

Current Perspectives on DOE Chemical Safety Vulnerabilities

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1994

DOE's Chemical Safety Vulnerabilities Working Group Completes their broad-based review of the DOE Complex

The working group condensed the vulnerabilities into eight generic categories

- Characterization of Chemicals
- Unanalyzed Hazards
- Past Chemical Spills
- Planning for Disposition of Chemicals
- Chemical Storage Practices
- Condition of Facilities and Safety Systems
- Abandoned and Residual Chemicals
- Inventory Control and Tracking

That was then, what about now?

1994

- DOE Complex Transitioning to a heavier EM mission
- Starting to evaluate and treat legacy wastes, both chemical and nuclear



Hazardous Chemical Wastes at Rocky Flats

2012

- EM mission is well established
- Significant progress being made in TRU, low-level, and chemical wastes. Some progress with HLW.



No Rocky Flats

Characterization of Chemicals



1994

Uncharacterized chemicals throughout the complex including:

- corroded gas cylinders
- drums of waste
- residues in process areas and abandoned facilities

2012

Still plenty of mysteries. Many obvious vulnerabilities have been addressed, but especially during D&D and waste remediation poorly characterized chemicals can create hazards.

Recent example:

July 2010 exothermic reaction involving lithium oxide during uranium washing at LLNL. Labeling (characterization) did not match actual form.

Unanalyzed Hazards



1994

The start of some major D&D efforts led to incidents with asbestos and hazardous residues in process equipment.

Programmatic safety analysis of chemical safety hazards was weak throughout the complex.

2012

Safety analysis of chemical safety hazards is much stronger and more formalized although recent overzealous 'screening' of hazards is worrisome.

Recent example: Legacy wastes with unknown hazards still turn up. In April 2010 (and again in November 2010), hazardous fumes (HCl) from TiCl_4 evolved during TRU venting operations in F-Canyon.



HAZMAT Training with TiCl_4

Past Chemical Spills



Past spills of chemicals usually don't fall into the Board's jurisdiction.



Mercury remediation at Oak Ridge

Planning for Disposition of Chemicals



1994

Hazardous chemicals everywhere (mercury, nitric acid, aluminum nitrate, TBP, carbon tetrachloride, etc.).



Chemical disposition activities at PFP (2004)

2012

Excellent progress

- Better coordination of deliveries to reduce inventories
- Chemicals are purchased with final disposal plan in place
- Old chemicals continue to be removed.

Chemical Storage Practices



1994

“Some of the most serious vulnerabilities identified at DOE facilities derive from the improper storage of hazardous chemicals.”



Chemical storage tanks at Fernald (1994)

2012

Significant improvements
The main problem now is degrading facilities with remaining chemical inventories.



Flammable storage cabinet at INEEL

Condition of Facilities and Safety Systems



1994

“The deterioration of facilities and their associated safety systems is widespread at most DOE sites.”



Beta-4 in the 1990's

2012

Still a significant problem for both nuclear and chemical safety. See the Board's reports to congress on degrading infrastructure.

- Progress slow due to the enormous costs involved with significant upgrades or new facilities
- Many degrading facilities are now gone—notably the entire Rocky Flats site.
- Aside from a few newcomers, remaining facilities are almost 20 years older than in 1994

Abandoned and Residual Chemicals



1994

Two major problems:

1. Surplus chemical inventories abandoned with questionable storage configuration
2. Residual chemicals in process equipment

2012

Surplus inventories have been largely addressed.

Residual chemicals are still a significant hazard during D&D activities.

Examples: Nitric acid in F-Canyon, Ammonium nitrate in ductwork, legacy Be.

Residual Chemicals during D&D



F-Canyon: Nitric Acid
Ammonium nitrate



Inventory Control and Tracking



1994

- Inventory controls usually in place
- Multiple systems often existed for different purposes creating confusion
- Computer based systems limited by technology



2012

- On-going progress in this area often related to improvements in computer technology

Example: Pantex recently moved from two inventory tracking systems to a single one. The transition period—where three systems were in use led to a TSR violation.

Conclusions



- In general the DOE complex is in a better state regarding chemical safety than it was during the major assessment in 1994
- Significant problems in chemical safety remain. Most notably remaining poorly characterized hazards and aging infrastructure.
- It may be prudent to initiate another complexwide assessment of chemical hazards.
 - It's been almost 20 years
 - New vulnerabilities may turn up
 - Continued weaknesses in formerly identified vulnerabilities should be examined
 - Does anyone know what the overall state of chemical safety in the DOE complex is today?