Washington River Protection Solutions

“Chemical ALARA” – Tank Farms, Part 2

by

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“Chemical ALARA” – Tank Farms, Part 2

Topics

1. Driving forces behind “Chemical ALARA”
2. How it is being implemented at Tank Farms
3. “Chemical ALARA” into the future…
Hanford nuclear fuel processing created wastes for ~ 60 years. Wastes are stored in:

18 Tank Farms
- 7 located in 200W
- 11 located in 200E

177 total underground tanks
- 149 Single Shell Tanks (SSTs)
- 28 Double Shell Tanks (DSTs)
Identification of Tank Farm Chemicals of Potential Concern (COPCs)

Reviewed > **1800 possible** chemicals

~**1500** chemicals **detected** in all tank headspaces

**59 COPC** chemicals measured:
  at or above **10% of an OEL**
  In tank headspace or at an emission source

**7 COPC** chemicals measured
  at or above **50% of an OEL**
  at emission sources
7 COPCs found at or above the Action Level (50% of the OEL) at emission sources make up 0.3% of the 1800 possible chemicals in tank headspace:

- Ammonia
- Inorganic Mercury
- Nitrosamines (3)
- Nitrous Oxide
- Furan
# Tank Farm Chemical Vapor Odors

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Odor Threshold</th>
<th>OEL</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>Methyleneclyl 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>
“Chemical ALARA”

Driving forces behind “Chemical ALARA”

1. Client – DOE

2. Integrated Environment, Safety & Health Management System (ISMS)

3. Good Industrial Hygiene Practice, ie Threshold Limit Values (TLV’s)
“Chemical ALARA” – Driving Forces

Client – DOE


Chapter 8 – Hazardous Material Protection

“exposures to hazardous materials are below regulatory limits & at a level ALARA”
“Chemical ALARA” – Driving Forces

ISMS

1. Guiding principles

• “Identification of Safety Standards and Requirements”

• “Hazard Controls Tailored to Work Being Performed”
“Chemical ALARA” – Driving Forces

ISMS

2. Core functions

• “Provide Feedback and Continuous Improvement”
“Chemical ALARA” – Driving Forces

INDUSTRIAL HYGIENE SAFETY MANAGEMENT PROGRAM PLAN - TFC-PLN-55

PURPOSE AND SCOPE

Washington River Protection Solutions (WRPS) is fully committed to implementing an industrial hygiene program of the highest quality. ... WRPS continues to look for ways to manage the risk of exposures to tank waste hazardous materials based on the principles of controlling exposures to as low as reasonably achievable (ALARA).
“Chemical ALARA” – Driving Forces

Good Industrial Hygiene Practice - TLV’s

• TLV definition – “nearly all workers…”

• “Considerable variation in the level of biological response”

• “TLV’s will not adequately protect all workers.”
“Chemical ALARA”

How it is being implemented at Tank Farms

1. Training – “Chemical Hazard Awareness Training” (CHAT)

2. Workplace controls

3. Industrial hygiene instrumentation
“Chemical ALARA” - Implementation

Training – “Chemical Hazard Awareness Training” class (CHAT)

• Topics include: (1) Origin of tank farm wastes, (2) How wastes were characterized/OEL’s, (3) Health effects…

• Exercises & instrument demonstration
“Chemical ALARA” - Implementation

Workplace controls

• Engineering
• Administrative
• Personal protective equipment
“Chemical ALARA” - Implementation

Valve Handles – Pit Penetrations

Fan Housing
“Chemical ALARA” – Implementation

Administrative Controls - Vapor Control Zones
“Chemical ALARA” – Implementation

- Area monitoring is conducted in the general work area.
- AreaRAE is a 5-gas monitor used for area monitoring.
- The AreaRAE can monitor remotely and log up to 64 hours at a time.
“Chemical ALARA” - Implementation
“Chemical ALARA” – Communication Plan

“Industrial Hygiene ALARA Communications Plan”  
(August 27, 2009)


2. CVST – Chemical Vapor Solutions Team

3. Message contents – what, why, when, how…

4. Communication medium – “Solutions”, tailgates, etc.
December 7, 2009 – “WRPS institutes chemical ALARA program”

“Now we need to focus on applying the same ALARA principles we have traditionally used to control radiation exposure to reducing our chemical exposures.” – TOC Safety & Health Mgr.
“Chemical ALARA” – Implementation Plan

TOC - IH Programs Mgr.

1. Training – Update “CHAT”

2. Submit ALARA policy updates to DSA

3. Work control – Update maintenance procedure to include the risk ranking system for vapor exposure assessments.
“Chemical ALARA”

“Chemical ALARA” into the future...

1. Current results...

2. Real world example – C 104 retrieval

3. Into the future...
Current results - Personal Gas/Vapor TWA Air Sample Results (2005-09)

• > 90% of personal samples - below instrument detection levels

• average of all personal samples - ≤10% of the OEL’s

• all personal exposure results are - <50% of their OELs
“Chemical ALARA” – Into the future…

Real world example – C 104 retrieval

Adjustments made through lessons learned:

1. Vapor reduction zones
2. Voluntary respiratory protection encouraged
3. Additional controls explored, eg stack extensions, etc.
“Chemical ALARA” – Into the future…

Industrial Hygiene Instruments

HAPSITE

Gasmet FTIR
“Chemical ALARA” – Into the future…

Industrial Hygiene Instruments

Lumex

Proton Transfer Reaction Mass Spec
“Chemical ALARA” – Into the future...

Keeping on the path...

1. Driving forces

2. Continued IH exposure assessment

3. Management commitment