U.S. Department of Transportation

DIGITAL MAPPING OF BURIED PIPELINES WITH A DUAL ARRAY SYSTEM

OPS ACCOMPLISHMENTS

Damage Prevention and Leak Detection For Pipeline Safety Research & Development

Challenge

The objective of this research is to develop a non-invasive system for detecting, mapping, and inspecting ferrous and plastic pipelines in place using technology that combines and interprets measurements from ground penetrating radar and electromagnetic induction (EMI) sensors.

Technology Description

This new approach will provide for the detection of all underground utilities, including plastic pipelines. The primary tasks will consist of the following:

1. Development of a mobile electromagnetic induction (EMI) sensor array, including software for interpreting collected data.

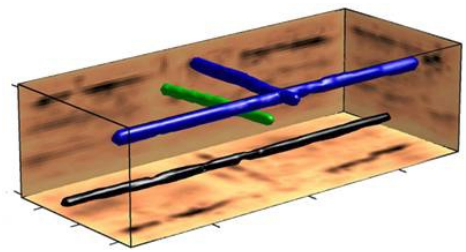
2. Development and integration of an onboard EMI transmitter that will require no contact with surveyed pipelines.

3. Integration of the new EMI sensor array with a pre-existing and field proven ground penetrating radar sensor array.

Accomplishments

The first quarter of the project produced very promising results. The research team built and tested a prototype EMI sensor array that provided encouraging results in locating simulated pipelines. Custom data acquisition software with early-stage processing and interpretation algorithms was implemented and validated through field tests and simulations. The early achievements in this project clear technology hurdles for future success of the overall research effort.

Computer-aided visualization of real data collected with ground penetrating radar.



Three-dimensional visualization of real data collected with ground penetrating radar.

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Office of Pipeline Safety

Research & Special Programs Administration

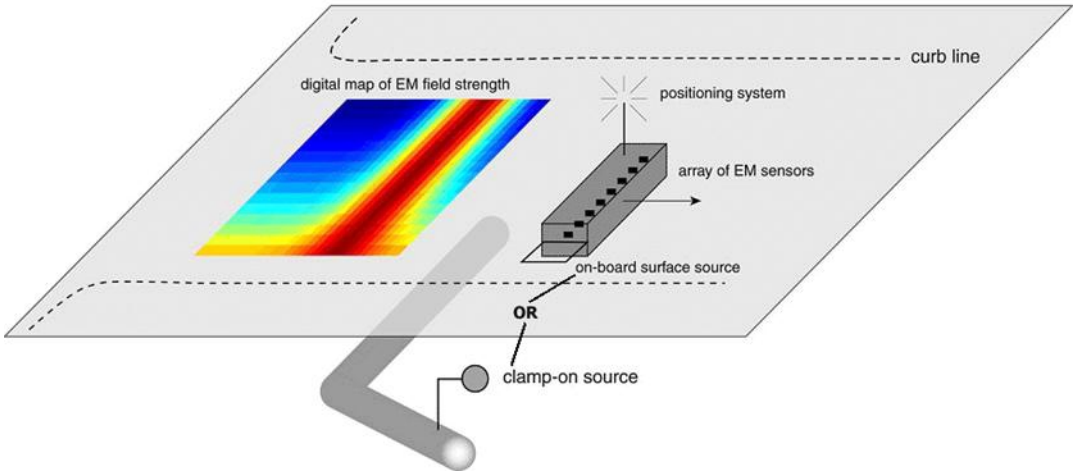

Diagram of the proposed electromagnetic induction (EMI) sensor system.

Benefits

The ground penetrating radar is a field proven technology for detecting and mapping underground utilities. Central to this project is the development of a novel array of electromagnetic induction (EMI) sensors that will supplement and enhance data collected with radar. The combined radar and EMI system will produce digital underground maps and images in computer aided design (CAD) and geographic information systems (GIS) formats. The system will be capable of detecting major liquid and gas leaks and can differentiate between diameters of pipes.

Future Activities

A prototype of the sensor array has been successfully constructed and tested. Next steps involve incorporating lessons learned from testing of the prototype. Future activities for the next phase include the development and assembly of the full array, refinement of the data acquisition software associated with the sensors, and development of the software to interface with CAD/GIS.

Partners in Success

- Witten Technologies, Inc.
- Electromagnetic Instruments, Inc.
- ConEdison
- New York City

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