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Developing an In Situ Leak Detection System for CO₂ and H₂ Pipelines and Storage Devices

Greg Lowry

Assistant Professor, Department of Civil & Environmental Engineering, Carnegie Mellon University, Pittsburgh, PA

Hoon Sohn

Assistant Professor, Department of Civil & Environmental Engineering, Carnegie Mellon University, Pittsburgh, PA

Industry Participants

Paul Orlando

President, Nitor Technologies, Inc., Beaver Falls, PA

Eugene DePasqual

PADEP Deputy Secretary for Community Revitalization and Local Government Support
U.S. Department of Energy, Rocky Mountain Oilfield Testing Center

Abstract

Fears of global warming and climate change have prompted several important changes in the energy sector. First, carbon dioxide capture and storage will accompany energy production from fossil fuels to mitigate climate change due to a build up of CO₂ in the atmosphere. Second, a move toward carbon-free energy carriers such as H₂ is beginning and will continue over the next several decades. These changes will require that a massive pipeline infrastructure be built to transport these products. For example, CO₂ generated at power plants will have to be transported to appropriate carbon sequestration sites. H₂ produced at H₂ generation facilities will have to be transported to urban areas.

This project between CMU researchers and Western PA-based Nitor Technologies, Inc. will modify an existing Nitor Technologies system, the Prowler™, designed for leak detection in gas and oil pipelines. These modifications will make it suitable for leak detection monitoring in CO₂ and H₂ pipelines. New membrane/sensor combinations will be developed and tested for detecting small CO₂ and H₂ leaks, and for accurately pinpointing where the leaks occur. The performance of different sensor/membrane combinations will be compared, and the resulting technology will be patented. Performance criteria include the detection sensitivity, response and recovery time, spatial resolution, reliability, and cost. Sensor type, tubing size, membrane type, and gas sampling rates will be varied to find the most reliable and robust combination. Finally, a field demonstration of the most cost-effective CO₂ sensing technology is planned at the DOE's Rocky Mountain Oil Testing Center (RMOTC).