SOUTHWEST RESEARCH INSTITUTE®
QUARTERLY STATUS AND PROGRESS REPORT
FOR PERIOD ENDING MARCH 8, 2004

OTHER TRANSACTION AGREEMENT DTRS56-03-T-0013
SwRI® PROJECT 14.10062

"HIGH-POWER LONG-RANGE GUIDED-WAVE INSPECTION OF PIPELINES

Approximately one-half of the nation's supply of crude oil and petroleum products and virtually all of its natural gas supplies are transported through a pipeline network over 2 million miles long. Since a majority of these pipelines are operated at high pressure, and some carry hazardous liquids, pipeline failure can cause severe damage to human health, property, and the environment. One of the inspection technologies that has recently emerged for enhanced pipeline safety is the long-range guided-wave technology. This technology can inspect long sections of pipeline (typically more than 100 feet from the sensor in either direction in aboveground pipe for detection of 2- to 3-percent internal and external corrosion defects) and is useful for inspection of buried and unpiggable pipelines. Due to high wave attenuation in buried pipelines, however, the range of inspection presently achievable is relatively short (about 20 feet in bitumen-coated pipelines for detection of 10-percent defects). To be economical for buried pipe inspection, the inspection range needs to be increased.

This project is aimed at producing a high-amplitude guided wave so that a significantly longer length of piping than is presently achievable could be inspected. Based on the magnetostrictive sensor (MsS) guided-wave technology, the high power would be achieved by a combination of technical approaches that include better sensor materials, multiple sensors, and sensor optimization. The target goal of the project is a twenty-fold increase in the guided-wave signal amplitude that would double the current inspection range in buried pipelines. Industrial partners in this project include the Pipeline Research Council International, Southern California Gas Company, Gulf South Pipeline Company, and Southwest Research Institute.

The efficiency of each technical approach in increasing the guided-wave signal amplitude was evaluated. Also, the existing MsS instrument system (hardware and software) is being modified to accommodate the increased guided-wave power and the associated large dynamic range of the detected signals. In laboratory testing, the combined application of power enhancing techniques showed a more than fifty-fold increase in signal amplitudes, far exceeding the target goal of a twenty-fold increase.

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