

Distributed Fiber Optic Sensor Network (DFOS) for Real-time Monitoring of Pipeline Interactive Anomalies



U.S. Department of Transportation
Pipeline and Hazardous Materials
Safety Administration

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Main Objective

This project was awarded to Stevens Institute of Technology in order to:

- overcome shortcomings of inadequate evaluation methods and underestimating the true magnitude of interactive threats to pipelines.
- develop an innovative DFOS technology that provides real-time in-situ monitoring data of pipelines subjected to interactive defects for improving pipeline safety.

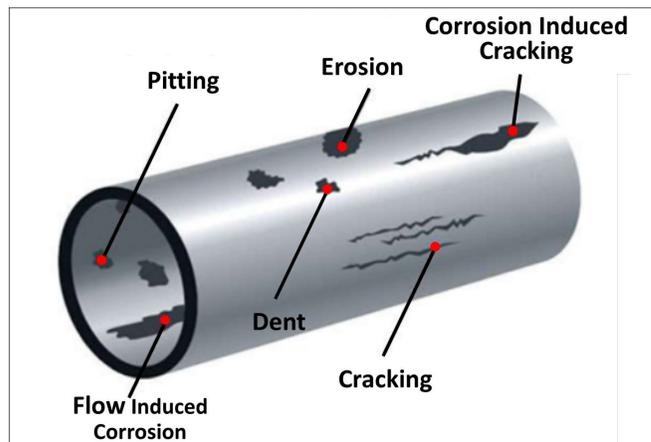


Figure 1. Pipeline failure due to interactive anomalies.

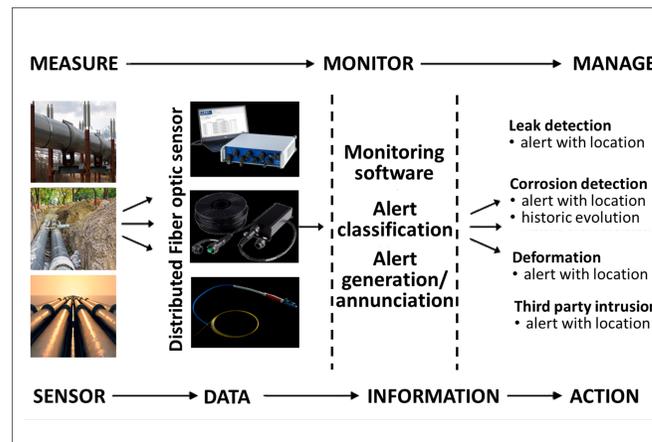


Figure 2. Real-time DFOS system for improving the pipeline safety and management.

Project Approach/Scope

- Develop DFOS network for detection, localization, and characterization of interactions anomalies, such as cracking, dent, corrosion, fatigue etc.
- Develop data processing methods for real-time sensor data analysis to improve the pipeline safety and management.

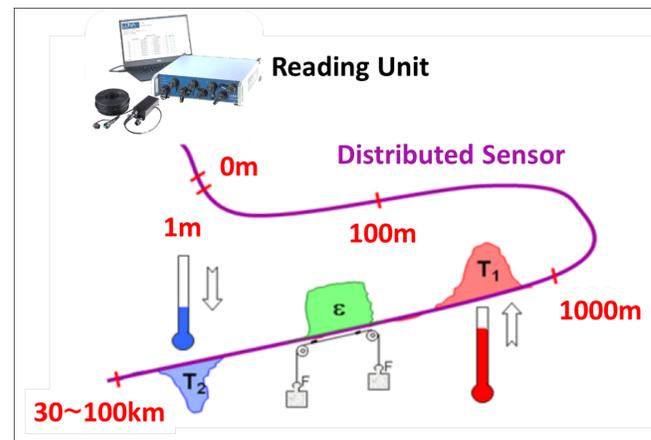


Figure 3. Concept of DFOS for multi-anomaly detection.

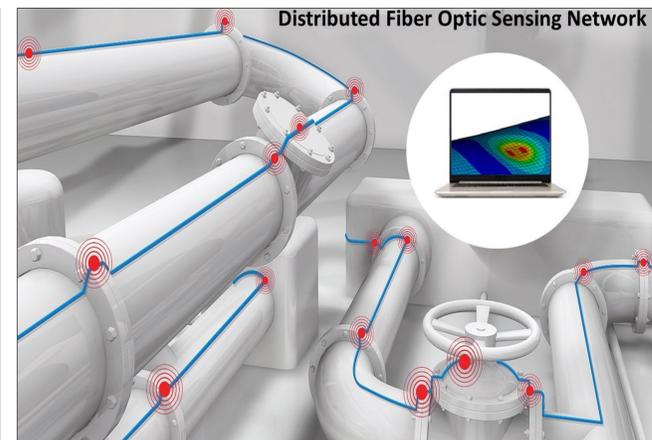


Figure 4. DFOS network Integrating both distributed and point fiber optic sensors

Expected Results or Results to Date

- One system, multi-anomaly detection
 - ✓ Leaks
 - ✓ Third-party and right of way interference
 - ✓ Ground movement
 - ✓ Corrosion monitoring
- Integrate both distributed and point fiber optic sensors
 - ✓ Distributed sensors: Full measurement along the pipelines
 - ✓ Point sensors: Critical locations

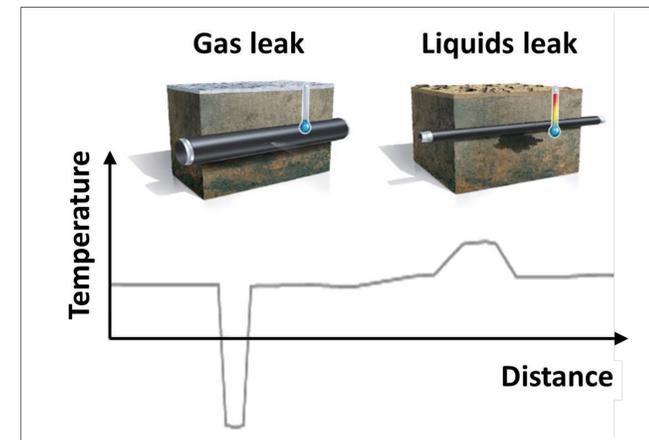


Figure 5. Pipeline leak detection.

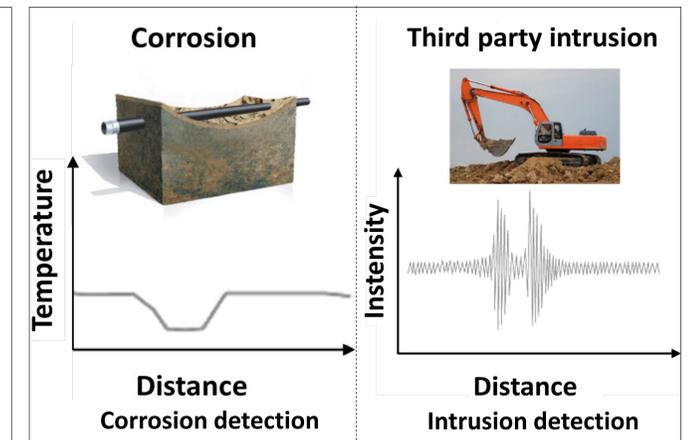


Figure 6. Pipeline corrosion and intrusion detection.

Acknowledgments

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References

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- [3] Bao, Y., Huang, Y., Hoehler, M.S. and Chen, G., 2019. Review of fiber optic sensors for structural fire engineering. Sensors, 19(4), p.877.

Public Project Page

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