NYSEARCH Spotlight

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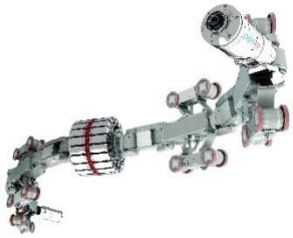
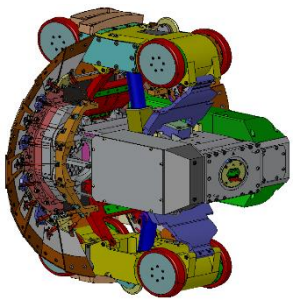
Dedicated to serving its utility member companies with focus on natural gas RD&D, technology development & commercialization, and joint industry collaboration

INSIDE





Explorer robot energy harvesting module development is complete

Invodane Engineering completes an energy harvesting module for the 20/26 EXP robot extending the battery life during pipeline inspections.

The objective of this project was to develop an on-board energy extraction module for the Explorer family of robots to extend tether less operation of the robot during pipeline inspections. The initial work focused on the 20/26 EXP for development and then determined the potential for energy harvesting applications on the rest of the EXP family.

The Energy Harvesting module was built to operate in four modes: Off, Power Supply, Tow, and Charge. In Off mode, the energy harvesting module is inactive, and the system is operating traditionally on batteries. In Power Supply mode, the module generates enough power to operate the robot without drawing energy from batteries or generating energy using tow force. In Tow mode, the module is generating energy using tow force and generates enough electricity to run the robot without having to draw from batteries. And in Charge mode, the batteries are being charged while the robot is parked and the barrier is deployed collecting energy from gas flow.

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(*Continued from pg. 1*) All four operation modes were tested successfully installed on the 20/26 EXP and the potential application of the EH module on other sizes is being evaluated. The success from the development of the EH module extends the inspection range of the robot while operating and greatly improves the efficiency of the system. Commercialization efforts are currently underway for the module on EXP 20/26.

A remaining limitation on range is the extent of the wireless signal which affects communication between the operator and the robot during inspection. To increase range even further, a new effort was evaluated at the June meeting. NYSEARCH approved a project by Invodane to investigate feasibility of extending the range of the wireless signal. Once a technological concept is identified, preliminary mechanical, electrical, hardware, and software designs will be completed. If the range of the wireless signal could be extended, the cost effectiveness of robotic inline inspection would be improved.

Field testing of robotic dog completed at RIT

In April 2021, NYSEARCH conducted a field test of the "robotic dog" developed for ground survey for leak survey applications. Rochester Institute of Technology developed a robotic vehicle to act as a surveyor in the field equipped with sensors and programmed for autonomous operation.

The field test was conducted in the Rochester Gas & Electric territory with RMLD and RKI OPLS sensors mounted on the robot for detection capabilities. A LiDar sensor was also integrated for the Collision Avoidance System. The test was completed successfully under both semi-autonomous and fully autonomous operation. The field test confirmed the feasibility of an autonomous ground vehicle for leak detection.

A final report was issued to funders at the end of April 2021 with recommendations on Phase II work. If funded, Phase II would focus on developing an autonomous gas leak survey and localization system by:

- Integration of sensors for gas detection and pipe location
- Algorithm development for leak localization and pipe location
- Creation of more robust robot able to navigate hazardous areas
- Inclusion of program to "teach" robot to read utility GIS data

Gas ops data collected to examine Machine Learning

The objective of this project is to determine whether NYSEARCH members can leverage their resources and data to apply Artificial Intelligence (AI) for predictive maintenance in key gas operational tasks.

The goal is to learn about how to structure data and to conduct experiments that test AI solutions. We hope to also determine whether the selected applications, corrosion management and leak detection, can work with AI solutions. In March, the Task 1 AI Guidebook was issued to funders.

A way to begin structuring data for machine learning is by synthetic data collection. Synthetic data is information that mimics real-world data and preserves all the statistical properties of the data set so that machine learning algorithms can draw valid inferences and create valid rules.

Synthetic data collection has been initiated with gas ops data provided by funders.

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NYSEARCH wins awards for AR project work with HoloLens

NYSEARCH's contractor, CraneMorley, Inc, submitted the project work with NYSEARCH funders from the Augmented Reality Application Development project for consideration at AVA and VEGA Digital Awards. AVA Digital Awards is an international competition that recognizes excellence by creative professionals responsible for the planning, concept, direction, design, and production of digital communication. VEGA Digital Awards honors the talents and creative minds of digital content creators worldwide. NYSEARCH received accolades for the training development using the Microsoft HoloLens platform to bring the innovation of AR to utility operations. In addition, NYSEARCH was awarded the Platinum award by MarCom Digital Awards in 2020 for the work completed in Phase II of the AR project.

NYSEARCH June 2021 meeting recap

Yet another successful virtual meeting was held with members in June with five new proposals presented as shown below and an interactive brainstorming session that generated some exciting avenues for R&D. We also welcomed Gautam Kakaiya back to the NYSEARCH team as he returned as NYSEARCH Project Manager in April.

- **Handheld NE Damage Assessment and 3D Mapping Tool –** The overall objective of the proposed project is to explore damage mapping solutions by applying 3d laser scanning mapping and flexible ultrasonic (UT) array technology. The inspection techniques are to be performed with minimal training or need for NDE certification.
- **Impact of Blended Hydrogen on Threaded Connections –** The objective of the project is to determine if blended hydrogen in natural gas causes any change in the presence/absence of leaks in threaded connections and if blended hydrogen can change the flow rate of a leak in a threaded connection. This program was designed from an ongoing NYSEARCH program evaluating threaded connections of the natural gas system.
- **Alternate Crack Sensor Phase IV** – The InvoDane Engineering work for Phase IV of this program focuses on resolving the remaining issues from Phase III and preparing for commercialization of the alternate crack sensor system.
- **Extending the Wireless Range of EXP Robotic Inspection Platforms –** The work focuses on carrying out a feasibility study to identify means to extend the range of the wireless communication system used on the Explorer robots.
- **Living Lab for Blended Hydrogen –** The living lab would provide means of a rigorous pilot test to evaluate the impacts of blended hydrogen to both infrastructure and end-use residential appliances. Furthermore, the results and lessons learned from the living lab would inform subsequent demonstrations including an isolated mixed plastic and steel natural gas distribution system and an isolated steel pipeline demonstration.

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Successful field test completed for sUAS survey of submerged pipe

At the end of June 2021, NYSEARCH conducted a successful field test of the initial trials of methane sensors and visual detection techniques using aerial, floating and submersible drones. Mounted sensors were maneuvered on sUAS aerial flights, floating surface barges and underwater movement patterning. Images of the floating surface barge and submerged drone are shown to the right.

The field test was conducted in the Rochester Gas & Electric territory and the three leak detection methods: aerial, floating, and submerged were deployed and demonstrated. Methane sensor data is currently being analyzed from the data collected by the OPLS and Pergam sensors used during the aerial and floating evaluations. The trial of submerged remotely operated underwater vehicle (ROV) demonstrated the ability to search for other physical attributes of a leak from submerged pipe as there are no underwater methane sensors available at this time. The ROV's 12MP photo production and 4k video capability were evaluated with underwater rising bubbles produced by simulated pipeline methane leaks. Flow rates from 0.5scfh down to 0.01scfh were released with visual detection confirmed even in murky water.