3.4 Small Pipe Characterization System

Technology Needs

Across the DOE complex, there are numerous facilities identified for D&D with piping that have been placed on the contaminated list because of internal contamination risk. Much of this piping is inaccessible because it is buried, embedded in concrete, or runs through hot cells. Identification and mapping of contaminants in piping is a major concern during facility deactivation. An understanding of the types of contaminants present and the extent of contamination are primary drivers for decisions regarding decontamination and/or dismantlement, all of which affect initial deactivation cost, ongoing surveillance and maintenance risk and cost, and eventual D&D strategy and cost. Currently there are no robotic/remote systems capable of characterizing pipe in the two- to three-inch size range. Characterization of this piping is essential before, during, and after D&D activities. Identifying those sections of the piping that are actually contaminated can greatly reduce the amount of material sent to waste handling facilities and/or the amount of secondary waste generated performing unneeded decontamination.

Technology Description

The Small Pipe Characterization System (SPCS) activity provides for the design, procurement, fabrication, integration, demonstration, and technology transfer of a system for characterizing contaminants in pipes with internal diameters between two and three inches. The SPCS, shown in Figures 3.4-1 and 3.4-2, consists of a control computer, a tether for data communication, and a pipe crawling vehicle. The pipe crawler is driven by DC-motor-powered wheels arranged in a triangular configuration and sprung against the sides of the pipe for traction. The configuration of the wheels allows the pipe crawler to maneuver through radiused elbows and to adapt to changing pipe diameters "on the fly." Live color video is transmitted from the camera on the front of the pipe crawler to the control computer. The SPCS is also capable of deploying small sensors such as radiation detectors; however, appropriately sized sensors have not yet been developed.

Benefits

This technology makes it possible to characterize previously inaccessible piping. Determining the absence or presence of contamination and the extent of contamination in piping will reduce the costs of D&D activities by treating only the affected areas. It also reduces the amount of generated secondary waste from uncontaminated piping. Personnel exposure can then be limited only to areas with uncontaminated piping.

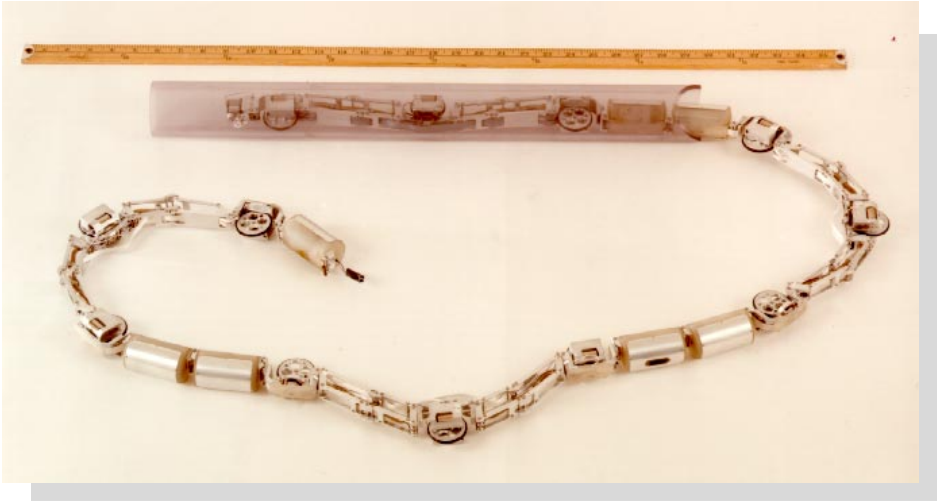

Figure 3.4-1. Close-up of Front Section of SPCS Vehicle.

Figure 3.4-2. SPCS Inserted Into 2-Inch Pipe.

Collaboration/Technology Transfer

A Cost Share Agreement was negotiated with Foster-Miller, Inc. in FY95, to provide design enhancements and facilitate transfer of the SPCS technology to Foster-Miller for potential commercial development. Under the Cost Share Agreement, Foster-Miller has been granted nonexclusive rights to the SPCS technology.

Accomplishments

- Significant modifications were made to the prototype system to improve maneuverability, increase travel range, and minimize tether diameter.
- A Cost-Share Agreement was placed with a commercial partner for much of the modification work.
- The modified SPCS was demonstrated at a major programmatic technology demonstration. Demonstrated features included video inspection, horizontal and vertical travel, selective steering, cornering, and the ability to transition between two- and three-inch pipe "on the fly."

TTP Information

The Small Pipe Characterization System activities are funded under the following TTPs:

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Bibliography of Key Publications

None at this time.