U.S. Department of Transportation

APPLICATION OF REMOTE-FIELD EDDY CURRENT TESTING TO INSPECTION OF UNPIGGABLE PIPELINES

OPS ACCOMPLISHMENTS

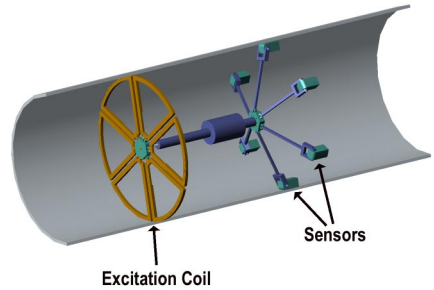
Pipeline Safety Research and Development for Enhanced Operations, Controls, & Monitoring

Challenge

Corrosion of buried pipelines can lead to catastrophic failure. Many pipelines are successfully inspected by magnetic flux leakage (MFL) pigs to detect corrosion. However, there is a subset of pipelines for which MFL is not feasible. To inspect those "unpiggable" pipes will require a more adaptable technology. Remote-field eddy current (RFEC) is an alternative inspection technology and potentially capable of detecting corrosion defects in pipelines not "piggable" by conventional technologies. Traditional RFEC is configured with a large excitation coil, only slightly smaller then the inside diameter of the pipe, and with multiple small sensors. This traditional exciter coil configuration often cannot pass by internal pipeline restrictions.

Technology Description

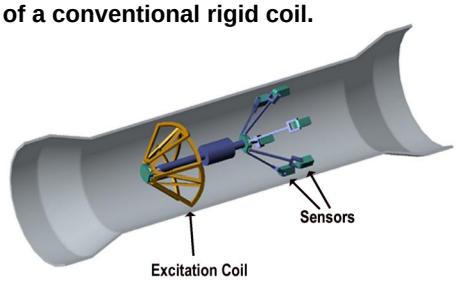
This R&D effort is to design and demonstrate the feasibility of an exciter coil configuration that is either small enough to pass through unpiggable pipelines or collapsible in a manner that will allow it to pass internal pipeline restrictions and also expand to full diameter as appropriate.



Collapsible RFEC system fully deployed

Accomplishments

A conceptual, collapsible RFEC system design was developed, consisting of a unique collapsible excitation coil, and a collapsible array of sensing coils. The excitation coil consists of six hinged segments that expand into a full-diameter coil or collapse to accommodate smaller diameter restrictions. Other implementations of the collapsible coil involve folding the coil into two halves to allow passage through plug valves that have openings about the same as the pipe diameter in one direction, but are narrow in the other direction. Computer modeling results indicate that the collapsible coil configuration should produce inspection results similar to that of a conventional rigid coil.



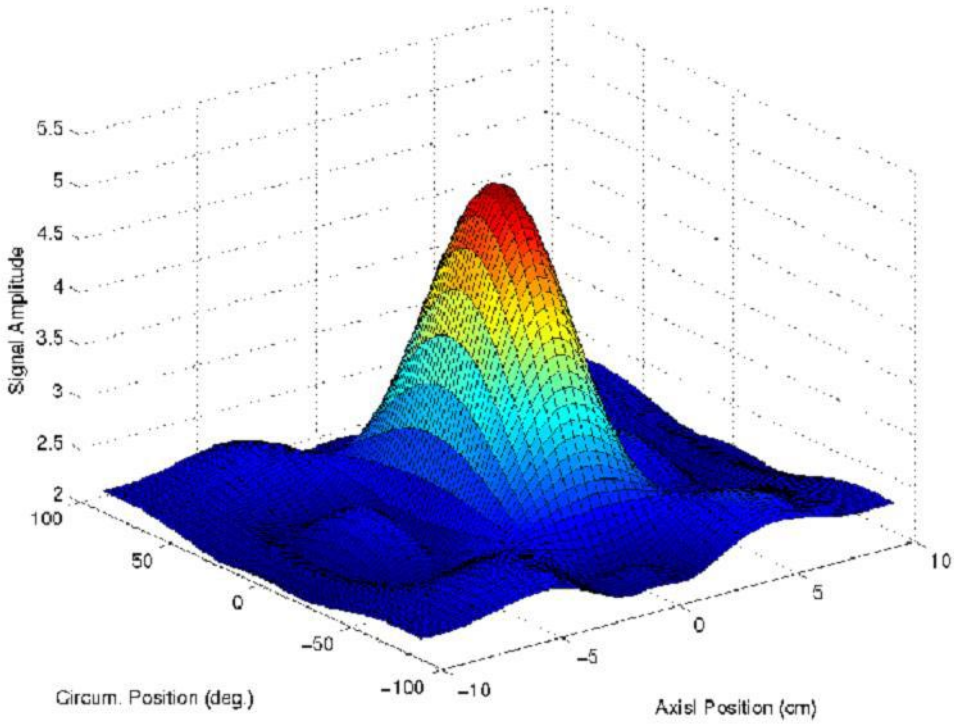
RFEC system in folded position to accommodate restricted pipe diameter

Contact

James Merritt
R&D Program Manager
(303) 683-3117 office
(303) 638-4758 mobile
(303) 346-9192 fax
James.Merritt@rspa.dot.gov

Office of Pipeline Safety

Research & Special Programs Administration



RFEC signal from simulated corrosion pit as calculated by computer model

Benefits

Successful development and implementation of the RFEC collapsible system will allow inspection of pipelines that are currently unpiggable and thus not inspectable. This will be of tremendous benefit to the pipeline industry by allowing detection and repair of potentially dangerous corrosion defects before leakage and potential catastrophic damage occur.

Future Activities

In the remainder of the project, a breadboard RFEC system will be developed and demonstrated in the laboratory. Design guidelines will be prepared for use by a commercializing vendor in development of an RFEC system for field use.

Partners in Success

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