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Office of Pipeline Safety Presentation on

Damage Prevention

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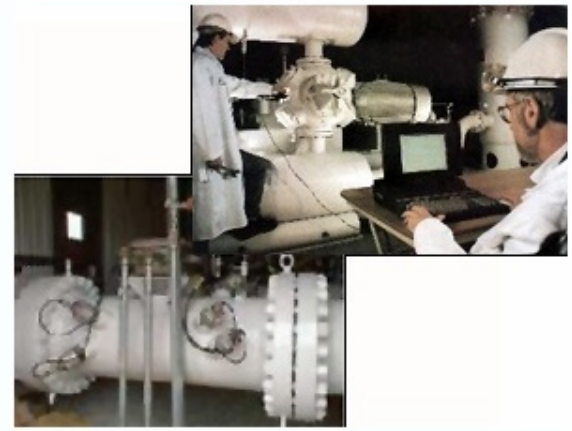
Research & Development



Welcome to RSPA's Pipeline Safety Research and Development Website.

This site is dedicated to the coordination and dissemination of Research and Development information related to Pipeline Safety.

OPS conducts and supports research to support regulatory and enforcement activities and to provide the technical and analytical foundation necessary for planning, evaluating, and implementing the pipeline safety program. OPS is sponsoring research and development projects focused on providing near-term solutions that will increase the safety, cleanliness, and reliability of the Nation's pipeline system.

Recent R&D projects are focused on: leak detection; detection of mechanical damage; damage prevention; improved pipeline system controls, monitoring, and operations; and, improvements in pipeline materials. These projects are addressing technological solutions that can quickly be implemented to improve pipeline safety.

In 2003, a study by the General Accounting Office (GAO) found that OPS's R&D program is aligned with OPS's mission and pipeline safety goals.

Damage Prevention Research

Project Title	Researcher	OPS	Co-Share	(MO)	%
Infrasonic Frequency Seismic Sensor System for Pipeline Integrity Management	Physical Sciences Inc.	$99,910		24	100
Pipeline Damage Prevention Through the Use of Locatable Magnetic Plastic Pipe and a Universal Locator	Gas Technology Institute	$95,502	$95,541	36	100
Digital Mapping of Buried Pipelines with a Dual Array System	Witten Technologies, Inc.	$469,060	$539,671	27	100
Mechanical Damage Inspection Using MFL Technology	Battelle Corporation	$410,000	$380,000	36	100
Emerging Padding and Related Pipeline Construction Practices	Battelle Corporation	$70,000	$70,000	24	85
Effectiveness of Prevention Methods for Excavation Damage	C-FER Technologies	$70,000	$80,000	12	40
Nonlinear Harmonic-based Mechanical Damage Severity Criteria for Delayed Failures in Pipelines	Southwest Research Institute	$244,740	$250,000	24	40
Mechanical Damage at Welds	BMT Fleet Technology Limited	$80,000	$149,997	12	38
Infrasonic frequency seismic sensor system for preventing third party damage to gas pipelines	Northeast Gas Association	$175,000	$199,500	18	27

Portfolio Summary (9 Projects)

Total OPS Funding	$1,714,212
Total Industry Co-Funding	$1,764,709
Average Project Duration	24 months
Average % Complete	70 %

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OPS R&D Projects

Project Title: Infrasonic Frequency Seismic Sensor System for Pipeline Integrity Management

Researcher: Physical Sciences Inc.

Goal: To develop an infrasonic gas pipeline evaluation network that uses low frequency seismic/acoustic (0.1 to 100 Hz) sensor technology to proactively detect and warn of unauthorized activity near underground gas pipelines before damage occurs.

Small Business Innovative Research

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OPS R&D Projects

Project Title: Pipeline Damage Prevention Through the Use of Locatable Magnetic Plastic Pipe and a Universal Locator

Researcher: Gas Technology Institute

Goal: The purpose of this research is to develop and commercialize economical, reliable locatable magnetic plastic polyethylene pipe material. The research is intended to: develop locatable plastic pipe for new installation or retrofit of gas distribution pipelines, determine pipe magnetic field strength, modify and re-design the "magnetizer," remagnetize the existing stockpile of PE pipe, determine minimum acceptable concentration of such pipe, and validate the field strength of the new pipe.

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OPS R&D Projects

Project Title: Digital Mapping of Buried Pipelines with a Dual Array System

Researcher: Witten Technologies, Inc.

Goal: Witten Technologies Inc. is developing a non-invasive system for detecting, mapping and inspecting steel and plastic pipelines. The system will combine measurements from ultra-wideband radar and electromagnetic induction arrays with precise positioning and advanced image processing. This will be accomplished by development of a wideband array of 3-component sensors and software, fabrication and testing of EMI sensors, integration of EMI and radar sensors, and development of an on-board transmitter.

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OPS R&D Projects

Project Title: Mechanical Damage Inspection Using MFL Technology

Researcher: Battelle Memorial Institute

Goal: This research will address mechanical damage ILI through the use of smaller/simpler MFL tools. The project hypothesis is that this approach might work for inspection of currently unpiggable pipelines since the tools will be smaller. The approach for this project is as follows: a simplified multiple magnetization tool will be designed, a magnetizer and sensor will be developed, and ultimately the researches will collect and analyze pull rig and flow loop data.

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OPS R&D Projects

Project Title: Emerging Padding and Related Pipeline Construction Practices

Researcher: Battelle Memorial Institute

Goal: The objective of this project is to quantify the merits of modifications to existing construction practices and emerging practices related to pipeline padding. The work will assist in determining the value of such construction practices when made in the context of performance-based inspection or re-inspection plans in response to pending pipeline safety legislation. The proposed project will complement and follow an INGAA Foundation project, which acts as co-funding and which is directed primarily at a qualitative evaluation of the potential of these techniques to improve productivity and improve safety. The combined effort will involve a field evaluation of these emerging approaches for benching pipelines and for bedding and padding in areas where native soils contain rock and other debris that could damage the pipeline or degrade its integrity over time.

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OPS R&D Projects

Project Title: Effectiveness of Prevention Methods for Excavation Damage

Researcher: C-FER Technologies

Goal: The main objective is to develop a new fault tree model that will estimate hit frequency due to third-party excavation based on pipeline condition and prevention practices. In addition to the evaluation of prevention effectiveness, this model can be used to facilitate the selection of the most cost-effective prevention methods, and to evaluate risk and reliability of existing or new pipelines.

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OPS R&D Projects

Project Title: Nonlinear Harmonic-based Mechanical Damage Severity Criteria for Delayed Failures in Pipelines

Researcher: Southwest Research Institute

Goal: The objectives of the proposed research are to:

1. Determine and characterize the time evolution of strain anomalies due to mechanical damage in terms of the NLH signals measured as a function of cycles on full-scale cyclically pressurized pipe segments containing realistic gouged dents.
2. Derive NLH-based defect severity criteria in terms of remaining fatigue life that can be used to assess delayed failures in mechanically damaged pipelines.
3. Transfer the developed NLH-based technology to ILI companies by cooperating with Tuboscope Pipeline Services, Inc. to develop preliminary software for implementing the defect severity criteria in ILI equipment and identifying future requirements.

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OPS R&D Projects

Project Title: Mechanical Damage at Welds

Researcher: BMT Fleet Technology Limited

Goal: The objective of this project would be to reduce unnecessary conservatism of the existing mechanical damage repair criteria when detailed information is known, while maintaining or increasing overall safety. Recent advances in the understanding of mechanical damage failure suggest that the regulatory requirements could be made less restrictive for pipelines by considering the relatively smooth pressure history (low fluctuation) of gas transmission lines, type and extent of the mechanical damage, and position of the weld with respect to the mechanical damage.

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OPS R&D Projects

Project Title: Infrasonic frequency seismic sensor system for preventing third party damage to gas pipelines

Researcher: Northeast Gas Association

Goal: The objective of the proposed program is to design, develop and test an Experimental Prototype (EP) sensor, advancing the Infrasonic-Frequency Seismic Sensor System (aka PIGPEN) technology to a point where the system is ready for advanced engineering and pre-commercial design and prototyping. Using an independent consultant (to be determined), all issues related to soil geophysics (and in particular signal wave velocity) will be examined and interpreted for the proposed design and EP. Also, as a result of utility, sponsor and cosponsor review, additional tasks will be determined.

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