

Operations Technology Development (OTD) Roadmapping Activities

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OTD Overview

- > OTD is a stand alone, 501c(6) not-for-profit, member-controlled company where gas utilities work together to develop technology solutions to common issues
 - Annual membership dues are based on the number of customers
 - Each company votes their own dollars to specific projects
 - All members have access to all project information
 - OTD was established in 2003
 - Currently there are 23 members
 - Annual Dues are over \$8M

OTD Topical Areas: Four Working Groups

- > Addressing the strategic concerns of primarily the distribution infrastructure in the U.S. and Canada

**Infrastructure
Rehabilitation and
Improvements**

**Data and Integrity
Management**

**Environmental Matters,
Renewable Gas, and Gas
Quality**

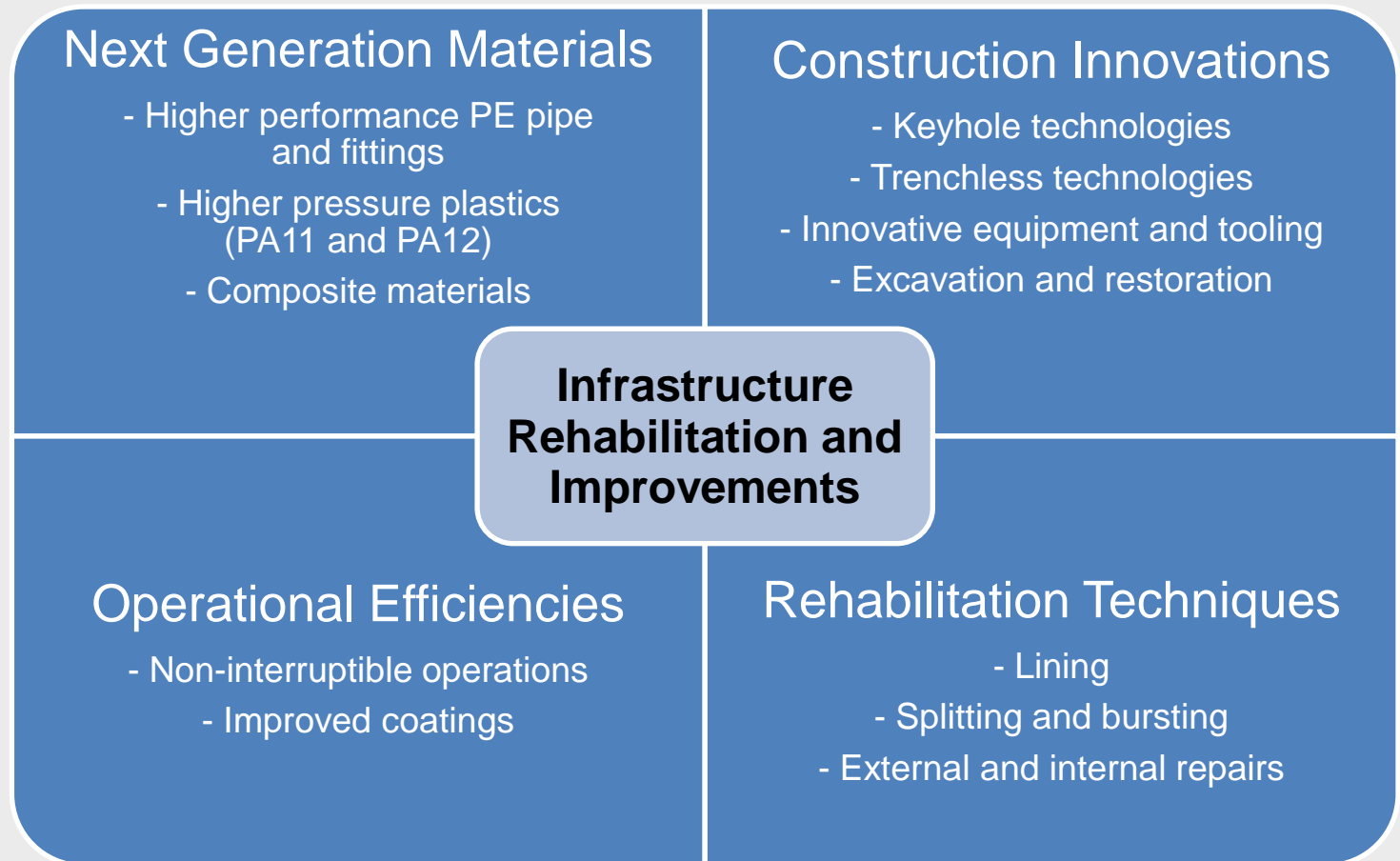
**Breakthrough
Technology**



Roadmap for Each Working Group

- > Technical Objectives
- > Industry Needs
- > Research Gaps
- > Research Projects and Proposals

Infrastructure Rehabilitation and Improvements



Infrastructure, Rehabilitation and Improvements

Covers an important range of topics including next generation materials, operational efficiencies, rehabilitation techniques, and construction innovations (processes, tools/equipment, and workers.)

Areas of Research (High Impact Topics):

> Replacement/Rehab

- Aging infrastructure
- Service reconnects
- Trenchless technologies
- Materials
- Processes
- Excavation and restoration

> Maintain Existing Facilities

- Maintenance
- Leak repair
- Leak pinpointing

> Maintain Existing Facilities

(continued)

- Processes
- Excavation and restoration

> 3rd Party Damage

- Locating tools and processes
- Data sharing
- Processes

> New Infrastructure

- Installation practices and processes
- Materials

Focus Area		Objective	Research Projects and Proposals					
Infrastructure, Rehabilitation and Improvements	New/ Replace/ Rehab	Next Generation Materials	Completed Projects	RTP/Composite Pipe Selection Guide	Increased Design Factor (for new bi-modal materials)	Composite Pipe Workshop	Composite Pipe Testing and Standards Development	
			Current Projects	PA11 and PA12 Testing and Implementation	Composite Repair		Non-Metallic Systems (below & above ground)	
		Process Improvements	Completed Projects	EF Coupling Evaluations	Gas Distribution Model – facilitate interoperability	Essential Data Collection for PE Fusion Processes		
			Current Projects	Lateral Joint Integrity	Tracking & Traceability	Automated Butt Fusion of 2" PE Pipe		
			Completed Projects	PE Butt Fusion Integrity	Tracer Wire for HDD		Main and Service Repl. Process improvements	
			Current Projects	Smart Mole	Cold Assisted Splitting and other Splitting Enhance	Piercing Tools for Keyhole applications	Main and Service Repl. Tech. Improvements	
		Construction Innovations	Current Projects	Automated Welding	Starline and other liner technologies	Cross Bore Database and Best Practices Projects		
			Completed Projects	Keyhole Technology	HP Bag Stopping	Casing End Seals		
			Current Projects	EZ Valve	Asphalt Cold Patch			
			Completed Projects	Composite Repair	ULC Robotics Keyhole Camera Enhancements	Yield Strength	External Pipe Cleaning/Preparation Tool	
	Maintain Existing Facilities	Operational Efficiencies	Completed Projects	NIMCO Systems	Numerous Coating Evaluation Projects	Dewatering of Mains and Services	One Coat Infrastructure Protection	
			Current Projects	Timberline PE Patch	CARP	Remote shut-off and disconnect	No-Blow Tooling Enhancements	
			Completed Projects					
		Current Projects						
	Threats to System	Damage, Corrosion, Leaks	Completed Projects	Aldyl-A Pipe Testing, Analysis, and Life Prediction	Acoustic Pipe Locator	Cross Bore Workshop	Cross Bore Best Practices and Database	Managing Threats and Risks
			Current Projects	MJL	HDD Obstacle Detection Systems	Tracking & Traceability	Breakaway Fitting for MSA's	Intelligent Shut Off of Commercial/Ind. customers
			Completed Projects	MFL and BEM Technologies	Small Diameter Camera ID and Enhancements	Vehicle Barrier Designs	RFID Tags	Risks for Various Leak Prone Pipes

Data and Integrity Management

Pipeline Integrity Management

- Inspection technology development and evaluation
- Guidance materials and best practices

Distribution Integrity Management

- Distribution risk models
- Standardized distribution data model

Data and Integrity Management

Data Collection

- GPS-based excavation encroachment notification
- GPS-enabled leak surveying

Data Collection

- Automate, Reduce costs, Improve data quality

Data Utilization

- Remote monitoring of field operations
- 3-D multi-utility repository

Data and Integrity Management Program

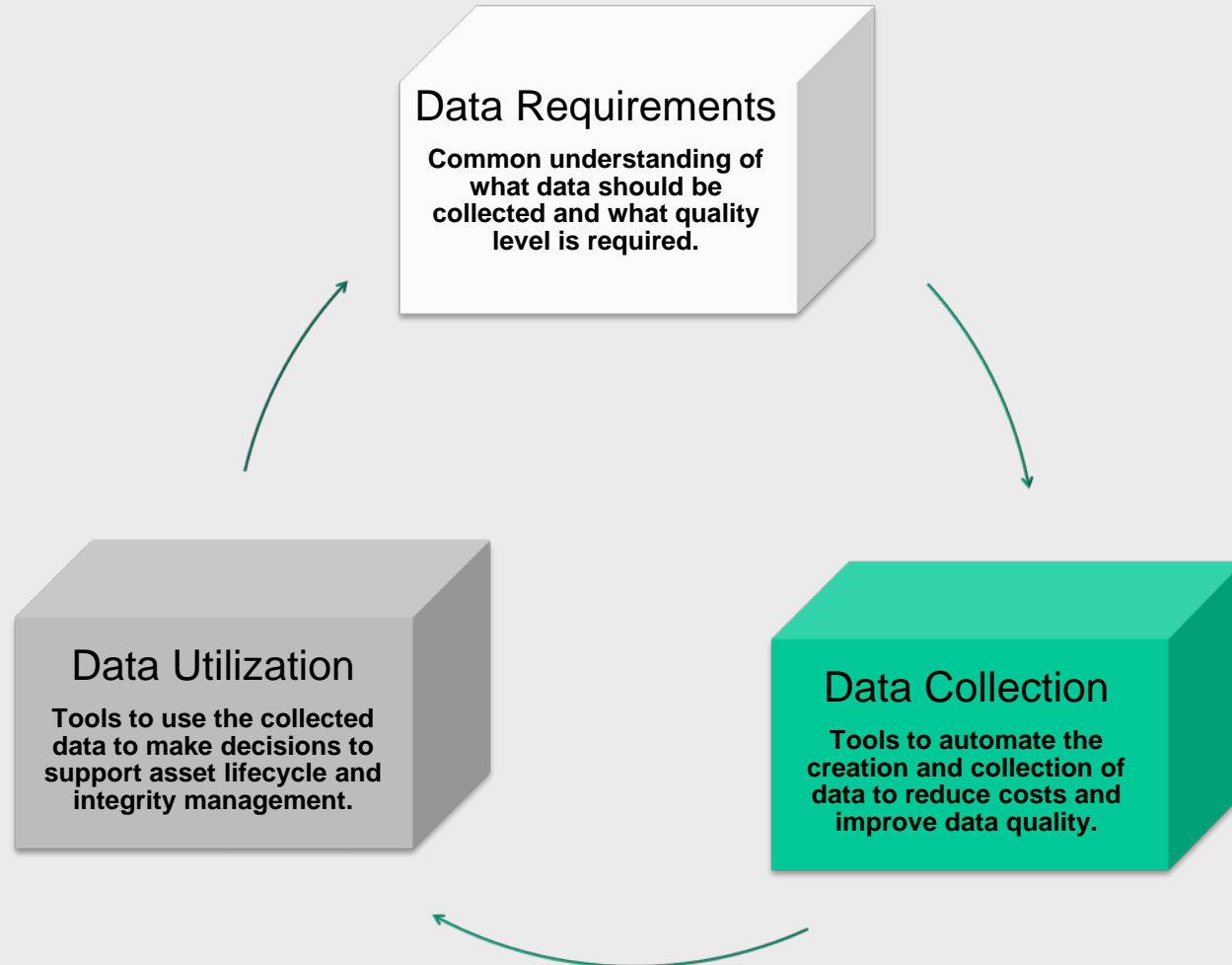
Pipeline Integrity Management

- > Develop resources to assist operators in executing their IM programs. Short-term goals focus on developing tools, methodologies, and knowledge with the long-term goal of reducing the cost of integrity management compliance. Program goals include effective technology transfer to operators and support to ensure market acceptance.

Distribution Integrity Management

- > Develop and implement tools to decrease the cost and increase the quality of collecting and managing operations field data. The program will develop methodologies to assist operators in turning field data into system knowledge that can be used to support IM decisions and reduce system risk.

Data-Focused Strategic Area



Data and Integrity Management Program

Data Program

Intelligent Utility System

- > Develop technologies and processes to facilitate the efficient and accurate collection of field data that can be used to improve decision making regarding risk mitigation and asset maintenance. Use advances in consumer grade IT to extend electronic data capture and real-time GIS access to users in the field.

Smart Grid

- > Develop and deploy technologies and processes that effectively use two-way communications and intelligent field devices to enhance safety and efficiency of the network and effectively serve new end uses and supply sources.

Focus Area	Objective	Needs and Gaps	Research Projects							
Integrity Management	Distribution	Know Your System	Accurate maps and asset location data	Marker Ball Program	Intelligent Utility Installations	Guidelines for Data Collection – Design, Construction, Operations				
			Accurate records of material and asset data	Tracking and Traceability						
		Assess Threats	Understand material failure modes	PE data fusion capture	Assessing Vintage Pipe Risk		Continuous Threat Identification Program			
			Understand environmental threats	Auto Public Data Capture	Cross Bore BP					
			Pipe inspection	Various Projects						
		Assess Risk	Risk modeling	DIM Risk Model	Plastic Pipe Risk Model	Cross Bore Risk Model				
			Understand threat interactions	Threat Interactions	Assessing Vintage Pipe Risk					
		Threat Mitigation	Decision criteria	GDLNS for PRMC MSRS	Criteria for MTGN TCHN		Other MTGN TCHN			
			Mitigation techniques	EFV Testing Program	Various Projects					
		Transmission	Know Your System	Accurate maps and asset location data	Alternative Yield Strength	Techniques for Backfilling Missing Records				
				Accurate records of material and asset data		Model for SPK and PSR TEST	Continuous Threat Identification Program		Continuous monitoring tech	
			Understand material failure modes	Auto Public Data Capture	Int Inspect Opt		Assess Tech Effect	Tether MFL		Defect Sizing
	Understand environmental threats		Pipe inspection							
	Assess Risk		Understand threat interactions	Threat Interactions						
			Risk models	Leak Rupture Boundary						
	Threat Mitigation		Mitigation techniques	Wax Filled Casings	Composite Wraps					
			Decision criteria	Flaw Acceptance Criteria						
				Existing Projects	Current Proposals	Future Proposals				

Focus Area	Objective	Needs and Gaps	Research Projects			
Smart Grid and Intelligent Utility System	Data Collection	Improve Manual Data Collection	Reduce the cost of collecting field data for regulatory compliance	Intelligent Utility System – low cost data collectors		
			Reduce risk through improved data quality	Intelligent Utility Installations	GPS-Enabled Leak Surveying	Data quality health index metrics
			Increase data accessibility and interoperability	Intelligent Utility System – streamlined GIS integration		Gas Distribution Model – facilitate interoperability
		Automate Data Collection and Monitoring	Reduce the cost of collecting field data for regulatory compliance	CP Monitor	Automated Public Data Capture for IM	Real-time data capture with sensor networks
			Reduce risk through improved data quality	Tracking and Traceability Algorithms		
			Reduce risk through real-time operations monitoring	Remote Monitoring for Quality Assurance		
			Reduce risk through real-time system monitoring	Solar Powered Remote Monitoring	AMI and Pressure Sensor Integration	
		Data Usage	Create System Knowledge from Data	Optimize surveys, patrols, and inspections	GIS-Based routing and emergency response	Risk-Based Survey and Inspection Intervals
	Reduce risk through enhanced modeling and risk analysis (Toolboxes)			Plastic Pipe Risk Model	DIM Risk Model	Assessing vintage pipe risk
	Reduce risk through real-time mitigation			Remote shut-off and disconnect	Real-time system controls	
	Supply and demand balancing and network optimization			Smart Grid – Standards and Regulations	Demonstration project of communications between the grid and the end user	Smart meter interoperability and deployment

Existing Projects Current Proposals Future Proposals



Environmental, Gas Quality, and Renewable Gas

Environmental Concerns

- Fugitive emissions
- PCB detection
- Isotope ratio analysis for source ID
- Indoor air quality

Enabling the Renewable Supply

- Dairy, landfill and wastewater biomethane
- Cleanup technology validation

Environmental, Gas Quality, and Renewable Gas

Biology/Energy Nexus

Interchangeability

- Effect of varying gas composition on materials associated with the LDC infrastructure
- Odorant fade

Environmental and Gas Quality Program

Gas Quality

- > Facilitates the introduction of new gas supplies (e.g., renewables, unconventional), maintains the gas quality of these new and existing supplies, and ensures the long-term safety and integrity of the natural gas infrastructure. The program also develops a thorough understanding of supply characteristics and resulting implications to the delivery infrastructure or end-use equipment or related processes.

Environmental Regulations

- > Better enables natural gas companies to comply with environmental regulations by developing improved methods and analytical techniques for measuring and monitoring environmentally regulated compounds. Program goals include developing a better understanding of the impact of regulated compounds on natural gas infrastructure through modeling and risk analysis.

		Objective	Needs and Gaps	Research Projects			
Environmental and Gas Quality Program	Gas Quality	Facilitate introduction of renewable and unconventional fuel into gas infrastructure	New fuel development	Macroalgae (GTI)	Co-digestion (GTI)	Electrofuels	
			Resource and economic assessment	Biomass	Shale Gas		
			Real-time measurement of trace constituents	Sensors	MIC Device	Bio-Gas Sensor Package Analysis/Implementation	
			Improve analytical techniques	Elemental sulfur	Siloxanes method comparison		
		Maintain gas quality	Fuel characterization	Analytical and MIC services	Trace constituents	Landfill project	WWTP project
			Common knowledge and understanding of gas quality issues	Gas Quality Resource Center	Develop hydraulic gas quality model for tariff and supply constraints		
			Develop and assess technologies to improve or sustain gas quality	Biofilter device			
		Ensure long-term safety and integrity of infrastructure	Understand changing gas supply's impact on infrastructure (interchangeability)	Interchangeability (NYSEARCH project)	Landfill gas interchangeability	Ethane variability of shale gas	
			Reduce risk through enhanced modeling and risk analysis	Siloxanes assessment on residential appliances	Corrosivity assessment and modeling	Odor Fade	Cleanup technology assessment/modeling
	Environmental Regulations	Enable compliance with regulations	Improve quantification of greenhouse gas emissions	Methane emission factors - plastic pipe	Methane emission factors - other materials		
			Improve measurement techniques of environmentally regulated compounds	PCBs – Dipstick	Asbestos – Field Tool	Arsenic	
			Reduce risk through enhanced modeling and risk analysis	PCB absorption (NYSEARCH proposal)	Asbestos – Risk Analysis		

Existing Projects	Current Proposals	Future Proposals
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Breakthrough Technology

Leak Survey

- Improve leak survey with advanced technologies
- Reduce operating costs
- Differentiate natural gas leaks vs. leaks from other sources
- Imaging leaks vs. detecting leaks

Reduce “Third-party” Damage

- Pipe location including PE pipes
- Detection of objects during installation of pipes using HDD machines
- Sewer mains and laterals detection

Breakthrough Technology

Inspection

- Real-time inspection of pipes in “live” environment
- Detection and inspection of joints

Automation and Sensors

- Sensors/technologies for Smart Energy Grid
- Nano sensors development with emphasis on materials and environmental needs

Breakthrough Technology Program

Damage Prevention

- > Develop technologies to reduce “third-party” damage. This program includes technology development efforts for location of pipes, detection of sewers, and pipeline monitoring.

Inspection/NDE

- > Develop/assess/optimize technologies to inspect short/long segments of pipes
- > Develop technologies to detect pipeline flaws in butt fusion joints and pipes, and graphitic corrosion.

Leak Detection

- > Develop technologies to detect/image natural gas leaks and improve leak pinpointing operations. Additionally, address technology development for differentiating natural gas leaks vs. sewer gas leaks and methane detection alarms/monitors for use in the home.

New Materials and Sensors

- > Directed at applications of advance materials (e.g., nanotechnology materials) for the gas industry operational needs (self healing material for leak repair, pipe detection, etc.).

		Objective	Needs and Gaps	Research Projects	
Breakthrough Technology Group	Damage Prevention	Reduce "Third-party" Damage	Locate pipes, particularly PE	APL development (1.h and 1.10.c)	APL: Tech Transfer - Phase 2 (1.10.c)
			Detect objects/pipes during HDD	GPR-based (1.k); Acoustic-based (1.8.f)	Evaluations of system at DW
			Detect sewer mains/laterals	Acoustic sewer lateral pipe locator (1.8.g)	Technology transfer
				Cross Bores – Technology Review (1.11.a)	Select technologies for development
			Pipeline monitoring (buried)	RFID technology (Potential SMP funding); other technologies	
	Pipeline monitoring (above ground)	Technology TBD			
	Inspection/NDE	Inspection of Pipes and Joints	Real-time inspection of short segments of pipes (tethered)	MFL inspection system (4.11.c); awaiting funding decision	Other robotic platforms (Pipeline custodian, LLC robotic, European, etc.)
			Real-time inspection of pipelines (un-tethered)	Understanding, evaluating, optimizing inspection technologies (4.11.f, 4.11.e, 4.11.d) (Data and Integrity management WG)	
			Inspection of butt fusion joints and other pipeline flaws (external)	Field ready Ultrasonic Inspector, Phase 2 (2.6.e)	
			Detect cast iron graphitic corrosion (GC)	RSD X-Ray for PE assessment (2.11.d)	
	Leak Detection	Improve technology to detect image leaks	Improve leak survey operations	Remote leak survey using lasers (1.i)	Prototype development and testing
			Differentiate sewer gas vs. natural gas leaks	Ethane-only detector (1.10.a)	Technology transfer
			Methane detection alarms and monitors	Low-cost MEMS methane sensor platform (1.11.c)	Packaging and commercialization efforts
			Improve leak pinpointing	Automating leak pinpointing (1.9.g)	
	New Materials and Sensors	Develop or Apply New Materials and Sensors	Develop advanced materials to reduce operating cost; Use of nanotechnology	Applications of nanotechnology materials for self-healing (repair leaks), pipe detection, etc.	

Existing Projects Current Proposals Future Proposals



Thank You!

Any Questions?