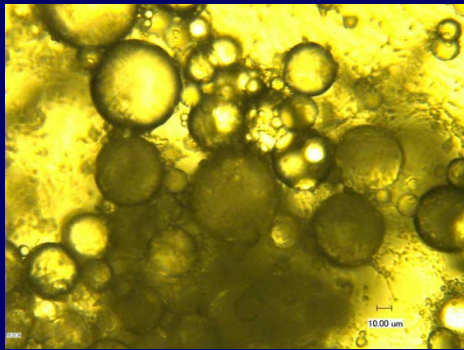


NYSEARCH Research Roadmap



Dr. George Vradis, Daphne D’Zurko
NYSEARCH/NGA
PHMSA R & D Forum, August, 2014



NYSEARCH Program Objectives

- Address technology needs and opportunities as the business and technology environment changes
- Produce viable and deployable R & D products that provide quantifiable benefits through increased safety, greater efficiency & reduced costs
- Sustain high customer satisfaction through positive financial performance and high R & D funding leverage



NYSEARCH Program Areas

- Improved Installation, Maintenance and Repair
- Pipeline Integrity/Direct and Remote Assessment
- Pipe Location/Damage Prevention
- Leak Detection
- Real-time Sensing & Inspection for Distribution
- Environment/Reducing GHG Emissions
- Gas Quality
- Evaluation of New Materials



NYSEARCH Roadmapping

- Viewed as providing a **framework** for long-term planning; multi-year process
 - Specific roadmapping exercises (started in 2010; dynamic with changing personnel)
 - Annual brainstorming/needs prioritization efforts within NYSEARCH membership
 - R & D Forums/Industry Conferences (e.g. AGA Annual Operations Conference)

Roadmap Vision Statement

- Since natural gas will be the sustainable fuel of choice because of its availability, relative environmental benefits and its importance to national security, NYSEARCH will conduct R & D in areas of interest to its members to:
 - Reduce Operating Costs and Increase Safety
 - Provide for Growth
 - Mitigate Risk
 - Anticipate Regulatory Requirements, and,
 - Improve Environment, Health & Safety to its members' workforce and the public.



Highest Executive Priorities at Start of NYSEARCH Roadmapping Process

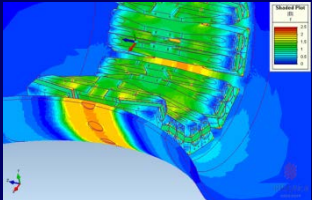
- Members' polled for top R & D priorities over next two decades

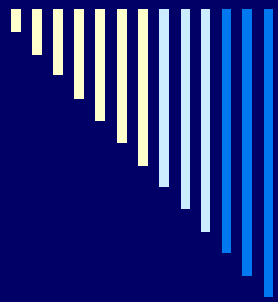


- Aging Infrastructure
- Environmental Concerns (including impact of gas supply growth)
- Change in operational and business needs as a result of Climate Change

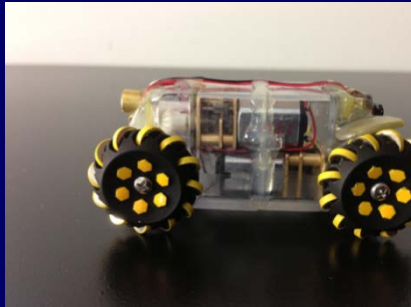
Current Work in Integrity Management/Anomaly Detection

- Completion of all planned EXP robotic inspection platform sizes for un-piggable pipe
- Addition of sensing functionality to EXP platform
 - Mechanical damage/ovality (commercial but add'l demos ongoing)
 - Crack sensor
 - Hardness Tester
 - Data collection in bends





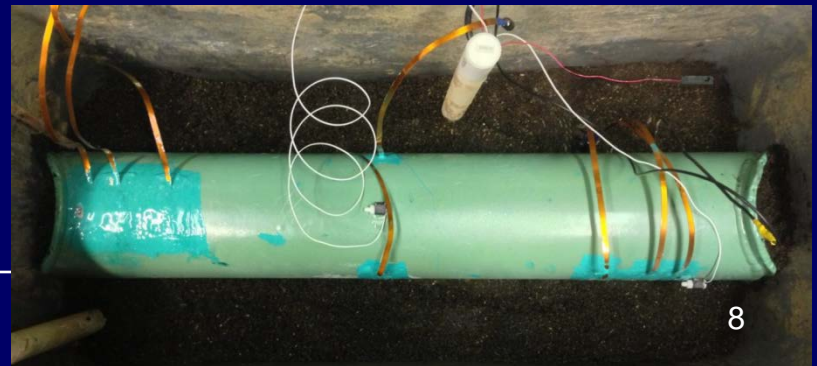
Current Work in Integrity Management/Anomaly Detection (cont.)



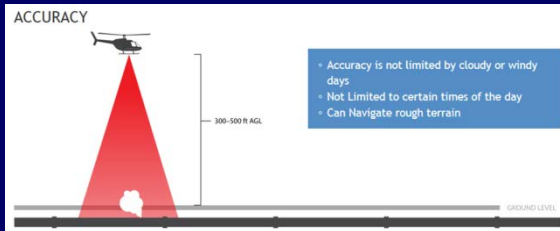
- Risk Assessment Techniques
- Cased Pipe Vent Inspection



- Critical Crack Threshold Definition
- Real-time corrosion sensing on surface of pipe



Current Work in Leak Detection



- ❑ Leak Survey/Leak Emissions RATE quantification – SOA Evaluation and Test Program
- ❑ Evaluation of Application of Aerial Leak Survey for Distribution
- ❑ Leak Pinpointing – new approach; leak pinpointing inside pipe
- ❑ Safety Sensor for Residential Methane Detection
- ❑ Analytical Sensor for Methane Detection & Monitoring
- ❑ Mercaptan Sensor/Smart Nose

Current Work in Damage Prevention

□ Proactive Monitoring/DP Systems for Distribution & Transmission

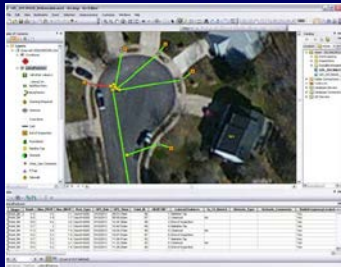
- Underground Sensors
- small Unmanned Aerial Systems (sUAS)

□ Alternative facility detection technologies including those for sewer cross bores

□ Small footprint/ low GHG emissions trenchless techs for gas service upsizing

□ Self-Healing PE Pipe

□ Innovative Power & Communications Systems for Real Time Sensing



Current Work in Advanced Materials & Testing



- Self-Healing PE Pipe

- Non-Destructive Evaluation of PE Butt Fusion Joints

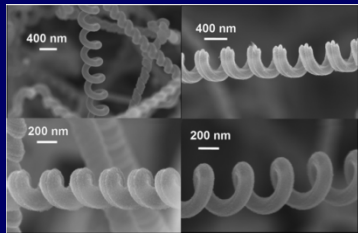
- Testing & Demonstration of CIPP-lined cast iron and steel pipe



Current Work in Gas Quality/Changing Gas Supply



- ❑ Odor Masking
- ❑ Odor Intensity Measurement
- ❑ Gas Interchangeability for Couplings Study
- ❑ Expanding Commercial Use of NYSEARCH RANGE™ model for impact of gas supplies on residential appliances
- ❑ Advanced Chemical Nano and MicroSensors for Measuring Trace Constituents





Closing Remarks

- ❑ Other areas of NYSEARCH Technology Roadmap not covered today
- ❑ RD & D is only beneficial if technology transfer & deployment are effective; **resources for deployment of new technology are getting more scarce with competing industry demands**
- ❑ Success with our voluntary RD & D model comes through thorough testing and vetting of each technology – **we greatly appreciate our members commitment to this effort!**

