DOE/AMO
NG INFRASTRUCTURE R & D & METHANE EMISSIONS MITIGATION WORKSHOP

November 2014
David Merte & Daphne D’Zurko,
NYSEARCH/NGA
dmerte@northeastgas.org
ddzurko@northeastgas.org
NYSEARCH Program Research Areas

- Improved Installation, Maintenance & Repair
- Pipeline Integrity/Direct & Remote Assessment
- Pipe Location
- Leak Detection
- Real-time Sensing and Inspection for Distribution
- Environment/Reducing Greenhouse Gas Emissions
- Monitoring for Third Party Damage
- Evaluation of New Materials
- Gas Quality including sensing for trace constituents
- Quantum Leap Innovations – Oracle
Strategies Related to Methane Detection & Emissions

- Improve Safety through development of next generation, low-cost and more reliable methane and mercaptan sensors

- Evaluate SOA technologies that could serve to improve safety and leak detection in distribution sector

- Evaluate and develop technologies that can quantify and validate methane emissions on individual leaks in distribution environments
Ongoing Activities for Methane Emissions

- Recently completed first stage of three-stage technology assessment specific to evolving systems that can QUANTIFY emissions from rates from stationary or mobile platforms to prioritize Type 3 non-hazardous leaks.

- Determining what test processes are necessary to fully characterize technologies’ fit-for-purpose.

- Addressing work required to gain consensus on operator validation practices for emissions quantification.
Objectives of Overall Program

- Overall Goal
  - To identify and implement technology in order to develop a plan to prioritize non-hazardous leaks and minimize methane emissions

- Objectives of Phase I
  - To identify technologies and methodologies that enables a cost effective means to measure Type 3 non-hazardous leaks

Objectives of Phases II/III

- To identify, test and validate what technology or technologies can be applied to a mobile platform in an urban environment to quantify methane emission rates
  - NYSEARCH RFP issued on 11/3/14 for PhII controlled testing
small Unmanned Aerial System (sUAS) Application Development

- Objectives
  - Confirm FAA regulatory compliance of sUAS applications
  - Evaluate the capabilities and benefits of an sUAS in performing routine and emergency gas pipeline inspections and surveys (at “tree-top” level)
sUAS Application Development - Workscope

- **Task 1** – Participate in sUAS groups that work with the FAA to decide on appropriate regulation of flight requirements

- **Task 2** – Perform field demonstrations of routine survey and inspections with the current sUAS configuration

- **Task 3** – Collaboratively develop a methane leak detection device capable of mounting onto a sUAS
Real Time Distribution Sensing Network Development with Telog/Enetics

- **Objective** – Complete development & pre-commercial testing of Distribution Sensing Network

- **Measuring**
  - Pressure
  - Temperature
  - Humidity
  - Flow (volume and flow direction)

- **Range of Wireless Communication options**
  - Data logger SD Card
  - Wireless Bluetooth
  - Cellular / Modem
Real Time Distribution Sensing Network
Completing development/testing

- Working with members on preferred sensor options based on range and accuracy
- Building alpha/pre-production prototypes
- Performing laboratory testing of selected technologies
- Field testing in 2015
Damage Prevention Programs Since 2002

- Program with Multiple Projects; for Transmission and Distribution pipelines
  - Initial focus: Transmission; easier application

- Have been targeting proactive warning before encroachment
Objective: Conduct Third Party Interference (TPI) tests on Aura™ system to determine advantages and disadvantages of higher resolution system.

Targets:

- Real-time warning of TPI activities, identify and track vehicles, people, and digging activities above pipeline
- Pinpoint location of TPI to 26 feet (8 meters) or better
- Detect foot traffic up to 5 meters (16ft) and mechanical activity up to 20 meters (66ft) laterally from the buried sensor
Aura™ Principle of Operation

- A single mode fiber optic cable is used as the sensor
- A pulsed light is sent down the fiber
- When any vibration acts on the active section of fiber, the reflected light is affected
- Light change is detected and intrusion event is classified
Sample Mechanical Testing on Aura™ System

- **Mechanical Excavation**
  - Energy is spread out over larger area
  - Surface energy is smaller as bucket creates less noise
Self Healing of HDPE Pipes

- Combination of microcapsules (including epoxy) and catalyst
- Issues with self healing in MD/HDPE are centered in the manufacturing process
  - Most established healing materials/agents cannot withstand the high temperatures of extrusion
- The problem requires the concurrent study of materials properties, structural analysis and manufacturing processes
Self-Healing Pipe Project

- Develop plastic pipe that self-heals when damaged by cracking or mechanical impact
- Deliverable: Prototype of PE pipe with self-healing characteristics
  - Nanocomposite material, with PE as the matrix material
- Completed Feasibility Study to determine proof-of-concept
- Currently moving into Phase III test effort
  - Nanocomposite material retained the mechanical properties of the matrix material (PE)
  - Testing for self-healing properties
Summary

- NYSEARCH’s voluntary RD & D program has been focused on innovative product development in the gas operations arena for many years.

- Several program areas are active that address methane mitigation and improving operations related to natural gas infrastructure.

- We have collaborated with DOE/NEXTL in the past; have been active with PHMSA and others in several cofunded projects; some successfully completed.