PROCESS KNOWLEDGE DATA GATHERING AND REPORTING IN SUPPORT OF DECOMMISSIONING

Health Physics Society
Annual Meeting
West Palm Beach, Florida

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June 27, 2011

Backdrop

- Summary of recent ORAU decommissioning activities at the Oak Ridge National Laboratory (ORNL) and the East Tennessee Technology Park (ETTP).

- Project objective was to generate approved Waste Lot Profiles for legacy facilities scheduled for demolition and shipment to the Environmental Management Waste Management Facility (EMWMF) or appropriate alternate facility.

- The form and content of process knowledge (PK) reports were developed with input from the EMWMF Waste Acceptance Criteria (WAC) Attainment Team and regulators.

What is PK?

- PK may be defined as the knowledge of the design and the history of operations that occurs during the life cycle of a facility (paraphrased from SRNL guidance) – similar to the MARSSIM historical site assessment.

  - What was the facility designed to do?

  - What types of operations were conducted at the facility?

  - Could these operations have contaminated the facility or surrounding environment?

  - What potential contaminants were used or stored at the facility?

  - Were there spills or releases?

Why is PK Important to Decommissioning?

- Worker safety:

    - The level of PPE can be set based on PK (e.g., is there potential for mercury vapor?).

    - Dangerous environments/conditions may be identified (e.g., were perchlorates were used in hoods?)

    - Special training requirements can be identified (e.g., beryllium awareness).

Why is PK Important to Decommissioning? (cont.)

- Characterization planning:

  - Identify potential contaminants and, thus, the target analytes for laboratory analysis.

  - Identify process systems and system configurations, whether the system should be sampled, and where the sample should be collected.

  - Identify areas with high potential for contamination for biased sampling.

- Address WAC (physical and analytical).

- Identify anomalous waste.

What Are Some Types of PK Data?

- Some types of PK data used to decommission ORNL and ETTP facilities include:

  - Design drawings.

  - Historical documents [e.g., *History of the Oak Ridge National Laboratory* by Thomas (1963) and *A Brief History of the Chemical Technical Division* (ORNL/M-2733)].

  - Historical photographs.

  - Radiological survey reports.

What Are Some Types of PK Data? (cont.)

- Facility-specific databases:

  - Spill history,

  - Waste Information Tracking System (WITS), and

  - Hazardous Materials Management Information System (HMMIS).

- Facility walkdown summary reports.

- Living memory data.

Facility Walkdowns

- Facility walkdowns are critical for worker safety planning and to assure on-the-ground-conditions match historical descriptions.

- For Oak Ridge operations, investigators also document the nature and number of items requiring special handling or disposition planning, such as the following:

  - Items containing polychlorinated biphenyls, asbestos, lead, or refrigerants,

  - Items with physical WAC restriction (e.g., large items, pipes, and concrete), and

  - Too "hot" for EMWMF.

Living Memory Interviews

- Special emphasis was made to interview facility managers, scientists, technicians, or anyone with direct knowledge of process-related activities.

- Interviews often led to more contact names and reports but also offered anecdotal accounts of releases, process-related operations, maintenance activities, and other relevant information not addressed in the written record.

- "Fun" part of PK data gathering. Often got not-so-useful information such as, "The operations manager was a jerk and we all hated him."

Example PK Data – Timeline

1948   Constructed as the Solvent Column Pilot Plant (Bldg. 706-HB).

1952   Interim-23 process experimentation in progress (kilogram quantities of ^{233}U extracted from irradiated thorium).

1950s   Used for chemical engineering studies of radiochemical processes involving evaporations, solvent extraction, and ion exchange.

<1963   Facility was used to store empty mercury flasks and cleaned mercury from the resin columns in Bldg. 3592.

1975   Major decontamination effort completed including pouring a new 2-in slab over existing slab to affix radiological contamination.

~1980   The sol-gel technology development program operated out of Bldg. 3503 for coating nuclear fuel pellets with a metal oxide.

~1986   Building houses a program producing microspheres from depleted U.

> 1986   Facility used for equipment and material storage (start date unknown).

2005   Majority of legacy materials removed.

Example PK Data – Waste Summary

Waste Description	Classification	Proposed Disposal Location	Amount*
Radiological-contaminated demolition debris (PCB remediation waste)	LLW	EMWMF	91,250 yd^3
Non radiological demolition debris	Construction/demolition waste	ORRILF	22 yd^3
PCB Oil	TSCA Waste	Commercial Vendor	3,600 gal
Used Oil (non-PCB)	Used Oil	Commercial Vendor	200 gal
PCB Ballasts/Capacitors	TSCA/PCB Remediation Waste	EMWMF	3,820 (no.)
Radiological PCB-Contaminated Equipment	TSCA LLW	EMWMF	850 yd^3
Lamps (bulbs, tubes, etc.)	Universal Waste	Commercial Vendor	7,200 (no.)
Batteries	Universal Waste	Commercial Vendor	550 (no.)
Mercury-containing equipment	Universal Waste	Commercial Vendor	70 (no.)
Contaminated wastewater from demolition activities	LLLW	LGWO	TBD
Radiological-contaminated ACM	ALLW	EMWMF	645 yd^3
Hazardous/Mixed Waste	MLLW	Energy*Solutions*	20 yd^3

*All volumes were initial project estimations. Final volumes are accurate and included in the waste profile document.

ACM = Asbestos-Containing Material

ALLW = asbestos low-level waste.
EMWMF = Environmental Management Waste Management Facility.
LGWO = Liquid and Gaseous Waste Operations.
LLLW = liquid low level waste.
LLW = low level waste.
MLLW = mixed low level waste.
ORRILF = Oak Ridge Reservation Industrial Landfill
PCB = polychlorinated biphenyl.
TBD = to be determined.
TSCA = Toxic Substances Control Act.

Example PK Data – Photographs

Conclusions

- PK data are used to indicate the presence or absence of contaminants.

- Multiple lines of investigation are necessary for characterization planning and to help determine which disposal facility is best suited for targeted wastes.

- The model used by ORAU assisted remediation contractors and EMWMF managers by identifying anomalous waste and items requiring special handling.

QUESTIONS?