

Identification:

Date:	11 March 1998	FY97 expenditure:	\$100K
Project Number:	B2310	FY98 budget:	\$100K
Project Title:	"Optimal Planning of D&D Projects via Simulation Based Optimization"	FY99 anticipated:	\$100K
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Current project abstract and accomplishments:

Abstract:

This project is a continuation of the successful FY1997 LDRD with the same title. It is using the technology investigated and developed during FY97 to create accurate, three-dimensional, geometry models of contaminated facilities. We have named this technology "The Decontamination, Decommissioning, and Remediation Optimal Planning System (DDROPS)". Optimization techniques are being used to identify locations for segmenting the contaminated materials and to determine packaging locations to attain optimal packaging densities within waste boxes. A model of an actual D&D site is being created to test optimal segmentation and packaging tools. A robotic interface will be developed to help perform the waste packaging function. Design criteria can be defined to minimize the number of cuts, minimize number of waste boxes, maximize packaging densities, minimize worker radiation exposure, minimize cost, etc. A report generating function will be investigated for development to provide images, automatic identification, radiological and physical properties, and manifests for segmenting and packaging sequences. A draft business plan has been developed, and is being refined, to take this technology from a research and development stage to a marketable product. We also plan to obtain contracts with government and commercial entities for actual optimal D&D planning activities.

Key accomplishments:

- ◆ Created the ability to accurately model three-dimensional sites for D&D planning with ProEngineer. Mass property and radiation level data can be assigned to individual components in the 3D model.
- ◆ Dynamic flythroughs of 3D site models can be performed to gain a better understanding of the D&D planning problem. The model can be visualized with colors representing the different levels of radiation.
- ◆ The optimal number and location of cuts with respect to length, mass properties (mass, volume), and radiation can be determined.
- ◆ Plans for packaging of segmented items (pipes, elbows, pumps, valves, tanks, etc.) into waste containers can be developed.
- ◆ A videotape recording has been made showing the 3D modeling, optimal cutting, and packaging sequences.
- ◆ We visited several candidate D&D sites for an actual D&D site model and planning.
- ◆ We selected a site to model for a test case plan of an actual D&D site, namely, the Central Facilities Area Old Sewage Treatment Plant.
- ◆ We have acquired the blue prints. The modeling of the actual site is completed.
- ◆ A draft business plan has been developed for the "harvesting " of this technology.

Budget Status:

The original plan was a flat line expenditure of funds. Work (and therefore spending) has been slightly accelerated to meet our milestones, ahead of schedule, to be able to market this technology sooner. We are at the 48% point of FY98 with 55% (\$55K of \$100K) of the funds being spent. This 7% overrun is appropriate for the accelerated schedule we have taken. We will continue this rate of spending because we feel we can get this technology in front of customers that we have already contacted. We will be able to present this to other promising customers also. If it is desirable, we will submit a revised spending schedule. We feel that the 7% is within reasonable limits.

Issues and Path Forward:

Current problems: We need to procure an additional ProEngineer license and a ProEngineer Toolkit license for a total amount of \$20,000.

Harvest strategy:

- ◆ A LMITCO Patent Application on this technology was filed in January 1998. It is LIT-PI-327, "Optimal Segmentation and Packaging Process".
- ◆ A Draft Business Plan is almost complete that defines how best to move this Optimal Planning System into the commercial market. This Plan includes an assessment of the D&D market, a review of competitive technologies (i.e. baseline technologies and emerging technologies), potential strategic partners, and financial requirements.
- ◆ Various aspects of this technology are at levels of maturity where Project funding is being sought. Examples of proposals and marketing activities underway follow.
 - ◆ A proposal has been submitted to the LMITCO Pollution Prevention Program that would take actual INEEL facilities and demonstrate volume reduction of packaged waste.
 - ◆ A proposal is being developed for submittal to FETC in the Robotics Cross Cutting technology area for development of a robotic sorting table to package segmented waste into containers.
 - ◆ This technology was proposed for use in the Accelerated Technology Deployment Initiative (cost saving technologies) to DOE EM-50.
 - ◆ A proposal is being submitted for FY99 funding to apply this technology in the Large Scale Demonstration Program (also a DOE EM-50 project).
- ◆ Additional marketing activities and opportunities are listed here.
 - ◆ We presented DDROPS to government (DOE, NRC) and commercial D& D entities at the X-Change '97 Global D&D Marketplace. The INEEL had a booth at the trade show. 1-4 December 1997. Miami, FL.
 - ◆ We will present DDROPS at a training course sponsored by the International Atomic Energy Agency on Decommissioning of Research Reactors and Other Small Nuclear Facilities at Argonne East, IL. 2326 March 1998.
 - ◆ We are contacting commercial D&D contractors, such as BNFL, Parsons, TLC Engineering, Bechtel, etc.
 - ◆ A memorandum of agreement between FETC, the nuclear power industry, Florida International University, and Argonne National Lab was created to develop better technologies for D&D of commercial power plants. These parties have expressed interest in this technology.

- ◆ We will submit at least two articles to scientific publications (conference presentations, journal articles).
- ◆ Anticipated direct funding, from the successful proposals mentioned above, will primarily fund FY99 work. This work will include services to help customers plan D&D activities with our tools, sales and training for customers to use our technologies at their sites, etc. New areas will be defined that will qualify for future funding under the LDRD program.
- ◆ We feel that there are literally hundreds of opportunities to market the technology and to provide services for optimal D&D planning. The current estimate for stored waste is \$500 (five hundred) per cubic foot. Commercial and government entities are searching earnestly for cost effective ways to reduce the total cost of waste processing and storage. The application of this technology to help reduce waste volume will save the industry millions of dollars.

Interface/Communications with Business Area Leaders:

The concerned Business Area Leaders are Kevin Kostelnik and Bob Snelling. Bob is the Director of Environmental and Life Sciences Products. He is very supportive and interested in this project and its resulting technologies. Kevin is the Manager of the Environmental Restoration and Technologies Department. He is intimately involved in this project as a team member. Kevin is responsible for the Business Plan and he lead the effort to get the patent application completed.

This project directly contributes to the business objectives and success of the Environmental Restoration and Technologies Department and the Environmental and Life Sciences Products Directorate. Objectives of the department are to increase LMITCO's market presence in the field of environmental management by increasing DOE and commercial sales (license royalties, services, research contracts, etc.). The vision of the department is to be nationally recognized as a leader in the integration, testing, validation, and commercialization of innovative environmental management technologies. The mission of the department is to be a service organization dedicated to safely managing the development and promotion of emerging remediation technologies to improve our customer's capabilities for environmental management operations.

We have had a series of meetings with the managers and personnel of LMITCO's Environmental Restoration. They, with our BALs recognize the value of this technology to significantly reduce D&D planning time, risk and waste storage costs;