hygiene Program, 2013
- Voluntary Protection Program review, 2014
- Health and Human Services audits of occupational medicine, biannual
- Special tank farm assessments of occupational medicine, three since 2009 by ORP and URS Corporation