Developing and Implementing Lifecycle Chemical Management Systems for A&M System Members: A Toolbox for the Workplace

by
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The Texas A&M University System

March 31, 2014
A Core Set of Concerns

• Lax inventory and control of emergency responders
  – CFAT Appendix A chemicals
  – Tier 2 Extremely Hazardous Substances
  – Potentially explosive chemicals
  – Precursor chemicals
  – Controlled substances
  – Extremely toxic or physical hazard chemicals
  – Select agents
  – Old, outdated or unstable chemicals
• Lack of information to support

• Lack of inventories for compliance with fire codes (e.g., NFPA 45)
• Lapses in cryogenic and compressed gas safety
• Poorly labeled or unlabeled containers
• Unsystematic chemical storage
• Inconsistent waste management
• Deficient tools & training for chemical users
System Internal Audit

• For 10 years, Audit cited lack of chemical control and urged chemical inventories

• NOW, Audit **assumes** that a member has chemical inventories in place
  – Picks entries from inventories and verifies on the shelf
  – Picks items from the shelf and verifies in the inventory
Incidents are uncommon, but a single event can be devastating …

… injuries, property damage, and lost productivity
Texas A&M University

January 12, 2006, 3 am …

… Physical Plant personnel notice drop in water pressure in the Chemistry Building.

Work crew arriving at 5:30 am to investigate discovers …
February 2006 …

… After chemical safety training, Ag research personnel discover old bottle of picric acid.

EH&S personnel arrive and find a 19-year old bottle whose contents are dry and crystallized …
PVAMU Ag Research – Bottle of Picric Acid discovered
Picric Acid

- Picric acid, common name for 2,4,6-trinitrophenol (TNP).
- A yellow crystalline solid.
- Highly nitrated compounds can be explosive (e.g., TNT – Trinitrotoluene - TNT).
Picric acid detonated by a gallon of gasoline

Vial of wet picric acid that has been agitated, leaving yellow crystals on the glass. Most has settled to the bottom.

Aftermath of NJ picric acid explosion that killed one factory worker.
Halifax, Nova Scotia, December 6, 1917

- Two ships collide in the harbor
- Vessel with >2,000 tons of picric acid explodes
- Shatters the town
- Kills 2,000 and injures another 6,000
- The largest manmade explosion in history until the A-bombs of WWII
What’s on your shelves?
What's on your shelf?
What's on your shelf?

Sensitizer!
Highly toxic! Corrosive!
Cancer suspect agent! Mutagen!
Readily absorbed through skin!
Target organ: nerves, blood!
Target organ: liver, kidneys!
Combustible liquid!

Aldrich

20.794-2

100g

Hydrazine monohydrate, 98%
b.p. 120.1°C  H₂NNH₂·H₂O  F.W. 50.06
m.p. -51.7°C  n° 1.4280
d 1.032
Necessary Elements

1. User-Friendly Data Collection / Inventory / Tracking Tools
2. Strong education and communication
3. Periodic inventory & audits of chemicals & waste management
Building the Toolbox

Organized Around the
Chemical Management Cycle
or “Lifecyle”
Chemical Management Cycle

CONTENTS:
1. Product Ordering / Shipping – neat chemicals and products
2. Receiving & Storage – stores & chemical stockrooms
3. Use & Management
   - Reagents & stock solutions
   - Process chemicals
   - Samples
   - Mixtures & spent products
   - Reaction by-products
   - Residues & empty containers
4. Treatment, storage & disposal (TSD)
5. Treatment Distillation Recycling
6. Waste Accumulation
   - HAZARDOUS WASTE – SATELLITE ACCUMULATION AREA (SAA)
   - UNIVERSAL WASTE ACCUMULATION AREA (SEPARATE FROM SAA)
7. <90-day (<180-day) central accumulation area
8. Waste consolidation, manifesting, & shipping
9. Recycling

Chemical exchange (Old chemicals are not “waste” until determined to be unusable.)
Chemical Inventory

A Major Tool for Safe Chemical Management
Inventory Options – From Simple to Comprehensive

- Homegrown spreadsheets or handwritten lists
  - In use at TAMUCC,
- A&M System Excel inventory tool
  - In use at TAMIU, Commerce at one time, TVMDL, TAMUSA, TAMUT
- Commercially-available inventory software or service
  - Chemtracker (WTAMU, TAMHSC, TAMUK)
  - Vertere (Tarleton, just beginning)
  - EHS Assistant (TAMU)
  - Other (PVAMU)
My Decade-Long Quest

- Reviewed dozens of inventory and MSDS systems
- Built my own and conducted inventories to grow my wish-list of features
- **CONCLUSION**: Stanford University’s ChemTracker feature set fits our needs
- Willing to give price breaks for A&M System
## 2013 Fee Schedule

<table>
<thead>
<tr>
<th>Institution Category</th>
<th>R&amp;D Expenditure*</th>
<th>Annual Membership Fee</th>
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<tbody>
<tr>
<td>Category 1</td>
<td>&gt; $100 M</td>
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<tr>
<td>Category 2</td>
<td>&gt;$30 M - $100 M</td>
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<td>Category 3</td>
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<tr>
<td>Member</td>
<td>R&amp;D ($\times 1000)</td>
<td>Annual Fee</td>
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<tr>
<td>System Offices</td>
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<td>Prairie View A&amp;M University</td>
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<tr>
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<td>Annual Fee</td>
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**TOTAL EST. FEE** $68,000

Total TAMU R&D Expenditures (FY14 Est) $664,954

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