OPERATING EXPERIENCE SUMMARY

Inside This Issue

- *Flying debris from ruptured gas drying units injured three laboratory workers*
- *An unsecured 9-ton counterweight fell off a flatbed truck during transport*
- *A QA inspector identified and confiscated a suspect bolt based on information in a lessons-learned report*
- *Sparks from an abrasive wheel saw ignited a worker's personal protective clothing during a cutting operation*
- *Price-Anderson Enforcement Conference convened to investigate welding inspection program inconsistencies*

U.S. Department of Energy

Office of Environment, Safety and Health

OE Summary 2003-05

March 10, 2003

The Office of Environment, Safety and Health (EH), Office of Performance Assessment and Analysis publishes the Operating Experience Summary to promote safety throughout the Department of Energy (DOE) complex by encouraging the exchange of lessons-learned information among DOE facilities.

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Operating Experience Summary 2003-05

TABLE OF CONTENTS

EVENTS

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EVENTS

1. WORKERS INJURED WHEN GAS DRYING UNITS RUPTURE

On December 19, 2002, at the Idaho Falls Facilities and Laboratories complex, a researcher and two laboratory workers sustained injuries when two gas drying units (plastic canisters) ruptured, sending debris flying throughout the laboratory. The drying units were accidentally overpressurized with compressed air during an experiment. The researcher sustained only minor abrasions to the forearm and hand, but the other workers were more seriously injured. One worker suffered a deep laceration to the forearm and a groin injury; the other sustained abrasions on the arm, eye irritation from desiccant material and carbon granules, and bleeding from his left ear. Emergency medical personnel took the most seriously injured worker to a local hospital, where he received stitches to close the arm laceration. The other workers were treated at the contractor's medical facility and released. (ORPS Report ID--BBWI-TOWN-2002-0006)

The previous day, the researcher had performed an experiment using nitrogen as the gas supply to an ion spectrometer and did not encounter any problems. He used a compressed nitrogen cylinder, pressure regulator, and filter canister arrangement in the carrier gas supply system. Figure 1-1 shows the system flow path beginning at the nitrogen cylinder, through the pressure regulator to the two canisters (dryers), to flow control devices, and to the exhaust. Maximum design pressure for the canisters was 90 psig. The pressure regulator on the nitrogen cylinder had an outlet pressure gauge with a range of 0 to 250 psi.

On the day of the incident, the researcher returned to the laboratory to perform another experiment that required using compressed air rather than nitrogen. The compressed air alignment included the same canisters between the carrier gas cylinder and the analytical equipment that were used the previous day. The researcher retrieved a compressed air cylinder, which did not have a regulator, from a storage area. Instead of using the regulator that was on the nitrogen cylinder, he took a regulator he believed would fit the application from a storage drawer and installed it on the compressed air cylinder. The researcher apparently either did not notice that the gauge on the newly installed regulator had a range of 0 to 300 bar (0 to 4,000 psi) or misread the "0 – 300 bar" on the gauge face as "0 – 300 psi."

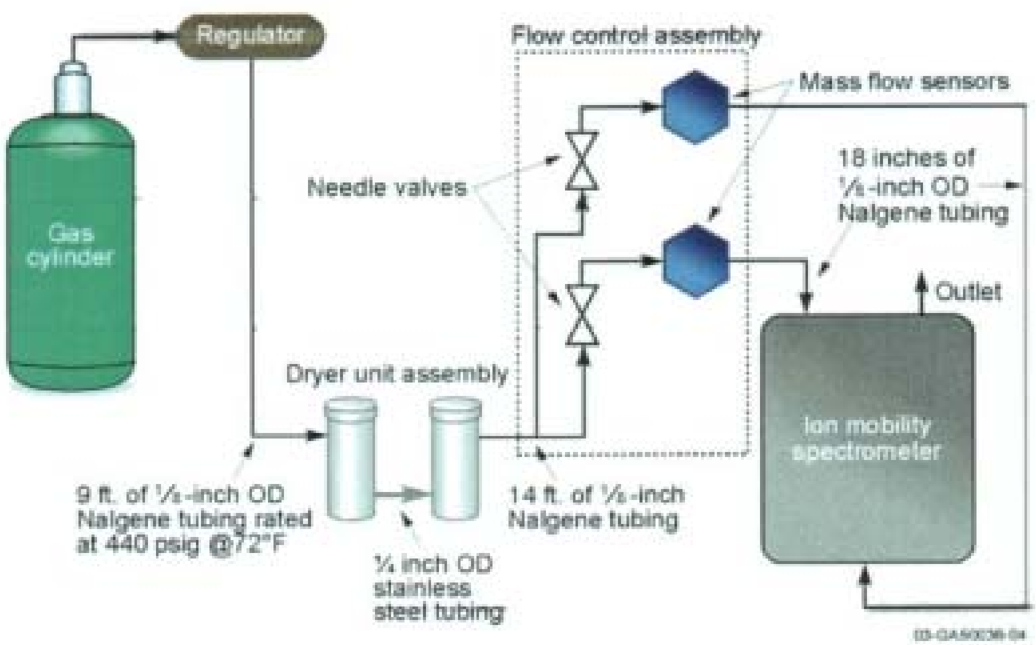

Figure 1-1. Ion spectrometer gas supply diagram

When the researcher opened the isolation valve to the compressed air cylinder, there was no indication of gas pressure on the regulator supply pressure gauge. Another lab worker came over to inspect the test hookup and tried to determine why the pressure regulator gauge was reading zero. He saw the gauge indicate pressure, heard a "whistling" noise, and suddenly the plastic canisters ruptured, spreading airborne debris around the room. Figure 1-2 shows the top of the compressed air cylinder after the incident, with the regulator still in place.

Figure 1-2. Compressed air cylinder with regulator

Investigators determined that the direct cause of this incident was personnel error (inattention to detail). The significant and sudden overpressurization of the plastic canisters that comprised the laboratory gas dryer system was possible because the researcher used a pressure regulator capable of delivering gas flow rates at pressures up to 2,500 psig, considerably in excess of the 90 psig maximum design pressure for the plastic canisters.

A deficiency in the compressed gas training program was a contributing cause in this incident. Training courses provided insufficient information about the hazards of stored energy systems or about relief valves, selection of regulators and gauges, regulator design theory, maximum working pressure, maximum operating pressure, and burst pressure.

Investigators identified the root cause of the incident as a management problem (policy not adequately defined, disseminated, or enforced). Contractor policies and procedures implement only portions of the appropriate compressed gas standards, such as those specified by the Compressed Gas Association (e.g., CGA P-1, *Safe Handling of Compressed Gases in Containers*) and the National Fire Protection Association (e.g., NFPA-45, *Standard on Fire Protection for Laboratories Using Chemicals*). The items missing in the policies and procedures are generally the same as those missing from the training courses.

Corrective actions identified by incident investigators included the following.

- Upgrade the current contractor requirements, policies, and procedures to adequately implement requirements for the safe assembly of compressed gas systems and the safe use of compressed gases.
- Upgrade the current contractor training programs to provide the appropriate level of knowledge for the safe assembly and use of compressed gas systems.
- Upgrade the current contractor inspection program to include critical elements of compressed gas safety, with emphasis on the safe assembly and use of compressed gas systems.

A search of the ORPS database for overpressure conditions that created hazards revealed several such events in the past few years. On August 11, 2002, at the Sandia National Laboratory, a pressure regulator connected to a gas cylinder failed, propelling the plastic lens off of a pressure gauge approximately 30 feet to strike an adjacent wall. The low-pressure side of the regulator had been incorrectly connected to the high-pressure cylinder. No injuries resulted from this occurrence. (ORPS Report ALO-KO-SNL-6000-2002-0007) On May 11, 2001, at the Hanford Tank Farm, a near miss incident occurred when a quick-disconnect pipe plug assembly was ejected from the end of a pressure test manifold and traveled 25 to 50 feet through an occupied area. The manifold was assumed to be depressurized when the event occurred, but a pressurization check was not performed. No injuries resulted from this occurrence. (ORPS Report RP--CHG-TANKFARM-2001-0033)

These events underscore the need to follow established standards and procedures when working with stored energy sources in the form of compressed gases. In the December 2002 event, a worker selected a pressure regulator for an experiment without noting the pressure range at which it could deliver compressed gas. This simple oversight resulted in the rupture of the experiment apparatus and injuries to him and two co-workers. Policies, procedures, and training programs need to encompass the appropriate requirements from existing regulations and standards. Personnel errors can negate the benefits of high-quality policies, procedures, and training programs, and thus these errors must be minimized by continuously paying attention to the details of the task at hand.

KEYWORDS: *Compressed air, gas cylinders, pressure regulator, injuries*

ISM CORE FUNCTIONS: *Analyze the Hazards, Develop and Implement Hazard Controls, Perform Work within Controls*

2. UNSECURED NINE-TON LOAD FALLS OFF TRUCK DURING TRANSPORT

On January 6, 2003, at the Idaho National Engineering and Environmental Laboratory, an equipment operator was transporting two unsecured, multiple-ton crane counterweights in a flatbed truck when one of the weights fell from the truck. A crane was used to lift the counterweight back onto the truck. Both counterweights were secured, and the driver delivered them to a staging area where equipment operators were to be trained in mobile crane operations. Line managers were notified of the incident after operators unloaded the counterweights about 90 minutes after the occurrence. There were no injuries and no reported damage to equipment. (ORPS Report ID--BBWI-CFA-2003-0001)

An equipment operator was assigned to drive the truck about a mile to deliver the counterweights, but he was redirected to another task, so another operator transported the counterweight. When the second operator turned a corner, driving at about 4 miles per hour, the 9-ton weight slid off of the truck bed and fell to the ground. The equipment operator immediately stopped the truck and called for assistance. A crane was brought to the scene to put the counterweight back on the truck. Equipment operators secured both counterweights before driving the truck to its destination and unloading them. Figure 2-1 shows the crane preparing to lift the fallen counterweight; Figure 2-2 shows the second counterweight after it was secured to the truck bed.

Figure 2-1. Crane and fallen counterweight

Investigators determined that neither counterweight was secured to the truck's flatbed before the operator began driving. The operator who inspected the truck knew that the

Figure 2-2. Truck with a secured counterweight

counterweights were not secured, but decided that the weight of the loads would prevent any movement during transport. However, the operator did not know that the 9-ton weight was resting on ice (Figure 2-3) that had formed on the bed of the truck after the weights were loaded 2 weeks earlier. The ice contributed to the counterweight falling off the truck.

Figure 2-3. Ice on bed of truck where the counterweight had rested

Investigators learned that the equipment operators did not think it was necessary to secure counterweights before moving them. The operators were also unaware that site management control procedures required loads to be tied down and assigned responsibility for ensuring properly secured loads to the driver, as did the Idaho Commercial Drivers License Manual.

The equipment operators' failure to secure the counterweights before moving the truck was the direct cause of this incident. Contributing causes included inadequate job planning and work control; failure to recognize the need to secure the loads; failure to follow standards and procedures for securing and transporting loads; ambient icy conditions; and operator complacency.

Corrective actions for this event included the following.

- Review the incident and lessons learned at tailgate (job-site) training sessions with equipment operators and their supervisors. Discuss the requirements for loading, securing, and hauling cargo safely as identified in site management control procedures, program requirement documents, and the Idaho Commercial Drivers License Manual.
- Conduct an adequacy review of the ratio of managers to workers in the Central Facility Area and reallocate resources as needed to ensure all work is adequately supervised.
- Issue a directive on the proper methods for loading and securing cargo. Develop a tailgate training program for equipment operators and other crafts targeted in the directive. Schedule and conduct tailgate training to the target audiences.
- Schedule management reviews in July and September 2003 to evaluate worker compliance with site requirements for loading and securing cargo. Based upon the evaluation results, determine the need for similar reviews in 2004.

A similar event occurred at Los Alamos National Laboratory on October 17, 2001, when an unsecured diesel generator fell from a flatbed truck during transport from one project site to another. Investigators learned that the truck driver had questioned a laborer about why there were no tie-down straps on the load and was told that the generators appeared to be heavy enough and well balanced to transport the short distance without being strapped down. There were no personnel injuries, but the generator sustained approximately $25,000 in damages and lubricating and cooling fluids from the damaged diesel generator leaked into the soil. (ORPS Report ALO--LA-LANL-SECURITY-2001-0001)

The following references provide information about securing loads for transport.

1. 49 CFR 393.100, *Protection Against Shifting or Falling Cargo;* http://www.gopher-resource.com/main.nsf/49CFR393-100?-OpenPage

2. 49 CFR 393.102, *Securement Systems;* http://www.gopherresource.com/main.nsf/49CFR393-102?OpenPage

The U.S. Department of Transportation Federal Motor Carrier Safety Administration has issued new rulemaking for loading and securing cargo. The final rule, 49 CFR Parts 392 and 393, *Development of a North American Standard for Protection Against Shifting and Falling Cargo,* became effective December 26, 2002. Motor carriers have until January 1, 2004 to comply with the new requirements. The URL is http://www.teamsters.org/sh/pdf/FMCSACargoShiftingStd.pdf

It is important for equipment operators and drivers who are transporting loads to understand the dynamics of loads under transport and their responsibility to ensure all loads are properly secured before moving them. Although this incident caused no injuries or property damage, there was the potential for harming personnel and equipment.

KEYWORDS: *Cargo, hauling, loading, securing, transportation*

ISM CORE FUNCTIONS: *Analyze the Hazards, Develop and Implement Hazard Controls*

3. SHARING LESSONS LEARNED HELPS IDENTIFY SUSPECT/ COUNTERFEIT BOLTS IN TIE-DOWN STRAPS

On January 30, 2003, a quality assurance (QA) inspector and a QA engineer at the West Valley Demonstration Project (WVDP) identified a suspect bolt. They found the suspect bolt on a ratchet lever tie-down strap that was to be used to secure a container of low-level radioactive waste to a shipping pallet. At the WVDP, QA inspectors observe all tie-down activities before shipping and specifically check the tie-down equipment for suspect/counterfeit items. Site management instituted this practice based on a review of a Hanford-issued lessons-learned report. (ORPS Report OH-WV-WVNS-HMT-2003-0001)

Six high-integrity containers at the WVDP were being prepared for shipment to the Nevada Test Site by a transport vendor when a QA inspector identified the suspect bolt on one of the ratchet lever tie-down straps. The QA inspector confiscated the bolt from the ratchet mechanism (Figure 3-1).

Figure 3-1. Ratchet mechanism for tie-down strap

The markings on the bolt head corresponded to the imported grade 8 fasteners identified in a Stanford Linear Accelerator Center (SLAC) ES&H bulletin on counterfeit parts (www.slac.stanford.edu/esh/bulletins/b09c.html). The bolt head carried the six marks of a grade 8 bolt, but did not have a manufacturer's mark (Figure 3-2). The Fastener Quality Act (www.nist.gov/fqa) requires fasteners to bear an insignia that identifies the manufacturer and indicates that the manufacturer's insignia has been recorded.

Figure 3-2. Bolt head showing markings

Inspectors found all the other bolts on the tie-down straps to be satisfactory. The transport vendor was asked to examine its remaining inventory of ratchet lever tie-down straps and to contact its supplier(s) to determine the origin of the strap. In an ongoing investigation at WVDP, investigators have identified four additional ratchet lever tie-down straps with suspect/counterfeit bolts. The manufacturer of the tie-down strap in this event is Kinedyne. A typical tie-down strap is shown in Figure 3-3.

Figure 3-3. A typical ratchet tie-down strap

The Hanford lessons-learned document (SELLS Identifier 2002-RL-HNF-0064) reported finding suspect/counterfeit pivot bolts in ratchet tie-down straps manufactured by Olympic Synthetic Products, Inc. and Highlift (Liftall) Ratchet Tie-Down Assemblies. A copy of this report can be accessed from the SELLS website at http://tis.eh.doe.gov/ll/listdb.html. Other manufacturers identified in ORPS reports include ITW Cargo-Safe, Allied International, Wire Rope Corporation of America, and Old Truck Straps, Inc.

Issue 2002-03 of the Operating Experience Summary reported a similar success story. A QA representative at Argonne National Laboratory – West found ratchet-type tie-down straps that had suspect/counterfeit bolts (Figure 3-4). The inspection leading to this discovery was performed in response to information in an ORPS report filed by Brookhaven National Laboratory (BNL) on this very problem.

Figure 3-4. Ratchet tie-down strap and suspect/counterfeit bolt

BNL Plant Engineering had received a DOE Quality Assurance Working Group Data Collection Sheet indicating that a Bechtel Hanford, Inc., QA engineer had found some suspect/counterfeit bolts in tie-down ratchet strap assemblies. BNL Plant Engineering personnel inspected these assemblies, and they also found suspect bolts.

The continued reporting of suspect/counterfeit items is positive in that personnel are proactively identifying potential problem-causing items and removing them from service. Since the beginning of 2003, seven occurrence reports have been filed regarding the discovery of suspect bolts in ratchet-type tie-down straps; of those, six were reported at the Hanford site following building and facility searches.

Suspect/counterfeit items have been a problem for both government and industry and have been a concern across the DOE complex since the early 1980s. Suspect/counterfeit items are not limited to bolts and fasteners. From January 2001 through January 2003, 168 occurrences involved the discovery of suspect/counterfeit items, including electrical circuit breakers, explosion-proof motors, pipe fittings, and hoisting and rigging components. For example, during a receipt inspection of a swaged hook attached to a lifting sling, inspectors discovered that the raised casting mark for the working load limit had been ground off and stamped to indicate a 2-ton limit (Figure 3-5).

Figure 3-5. Tampering on a swaged lifting sling hook

These events underscore the importance of identifying and removing from service suspect/counterfeit items and materials that do not conform to standards, such as UL, ASTM or SAE, or where tampering is suspected. In the case of tie-down straps, which are used to secure waste containers during transport, a failure could represent a substantial safety hazard and financial liability. Many of the manufacturers of this equipment are not aware that there is a problem with their products, so some explanation to them may be in order as to the situation identified. Sites should use this particular information to inspect their ratchet tie-down strap assemblies, and continue to exercise appropriate diligence and care in the use, inspection, and maintenance of all lifting, hoisting, and tie-down equipment to ensure that it can safely fulfill its intended function.

The Office of Environment, Safety and Health encourages the sharing of information and lessons learned from operating experience, events, and issues that are important to safety. The identification of suspect/counterfeit bolts in similar equipment at various sites and facilities demonstrates the benefits of sharing information throughout the DOE complex.

KEYWORDS: *Suspect/counterfeit items, bolts, ratchet tie-down straps*

ISM CORE FUNCTIONS: *Analyze the Hazards, Provide Feedback and Continuous Improvement*

4. PERSONAL PROTECTIVE EQUIPMENT SCORCHED BY SPARKS FROM CUTTING SAW

On February 17, 2003, at the East Tennessee Technology Park, a worker was cutting rebar with an abrasive wheel saw when his personal protective clothing began smoldering. A second worker in the area sprayed the burning material to extinguish the fire. The worker's anti-contamination coveralls, plastic bootie, and rubber shoe cover were scorched, but he was not injured. (ORPS Report ORO--BJC-K25GENLAN-2003-0001)

A subcontractor team was involved in decontamination and decommissioning activities. Ten facilities had been demolished, and some of their supporting concrete slabs remained. The worker's task was to cut protruding rebar from the remaining slabs flush with the surface to prevent a safety hazard.

The subcontractor's activity hazard analysis required a hot-work permit for grinding and abrasive work, but the contractor's procedure, modeled from the 1997 version of the National Fire Protection Association (NFPA) standard 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work* did not require the permit. The 1997 version of NFPA 51B did not address grinding and abrasive work; the 1999 revision, however, specifically addresses grinding and abrading. The contractor and subcontractor safety representatives and the subcontractor technical representative met before work began and decided to adhere to the contractor's procedure instead of adding the hot work permit requirement.

The team signed in on a radiological work permit, and wore radiological personal protective equipment (PPE): anti-contamination coveralls, gloves, clear plastic booties, and rubber shoe covers. They also wore steel-toed shoes, safety glasses, face shields, and hard hats.

One worker began cutting the rebar that protruded from the concrete slabs using a portable gasoline-powered abrasive wheel saw. Another worker stood nearby with a water sprayer to control dust. After making approximately 10 cuts, the worker moved to another section. As he did, he noticed that his anti-contamination plastic bootie was smoldering from sparks generated by the saw. The second worker extinguished the fire with the water sprayer; then both workers walked to the boundary control station, doffed their PPE, and reported the incident. Neither worker was injured.

Figure 4-1 shows the worker's PPE and bootie where it was scorched. Melted plastic from the bootie dripped onto the worker's jeans. Figure 4-2 shows the scorched PPE, and Figure 4-3 shows the burned rubber shoe cover.

Figure 4 -1. Worker's PPE and bootie

The contractor stopped all rebar cutting work at the site, and the deputy general manager declared a stand-down on all heat- and spark-producing activities company-wide.

The DOE Oak Ridge Operations Manager initiated a Type B investigation of the event under the "Other Effects" category of DOE O 225.1A, *Accident Investigations*. DOE elected to initiate a Type B investigation because of a 1997 fatality at this facility involving a welder who was torch cutting in a poorly lit area without fire-retardant PPE and without a fire watch. (ORPS Report ORO--LMES-K25GENLAN-1997-0001)

Figure 4-3. Burned rubber shoe cover

A critique was held shortly afterward, and a Lesson Learned was entered into the DOE Lessons Learned database (URL http://tis.eh.doe.gov/ll). Corrective actions will be developed after the Type B investigation is complete. Recommended actions include the following.

Figure 4-2. Scorched leg of PPE

- Fire-resistant PPE should be required for any projects involving grinding and abrasive disc cutting.
- Hydraulic cutters instead of abrasive cutting equipment should be used when size-reducing rebar to prevent sparking.
- The contractor's welding, burning, and hot work procedure should be revised to include the requirement in the 1999 version of NFPA 51B standard that flame-resistant PPE must be used in all grinding or abrading activities.
- A welding, burning, and hot work permit should be obtained for all welding, heat-treating, grinding, abrasive cutting, pipe thawing, powder-driven fasteners, hot-riveting, and any other activities producing sparks, flames, or heat.

A similar event took place at the RMI Decommissioning Project Office in Ashtabula, Ohio. A restoration technician was cutting steel with a torch when hot slag or sparks collected in a fold of his flame-resistant coveralls and burned through, causing a second-degree burn to his right calf. Investigators determined that the coveralls, constructed of Nomex® treated material, did not provide adequate protection from molten slag when the slag remained in contact with the material. (ORPS Report OH-AB-RMI-RMIDP-2002-0008)

These occurrences illustrate the hazards associated with welding and heat- or spark-producing work. Project managers should carefully analyze work activities to ensure that *workers are adequately protected while performing spark- or heat-producing work. Appropriately weighted, flame-resistant PPE should be worn, fire blankets should be used to shield flammable objects nearby, and spotters or fire watches should maintain line-of-sight contact with the person performing the hot work. Workers performing these activities need to recognize the potential for flying sparks or excessive heat to cause fires.*

KEYWORDS: *Personal protective equipment, sparks, fire, hot work*

ISM CORE FUNCTIONS: *Analyze the Hazard, Develop and Implement Hazard Controls*

5. INADEQUATE WELD EXAMINATIONS RESULT IN ENFORCEMENT CONFERENCE

The Office of Price-Anderson Enforcement conducted an Enforcement Conference on March 6, 2003, regarding continued inconsistencies in the welding inspection program at the Oak Ridge Y-12 Site. Specifically, weld examinations for the Intermediate Evaporator and the Oxide Dissolver had not been completed as specified in the engineering technical specifications. (ORPS Report ORO--BWXT-Y12SITE-2002-0015, formerly ORO--BWXT-Y12NUCLEAR-2002-0030; final report filed August 2, 2002)

In April 1998, a construction project engineer notified the plant shift superintendent that seven of nine welds on piping that would contain hydrogen fluoride had been rejected for incomplete penetration on the inside of the pipe.

Project managers committed to compliance with the requirements of American Society for Mechanical Engineers (ASME) International Standard B31.3, *Process Piping* (this standard, as well as other ASME standards, can be ordered at the ASME web site, http://www.asme.org). This standard specifies the type of piping that is appropriate for the material it will contain. Category M piping is most appropriate when piping will contain hydrogen fluoride, a colorless, corrosive, toxic gas that can cause permanent eye, skin, or lung damage or even death in high concentrations. In this event, the Category M piping was made of ¾-inch Hastelloy C-276, a nickel-chromium-molybdenum wrought alloy for which it is difficult to achieve welding penetrations.

ASME Standard B31.3 requires Category M piping to undergo radiographic inspection of 20 percent of completed butt welds. The standard also permits substitution of in-process examination for all (or part) of the radiographic examination if specified in the engineering design. This in-process examination is described in ASME B31.3 as a visual examination of the joint preparation, fit-up, root pass, external and accessible internal surfaces, aided by liquid penetrant examination when specified by the engineering design, between passes, and final weld surfaces. There is a long-standing prohibition of radiography in the area because of interference with the criticality accident alarm system, so the engineering group specified alternate examination requirements for the transfer line welds that were required to be fabricated. The weld examinations performed exceeded the in-process examination permitted by the Code. Equipment Testing and Inspection personnel performed the alternate examinations, including liquid penetrant examination. These additional examinations did not identify incomplete penetrations in the transfer line welds.

An assessment defined by the project team identified the defective welds following a DOE survey of other welds on the same project. Investigators determined that in addition to inherent difficulties with the Hastelloy C-276 material, defective welds occurred because of a combination of cramped working quarters (in some cases, as little as 18 inches), full anti-contamination clothing, access problems, fall protection equipment, respirators, and the need for a pipefitter's assistance to operate foot control pedals during welding. However, because the defective welds were not detected immediately (some welds had been created up to a year previously), the process of re-inspecting and repairing defective welds cost approximately $150,000 and factored into the issuance of a Notice of Violation with a resultant imposition of a civil penalty to Lockheed Martin Energy Systems.

Corrective actions taken to address this event included suspending the use of Hastelloy material for field welding, evaluating additional welds for deficiencies, re-examining previously completed and approved welding projects, and performing a self-assessment of the welding program. A means for radiographing welds in all areas at Y-12, including those equipped with criticality alarm systems, will be devised, and all welds in the hydrogen fluoride primary containment piping will undergo radiography. The master specifications for welding activities will also be revised to improve inspections.

On June 17, 2002, the certified weld inspector assessment review of welds on the Intermediate Evaporator and the Oxide Dissolver identified weld examinations that had not been performed in accordance with engineering technical specifications. Specifically, the review cited failure to perform penetrant tests, weld mapping, and in-process weld examinations; unnecessarily exempting welds from radiography inspections; and failure to review work packages in a timely manner.

The assessment report observed that multiple requirements for welding inspection existed from a variety of sources, creating confusion. Although weld history cards were being used, they were used only for welds in construction activities, not for maintenance activities, the justification being that maintenance welds were not considered to be sufficiently complex to require the use of the weld history cards. The welding inspector supervisor provided too little oversight of inspections and left a temporary replacement, who was unable to perform field inspections in a timely manner. As a result, there were no controls in place to ensure welds were properly inspected prior to installation. The report concluded that if the corrective actions from the 1998 event had been completed, they would most likely have prevented the 2002 event.

Numerous corrective actions have been developed, and most of these are complete. These included the following.

- Revise the planning and work execution documents for welding activities.
- Establish controls for timely reviews of welding packages by certified welding inspectors.
- Update welding inspector job descriptions and training documentation to require the use of certified welding inspectors.
- Develop a schedule for certified welding inspector qualification to incumbent inspectors or for preparing waiver documentation.
- Integrate welding activities and inspections.
- Track and trend weld inspector performance.
- Training supervisors, inspectors, planners, and welders on weld inspection specifications;
- Establishing a responsible individual for overseeing welding inspections;
- Testing heavily oxidized welds in a nitric acid environment and providing recommendations for existing welds in nitric acid service;
- Developing a weld history card for use by all organizations that perform welding activities;
- Briefing engineers on welding requirements for piping;
- Establish a method for welders to review rejected welds with the inspectors.
- Establish requirements for field radiography of welds.
- Establish a method for on-the-job evaluation of welding inspector performance.
- Identify inconsistencies between welding activities and work execution.

During the first two weeks of September 2002, site personnel performed an independent review of the corrective actions that had been identified as closed. At that time, a concern was raised about which organization was responsible for monitoring weld inspector performance. This issue is still in the process of being resolved.

These occurrences illustrate the importance of implementing corrective actions that are developed. In the 1998 event, faulty welds could have resulted in process pipes leaking toxic hydrogen fluoride gas.

KEYWORDS: *Welds, inspection, maintenance*

ISM CORE FUNCTIONS: *Perform Work within Controls, Provide Feedback and Improvement*