

ARMY INVESTIGATION FINDS LAX PROCEDURE LED TO AGENT EXPOSURE

A high-level Army investigation has found that failure to properly document design changes and false assumptions about where nerve agent was likely to be present contributed to a recent incident where a worker was accidentally exposed to nerve agent in Utah. The investigation also says the incident revealed several weaknesses in procedures used to respond to the agent exposure.

The Army deputy assistant secretary for environment, safety and occupational health led the investigation, which sought to determine the causes of the July 15 incident where a maintenance worker was exposed to the chemical agent GB, also known as sarin, at the Tooele Chemical Demilitarization Facility.

Weapons destruction activities halted as a result of the incident, and the plant is still not back online, according to an Army spokesman, who says Utah's report has led the Army to issue a safety improvement program, with an emphasis on augmenting the safety culture at Tooele and the Army's other chemical demilitarization sites. The Army is also developing a corrective action plan for Tooele, which will be vetted by the investigation team and then also sent to the other sites. Once the corrective actions are in place and validated, the chemical demilitarization program will petition the state to allow the plant to restart agent operations, probably in late November or early December, the spokesman says.

The sequence of events leading to the agent exposure began in the spring of 2001, when the Tooele chemical demilitarization field office approved changes to the air pressure regulator in the liquid incinerators' air purging system to eliminate carbon monoxide spiking and false agent alarms connected with the spikes. The air purging system is used to flush lines carrying agent from holding tanks into the incinerator.

The plant has two liquid incinerators, known as LIC 1 and LIC 2, and work requests for the changes were prepared at essentially the same time, "limiting the ability to take advantage of the lessons learned from doing them one at a time," according to the executive summary of the investigation report. And while the repairs to the air pressure regulators were to be done sequentially, neither work request recognized the need to specifically review the results of the first repair before proceeding with the second, the report says. *The executive summary is available on InsideEPA.com. See page 2 for details.*

The work on LIC 1 was performed in late 2001, while GB destruction was ongoing. Workers wore full personal protective equipment that included supplied air and a fully encapsulated suit. Agent was monitored by the plant's continuous air monitoring system. And precautionary measures for responding to inadvertent contamination included a shower system and decontamination equipment located near the exit to the LIC 1 room.

But on Jan. 16, 2002, high levels of GB were detected in the LIC 1 room, and control room operators, using remote cameras, discovered that GB was dripping from the newly installed air pressure regulator assembly, "indicating the agent had migrated beyond established engineering . . . boundaries in the air purge line," the report says. Further analysis determined that valves designed to prevent backflow of agent were stuck in the "open" position, could not be repaired and must be replaced.

"Although entries were made in the shift logs of January 16 and 17 describing the event and the corrective actions taken, the piping and instrumentation diagrams (P&ID) in the control room were not revised to reflect that agent had migrated beyond the 'agent expected' boundaries in the air purge line," the report says.

The Army chemical demilitarization field office sent a formal advisory letter to the plant's contracted manager on Feb. 5, saying that measures should be taken to validate the integrity of valves that were to be installed in the LIC 2 system, but the contractor did not respond to the letter nor was it placed in the contractor's tracking system. And neither the contractor nor the Army field office notified the Army's centralized "lessons learned" database.

The Tooele plant finished destruction of GB in March, and plans were made to change the air pressure regulators on LIC 2, according to the report. But this work package differed from the LIC 1 plans in several aspects, including using less protective worker gear, changing the emergency exit route, using a portable GB monitor and not providing temporary showers or decontamination materials at the egress route.

On July 15, two maintenance workers entered the LIC 2 room to install the new air pressure regulator. They were wearing full face industrial respirators, overalls and leather boots and gloves. The workers loosened the couplings for the three-foot section of purge air line containing the existing air pressure regulator, removed the section of pipe and placed it on the floor. Immediately, the portable GB monitor alarmed and both workers exited to a secondary room, warning two inspectors who were in street clothes they should don their masks. The maintenance workers removed their industrial respirators and put on their government issue respirators. "During the change of masks, some of the contamination from the leather glove of the Worker who had handled the pipe was transferred to his head, hair, and/or respirator," the report says.

The inspection team exited the LIC 2 secondary room without undergoing monitoring or decontamination procedures, although they were later sent to the onsite medical clinic. The maintenance workers changed masks and

into clean coveralls, but water or decontamination materials were not brought to the scene nor were medical personnel sent to observe the workers, the report says.

The workers had failed to bring the portable GB monitor with them when they left the LIC 2 primary room, as specified in plant protocol. GB readings in the room were confirmed and continued to be abnormally high. The plant requested additional monitoring equipment from nearby Deseret Chemical Depot, although the monitor from Deseret was of a different type than at Tooele. "Problems arose regarding the monitor readings when the instrument became saturated with agent and defaulted to a reading of 0.0," the report says. The instrument operator knew that high levels of GB agent were present because the monitor flashed a warning, even with the reading of 0.0, but the contractor's on-scene incident commander assumed the reading was accurate and there was no agent present, the report says. The plant attempted an alternate reading, using a different monitoring device, and a low level of contamination was recorded. But the Army investigation says this reading "was not accurately extrapolated to a normalized sample time, which would have indicated significant contamination levels."

About an hour after the initial alarm, the maintenance workers were released from the LIC 2 secondary room, based on the inaccurate perception that they had cleared at least two monitoring cycles, the report says. They unmasked and were transported to the medical clinic without having undergone decontamination or a preliminary medical evaluation. But when they walked into the clinic, GB monitors alarmed. The workers spent approximately three and a half to four hours in the clinic's decontamination vestibule undergoing repeated decontamination cycles before they were declared free of contamination and brought into the treatment area for evaluation, the report says.

The investigation says a preventative medication, atropine, was not administered at any time, and once doctors were able to examine the workers, they found one worker's pupils had decreased in size, which is a sign of agent exposure. "Later, it was learned that he also experienced disorientation, headaches, blurry vision, tightness in the chest and a runny nose, but he did not report these symptoms to the medical staff while he was in" the decontamination vestibule or under observation, the report says. Blood analysis indicated about a 25 percent depression of red blood cell cholinesterase from the worker's baseline, which is also indicative of GB exposure.

The investigation concludes there were three major problems with the way the air pressure regulator replacements occurred. "First, the modified air pressure regulator valve from which agent was observed leaking was never examined to determine the reason for the agent leakage. Second, the fact that agent was found to be present in a portion of the air purge system beyond the 'agent expected' boundary was neither indicated in the P&ID nor included in a lessons learned program. Third, the experience with the LIC 1 Primary air purge line check valves and block valve was not considered in preparing the Work Package for the modification of the LIC 2 Primary air purge line air pressure regulator."

The major difference between the LIC 1 work and the LIC 2 work was the plant's status, the report says. When the LIC 1 work was done, the plant was operational and a more cautious approach was used. During the LIC 2 work, the plant was not operating because it was preparing to switch to destroying VX agent. The plant was assumed to be decontaminated, "a false assumption since only external surfaces were declared agent free," and the modification was performed under a different set of procedures and assumptions, without confirmation, the report says. The investigation says that "numerous sources of information existed, such as documentation in shift logbooks," that should have made operating and maintenance personnel aware of the prior back leakage problem, but they were not used. The systems engineer who was aware of the problems encountered with the first repair did not participate in planning the LIC 2 fix, the report says.

And "[o]nce the incident occurred and a worker was inadvertently exposed, additional weaknesses were identified in the onsite emergency response relative to monitoring, decontamination, and medical evaluation of contaminated individuals," the report says.

SUBSCRIPTIONS:

703-416-8500 or
800-424-9068

custsvc@iwpnews.com

NEWS OFFICE:

703-414-5003

Fax: 703-416-8543

defenvalert@iwpnews.com

Publisher: Jeremy Bernstein
Senior Editor: Suzanne Yohannan
Managing Editor: Lara Beaven
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