Final Decontamination Report

Engineering Study
To
Demonstrate Environmental Alternatives, Inc.
Rad-Release Decontamination Solution and Process

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Hosted By:

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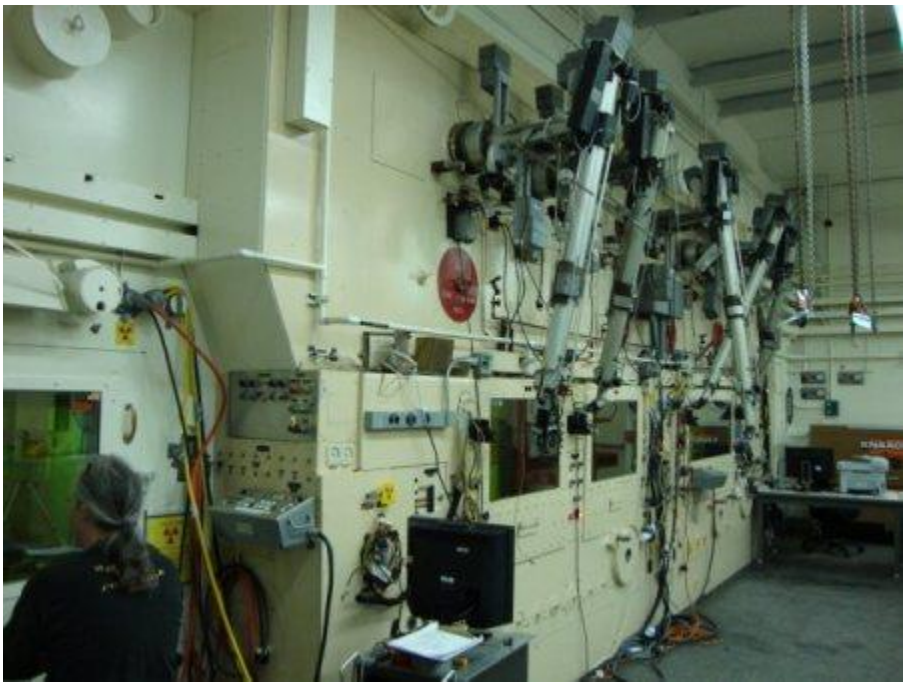
Background

Argonne National Laboratory (ANL) is one of the largest and oldest Department of Energy National laboratories. ANL is managed by the University of Chicago under DOE Prime contract DE-AC02-06CH11357. The laboratory has been in operation since the 1940's. ANL is currently supporting many missions for scientific research and technology transfer, as well as, beginning environmental restoration work to deactivate and decommission some of the older facilities.

During past operations the building 205 K Wing was used to conduct various tests on spent nuclear fuel. The testing has caused many of the rooms, hot cells, glove boxes and associated equipment, such as the manipulators, to become highly contaminated with radiological materials thus requiring innovative technologies to speed the ease and effectiveness of decontamination operations.

The Laboratory requires an engineering study to be performed to determine the effectiveness of a proprietary decontamination solution, as it is applied to radioactively contaminated manipulators in 205 K-Wing. The Laboratory hopes that this process may dramatically increase the effectiveness of decontamination efforts, and decrease the radiation exposures to workers performing the decontamination activities.



The lab is currently embarking on several ARRA de-inventory projects at the site. The successful demonstration of this proprietary chemistry and process may provide the ARRA de-inventory projects with an effective tool to improve decontamination efforts. This success will allow for a reduction in worker exposure and reduce the overall time spent for equipment repair and work area preparation.

EAI was awarded purchase order number 0A-47608 under the ANL prime contract to perform an engineering study to evaluate a new decontamination technology to improve decontamination effectiveness and efficiency for future operations.

Purpose

The purpose of this engineering study was to evaluate a new technology developed by Idaho National Laboratory and licensed and manufactured exclusively by Environmental Alternatives, Inc. (EAI). Periodically, equipment and various rooms at the lab (hot cells and glove boxes) become contaminated to the point where operators receive too much radiation exposure thus requiring work to be suspended until decontamination activities are implemented to reduce the levels. Also, prior to maintenance and repair operations on certain equipment, such as manipulators, past decontamination methods employed by ANL have been labor intensive and have resulted in excessive radiation exposure to lab personnel.

EAI was contracted to demonstrate our Rad-Release chemical decontamination technology and evaluated its performance against previously used ANL methods to improve decontamination effectiveness and efficiency for upcoming work.

Scope of Engineering Study

EAI provided the technical personnel, Rad-Release decontamination chemicals, instructions for its use, and direction to the Laboratory workers who performed the decontamination work in 205 K-Wing. EAI also provided procedures, MSDS, Job Hazard analysis and waste solidification instructions for the chemical(s). In addition, EAI provided application-specific training to the technicians prior to use of the process in 205 K-Wing.

Upon completion of the decontamination demonstration, EAI is also required to deliver to the Argonne Technical Representative via U.S. mail a written report detailing the effectiveness of this proprietary process in a contaminated environment. The report shall also include the relative effectiveness of this process, as compared with the water, soap, Simple Green, and Radiac wash that have been tested in a similar manner in 205 K-Wing decontamination activities. This report will serve to satisfy the deliverable requirement of the scope of work.

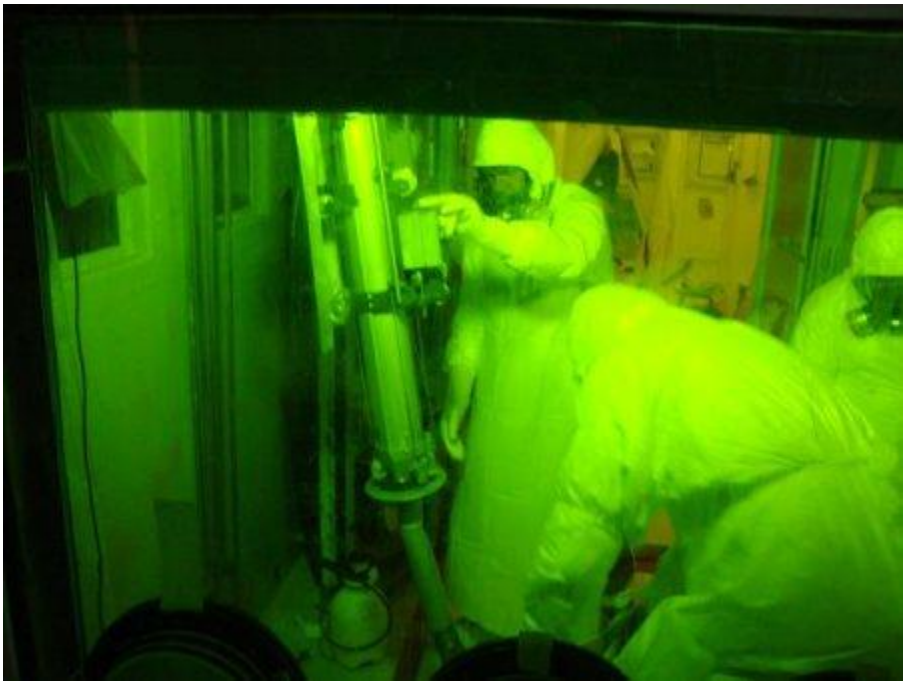
Work Plan

EAI mobilized to ANL on Monday February 8, 2010 and met with technical representatives of the 205 K Wing, as well as other personnel at the facility to gather the necessary information needed to prepare for the decontamination testing. A briefing was held to discuss the work plan, decontamination procedure and other project specific issues. EAI representatives instructed the

ANL operators on the Rad-Release process and finalized the work package for the work that was to take place the next day.

On Tuesday February 9, 2010, the decontamination formulas were brought to site and final preparations were made to start the decontamination trials. The ANL staff furnished two operators and one Radiation control technician to support the test.

At approximately 11:00 a.m. CST, the workers entered the 205 K Wing and began donning the necessary personal protective clothing and respiratory protection required by the radiation work permit. Once the suit up was complete, the workers accompanied by the RCT entered the C Cell through the access tent and began positioning the manipulator, decon drum apparatus and glove bag. The glove bag was raised up around the manipulator with the waste drum positioned beneath the manipulator so that all decontamination liquids would be collected as the decontamination work was conducted.



The Rad-Release formulas were applied to all surfaces of the manipulator using a hand held pump sprayer. The chemical solutions were misted onto the contaminated surfaces while light scrubbing was applied from a brush attached to the spray wand. Once all of the surfaces had been coated with the decontamination solution, the solutions were allowed to dwell for approximately 5-10 minutes. Upon completion of the prescribed process dwell time the entire manipulator was rinsed down with De-ionized water. This constituted one cycle of the process.

The RCT then took radiological surveys and swipe samples from the manipulator and obtained the results using an R0-20 survey meter. All surfaces of the manipulator were well below the acceptable range that had been established for determining the success of the decontamination process except the wrist/grip region. The wrist/grip area of the manipulator had been greatly reduced. However, the levels were still above the labs acceptable range. A second application of the Rad-Release process was applied to just the wrist/grip area using the same method described earlier in this section. After approximately 5 minutes, readings taking on the wrist/grip region were found to be in the acceptable range.

At approximately 12:30 pm CST the decontamination test was terminated and all levels of contamination were within the accepted range.

Results

The Rad-Release process successfully demonstrated that it can dramatically reduce the labor hours required to perform decontamination and drastically increase decontamination efficiency.

Previous decontamination attempts on manipulators in Building 205 K-wing, bearing similar contamination levels, averaged 3 workers being required to use up to 5 cycles of spraying Simple Green, Radiac wash or various surfactants and water followed by scrubbing the surfaces of the

manipulator over the course of 4 or 5 days in order to reduce contamination levels to an acceptable range.

Rad-Release was applied in much the same manner as the laboratory baseline technology keeping the process simple to deploy without the need to change the deployment equipment, process area or acquire any special tooling. This allowed the operators to conduct the decontamination operation with a degree of familiarity and minimized adding complicated steps into the evolution.

The majority of the contamination on the manipulator was reduced to acceptable levels after a single cycle of the process. The wrist/ grip section of the manipulator did require a second cycle to further reduce the levels to acceptable range. However, the entire decontamination operation was completed by 3 workers in 1 hour.

The result of employing the Rad-Release process over the lab's baseline technology has shown an improvement in both effectiveness and efficiency. The labor has been reduced from 4 or 5 days down to approximately one hour and 30 minutes. The reduction of removable contamination using rough field conversions at pre-decontamination levels of approximately 8,000,000 dpm/100 cm^2 down to post decontamination levels of between 500,000 and 1,000,000 dpm/100 cm^2 results in a decontamination factor (DF) of between 8 and 16.

Using actual survey data as reported by the RCT, the decontamination effectiveness is as follows:

Location	Pre-Decon	Post Decon	DF
Slave wrist	450 mRad/hr	25 mRad/hr	18
Slave Middle	90 mRad/hr	15 mRad/hr	6
Slave Top	80 mRad/hr	32 mRad/hr	2.5

Conclusion

The use of this new decontamination technology has demonstrated the ability to dramatically reduce labor hours required to perform decontamination throughout the laboratory and minimize radiation exposure to personnel. The technology can easily be adapted to decontaminate hot cells, glove boxes, manipulators and miscellaneous equipment, building surfaces and rooms, as well as, being able to reduce levels on surfaces from TRU to LLW for significant savings on disposal.

Attachments:
Radiological Survey Report – Survey # 20100208 JAP 205 JSS 01
Radiological Survey Report – Survey # 20100209 JAP 205 JSS 01