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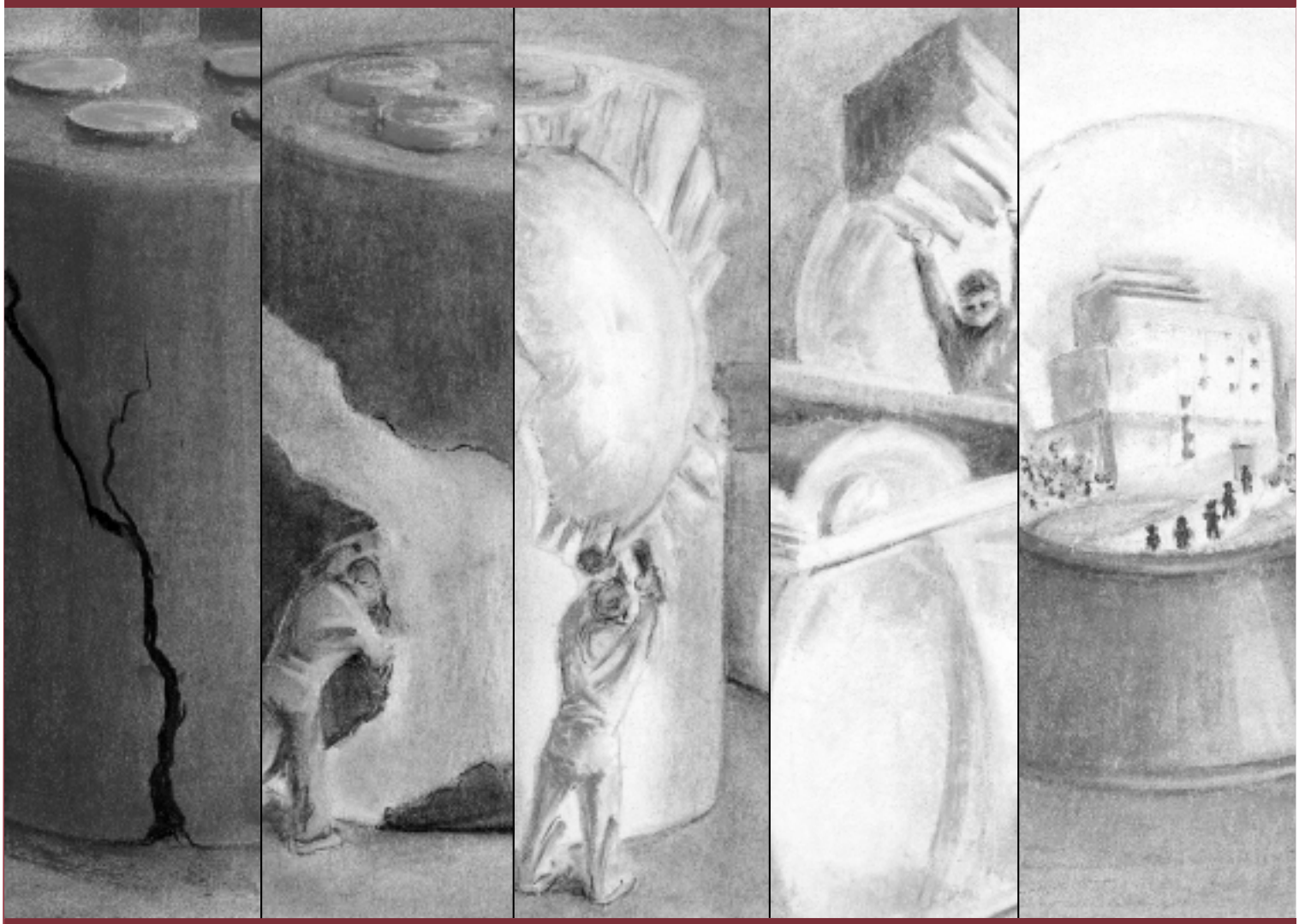
DOE/EM-0503

U.S. DEPARTMENT OF ENERGY
OFFICE OF ENVIRONMENTAL MANAGEMENT
OFFICE OF SCIENCE AND TECHNOLOY

FY 1999
ANNUAL REPORT



TOMORROW'S TECHNOLOGIES TODAY

DEACTIVATION & DECOMMISSIONING FOCUS AREA

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FY 1999
ANNUAL REPORT

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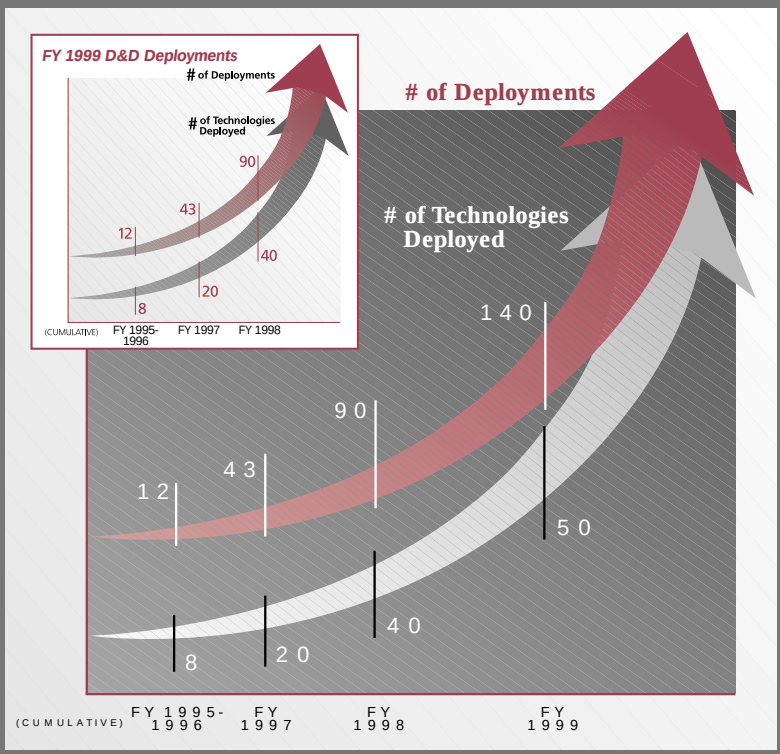
TOMORROW'S TECHNOLOGIES TODAY

The goal of the Deactivation and Decommissioning (D&D) Focus Area is the rapid, widespread deployment of innovative and improved technologies across the DOE Complex in order to reduce the surplus facility mortgage. The D&D Focus Area set out with the goals of providing improved capabilities to D&D 90% of surplus facilities by FY 2002 and reducing the DOE mortgage for D&D by 25% through FY 2006. The D&D Focus Area reached a milestone towards achieving these goals in FY 1999, by introducing its 100th technology and by deploying its 50th technology. This is the result of its successful partnerships with DOE end users, industry, and universities. From tritium to plutonium contamination, and from gaseous diffusion plants to research laboratories, the D&D Focus Area has introduced innovative and improved technologies to address over 80% of present day technology needs.

More than 80% of DOE surplus facilities will be decommissioned after FY 2006, so DDFA's R&D efforts are supplemented with basic and applied research to solve long-term customer needs. Data gained is critical to the advancement of technologies that are under development, as well as for solving problems that are considered intractable without new knowledge. The D&D Focus Area FY 1999 Annual Report details these accomplishments, and illustrates its commitment to providing solutions to D&D problems well into the next century.



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FY 1999 TECHNOLOGY ACHIEV

DEPLOYMENTS

BROKK

GAMMACAM

OXY-GASOLINE TORCH

CHARACTERIZATION

Pipe Explorer (TM) Surveying System

Position Sensitive Radiation Monitoring (Surface Contamination Monitor)

GammaCam(TM) Radiation Imaging System

Remote Underwater Characterization System (RUCS)

CDI Remote Characterization System

D&D and Remediation Optimal Planning System (DDROPS)

3-D Visual and Gamma Ray Imaging System

Compact Subsurface Investigation System

Quantrad Scout Gamma Spectroscopy System

Non-Instrusive Liquid Level Detection System

DECONTAMINATION

Strippable Coatings and Fixatives

ROTO PEEN Scaler and VAC PAC System

DISMANTLEMENT

Oxy-gasoline Torch

Remote Control Concrete Demolition System

Track Mounted Shear/Cursher

MATERIAL DISPOSITION

Soft-Sided Waste Containers

WORKER SAFETY/OTHER

Excel Automatic Locking Scaffold

Personal Ice Cooling System (PICS)

Mobile Integrated Temporary Utility System

Sealed Seam Sack Suits

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EMENTS

DEMONSTRATIONS

CHARACTERIZATION

Portable Scintillation Counter
Long Range Alpha Detection for Component Monitoring
Portable X-Ray, K-Edge Heavy Metal Detector
Electret Ion Chambers
Lead Paint Analyzer
Non-Intrusive Liquid Level Detection System
Vehicle and Cargo Inspection System (VACIS)
Electromagnetic Radiography
NITON 800 Series Multi-element Spectrum Analyzer
3-D Visual and Gamma Ray Imaging System
Global Positioning Radiometric Scanner
Direct Reading Tritium Monitor

DECONTAMINATION

Strippable Coatings and Fixatives
Paint Scaler

DISMANTLEMENT

Size Reduction Machine
Mobile Work Platform
Diamond Wire Cutting of the Tokemak Fusion Test Reactor Vacuum Vessel
Mega-Tech Hydraulic Shears

MATERIAL DISPOSTION

Water Solidification
Oil Solidification
Asbestos Pipe Insulation Removal System

WORKER SAFETY/OTHER

Excel Automatic Locking Scaffold
AeroGo Air Lift Pallet System

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APPLIED R & D

- GROUND-BASED LASER-INDUCED FLOURESCENCE IMAGING
- THREE-DIMENSIONAL INTEGRATED CHARACTERIZATION AND ARCHIVING SYSTEM (3-D ICAS)
- FAST RESPONSE ISOTOPIC ALPHA CONTINUOUS EMISSIONS MONITOR
- COHERENT LASER VISION SYSTEM

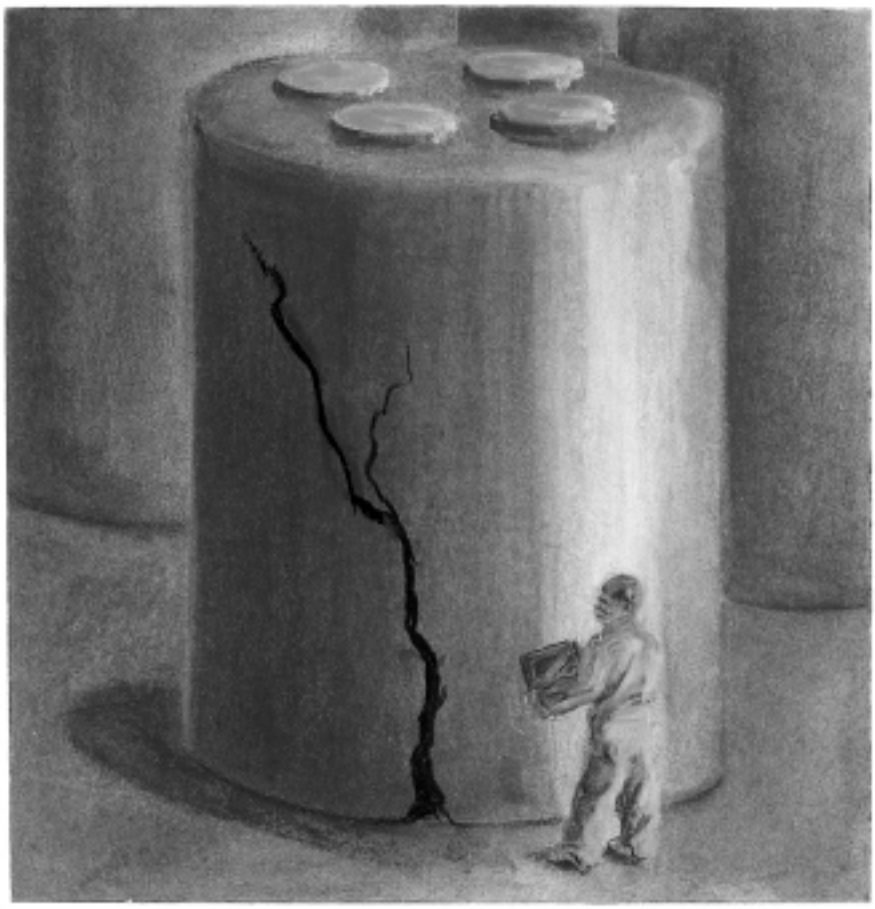
CHARACTERIZATION

DEPLOYMENTS

- PIPE EXPLORER (TM) SURVEYING SYSTEM
- POSITION SENSITIVE RADIATION MONITORING (SURFACE CONTAMINATION MONITOR)
- GAMMACAM (TM) RADIATION IMAGING SYSTEM
- REMOTE UNDERWATER CHARACTERIZATION SYSTEM (RUCS)
- CDI REMOTE CHARAC-TERIZATION SYSTEM
- D&D AND REMEDIATION OPTIMAL PLANNING SYSTEM (DDROPS)
- 3-D VISUAL AND GAMMA RAY IMAGING SYSTEM
- COMPACT SUBSURFACE INVESTIGATION SYSTEM
- QUANTRAND SCOUT GAMMA SPECTROSCOPY SYSTEM

DEMONSTRATIONS

- PORTABLE SCINTILLATION COUNTER
- LONGE RANGE ALPHA DETECTION FOR COMPONENT MONITORING
- PORTABLE X-RAY, K-EDGE HEAVY METAL DETECTOR
- ELECTRET ION CHAMBER
- LEAD PAINT ANALYZER
- NON-INTRUSIVE LIQUID LEVEL DETECTION SYSTEM
- VEHICLE AND CARGO INSPECTION SYSTEM (VACIS)
- ELECTROMAGNETIC RADIOGRAPHY
- NITON 800 SERIES MULTI-ELEMENT SPECTRUM ANALYZER
- 3-D VISUAL AND GAMMA RAY IMAGING SYSTEM
- GLOBAL POSITIONING RADIOMETRIC SCANNER
- DIRECT READING TRITIUM MONITOR



LSDDP

MOUND TRITIUM D&D

FACILITY: Building SW/R, T, and HH at Mound site used for weapons-related R&D and production.

CHALLENGES: tritium contaminated gloveboxes, tritium characterization, mixed waste treatment and disposal, tritiated water treatment, piping system removal,etc.

PROJECT SCHEDULE: April 1998 – September 2001

TECHNOLOGIES DEMONSTRATED TO DATE: Portable Liquid Scintillation Counter, Water solidification, Oil solidification

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LEAD PAINT ANALYZER

OST/TMS ID 2317

The Lead Paint Analyzer meets the need for an in situ, real-time identification and quantification of lead, cadmium, chromium, and other metals in lead-based paint.

The Lead Paint Analyzer consists of a hand-held, battery-operated unit that uses x-ray fluorescence spectroscopy to identify and quantify metals and elements in lead-based paint. All eight RCRA metals and up to 17 other elements can be characterized in less than a minute. The analyzer stores up to 3,000 data sets, including sample locations, and data can be easily downloaded to a conventional PC.

Demonstration of the Niton 700 Series Multi-Element Spectrum Analyzer was completed in February 1999 at the Fuel Storage Canals and Underwater and Underground Facilities D&D LSDDP at INEEL. The technology completed characterization at all facilities. Data from the demonstration indicated that the Niton 700 Series analyzer provides data equal to or better than laboratory data. With an average laboratory analysis cost per sample of $1,000 the Niton 700 Series analyzer will pay for itself after measuring only 25 samples. The main value of this analyzer is that it provides a result in about 20 seconds. These results can be used by decommissioning project managers to make immediate decisions on the appropriate approach to remediate an area of a facility, instead of waiting days or weeks for laboratory results.

PORTABLE SCINTILLATION COUNTER

OST/TMS ID 2311

The Portable Liquid Scintillation Counter measures a variety of radioscopic and enhanced luminescense assays.

The Lumi-Scint 1000 Portable Liquid Scintillation Counter is a portable version of the baseline liquid scintillation counter that can be easily transported to survey field sites. A dry smear of a 100 square centimeter area of a surface, in this case a tritium-contaminated surface, is taken and placed directly into a vial containing a liquid scintillation "cocktail." The vial is then placed in the Lumi-Scint 1000 for immediate counting, eliminating the need to transfer the smears to a laboratory for measurement by a large immobile liquid scintillation counter. This will help eliminate the turn-around time required for the baseline technology.

This technology is part of the Mound Tritium D&D LSDDP. From March 1999 through May 1999, a demonstration of this technology was conducted in the SW and T Buildings of the Main Hill Tritium area at Mound. The Lumi-Scint technology proved very easy to use for the detection of tritium on contaminated surfaces. It was accurate for counting the beta activity produced by tritium for large variations of activity, and saved time when used for non-routine surveys/monitoring as a result of its quick turnaround time, portability, and ease of use. By taking the Lumi-Scint to the source of activity, users can obtain a significant reduction in time and labor requirements over the baseline technology.

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APPLIED R & D

LASER SURFACE CLEANING	HIGH PRODUCTIVITY VACUUM BLASTING SYSTEM	INTEGRATED VERTICAL AND OVERHEAD DECONTAMINATION SYSTEM	EX SITU LARGE-BORE PIPE DECONTAMINATION AND CHARACTER-IZATION SYSTEM	IN SITU PIPE DECONTAMINATION SYSTEM

DECONTAMINATION

DEPLOYMENTS

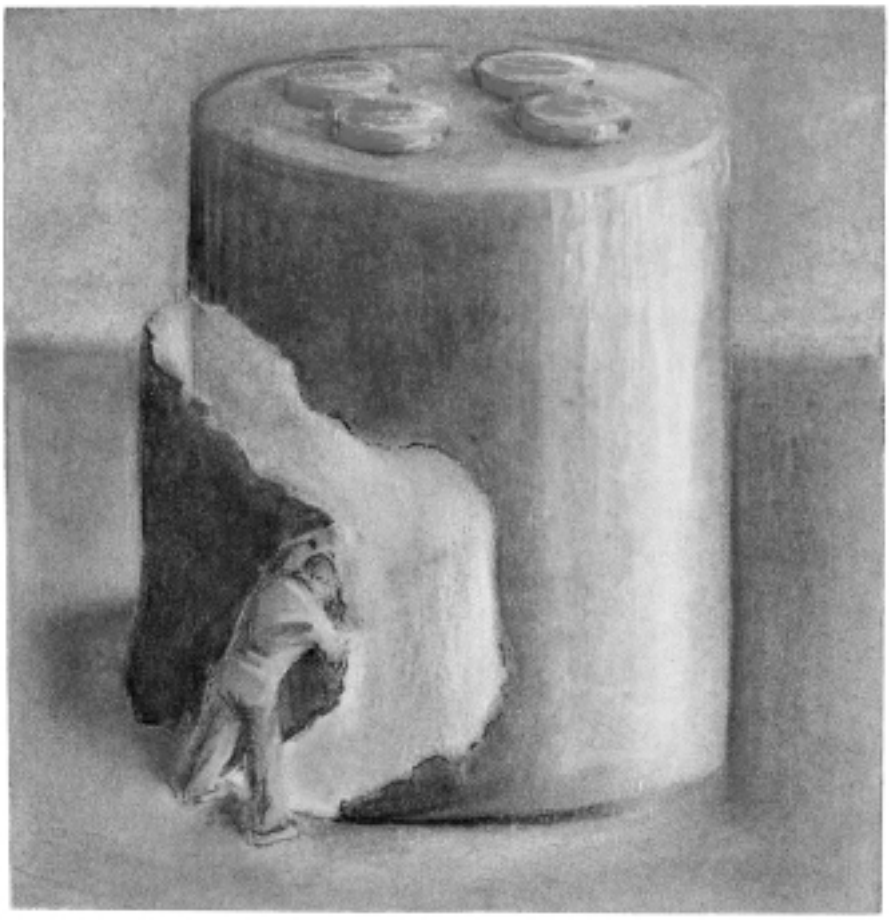
STRIPPABLE COATINGS AND FIXATIVES

ROTOPEEN SCALER AND VACPAC SYSTEM

DEMONSTRATIONS

STRIPPABLE COATINGS AND FIXATIVES

PAINT SCALER



LSDDP

INEEL FUEL STORAGE CANAL AND UNDERWATER AND UNDERGROUND FACILITIES D&D

FACILITY: Test Reactor Area TRA-660, housing two underwater research reators; TRA Filter Pit System, consisting of five structures containing large filters associated with the test reactor operation; and TAN-620 Initial Engine Test Control Room, a massive underground, shielded, heavily reinforced, concrete structure.

CHALLENGES: underwater inspections, characterization and dismantlement; inspection, characterization and dismantlement in confined spaces; recycle of materials; removal of loose radiological contamination on walls, floors, piping, and equipment; etc.

PROJECT SCHEDULE: April 1998 – September 2000

TECHNOLOGIES DEMONSTRATED TO DATE: Remote Underwater Characterization System, Soft-Sided Waste Containers, Excel Automatic Locking Scaffold, Lead Paint Analyzer, NITON 800 Series Multi-element Spectrum Analyzer and Electromagnetic Radiography

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STRIPPABLE COATINGS AND FIXATIVES

OST/TMS ID 2314

ALARA™ 1146 Cavity Decon strippable coating has advantages over the baseline including elimination of liquid waste and reduction of solid waste since it is compatable and incinerable.

The application of strippable coatings is an innovative technology for decontamination, which effectively reduces hazardous residuals at low cost. The process applies a plastic membrane or polymer on the contaminated surface. The strippable coating is allowed to cure for up to 24 hours, after which it can be easily peeled or stripped off the surface. The coating traps the contaminants in the polymer matrix. Strippable coatings are non-toxic and do not contain volatile compounds or heavy metals. Since the coating constitutes a solid waste, disposal is easier than treating contaminated liquid wastes. Benefits of strippable coatings include elimination of liquid waste; reduction of solid waste (dried coating can be incinerated); immobilization of surface contamination; adherance to and easy removal from complex surfaces and components; and rapid application and removal.

This technology is part of the 321-M HEU Fuel Fabrication Facility Deactivation LSDDP at SRS. In May 1999, ALARA™ 1146 Cavity Decon was demonstrated against the baseline Kelly Vac steam cleaner with vacuum-shrouded head in the decontamination and rollback of radiological areas. Approximately 2,200 square feet of wall and floor area were coated with the ALARA™ 1146 Cavity Decon in the Machining Room, Log Storage Room, and the Casting Room Cooling Hut. The surfaces were painted and unpainted carbon steel and painted concrete. For the surfaces that had the highest contamination levels, Decontamination Factors (DF) up to 7.2 (alpha) and up to 3.9 (beta/gamma) were achieved. The DF was lower for less contaminated surfaces, as would be expected. Seventy gallons of coating were applied during the demonstration. Actual coverage of the coating was approximately 31 square feet per gallon and the application rate was approximately 0.3 gallons per minute.

OST/TMS ID 1943

ROTO PEEN Scaler and VAC PAC System is a method for removing contaminated coating on concrete and steel located on floors, walls, ceilings and structural components. The system uses a hand-held ROTO PEEN Scaler with localized exhaust. The scaler is equipped with 3M heavy duty Roto Peen Flaps, each studded with rows of tough tungsten carbide cutters and mounted on a rotating hub. The debris removed by the ROTO PEEN scaler is simultaneously collected in a VAC PAC, a high performance HEPA Vacuum/Drumming System. This technology has been proven to be very efficient compared to mechanical scabbling and also up to forty percent cheaper.

The VAC-PAC System provides ports to support the operation of up to ten tool, each located up to 100 ft. away.

ROTO PEEN SCALER AND VAC PAC SYSTEM

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APPLIED R & D

EQUIPMENT PIT D&D SYSTEM

MODULAR MANIPULATOR FOR ROBOTIC APPLICATIONS

DISMANTLEMENT

DEPLOYMENTS

OXY-GASOLINE TORCH

REMOTE CONTROL CONCRETE DEMOLITION SYSTEM

TRACK MOUNTED SHEAR/CRUSHER

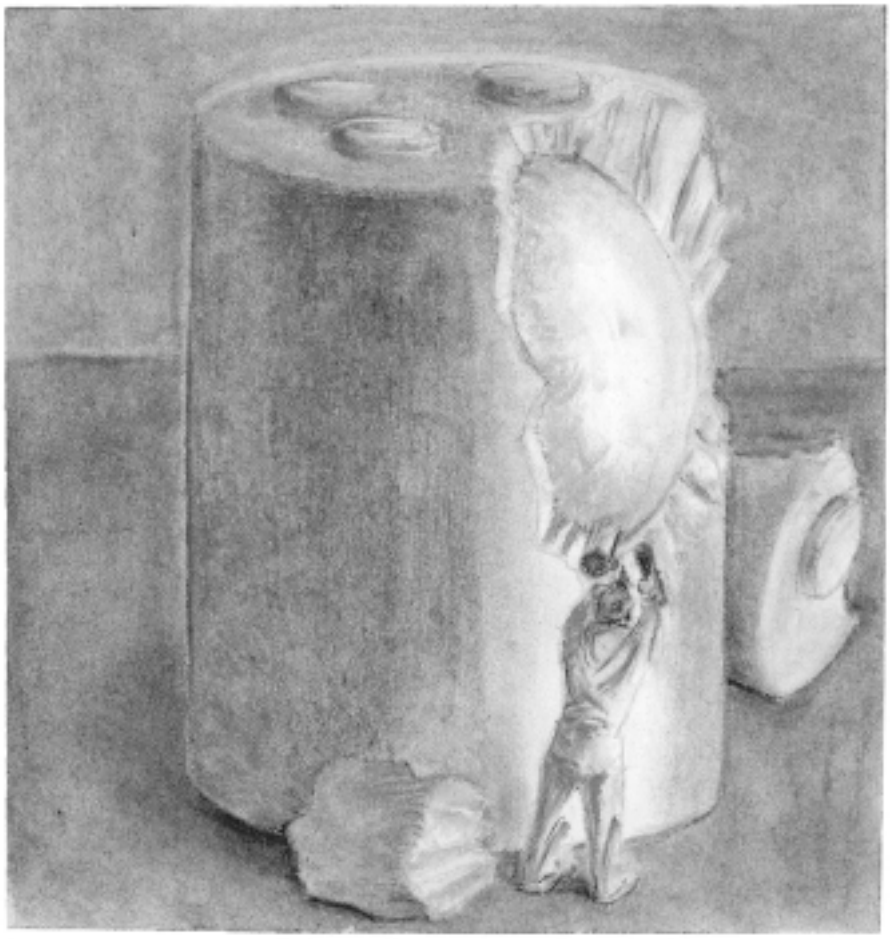
DEMONSTRATIONS

SIZE REDUCTION MACHCINE

MOBILE WORK PLATFORM

DIAMOND WIRE CUTTING OF THE TOKEMAK FUSION TEST REACTOR VACUUM VESSEL

MEGA-TECH HYDRAULIC SHEARS



LSDDP

FERNALD PLANT 1 COMPLEX DECOMISSIONING

FACILITY: Plant 1 Complex, a large, radioactively contaminated, multi-story process facilty containing asbestos insulation, transite paneling, large process equipment, and utilities.

CHALLENGES: cleaning of process piping, dismantlement of overhead piping and conduits, decontamination of structures, inspection of process piping, reduced worker prodctivity due to heat stress

PROJECT SCHEDULE: March 1996 – September 1999

TECHNOLOGIES DEMONSTRATED TO DATE: Steam Vacuum Cleaning, Soft Media Blast Cleaning, VecLoader HEPA Vacuum Insulation Removal, Oxy-Gasoline Torch, Field Raman Spectrograph, Ground Based Laser Induced Florescence Imaging, Process Piping Inspection using the BTX-II, Process Piping Inspection using the Pipe Crawler, Low Density Cellular Concrete Void Filling, Foam Void Filling, Personal Ice Cooling System, Centrifugal Shot Blasting, Mobile Work Platform

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MOBILE WORK PLATFORM

OST/TMS ID 2243

The Mobile Work Platform was used to remotely cut and lower overhead Fernald LSDDP.

The Mobile Work Platform (MWP) is a multi-articulating, folding main boom attached to a mobile chassis by means of a 360 degree rotating turret assembly. Attached to the telescoping jib end of the main boom are two independently operable arms that are mounted on a common articulating and rotating support platform base called the Rotec. End-effectors are attached to each arm that have the ability to grab, hold in place, crimp, and shear pipe/conduit and lower the segmented section to the floor, waste container, or a predefined staging area. The MWP is self-propelled and has the ability to steer each of the four wheels independently, increasing the maneuvering proficiency. Four outriggers can be extended laterally, and outrigger jacks can be deployed to stabilize the chassis. When stabilized, the MWP can be remotely operated to manipulate all its functions.

The final technology demonstration for MWP was completed in the first quarter of FY1999. The demonstration took place in the Tank Farm Complex and Building 6G (of Plant 6: Metals Fabrication Plant) to remotely remove overhead piping and conduit. The demonstration resulted in removing over 800 feet of piping up to 6" in diameter. The equipment's removal rate varied between 13-28 ft/hr with an average rate of 21 ft/hr. Initial analysis by USACE indicate that the unit cost for cutting pipe with Mobile Work Platform is about the same as manual cutting using scaffolding, etc., but the technology greatly reduces worker risk.

DIAMOND WIRE CUTTING SAW

OST/TMS ID 2389

The diamond wire cutting saw consists of a diamond matrix made to length for individual cuts, and a hydraulic drive system.

Diamond wire cutting has typically been used to cut thick, reinforced concrete slabs or walls, such as the biological shield in a nuclear facility. Diamond wire cutting involves a series of guide pulleys that draw a continuous loop of multistrand wire strung with a series of diamond beads and spacers through a cut. Contact tension kept on the wire, in combination with the spinning wire, cuts a path through concrete and reinforcing rods. Water is typically used for cooling and lubricating purposes during cutting operations. Recent developments in diamond wire technology may possibly make it a feasible alternative to the plasma arc torch. Improvements include the cutting of carbon steel components such as pipe, plate, and tube bundles in heat exchangers.

The DDFA conducted an assessment of diamond wire cutting technology using mockups of the stainless steel toroid component of Tokamak Fusion Test Reactor (TFTR) at the Princeton Plasma Physics Laboratory (PPPL) in Princeton, New Jersey. The demonstration was conducted to determine if existing diamond wire cutting methods and technology are suitable for cutting a mockup of the toroid component of the TFTR and other stainless steel devices that require, or will in the future require, D&D. The demonstration also attempted to optimize the following variables: the void-fill material for the vacuum vessel and the coolant for the diamond wire cutting technology. The demonstration proved that diamond wire cutting will reduce the costs of TFTR segmentation to 37% of the expected baseline cost of plasma cutting while also improving the worker safety.

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APPLIED R & D

ADVANCED TECHNOLOGIES FOR DECONTAMINATION AND CONVERSION OF SCRAP METAL

ASBESTOS PIPE-INSULATION REMOVAL SYSTEM

MATERIAL DISPOSITION

DEPLOYMENTS

SOFT-SIDED WASTE CONTAINTERS

DEMONSTRATIONS

WATER SOLIDIFICATION

OIL SOLIDIFICATION

ASBESTOS PIPE INSULATION REMOVAL SYSTEM

LSDDP

LANL DECONTAMINATION, TREATMENT AND SIZE REDUCTION OF LARGE METAL OBJECTS

FACILITY: Technical Area 54 (TA-54)

CHALLENGES: plutonium contaminated gloveboxes, plutonium characterization, TRU and LLW packageing, TRU and LLW segregation, imaging of packaged crate contents

PROJECT SCHEDULE: April 1998 – September 2001

TECHNOLOGIES DEMONSTRATED TO DATE: AeroGo Air Lift Pallet System, Vehicle and Cargo Inspection System (VACIS), Mega-Tech Hydraulic Shears

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SOFT-SIDED WASTE CONTAINERS

OST/TMS ID 2240

The greter capacity of Soft-Sided Waste Containers allows continuous loading without changing containers as frequently and ermitted larger objects to be placed, thereby reducing waste preparation.

Soft-Sided Waste Containers, manufactured by Transport Plastic, Inc., each include a 25-mil woven and coated outer polypropylene fabric shell with lifting straps, and a 40-mil high-density polyethylene inner liner. Each container has a capacity of 260 cubic feet, holds up to 24,000 lbs, and meets the Department of Transportation requirements for transport of low specific activity waste 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 which attaches to the lifting straps for hoisting the filled containers.

From August 1998 to January 1999, the Soft-Sided Waste Containers were demonstrated as part of the INEEL Fuel Storage Canals and Underwater and Underground Facilities LSDDP. Results indicated that the cost to use the soft-sided containers for disposal of D&D debris was about 70% less than the baseline technology of metal boxes. Other advantages include ease of loading the containers; reduction in waste processing (because larger pieces of debris can be placed in soft-sided containers); and reduced void space in the disposal cell. D&D debris loaded into the soft-sided containers during the demonstration included concrete, cinder block, structural steel, piping, wood, gravel, and soil. Since the demonstration, Soft-Sided Waste Containers are being deployed at all D&D sites at the INEEL and is now considered baseline. Interest in the soft-sided containers is increasing at other DOE sites and INEEL is receiving increasing information requests.

WATER SOLIDIFICATION

OST/TMS ID 2312

The WaterWorks Crystals SP-400 is a high-technology polymer capable of virtually instant absorption of liquids, allowing a user to essentially "freeze" problem in place while trapping any dissolved liquids.

The WaterWorks Crystals SP-400 Superabsorbent is a polymer-based absorbent that can be used to solidify aqueous waste. It is similar to other polymer-based absorbents that offer benefits over traditional solidification agents such as cement, or the Mound facility baseline solidification agent Aquaset. Benefits include a high liquid to absorbent ratio, no mechanical mixing required to promote the absorption process, little to no volume increase in the waste form following addition of the absorbent, and a very high retention in the form of the gel-like material.

The WaterWorks Crystals SP-400 was demonstrated as part of the Mound Tritium Facilities D&D LSDDP in April 1999. It was demonstrated in the WD Building Addition Room 110 to illustrate its absorbent properties in solidifying tritiated water. The demonstration of WaterWorks Crystals Superabsorbent demonstrated a number of advantages over the baseline solidification method. Advantages in the area of Speed/productivity are that Water Works Crystals Superabsorbent reacts very quickly with the tritiated water and does not require mixing. This reduces processing time over the baseline. Time savings come from reduced handling, no mixing, and no setup times. The Water Works Crystals Superabsorbent also costs approximately 75% less per unit volume of water.

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APPLIED R & D

ADVANCED WORKER PROTECTION SYSTEM

PROTECTIVE CLOTHING BASED ON PERMASELECTIVE MEMBRANE AND CARBON ADSORPTION

ROBOT TASK SPACE ANALYZER

COMPACT REMOTE OPERATOR CONSOLE

TELROBOTIC CONTROL

WORKER SAFETY

DEPLOYMENTS

EXCEL AUTOMATIC LOCKING SCAFFOLD

PERSONAL ICE COOLING SYSTEM (PICS)

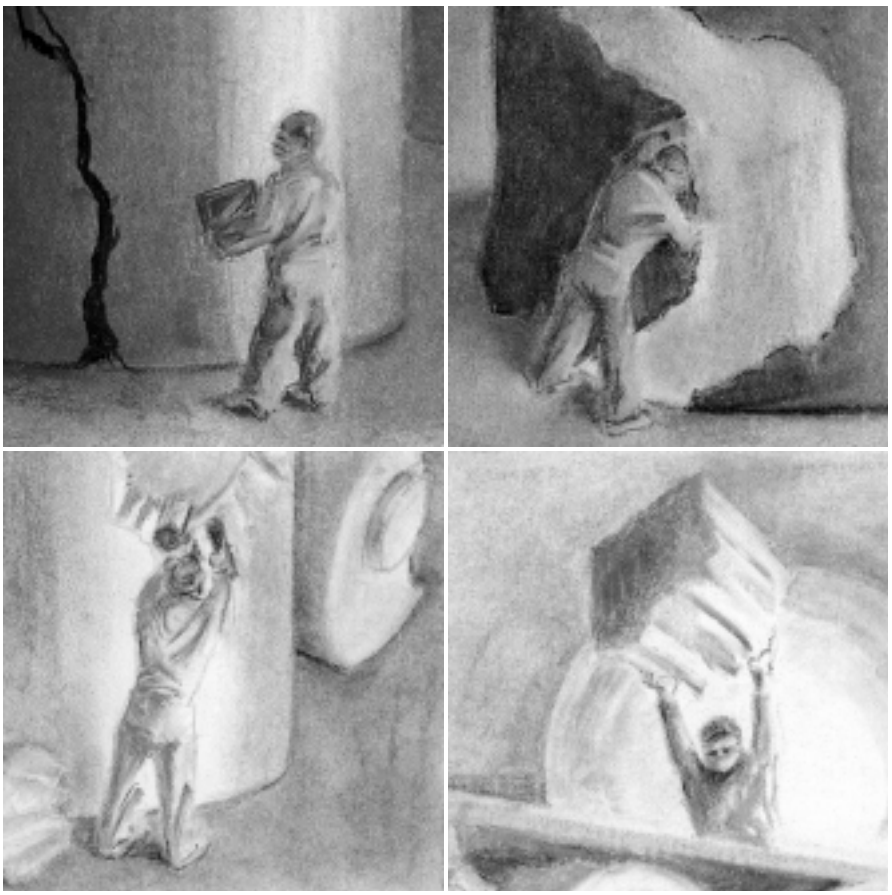
MOBILE INTEGRATED TEMPORARY UTILITY SYSTEM

SEALED SEAM SACK SUITS

DEMONSTRATIONS

EXCEL AUTOMATIC LOCKING SCAFFOLD

AEROGO AIR LIFT PALLET SYSTEM



LSDDP

SAVANNAH RIVER SITE 321-M FUEL FABRICATION FACILITY DEACTIVATION

FACILITY: 321-M Facility

CHALLENGES: HEU contaminated components, piping, ducts, enclosures; HEU (alpha) characterization, surface decontamination

PROJECT SCHEDULE: April 1998 – December 1999

TECHNOLOGIES DEMONSTRATED TO DATE: Strippable Coatings and Fixatives; Portable X-Ray, K-Edge Heavy Metal Detector; Size Reduction Machine, Electret Ion Chambers

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EXCEL AUTOMATIC LOCKING SCAFFOLD

OST/TMS ID 2320

The design of Snap Together Scaffolding has been shown to dramatically lower total scaffold man-hours and associated labor expenditures for maintenance and D&D activities.

The Excel Automatic Locking Scaffold is a positive locking system scaffold. Trigger release horizontal bearers are attached to vertical legs without the use of hand tools. This reduces the need for tedious, repetitive clamp tightening associated with baseline scaffolding. The following pre-manufactured snap together attachments offer increased safety and utility: swing gates, floor hatches, ladders, trusses, cantilevers, lifting devices, and trolley systems. Excel scaffolding can be erected for light, medium and heavy duty use as per OSHA requirements.

The Excel modular scaffolding was demonstrated as part of the INEEL Fuel Storage Canals and Associated Facilities LSDDP at the Security Training Facility during February, March, and April of 1999. The Excel scaffold was compared to tube and clamp scaffold during a D&D asbestos removal project. During the demonstration there were large areas requiring scaffolding including tanks, extensive piping requiring asbestos removal, and some areas that were access-limited. The Excel scaffold system was simpler for the carpenters to use, and there was a 63% reduction in set up time and a 67% percent reduction in takedown time compared to tube and clamp scaffolding. Some of the benefits of using the Excel modular scaffolding include reduced number of parts during mobilization and setup, reduction in scaffold labor hours, and ALARA dose savings. INEEL D&D Operations is buying the Excel modular scaffolding and deploying the new scaffolding at other job sites.

PERSONAL ICE COOLING SYSTEM

OST/TMS ID 1898

PICS is a self-contained core body temperature control system that uses ordinary ice as a coolant that is circulated through tubing incorporated into a durable, comfortable short or vest worn under an anti-contamination suit.

The Personal Ice Cooling System (PICS), developed by Delta Temax, consists of a garment with plastic tubing woven into it that is attached to a backpack pump unit containing a two-liter frozen bottle of ice. The self-contained system circulates water over the ice and through the tubing to remove metabolic heat from the body and avoid heat stress. The two-liter ice bottle can be changed out in approximately 30 seconds to a minute, providing fresh cooling to a worker. In contrast, a worker using an ice vest would have to leave the work area and remove their Personal Protective Equipment (PPE) to replenish his cooling.

The PICS was demonstrated as part of the Fernald Plant 1 LSDDP in an effort to find a safer, more productive method of controlling heat stress than the baseline ice vests and use of "cool down" rooms. Using the PICS, the workers were able to extend their stay times from twenty minutes to 80 minutes, realizing a 54% increase in productivity. Since the demonstration, this technology has been widely deployed within and outside of the DOE Complex.

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RESEARCH AND DEVELOPMENT

Over the past few years, DDFA has focused greatly on introducing and widely deploying commercially available D&D technologies in the DOE Complex. At the same time, DOE faces some unique challenges for which commercially available technologies do not suffice and new technologies need to be developed. DDFA addresses such near-term challenges with the assistance of crosscutting programs including Characterization, Monitoring, and Sensor Technology; Robotics; Industry; and University.

The following is list of technologies developed by these crosscutting programs in FY 1999.

CHARACTERIZATION, MONITORING AND SENSOR TECHNOLOGY

GROUND-BASED LASER-INDUCED FLUORESCENCE IMAGING (OST/TMS ID 1999)

PORTABLE X-RAY, K-EDGE HEAVY METAL DETECTOR (OST/TMS ID 134)

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ROBOTICS

COMPACT REMOTE OPERATOR CONSOLE (OST/TMS ID 2180)

TELEROBOTIC CONTROL (OST/TMS ID 2939)

EQUIPMENT PIT D&D SYSTEM (OST/TMS ID 2181)

UNIVERSITY

FLORIDA INTERNATIONAL UNIVERSITY:

INTEGRATED VERTICAL AND OVERHEAD DECONTAMINATION SYSTEM

EX SITU LARGE-BORE PIPE DECONTAMINATION AND CHARACTERIZATION SYSTEM

IN SITU PIPE DECONTAMINATION SYSTEM

INDUSTRY

THREE-DIMENSIONAL TNTEGRATED CHARACTERIZATION AND ARCHIVING SYSTEM (3-D ICAS) (OST/TMS ID 97)

FAST RESPONSE ISOTOPIC ALPHA CONTINUOUS EMISSIONS MONITOR (OST/TMS ID 2225)

LASER SURFACE CLEANING (OST/TMS ID 32)

HIGH PRODUCTIVITY VACUUM BLASTING SYSTEM (OST/TMS ID 2224)

ADVANCED TECHNOLOGIES FOR DECONTAMINATION & CONVERSION OF SCRAP METAL (OST/TMS ID 234)

ASBESTOS PIPE-INSULATION REMOVAL SYSTEM (OST/TMS ID 148)

ADVANCED WORKER PROTECTION SYSTEM (OST/TMS ID 75)

COHERENT LASER VISION SYSTEM (OST/TMS ID 94)

PROTECTIVE CLOTHING BASED ON PERMASELECTIVE MEMBRANE AND CARBON ADSORPTION (OST/TMS ID 95)

ROBOT TASK SPACE ANALYZER (OST/TMS ID 2171)

MODULAR MANIPULATOR FOR ROBOTIC APPLICATIONS (OST/TMS ID 2199)

Beyond the near-term challenges, the DOE must seek out technological solutions for significant long-term challenges. More than 80 percent of the surplus facilities will be decommissioned after 2006. Current R&D efforts must be supplemented with basic research to address long-term technical issues crucial to the EM mission. Basic research also provides EM with near-term fundamental data that may be critical to the advancement of technologies that are under development but not yet at full scale or implemented. The Environmental Management Science Program (EMSP) coordinates this basic research in collaboration with DOE's Office of Science. Basic research under this program contributes to EM activities that decrease risk to the public and workers, provide opportunities for major cost reductions, reduce time required to achieve EM's mission goals, and, in general, address problems that are considered intractable without new knowledge. This program is designed to inspire "breakthroughs" in areas critical to the EM mission through basic research.

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RESEARCH AND DEVELOPMENT
CONTINUED

The Basic Science Research Portfolio currently has more than 25 research projects addressing D&D needs. Representative projects from these 25 include:

Real-time Identification and Characterization of Asbestos and Concrete Materials with Radioactive Contamination

A project by Rensselaer Polytechnic Institute to develop the ability to determine the depth of contamination inside a concrete wall using in situ, non-invasive gamma spectroscopy and identify and map asbestos real time using non-destructive broadband radiation in the terahertz region. A prototype of the portable and integrated spectroscopy system is available for field testing.

Improved Decontamination: Interfacial, Transport, and Chemical Properties of Aqueous Surfactant Cleaners

This project, performed by Oak Ridge National Laboratory, aims to gain an understanding of interfacial, transport, and chemical processes that control the effectiveness of aqueous-based surfactant solutions.

Advanced Sensing and Control Techniques to Facilitate Semi-Autonomous Decommissioning

This Clemson University project is intended to advance the technology of semi-autonomous teleoperated robotics to allow human interaction with an environment via virtual reality. This project is developing a prototype dual-manipulator mobile work cell by integrating computer vision, artificial intelligence, and virtual reality technologies. Clemson University is currently working to integrate the vision system with a moving robot, and complete virtual reality rending and low-level robotic control software.

Optimization of Thermochemical, Kinetic, and Electrochemical Factors Governing Partitioning of Radionuclides During Melt Decontamination of Radioactively Contaminated Stainless Steel

The goal of this project is to optimize decontamination of radioactive stainless steel scrap through melt processing. The project will utilize molten slags to remove radionuclides from contaminated metal and optimize electroslag remelting to produce high-quality ingots. The project is a collaboration among Sandia National Laboratory, Boston University, and the Mining and Chemical Combine in Zheleznogorsk, Russia. Currently, experiments are underway to measure physical properties for electroslag remelting and thermodynamic models, and model surrogate separation.

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DDFA TECHNOLOGY PORTFOLIO

OST/TMS ID	Technology Title

CHARACTERIZATION

74	PipeExplorer (TM) Surveying System
134	Portable X-Ray, K-Edge Heavy Metal Detection
873	Field Raman Spectrograph
1476	2-D Linear Motion System
1790	Portable X-Ray Fluorescence Spectrometer
1793	Gamma Ray Imaging System
1798	Mobile Automated Characterization System
1810	Pipe Crawler Internal Piping Characterization System
1811	Pipe Inspection
1840	GammaCam (TM) Radiation Imaging System
1853	Field Transportable Beta Spectrometer
1942	Position Sensitive Radiation Monitoring (Surface Contamination Monitor)
1946	Indoor Radiation Mapping Using Laser-Assisted Ranging and Data System
1999	Ground Based Laser Induced Fluorescence Imaging
2098	In Situ Object Counting System
2103	RESRAD-BUILD
2151	Remote Underwater Characterization System (RUCS)
2153	Compact Subsurface Investigation System
2178	CDI Remote Characterization System
2241	Decommissioning In Situ Plutonium Inventory Monitor (DISPIM)
2310	Direct Reading Tritium Monitor
2311	Portable Scintillation Counter
2315	Electret Ion Chambers
2317	Lead Paint Analyzer
2382	Long Range Alpha Detection for Component Monitoring
2390	Electromagnetic Radiography
2397	NITON 800 Series Multi-element Spectrum Analyzer
2398	PCB Analyzer
2402	3-D Visual and Gamma Ray Imaging System
2403	Non-Intrusive Liquid Level Detection System
2912	Vehicle and Cargo Inspection System (VACIS)
2933	Real-Time Surface Tritium Monitor
2952	Paint Scaler
2954	Global Positioning Radiometric Scanner
2956	Solid State Pin Diode Direct Reading Surface Tritium Detector
2957	Passive Tritium Air and Surface Monitor
2959	Mobile Characetrization System for Large Crates
2960	Quantrad Scout Gamma Spectroscopy System

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DDFA TECHNOLOGY PORTFOLIO

CONTINUED

OST/TMS ID	Technology Title

DECONTAMINATION

87	Corpex Nuclear Decontamination Process
1421	Biodegradation of Concrete
1450	Lead TechXtract Chemical Decontamination
1476	2-D Linear Motion System
1543	Empore (TM) Membrane Separation Technology
1780	Steam Vacuum Cleaning
1796	Starbolt (TM) Flashlamp
1812	Rotary Peening with Captive Shot
1839	Reactor Surface Contaminant Stabilization
1851	Centrifugal Shot Blasting
1899	Soft Media Blast Cleaning
1943	ROTO PEEN Scaler and VAC PAC System
1945	Pegasus Coating Removal
1950	Concrete Shaver
1971	Advanced Recyclable Media System
2099	Remotely Operated Scabbling
2102	Concrete Grinder
2152	Concrete Spaller
2314	Strippable Coatings and Fixatives
2937	NURES Nuclide Removal System

DISMANTLEMENT

1477	Laser Cutting and Size Reduction
1787	Dual Arm Work Platform Teleoperated Robotics System
1799	Rosie: Mobile Teleoperated Robot Worksystem
1807	High-Speed Clamshell Pipe Cutter
1815	Swing-Reduced Crane Control
1847	Oxy-Gasoline Torch
1948	Self-Contained Pipe Cutting Shear
2100	Remote Control Concrete Demolition System
2107	Liquid Nitrogen-Cooled Diamond-Wire Concrete Cutting
2154	Concrete Dust Suppression System
2243	Mobile-Work Platform
2303	Track Mounted Shear/Crusher
2304	Hand Held Shear
2320	Excel Automatic Locking Scaffold
2389	Diamond Wire Cutting of the Tokamak Fusion Test Reactor Vacuum Vessel

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OST/TMS ID	Technology Title

DISMANTLEMENT
CONTINUED

2395	Size Reduction Machine
2953	Mega-Tech Hydraulic Shears
2955	Pipe Cutting and Crimping System

MATERIAL DISPOSITION

73	In Situ Chemical Treatment of Asbestos
80	Stainless Steel Beneficial Reuse
224	Thermal Conversion of Asbestos
1595	SEG Recycle and Reuse of Radioactively Contaminated Scrap Metal
1784	VecLoader HEPA Vacuum Insulation Removal
1816	Urethane Foam Void Filling
1846	Low-Density Cellular Concrete Void Filling
2240	Soft-Sided Waste Containers
2312	Water Solidification
2313	Oil Solidification
2958	Nukem Copper Recycle System

WORKER SAFETY AND OTHER

1795	Mobile Integrated Temporary Utility System
1854	FRHAM-TEX Anti-Contamination Suit
1855	Nu Fab Anti-Contamination Suit
1898	Personal Ice Cooling System (PICS)
1947	System for Tracking Remediation, Exposure, Activities and Materials (STREAM)
1953	Heat Stress Monitoring System
1954	Sealed-Seam Sack Suit
2104	Wireless Remote Radiation Monitoring System (WRRMS)
2322	D&D and Remediation Optimal Planning System (DDROPS)
2396	AeroGo Air Lift Pallet System

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Current information on the DDFA can be found on its homepage at:

http://www.netl.doe.gov/dd/

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