Office of Operating Experience Analysis, EH-33 • U.S. Department of Energy • Washington, D.C. 20585

OPERATING EXPERIENCE WEEKLY SUMMARY

Office of Nuclear and Facility Safety

September 25 - October 1, 1998

Summary 98-39

Operating Experience Weekly Summary 98-39

September 25 through October 1, 1998

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EVENTS

1. MULTIPLE RADIOACTIVE UPTAKES AT OAK RIDGE

On September 22, 1998, the Oak Ridge Y-12 Uranium Conversion and Processing facility manager reported that several workers conducting casting and parts cleanup operations had elevated personal air monitor sample results. The facility manager directed health physics personnel to process supplemental bioassay samples to assess the dose equivalent to the operator who had the highest collective result and identify other resident workers who may have been exposed. Facility personnel do not expect committed effective dose equivalents to exceed regulatory limits; however, bioassay samples for at least nine individuals exceeded the site threshold for investigation. The judicious use of personal air monitoring led to early detection and mitigation of radioactivity uptakes. (ORPS Report ORO--LMES-Y12NUCLEAR-1998-0075)

The facility manager initiated an investigation to determine causes and long-term corrective actions. In the interim, he directed facility personnel to implement the following short-term corrective actions.

- Require respiratory protection for entry to all affected areas pending completion of the investigation.
- Require personal air monitoring for all personnel entering affected areas.
- Install additional continuous air monitors at respiratory protection area boundaries.
- Conduct additional bioassays to identify sources of the radioactivity and to assess personnel dose equivalents.

Facility personnel are re-starting facility processes following a 4-year shutdown. Although the affected areas are monitored by fixed-location continuous air monitors, facility oversight personnel recommended the use of personal air monitoring early in the startup process to more accurately monitor breathing zone radioactivity. Investigators are uncertain as to whether an unexpected source of airborne radioactivity has developed or whether more accurate monitoring has revealed a chronic condition. OEAF engineers will continue to track this occurrence and will provide additional information as it becomes available.

KEYWORDS: airborne monitoring, airborne radioactivity, internal exposure, personnel monitoring

FUNCTIONAL AREAS: Operations, Radiation Protection, Startup

2. MERCURY VAPOR RELEASE AT LOS ALAMOS ACCELERATOR COMPLEX

On September 18, 1998, at Los Alamos National Laboratory Accelerator Complex, mercury vapors escaped from an accelerator shutter system after a technician opened a reservoir to fill it with mercury. He was testing the mercury-filled shutter system limit switches, when he heard a hissing noise and realized that gas and vapors were escaping through a taped hole at the top of the reservoir. He immediately notified personnel to evacuate the area, then shut down the system. A supervisor locked the area to prevent personnel access and requested support from hazardous material and industrial hygiene personnel. Hazardous material personnel monitored the area and determined that 0.044 mg/m^3 of mercury was present at a height of 3 feet from the floor. The threshold limit value for mercury is 0.025 mg/m^3. Response crews left the area and

returned in full protective equipment to obtain more detailed readings, and they obtained readings of 0.145 mg/m^3 directly above the mercury reservoir. The facility manager directed cleanup operations. He also advised personnel on the floor above the area of the release to avoid their work area over the weekend because 0.005mg/m^3 of mercury had been detected in that area. Failure to evaluate the hazards of performing work simultaneously (testing the switches and filling the reservoir) created a path for personnel to be exposed to mercury vapors. (ORPS Report ALO-LA-LANL-ACCCOMPLEX-1998-0014)

Investigators determined that facility personnel had replaced sensors in the upper and lower limit control switches of the accelerator neutron flight paths several weeks earlier. However, facility personnel tested the switches and determined that they did not activate the protection systems. Electrical personnel evaluated the switch malfunction and decided to increase the volume of mercury in the reservoir because they believed increased pressure and flow to an upper limit switch would activate the protection system. Investigators determined that the technician added mercury to the reservoir, then increased the helium delivery pressure to the system, driving the mercury toward the lower limit switch. Investigators determined that increased helium pressure drove the mercury beyond the lower limit switch, created bubbling in the mercury reservoir, and caused the release.

The facility manager held a critique. Critique members learned that the technician did not use the applicable procedure when testing the limit switches and did not complete a group work request before he began testing. They also learned that no one evaluated the hazards of performing two different tasks simultaneously. They also learned that the technician would have been exposed to a concentration of mercury that exceeded the threshold limit value if he had not immediately reacted to the sound of the venting helium. During the critique, the technician stated that he believed there was organizational pressure to ensure the neutron flight path was operable and that this pressure may have contributed to his failing to complete work as required by procedures. The facility manager will continue to review this event and will provided corrective actions as necessary.

NFS has reported on failure to follow procedures in several Weekly Summaries. Following are some examples.

- Weekly Summary 97-20 reported that a Fernald Environmental Management Project subcontract electrician was exposed to a 480-volt electrical shock hazard when he violated procedures. The facility manager determined that he connected wiring in a repaired conduit for parking lot lighting to a 480-volt source without authorization and outside his job scope. (ORPS Report OH-FN-FDF-FEMP-1997-0032)

- Weekly Summary 97-11 reported that 25 to 30 gallons of grout water contaminated with plutonium-238 and curium-243 overflowed from the risers of a tank at the Savannah River Site onto the ground. A subcontractor was filling the tank with grout as part of a Resource Conservation and Recovery Act tank closure. Investigators determined that the subcontractor did not follow procedures for checking excess water in the tank and did not effectively plan the grout-filling process. Failure to follow procedures and poor planning resulted in the spread of contamination. (ORPS Report SR--WSRC-SLDHZD-1997-0005)

- Weekly Summary 97-10 reported that a researcher at the Lawrence Berkeley National Laboratory spilled a small amount of orthosphosphate phosphorus while opening a vial. The surrounding area and equipment were also contaminated. The work was being conducted in a laminar-flow biohood in a laboratory room. Neither the biohood nor the room was authorized for the radioisotope work. The activity of the radioisotope was ten times the authorized amount for the laboratory, and the chemical form was not authorized. Bioassay (urine) testing confirmed that

the researcher received an uptake of 0.15 microrem. (ORPS Report SAN--LBL-LSD-1997-0002)

This event illustrates the importance of adequate work planning and control. In this event, the technician performed hazardous work without anyone performing a complete hazards analysis, resulting in the release of mercury vapors. Processes are in place at DOE facilities to ensure that work hazards are systematically identified and incorporated into hazard analyses, work permits, procedures, and other work-planning documents. Breakdowns in safety management systems occur when the information is not adequate or is not communicated to workers in a timely manner. Facility and construction managers need to ensure that work permits adequately define activity end points and that no work takes place until each worker understands the protective measures that apply and when these measures are to be in place. They also need to provide oversight and control adequate to ensure that work is completed safely and according to plan. Work planners and supervisors should review the following documents.

- DOE O 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees*, describes the required elements of a worker protection program at DOE facilities. Section 14.a(2) of attachment 2, "Contractor Requirements Document," states that workers shall be informed of foreseeable hazards and required protective measures before starting work on the affected operation.

- DOE O 4330.4B, *Maintenance Management Program*, section 8.3.1, provides guidelines on work control systems and procedures. The Order requires using control procedures to help personnel understand the requirements for working safely. Chapter 6, "Maintenance Procedures," identifies maintenance procedures and other work-related documents needed to provide appropriate work direction and ensure that maintenance is performed safely and efficiently. Chapter 8, "Control of Maintenance Activities," states that a work control program establishes the requirements for identifying, planning, approving, and conducting maintenance activities.

- DOE G 450.4-1, *Integrated Safety Management Guide*, provides extensive guidance to DOE contractors for developing, describing, and implementing an integrated safety management system to comply with DOE policy and acquisition rules. The guide addresses core functions and guiding principles related to defining scope of work, analyzing hazards, developing and implementing controls, and performing work at the facility, project, or activity level.

- DOE/EH-0256T, *Radiological Control Manual*, states: "Each person involved in radiological work is expected to demonstrate responsibility and accountability through an informed, disciplined, and cautious attitude toward radiation and radioactivity." The manual sets forth DOE guidance on the proper course of action in the area of radiological control.

KEYWORDS: work control, hazardous material, procedures

FUNCTIONAL AREAS: Procedures, Industrial Safety, Work Planning, Hazardous and Barrier Analysis

3. PIPE FALLS DURING ASBESTOS ABATEMENT AT OAK RIDGE

On September 14, 1998, at the Oak Ridge East Tennessee Technology Park, workers were performing asbestos abatement activities when an 8-foot section of 3-inch diameter metal pipe broke loose from its overhead hangers and fell approximately 20 feet into an area that was not isolated by a barrier. No personnel were injured; however, this occurrence had the potential for significant injury to anyone in the path of the falling pipe. (ORPS Report ORO--BNFL-K33-1998-0008)

Investigators determined that workers began to clean up the pipe debris, including asbestos material resulting from the falling pipe, before isolating the area to ensure that other facility personnel did not enter the work area. They determined that no one re-evaluated the personal protective equipment requirements previously identified on the radiation work permit. Investigators also determined that no one inspected the condition and configuration of the pipe hangers before work began.

Facility managers have stopped the asbestos abatement work activity until the work team's training, procedures, hazard reviews, and failure mode contingency plans are evaluated. This is the third falling pipe event on the Oak Ridge Reservation in the past 3 months, indicating potential weaknesses in the site lessons-learned program.

NFS reported a similar event in Weekly Summary 97-03. On January 7, 1997, at the Fernald Environmental Management Project, workers were lifting scrap metal with a hydraulic grappling unit when a piece of steel conduit was ejected approximately 30 feet and struck a worker on his back. Investigators determined that the work plan did not include safety distance requirements other than maintaining a safe distance from the swing radius of the grapple arm. (ORPS Report OH-FN-FDF-FEMP-1997-0004)

OEAF engineers searched the ORPS database for similar occurrences at the Oak Ridge Reservation and found the following reports.

- On June 17, 1998, a worker was struck by a falling pipe while workers were cutting piping in an elevated pipe rack. Facility managers determined that supervisors must coordinate work activities so that one crew does not jeopardize the safety of another crew. (ORPS Report ORO--BJC-K25GENLAN-1998-0005)

- On July 9, 1998, a section of pipe fell from the ceiling and landed on a table where employees where eating lunch. Investigators determined that the pipe remained inadequately supported in the overhead when its related pump was previously removed. (ORPS Report ORO--ORNL-X10ENVIOSC-1998-0002)

This event underscores the importance of using effective work control practices and job planning. DOE facility managers should ensure that personnel understand the basics of work control practices and safety and health hazard analyses.

- DOE O 4330.4B, *Maintenance Management Program*, section 8.3.1, provides guidelines on work control systems and procedures. The Order requires using control procedures to help personnel understand the requirements for working safely.
- DOE O 440.1, *Worker Protection Management for DOE Federal and Contractor Employees*, states that the contractor must identify workplace hazards and evaluate the risk of associated worker injury or illness.

- DOE/EM-0142P, *Decommissioning Handbook*, March 1994, DOE Office of Environmental Restoration, chapter 12 provides requirements for worker protection

during decontamination and decommissioning activities. It states that worker protection is an important element of any project. The handbook divides worker protection issues into three categories: (1) protection from radiation; (2) protection from toxic and hazardous materials; and (3) protection from traditional industrial safety hazards. The handbook further states that DOE decommissioning activities may combine hazards not commonly encountered elsewhere (such as industrial safety hazards and radiological hazards) and lists OSHA regulations that apply to decommissioning, as well as key elements of a health and safety program. Section 12 of the handbook states that extra precautions are required for worker safety because hazards in the facility may be unknown and many activities are infrequently performed.

KEYWORDS: fall, pipe, job planning, job-hazard analysis

FUNCTIONAL AREAS: Decontamination and Decommissioning, Hazards and Barrier Analysis, Work Planning

4. SPRAY LUBRICANT IGNITES AT HANFORD SITE

On September 18, 1998, at the Hanford Site, a mechanic applied spray lubricant to a truck-mounted drill head assembly he was repairing and the lubricant ignited. He was working inside a temporary structure that was controlled as a radiological buffer area. The fire lasted less than 30 seconds and was extinguished with a portable fire extinguisher. There were no injuries or equipment damage as a result of this event. Investigators believe that a static electric charge provided the ignition source for the spray lubricant. (ORPS Report RL--PHMC-TANKFARM-1998-0117)

Investigators determined that the spray lubricant used was Boman “Red Grease,” an aluminum complex-based grease with propellants that included butane, isobutane, propane, and hexane. Investigators determined that the equipment and surrounding areas were not radiologically contaminated. Facility managers are considering corrective actions that include spraying this lubricant on a rag away from potential ignition sources and wiping it on the equipment to be lubricated instead of spraying it. They are also considering adding the lessons learned from this event to the training program for mechanics.

NFS has reported similar events where job hazards were either not addressed during work planning or where personnel were unaware of the hazards in several Weekly Summaries. Following are some examples.

- Weekly Summary 98-13 reported that two electricians at the Los Alamos National Laboratory Accelerator Complex received burns to their hands and faces when vapors from an aerosol electrical contact cleaner they were using contacted an electrical space heater, ignited, and formed a fireball. They were using the cleaner while performing maintenance on two electrical transformers. Investigators determined that use of the space heater was not specified in the work package and they believe that no one performed a chemical hazard analysis before the electricians began work. (ORPS Report ALO-LA-LANL-ACCCOMPLEX-1998-0005)

- Weekly Summary 97-08 reported that a welder at the Oak Ridge K-25 Site was fatally injured when his anti-contamination clothing and coveralls caught fire. The welder was using a cutting torch in a contaminated cell area and was wearing multiple layers of protective clothing, a respirator, and a welder's mask. DOE appointed a Type A Accident Investigation Board to investigate the welder fatality. Board members found that concerns regarding the contamination hazard may have caused the use of a level of protective equipment that impeded the welder's response to the actual, but unrecognized, hazard of clothing ignition. (ORPS Report ORO--LMES-K25GENLAN-1997-0001, and *Type A Accident Investigation Board Report on the February 13, 1997, Welding/Cutting Fatality at the K-33 Building, K-25 Site Oak Ridge, Tennessee*)

- Weekly Summary 96-05 reported that two operators and a health physicist at Hanford Analytical Laboratory were exposed to hazardous vapors from a stripcoat while working in a contamination confinement structure. The exposure was a result of operators wearing powered air-purifying respirators that were inappropriate for a confined atmosphere. Investigators determined that no one reviewed the material safety data sheet for the stripcoat during preparation of the work package or during the pre-job briefing. (ORPS Report RL--WHC-ANALLAB-1996-0006)

OEAF recommends performing hazard assessments. Hazard assessments are valuable for identifying inherent or potential hazards that may be encountered in the work environment. The *Health and Safety Plan Guidelines,* developed by the Office of Environmental Management, identify the following four elements that should be included in a hazard assessment.

- identifying the operation or job to be assessed
- dividing the job or operation into constituent tasks
- identifying the hazards associated with each task
- determining the necessary hazard controls

Evaluation and identification of hazards must be an on-going process and should be performed for the following job phases.

- initially, during the work planning phase
- immediately when the work process or job starts (This assessment should be a more detailed, "real time" evaluation and should be used to further define existing hazards and to aid in the selection of appropriate engineering and administrative controls.)
- before any change in the job, task, or process
- as required by changing work conditions
- continually, as appropriate

In this event, facility personnel did perform a hazard assessment, but did not consider that a statically induced spark could ignite the lubricant.

Managers and supervisors in charge of job performance should conduct routine inspections of their work sites to identify new or previously overlooked hazards. Recent EPA-mandated reductions in the use of ozone-depleting substances have resulted in aerosol product manufacturers sometimes substituting ozone-depleting propellants with flammable alternatives. Managers and supervisors should also look for any failures to control known hazards. The *Health and Safety Plan Guidelines* document is available at URL http://tis.eh.doe.gov/docs/hasp.

These events underscore the importance of performing complete evaluations of potential hazards. In this event, facility personnel reviewed material safety data sheets when they assessed the job hazards. However, safety and health hazard analysis should not solely rely on information available on material safety data sheets. It should include changing work conditions that could create hazardous environments, such as the production of sparks. Facility managers should review their use of aerosol products and ensure that hazards associated with their use are evaluated and mitigated.

- DOE O 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees*, states that the contractor must identify workplace hazards and evaluate the risk of associated worker injury or illness.

- DOE O 4330.4B, *Maintenance Management Program*, section 8.3.1, provides guidelines on work control systems and procedures. The Order requires using control procedures to help personnel understand the requirements for working safely.

- DOE-STD-1050-93, *Guideline to Good Practices for Planning, Scheduling and Coordination of Maintenance at DOE Nuclear Facilities*, section 3.1.1.3, provides the key elements of an effective planning program. Included is guidance on consistency in planning between disciplines to avoid confusion and frustration of work groups. The standard also discusses the need for thorough reviews of work packages by experienced individuals to eliminate errors. Managers at DOE facilities should review their planning programs and policies to ensure consistency with the guidance in the standard.

KEYWORDS: work control, chemical, combustible materials

FUNCTIONAL AREAS: Hazards Analysis, Work Planning, Industrial Safety

OEAF ACTIVITY

The DOE Office of Operating Experience Analysis and Feedback (OEAF) (EH-33) will sponsor a 3 day Data Analysis Forum to be held January 26 to 28, 1999, in Las Vegas, NV, at the St. Tropez Hotel.

Those who should attend this meeting include DOE Federal and contractor personnel and other Federal agencies and contractors who collect, analyze, report, and/or use operational data in their work for the Federal Government.

The purpose of this forum is to share innovative techniques for collecting meaningful data, analyzing data to reveal useful insights, and presenting clear, concise results so that decision

makers can act and/or the public can be informed. Presentations will provide specific products or ideas that attendees can take back to work with them. The objectives of the forum are to:

- Share successful tools and techniques used to collect, validate, analyze, and present DOE operational data (so that others may emulate them).
- Share knowledge of available data sources in the DOE Complex at both the local as well as the corporate level.
- Share lessons learned (both good and bad) in collecting, validating, analyzing and presenting results.
- Promote the utilization of standard and innovative methods for data analysis to better evaluate DOE operational data.

Papers and presentations are currently being solicited for the Data Analysis Forum by a Call for Papers. Topical areas may include Data Collection, Data Analysis, and Presentation of Results. There are three ways to present information at the 1999 Data Analysis Forum: (1) by making a standalone presentation; (2) by leading or participating in a panel discussion or facilitated discussion; or (3) by providing a display in the "Analysis Display Area."

Additional information on submitting a paper, online registration, and hotel information can be found on the OEAF Web Page at URL http://tis.eh.doe.gov/web/oeaf/workshop. The deadline for submitting proposals is October 28, 1998. Presenters will be notified of selection results by November 11, 1998.

If you have any questions about the 1999 DOE Operating Experience Data Analysis Forum, please contact one of the following:

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