

TECHNOLOGY DEMONSTRATIONS AND DEPLOYMENTS AT THE INEEL

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ABSTRACT

The Idaho National Engineering and Environmental Laboratory (INEEL) is demonstrating and deploying new and improved technologies to help reduce decontamination and decommissioning (D&D) costs and expedite the cleanup of surplus facilities. To accomplish this, the U.S. Department of Energy (DOE) has provided the funding and guidance to demonstrate and deploy technologies that will replace existing baseline D&D technologies with those that are safer, cheaper, and more efficient.

Two independent sequentially involved projects achieve the demonstration and the deployment. The INEEL Large Scale Demonstration and Deployment Project (LSDDP) demonstrates the technology and independently validates and documents the benefits of replacing an existing D&D technology with a new and improved technology. Fact sheets and detailed reports are then distributed to the DOE, private utilities, universities, private industry, and other interested parties. Demonstrations are conducted as part of actual D&D operations at a scale that will furnish sufficient data to support cost-benefit analysis and presents reasonable opportunity to experience any challenges inherent to a new technology. The objective is to provide end-users a level of confidence that outweighs the risks associated with using a new technology.

The INEEL Accelerated Site Technology Deployment (ASTD) project selects technologies from those demonstrated at INEEL and other LSDDPs and facilitates and promotes additional deployments. Funding will be provided under the ASTD project to procure the technology and provide the end-user hands-on experience to remove any remaining skepticism. The ASTD will then arrange deployments at other sites to motivate end-users to accept the new technologies as improvements to their D&D operations.

INTRODUCTION

The DOE Deactivation and Decommissioning Focus Area is responsible for developing, demonstrating, and implementing cost-effective and safe technologies to deactivate approximately 7,000 contaminated buildings and to decommission approximately 700 contaminated buildings. Deactivation refers to ceasing facility operations and placing the facility in a safe and stable condition to prevent unacceptable exposure of people or the environment to radioactive or other hazardous materials until the facility can be decommissioned. Typically, deactivation involves removal of fuel and stored radioactive and other hazardous materials and draining of systems. Decommissioning is the process of decontaminating or removing contaminated equipment and structures to achieve the desired end state for the facility.

Baseline technologies used to perform these activities are often labor intensive, time consuming, expensive, and can excessively expose workers to radioactive and other hazardous materials.

Additionally, many baseline technologies also generate secondary waste beyond those of the building materials and their contents.

The DOE Deactivation and Decommissioning Focus Area developed the LSDDP and ASTD to demonstrate and facilitate deployment of technologies that generate less secondary waste, reduce waste volume, are lower in cost, require less labor, reduce exposure of personnel to radioactive and other hazardous materials, and improve worker safety. Innovative technologies developed for characterization of contamination, decontamination of buildings and materials, dismantlement of buildings and equipment systems, reuse or recycle of materials, waste minimization, and worker protection and safety are candidates for these programs.

Ultimately, the end goal of these programs is to make D&D activities safer, cheaper, faster by replacing baseline technologies with improved technologies. We achieve this by removing much of the risk for first time users and by building confidence that the benefit of using this new technology outweighs any perceived risk.

Data from demonstration of the technology should provide potential end-users sufficient information to make decisions regarding subsequent use of the technology. The primary end-user for the technologies is the DOE Office of Environmental Restoration (EM40). Additional end-users include private industry, utilities, universities, and our international counterparts.

At the INEEL, we accomplish this with a two-step program. The LSDDP selects, demonstrates, evaluates, and reports on technologies that appear to have high potential for benefit. The ASTD then selects technologies from those demonstrated in the LSDDP and provides an end-user with equipment and support for hands-on experience that motivates the end-user's to accept the new technology. The ASTD then coordinates deployment of the technology to other end-users within DOE.

THE INEEL LSDDP

Technologies that demonstrate high potential for benefit over baseline technologies are demonstrated in actual D&D operations side by side with the baseline technology. Data are collected and a cost benefit analysis is prepared. Results are documented in fact sheets, written reports, and photos and videos. The information is presented to interested parties through electronic mail, published reports, conferences, internet, and newsletters.

The DOE has sponsored seven LSDDPs, each of which focuses on a different DOE D&D need. The INEEL's focus is on fuel storage canals and underwater and underground facilities. Three INEEL facilities are used in the demonstration project: (1) the Advanced Reactivity Measurement Facility and Coupled Fast Reactivity Measurement Facility, which contain underwater reactors in a common canal at the Test Reactor Area, (2) the Test Reactor Area Filter Pits located in underground restricted entry pits, and (3) the Initial Engine Test Control Room at Test Area North. This project will select new or improved technologies for inspecting, characterizing, decontaminating, and dismantling these facilities and demonstrate the improved technologies alongside the established baseline technologies normally used in conventional D&D work. The INEEL's LSDDP schedule included two demonstrations in FY-98, six in FY-99, and three in FY-00, a total of eleven technologies to be demonstrated.

Technology selection criteria includes improvement over baseline, maturity of development, cost, INEEL needs met, not previously demonstrated, not already considered baseline, and interest and willingness of a vendor to cost share. Performance indicators include cost, effectiveness, ease of implementation, worker exposure, and secondary waste generation. Performance data are collected during the demonstration and subsequently forwarded to the U.S. Army Corps of Engineers for an independent cost benefit analysis.

The project is governed by an interdisciplinary Integrating Contractor Team (IC Team) selected for their broad experience in D&D operations and for their ties to targeted end-users. The IC Team comprises members from private industry, universities and DOE contractors. Voting members represent Parsons Engineering, British Nuclear Fuels Limited, Lockheed Martin Idaho Technologies Company, TLG Engineering, Florida International University, and Idaho State University. The DOE Idaho Operations Office co-manages the project with the DOE Deactivation and Decommissioning Focus Area. The team of experts define selection and acceptance criteria, define performance requirements, approve technologies for demonstration, review and approve test plans and final reports and fact sheets, and assist in placing these technologies into service outside this project. Although not a member of the project, the International Atomic Energy Agency will support international data dissemination.

TECHNOLOGY SELECTION PROCESS

Currently, baseline technologies used to solve D&D problems are met with varying degrees of success. Alternative technologies are available that could outperform baseline technologies but have not been proven or demonstrated in D&D operations. These technologies may have been developed for D&D applications or developed for other industries but adaptable to D&D applications. Technologies may be solicited through requests in public documents, advertising, internet communications, personal communications with vendors, other LSDDPs, end-users, etc. With decisions based on its meeting pre-established guidelines, a technology is approved by formal vote of the IC Team. (See Figure 1.) The IC Team's goal is to identify, demonstrate, and evaluate alternative technologies that could be an improvement over current baseline technologies.

Once a candidate technology has been formally identified, the IC Team considers a one page screening form to ensure the technology meets the following minimum requirements. It must address an existing INEEL need, must be ready for field deployment without further development, must be new or improved or a new application of an existing technology, cannot have a previous history of demonstration at other LSDDPs, and must show potential for benefit with respect to cost, worker safety, or secondary waste generation. If the technology is disapproved, it is so recorded in the database and no further action is taken. If the technology is approved, it is assigned to a test engineer for detailed evaluation.

The test engineer investigates the technology and performs a more detailed evaluation, addressing the same requirements on the screening form plus rough-order cost-benefit data, technology provider interest, demonstration cost, technology provider cost sharing, and applicability across the DOE Complex. The detailed evaluation is then presented to the IC Team for deliberation and formal vote.

If approved, a technology is wait-listed until the INEEL D&D Operations schedule identifies an opportunity for demonstration, at which time a test engineer is assigned to start procurement actions and prepare test plans and mobilization activities.

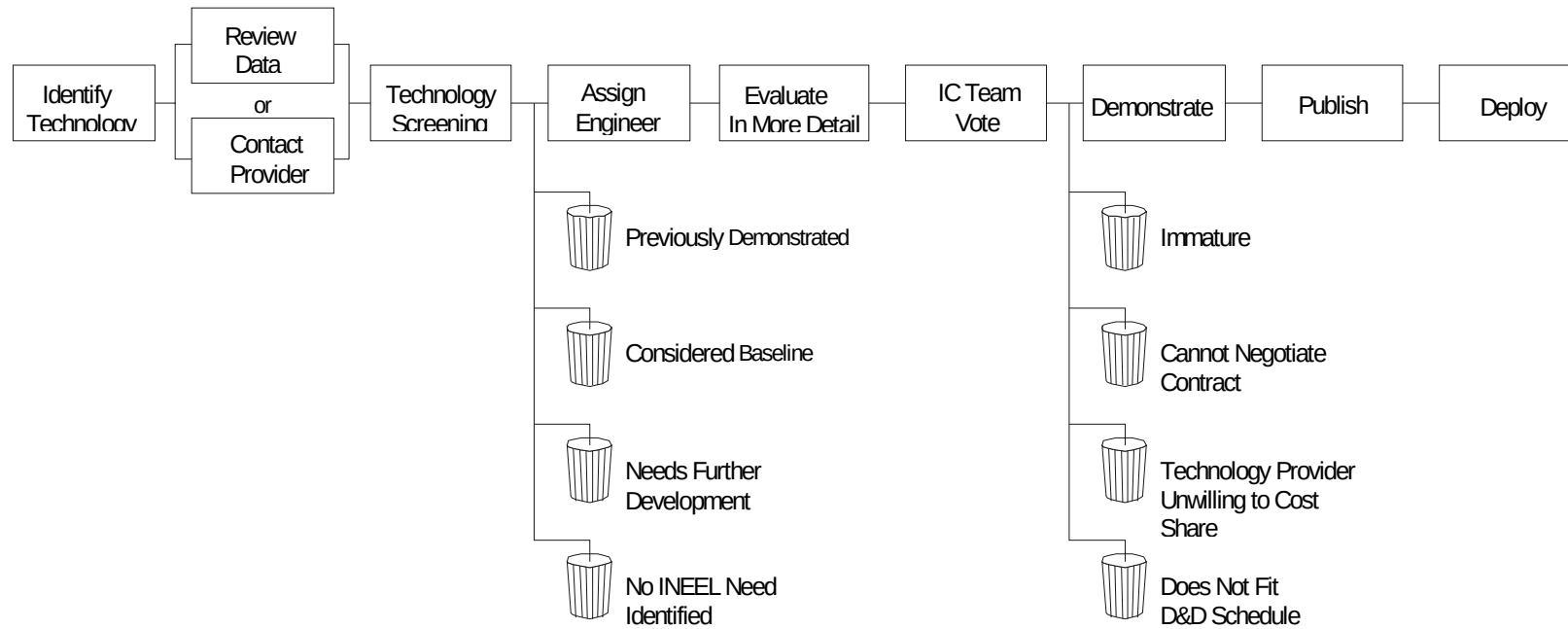


Fig. 1. INEEL LSDDP Process Flow Chart

Approval of a technology by the IC Team is no guarantee that a technology will be demonstrated. After approval by the IC Team, a technology may be rejected for budgetary reasons, inability to achieve acceptable contractual agreements with the technology provider, no fit with the schedule of D&D activities at INEEL, or preferences based on potential long-term benefit to the DOE complex, among others.

COMPARISON WITH BASELINE TECHNOLOGIES

Once a technology is approved for demonstration and a location and schedule are identified, the test engineer prepares the documentation required to procure the technology or service and coordinates the demonstration activities with the facility D&D manager. A test plan is generated with the participation of the vendor, the facility D&D manager, the U.S. Army Corps of Engineers, and the IC Team.

The test engineer arranges to bring the technology on site, preparing and coordinating the necessary on-site documentation, arranging any necessary training and support equipment, and transporting the technology to the D&D facility.

The new technology is demonstrated and evaluated side by side with the baseline technology as part of an ongoing D&D operation. The evaluations are performed under equivalent field conditions for a duration sufficient to obtain convincing data of the benefits obtainable through deployment of the new technology. This independent evaluation under field conditions and extended duration will validate or discredit any perceived or advertised benefit and if valid will provide a confidence level of the risk associated with equipment failure or operator handling.

All activities associated with the new and the baseline technology are monitored very closely, and the data collected will reflect any differences in cost, efficiency, safety, effectiveness, etc. The data are collected in accordance with the test plan generated prior to the start of demonstration. A worker other than the test engineer is dedicated to the data collection to ensure no data are lost or missed because of other activities or distractions.

At the completion of the demonstration, data collected under direction of the U.S. Army Corps of Engineers will be forwarded to them for independent cost-benefit analysis. Results of this analysis are presented in final documents reporting the performance of the specific technology.

COMMUNICATIONS

After a technology is approved and demonstrated, the test engineer prepares and publishes a one-page fact sheet overviewing the technology, the demonstration, and the results. The fact sheet is made available on our website (<http://id.inel.gov/lstdp/>) and is distributed electronically and by hard copy to over 600 addresses. A detailed report commonly called an "Innovative Technology Summary Report" follows the fact sheet and has the same distribution. The report discusses in detail the technology, the demonstration, the results, and the cost benefit analysis. The goal of this report and the goal of independent demonstration of the technology is to reduce end-user risks, or perceived risks, typically associated with using an unfamiliar technology.

Demonstration results are further promoted from project ties with the IC Team members, presentations and booths at conferences and symposiums, newsletters, other related web sites, and through the International Atomic Energy Agency.

DEPLOYMENT

It is our goal that these technology demonstrations result in deployment of the technologies and make D&D operations safer, more efficient, and more effective and thus result directly in savings to the end-user. The first opportunity occurs at the INEEL with the D&D operations group that performs the demonstration. Procurements are issued that will allow D&D operations to assume financial responsibility for the technology immediately following the demonstration, allowing the facility D&D to continue uninterrupted.

The second opportunity occurs with the ASTD program where successful technologies are selected for other DOE D&D activities. This program is described in more detail later in this paper.

PROJECT STATUS

To date, we have reviewed 128 technologies, performed detailed evaluations on 32, approved 9, and demonstrated 2. Of the two technologies demonstrated, one has been deployed site wide at all D&D facilities, the other has been deployed one more time at INEEL and negotiations are underway for off-site deployment. We are actively seeking new technologies, reviewing and evaluating proposed technologies, and preparing and demonstrating approved technologies. Demonstrations are expected to continue through the end of the calendar year.

TECHNOLOGIES DEMONSTRATED

Remote Underwater Characterization System (RUCS) (See Figure 2)

A remote underwater characterization system (RUCS) was successfully demonstrated at the INEEL in August 1998. The RUCS is a small, football size, remotely operated, submersible vehicle commercially available through Canadian-based Inuktun Services Ltd. The vehicle was modified by DOE's Robotics Technology Development Crosscut Program to add auto-depth control and to provide vehicle orientation and depth monitoring at the operator console. An onboard color tilt camera and a front-mounted GM tube radiation detector provide on-the-spot information to help characterize and D&D underwater components and equipment.

The RUCS was used to for underwater characterization of the reactor vessels in the canals at the Test Reactor Area. The characterization included visual inspection and gamma radiation characterization. The RUCS was evaluated against the baseline, an underwater camera and gamma detector mounted on the end of a long pole. Performance factors included how many people were required, ease of operation, accessibility, and quality of data.

The results show that the RUCS does not replace the baseline but adds another dimension to underwater characterization. It provides access to areas previously inaccessible with the baseline technology and greater precision in radiation detection.



The RUCS Vehicle



INEEL

Technical Demonstration Summary Sheet

REMOTE UNDERWATER CHARACTERIZATION SYSTEM (RUCS)

THE NEED

Characterization and inspection of water-cooled and moderated nuclear reactors and fuel storage pools requires characterization and inspection equipment capable of operating underwater. This equipment is often required to operate at depths exceeding 20 feet and in relatively confined spaces. The use of baseline technologies consists of radiation detectors and underwater cameras mounted on long poles, or stationary cameras with pan and tilt features mounted on the sides of the underwater facility. The need is for a more mobile method of performing close-up inspection and radiation measurements in confined spaces underwater.

THE TECHNOLOGY

The remote underwater characterization system (RUCS) is a small, remotely operated submersible vehicle intended to serve multiple purposes in underwater D&D operations. It is based on the commercially-available "Scallop" vehicle produced by Inuktun Services Ltd., British Columbia

Canada, but has been modified by DOE's Robotics Technology Development Program to add auto-depth control, and add vehicle orientation and depth monitoring at the operator control panel. The RUCS is designed to provide visual and gamma radiation characterization, even in confined or limited access areas. It utilizes a forward-looking tilt color camera and a GM tube radiation detector to get "on-the-spot" information needed to perform D&D intelligently and safely.

THE DEMONSTRATION

The remote underwater D&D system was demonstrated in August 1998 at Idaho National Engineering and Environmental Laboratory (INEEL) as part of the INEEL Large Scale Demonstration and Deployment Project funded by DOE's Federal Energy Technology Center (FETC) for the D&D Focus Area. The demonstration took place in a canal containing two defueled test reactors at the INEEL TRA-660 facility. The RUCS was used to visually survey the canal and its contents, and also to gather radiological characterization data on the reactors and equipment on the floor of the canal.

THE RESULTS

The RUCS was simpler to deploy than the baseline approach of mounting an underwater camera or underwater radiation detector to a cable or a long (15' – 20') reach rod. It also reduced the number of personnel that had to be suited up in the canal area, which saves labor and reduces the potential for personnel exposure and contamination. Its small size and maneuverability allowed it to operate beneath overhead structures and behind the reactors. It measured radiation

levels 50% higher than previously known because of its ability to approach closely up to objects from different perspective. It should be noted that it is not superior in all instances; the baseline approach provided slightly higher quality video and could access some areas such as the inside of pipes and get radiation data that the RUCS could not. However, both methods compliment one another and provide important enhancements as a system.

CONTACTS

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- Terry Knight, President, Inuktun Services Ltd., British Columbia, Canada, (360) 650-0460



The RUCS vehicle inspecting a control rod on the ARMF reactor

Soft-sided Containers for Low-Level Waste Packaging (See Figure 3)

Soft-sided containers (SSCs) were demonstrated at the INEEL as efficient, easy to use, cost effective packages for LLW. SSCs will replace fiberglass reinforced plywood (FRP) and metal B 25 boxes currently used. Large void volumes are typically associated with use of these solid construction boxes. The SSCs are double-layered woven poly-fabric bags, these DOT-approved strong tight containers are suitable for transporting low specific activity material or surface contaminated objects. The SSC packages cost approximately half as much as the hard-sided baseline containers and have a volume capacity of 2.75 more than the baseline containers. In addition, handling efficiency is increased and storage space is minimized. Based on the success of the SSCs, the use of wood and metal boxes at the INEEL has been significantly reduced. The hard-sided boxes still provide an effective package for such items as small diameter rebar and other small sharp objects that may puncture the soft-sided containers.

Our website is located at <http://id.inel.gov/lstdp/>, where you can find the INEEL needs, the technologies that have been reviewed and their status, reports and facts sheets, our demonstration schedule, INEEL LSDDP contacts, and links to other related sites.

ACCELERATED SITE TECHNOLOGY DEPLOYMENT INTEGRATED DECONTAMINATION AND DECOMMISSIONING PROJECT

The objective of the ASTD is to increase the use of innovative, proven technologies by motivating DOE D&D operations to replace existing D&D technologies with better, safer, cheaper technologies. Although the benefits of using innovative technologies have been proven, either in LSDDPs or in private industry, many of these technologies have not made the transition to replace the existing baseline technology. This is partly because of the risks inherent to D&D and partly because of a reluctance to use unfamiliar technologies. The Idaho ASTD will select and procure technologies with a proven high return on investment, and deploy them at the participating DOE sites, i.e., Idaho, Fernald, and Chicago. In addition, the project will fund the training of D&D personnel and measure results of the technology deployment. After the ASTD project is completed, the technologies will be available for ongoing D&D operations. Having seen the benefits of the new technologies during the project, workers are expected to continue using them, resulting in continued savings. In addition, the hands-on experience often turns the workers into advocates for the new technologies, further promoting their use. Information about the technologies will be shared by word of mouth, conferences, and publications, and thus increase their acceptance and use at other DOE sites.

The ASTD project is a team of three National Laboratories: INEEL, Fernald Environmental Management Project (FEMP), and Argonne National Laboratory East (ANL-E). By teaming, these three laboratories will share lessons learned, technology evaluation methods, and technical information. And teaming spreads news about the technology successes more quickly. In order to accommodate D&D schedules, the three sites are on different schedules: FEMP completed their work in FY-98, the INEEL work spans FY-98 and FY-99, and ANL-E begins their work in FY-99.



Loading the soft-sided container.

The containers meet the U.S. Department of Transportation requirements for transport of low specific activity and surface contaminated objects. The system also includes a loading frame used to support the shell and inner liner during loading and a lifting/spreader bar. The lifting/spreader bar attaches to the lifting straps for hoisting the container from the loading frame onto a transport vehicle. A small forklift can move the empty loading frame and lifting/spreader bar. The empty bags are light and compact enough to move by hand. Each container has a capacity of 260 ft³ and holds up to 24,000 lbs. This is about three times the weight and volume capacity of a metal waste box. There is a one-time cost of approximately \$7,000 for the loading frame and lifting/spreader bar. The cost of the soft-sided containers is \$380 per bag. This results in savings of about \$1,800 in container cost for each bag filled versus filling three metal boxes or four wooden boxes.

THE DEMONSTRATION

The INEEL demonstrated the Lift-Liner system soft-sided waste containers in August and November 1998, as part of the Large Scale Demonstration and Deployment Project. The U.S. Department of Energy's Federal Energy Technology Center funded the demonstration for the D&D focus area. The demonstration took place at the Central Facilities Area Sewage Treatment Plant D&D project. Waste debris packaged during the demonstration included broken concrete, cinder block, metal, piping, wood, gravel, soil, and miscellaneous items.

THE RESULTS

The soft-sided containers were easy to use. The bags worked best with a layer of contaminated soil or gravel in the bottom before loading large debris into the container. The waste container integrity held up to all types of debris including large concrete slabs with protruding rebar. Waste sizing and preparation activities were essentially equivalent for both the soft-sided containers and the baseline wooden boxes. However, the soft-sided containers did allow for larger pieces of debris to be loaded into them and under certain conditions could result in less waste preparation activities. The much greater capacity of the soft-sided containers allowed for continuous container loading without changing containers as frequently. The number of workers required to setup and fill a soft-sided container is the same as that required for a waste box. The use of the soft-sided containers was well received by the D&D workers and the onsite LLW burial ground. D&D operations at the INEEL are currently using the soft-sided waste bags as their waste container of choice for LLW debris.

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BENEFITS

- \$1,800 waste container cost savings per bag
- Easier loading and accepts larger debris
- Three times greater capacity
- Reduces void spaces and landfill subsidence



Lifting a full waste container.

Fig. 3. Soft-Sided Waste Packaging System Technical Demonstration Summary Sheet.

ASTD TECHNOLOGIES

Technologies are selected based on success in LSDDPs or private in industry, and on needs of the facilities scheduled for D&D. Specific performance measures considered in the selection process are safety, cost, schedule, radiation exposure, and waste volume. Table 1 lists the technologies selected for deployment to date.

Table 1. Selected technologies.

Technology	Function	Deployment Site	Supplier
Pipe Explorer	Remote visual inspection and gamma logging of piping	INEEL	Science and Engineering Associates, 6100 Uptown Blvd. N.E., Suite 700, Albuquerque, NM 87110 David Cremer, 505-884-2300, cdcremer@seabase.com
GammaCam	Thorough and documented remote radiation survey	INEEL	AIL Systems, 455 Commack Road, Deer Park, NY 11729 Bill Patrie, 800-944-1180
DDROPS—Decontamination, Decommissioning, & Remediation Optimal Positioning System	Optimized cutting and waste box packing of debris	INEEL	INEEL Dick Meservey, 208-526-1834, rhm@inel.gov
BROKK	Remote controlled demolition robot	INEEL	BROKK North American Sales, 144 Village Way, Monroe, WA 98272 Bill Barraugh, 360-794-1277, porbb@aol.com
PICS—Personal Ice Cooling System	Light-weight self-contained individual cooling for workers	INEEL, FEMP, ANL-E	Delta Temax Inc., 320 Boundary Rd., Pembroke, Ontario, Canada K5A 6W5 Kirk Dobbs, 613-735-3996
Oxy-Gasoline Torch	Fast and inexpensive cutting of carbon steel	INEEL, FEMP, ANL-E	Petrogen, 3001 Cutting Blvd., Richmond, CA 94804 Milt Heft, 510-237-7274, petrogen.com
Soft-sided Containers	Improved disposal containers for low-level waste	INEEL	Transport Plastics Inc., Sweetwater TN Al Beale (800) 603-8277
Track-Mounted Shear	Mobile demolition	FEMP	John Deere, Pemberton & Tiger Mfg. Marty Prochaska, 513-648-4089
Hand-Held Shear	Self-powered shear for tight locations	FEMP	Rescue Team Inc., P.O. Box 1277, Fredericksburg, VA, 22402 Marco Wischatta, Chris Klughardt, 540-891-6600

Personal Ice Cooling System

The Personal Ice Cooling System (PICS) is a cooling garment worn underneath personal protective equipment. The cooling system is self-contained, and features user-controlled cooling levels. Tap water is pumped past a reservoir of ordinary ice for cooling, then through small tubing embedded in the garment. The worker controls cooling by adjusting the flow rate with a battery-powered pump. The PICS has been shown to significantly increase worker productivity, stay times, and worker comfort. During the large-scale demonstration at Fernald, the PICS increased stay times four fold in one application.

BROKK Demolition Robot

The model 250 BM BROKK is a wheeled demolition robot remotely controlled with a tethered pendant. Radio remote control will be available in the United States upon FCC approval for the radio frequencies. The BROKK can be controlled at distances up to 400 feet from the demolition activities by a single person. The machine measures 1.2 by 3.6 meters and uses many different end effectors on a hydraulic boom to perform a variety of tasks. The BROKK was successfully demonstrated in the large-scale demonstration at Argonne, and has been used extensively in demolition of facilities world-wide. Remote operation reduces radiation exposure levels while increasing overall safety. In addition, the BROKK can perform tasks faster than baseline methods, resulting in labor savings and accelerated schedules. The end effectors selected for this project are the scabbler, shear, grapple, bucket, and hammer.

Oxy-Gas Torch

The Oxy-Gas torch cuts carbon steel using gasoline for fuel. The Oxy-Gas torch system consists of a three-gallon fuel tank, safety valves, a gasoline supply hose, and a cutting torch. The design keeps the fuel as a liquid all the way to the cutting tip, which prevents backflash down the fuel line and increases safety. Additional safety features include an automatic flow cut-off valve and a pressure-release valve. The Oxy-Gas torch cuts faster and cleaner and is a direct replacement for conventional oxy-acetylene torches. In addition to accelerated schedules, costs are reduced by the faster cutting rate and less expensive fuel. The cleaner cuts reduce the need for secondary cuts to remove metal that has resolidified in the cut. During the large-scale demonstration at Fernald, the Oxy-Gas torch cut 35% faster and reduced cost by 50% compared to the oxy-acetylene torch.

Decontamination, Decommissioning, and Remediation Optimization Planning System

Optimization of cutting locations and waste box filling can be done with the Decontamination, Decommissioning, and Remediation Optimization Planning System (DDROPS). With this software package, a three-dimensional model of the building is created, then optimization programs are run to identify the best way to demolish the building and fill the waste-boxes. Optimization can be based on number of cuts, radiation levels, and waste-box volume.

Using the DDROPS system provides five key benefits. First, it provides workers a preview of the job to better plan and perform D&D operations. Second, the number of cuts required to size the waste is reduced resulting in savings in cost, schedule, and radiation exposure. Third, it optimizes waste container loading by size and radiation levels to keep the container full while meeting disposal limits. This reduces container costs, shipment costs, and waste disposal site volume charges. Fourth, it generates an inventory with a detailed description of the waste, its origin, and its resting place in the container. Fifth, it reduces radiation exposure times during both cutting and waste-box filling operations. Created at the INEEL, the DDROPS system has been tested at the INEEL's Central Facilities Area, and will subsequently be deployed at the INEEL through the ASTD.

GammaCam

The GammaCam is a portable remote radiation survey tool that can identify radioactive hot spots and prepare a two dimensional image of gamma radiation fields superimposed on the corresponding video image. Operated by notebook computer, the GammaCam offers real-time

survey information from a remote location. Surveying with the GammaCam can reduce radiation exposure because the workers know the location of the hot spots, and can shield them first when entering the building. Without a tool such as the GammaCam, manual surveys must be conducted, exposing workers to high levels of radiation before hot spots are identified. The GammaCam was proven very successful in the Argonne large-scale demonstration.

Pipe Explorer

The Pipe Explorer is a remote pipe characterization and mapping tool used inside pipes ranging from 5.1- to 45.7-cm diameter including pipes with multiple elbows. Pipe runs up to 122 meters can be characterized for beta/gamma and alpha, while collecting video information. In the Pipe Explorer's unique deployment method, a membrane is pneumatically expanded into the pipe, and the detectors are deployed within the membrane. This protects the detectors and prevents spread of contamination along the inside of the pipe. Another benefit of the membrane is that pipes with some fluid in them can be characterized while keeping the detectors protected from the moisture. Using the Pipe Explorer to characterize pipes offers vital information for determining the remediation requirements for pipes. It can eliminate the need to excavate for characterization of underground piping or disposal of pipes that are not contaminated. Lastly, it can provide characterization of the entire pipe, eliminating some of the uncertainty associated with sampling methods. The Pipe Explorer was used successfully at the Argonne large-scale demonstration both for beta/gamma and alpha measurements.

Soft-Sided Containers for Low-level Waste

The soft-sided containers for low-level waste packaging offer an effective alternative to metal or wood waste disposal containers. These containers reduce disposal volume, disposal container costs, shipping costs, and disposal costs. They were demonstrated and proven to be successful at the INEEL LSDDP in FY-98 and FY-99.

Hand-Held Shear

The hand-held shear cuts metal in remote and hard-to-reach locations. The shear is portable and has a self-contained battery pack, eliminating problems associated with power supply or hydraulic lines. When cutting, the hand-held shears crimp the pipe up to 75% of its original diameter before completely shearing the pipe. This partial crimping contains some of the loose pipe contents and increases safety. The geometry of this shear allows it to cut pipes against walls without removing pipe hangers. The hand-held shear was used successfully during the Hanford large-scale demonstration to cut pipes up to 6.35-cm in diameter, and subsequently deployed at Fernald through the ASTD.

Track-Mounted Shear

The track-mounted shear is a large demolition machine for sizing and removing equipment and structures. It significantly reduces worker exposure to the radiation and airborne contaminants common to cutting and grinding techniques. The track-mounted shear increases productivity in cutting and concrete removal operations. The track-mounted shear was successfully deployed at Fernald in FY-98 as part of the ASTD project. In the future, the track-mounted shear will be used on other EM40 D&D projects at Fernald.

STATUS

The INEEL procured three technologies in FY-98: the Oxy-Gas torch, the PICS, and the BROKK demolition robot with scabbler, shear, grapple, hammer, and bucket. The Oxy-Gas torch was deployed at Central Facilities Area. The operators were pleased with the speed, safety, ergonomics, and ease of learning the Oxy-Gas torch. During FY-99, all seven of the INEEL-selected ASTD technologies will be deployed at various sites at the INEEL.

Fernald procured and deployed the track-mounted shear and Oxy-Gas torch in FY-98. In addition, they procured and deployed the hand-held shear and PICS under another project as part of the ASTD project. Using these four ASTD technologies, Fernald decommissioned five facilities: (1) the Propane Storage Shelter, (2) the Cylinder Filling Station, (3) the Railroad Engine House, (4) the Harshaw Digestion Fume Recovery Building, and (5) the Refrigeration Building. One of the technologies was also deployed on an EM-40 project, successfully completing the mission of the ASTD.

Additional information about the ASTD project can be found on the project's internet home page: <http://id.inel.gov/idd/>. This website includes information about the technologies, pictures of them in use, and contacts for the technologies and the project.

SUMMARY

The INEEL is demonstrating and deploying innovative D&D technologies as part of ongoing D&D operations to reduce D&D operational costs, provide improved worker protection, and improve efficiency. Innovative technologies are identified and tested side by side with baseline technologies in the LSDDP. Test results are used to select the most successful technologies, which are then deployed in the ASTD Program.

Innovative technologies already demonstrated by the LSDDP include a remote underwater characterization system that provides visual and radiation data about underwater equipment, and soft-sided containers for low-level waste that reduce disposal volume, disposal container costs, and shipping and disposal costs.

Technologies being deployed under the ASTD include a remote system for characterizing piping (Pipe Explorer), suits that control worker's core body temperature (PICS), a remote-controlled demolition robot (BROKK), an optimization program for demolition activities (DDROPS), an improved cutting torch (Oxy-Gas torch), and a camera that detects and maps gamma radiation (GammaCam).

These INEEL programs are providing significant reductions in cost, schedule, radiation exposure, and waste volume.