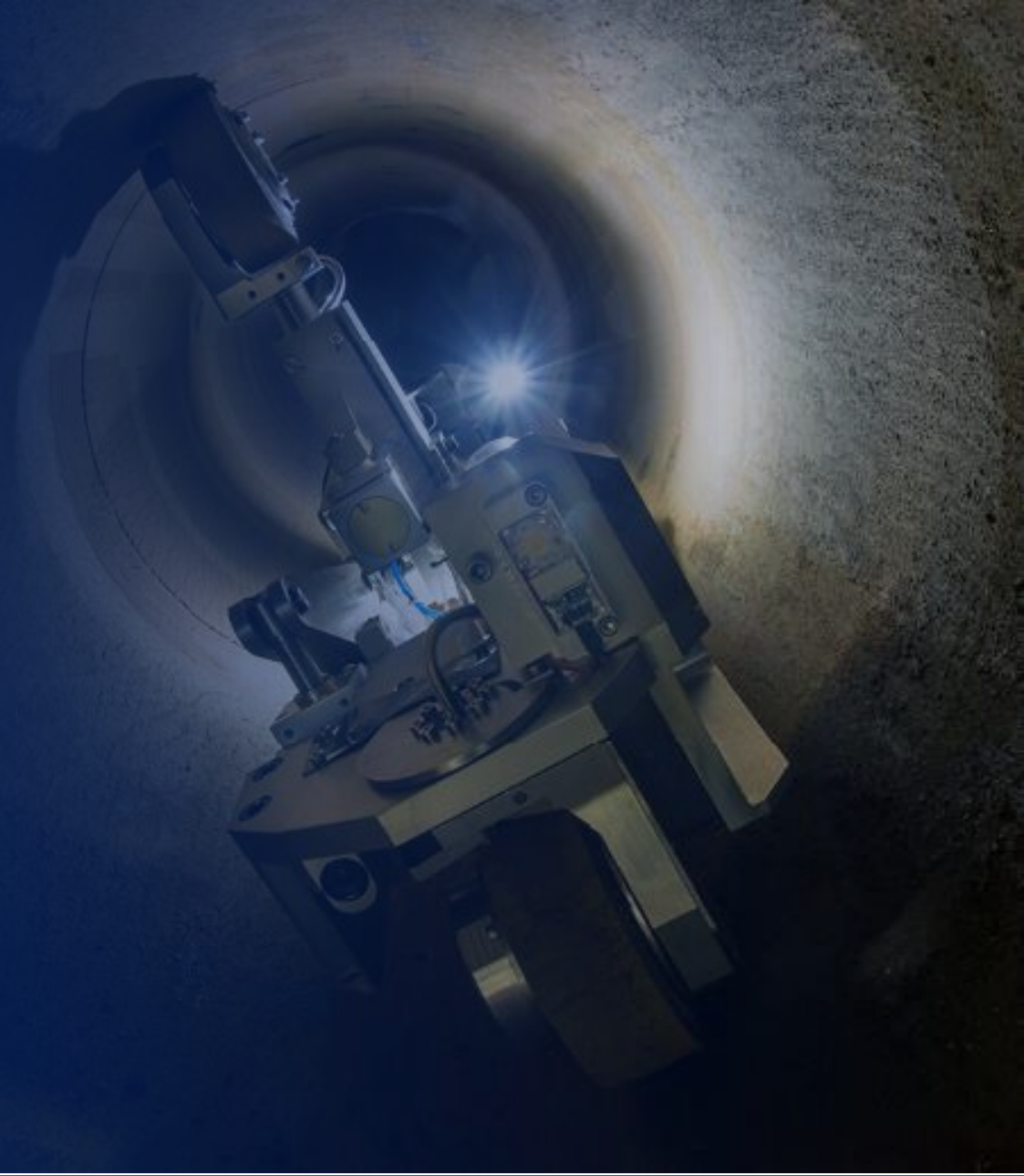


# Utility Technology Update

**Liz Gillick**, Project Manager

June 5<sup>th</sup>, 2020

NGA Gas Ops Instructor Session



# Agenda

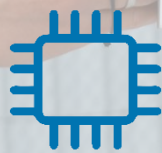
- ULC Robotics Overview/Introduction
- Reducing 3<sup>rd</sup> party damage to gas distribution facilities using In Pipe Locating
- CISBOT: Robotic system operates within live, large diameter cast iron gas mains to prevent leaks and minimize the disruption associated with traditional repair and replacement
- Thank you - Questions

# CREATING INDUSTRY SOLUTIONS FOR THE US & UK ENERGY MARKETS

ULC Robotics provides technology development, contracted services and innovative products to gas and electric utilities that reduces operations and maintenance costs while meeting the increasingly complex demands of regulators, energy customers and the general public.



**Mechanical  
Engineers**



**Electrical  
Engineers &  
Sensor Scientists**



**Robot Operators  
& Field Personnel**



**Software,  
Firmware &  
Application  
Developers**



**Manufacturing,  
Assembly &  
Quality Assurance**



**Project  
Managers**



# ULC ROBOTICS: WHAT WE DO

- Robotics Development
- Robotics-as-a-Service (RAAS)
- Artificial Intelligence & Machine Learning
- Unmanned Aerial System Development
- Industrial Inspection Equipment Development

GENERAL TECHNOLOGY UPDATE:

# Technology to Prevent 3<sup>rd</sup> Party Damage

- ULC Robotics develops and deploys pushrod camera systems and motorized crawler systems to locate gas distribution mains and features within the main
  - Pre/post-inspections of pipeline for rehabilitation projects
  - Identify issues to pinpoint early on repair efforts
  - Identify pipeline features
- Crawlers launch vertically through small tap holes; travel hundreds of feet/meters in either direction
- Entry methods for metallic and plastic mains; 2"-48" (50mm to 1,219mm) diameters

INTERNAL INSPECTION OF LIVE GAS DISTRIBUTION MAINS:

# Technology Used for Inspection

PRX 250 Live Gas Main Inspection Pushrod Camera System	Small VGC Live Main Inspection Robot	Large VGC Live Main Inspection Robot	M1 L Diameter Live Gas Main Inspection Robot
2"-12" plastic, steel and cast iron mains	12"-16" plastic, steel and cast iron mains	18"-48" plastic, steel and cast iron mains	24"-48" plastic, steel and cast iron mains
Pressures up to 60 psi / 4 bar	Pressures up to 99 psi / 6.8 bar	Pressures up to 99 psi / 6.8 bar	Pressures up to 99 psi / 6.8 bar
Travels up to 250ft/80m in either direction	Travels up to 350ft/110m in either direction	Travels up to 750ft/240m in either direction	Travels up to 750ft/240m in either direction
Self-deploying centering system	Pan/tilt camera & advanced lighting allowing full circumference view	Pan/tilt camera & advanced lighting allowing full circumference view	Pan/tilt camera & advanced lighting allowing full circumference view
Motorized cable feeder			Can navigate around weko seals



IN-PIPE LOCATING:

# What Needs Located?

Location and depth of:

- ✓ Taps for services and stubs
- ✓ Cross tees, branches and old bypass stubs
- ✓ Change in direction and depth
- ✓ Valves, Drip Pots
- ✓ Butt Fusions, joints and welds
- ✓ Couplings and reducers
- ✓ Damage and rock intrusion
- ✓ Water intrusion

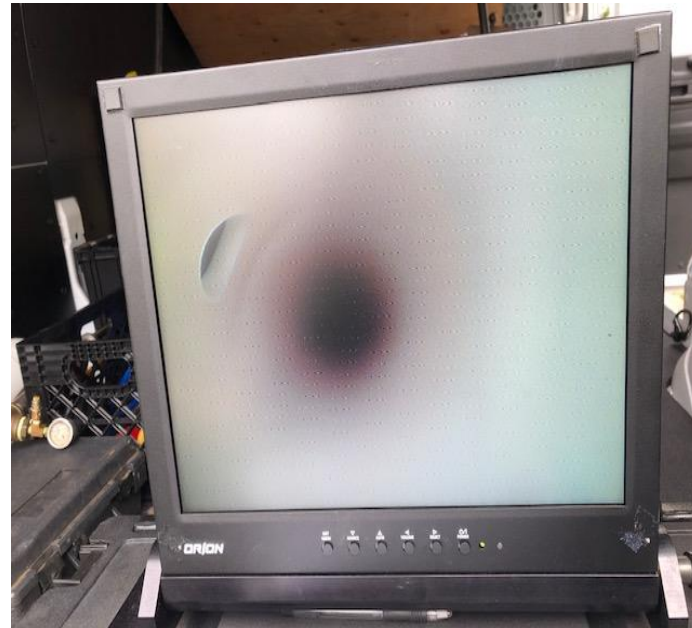
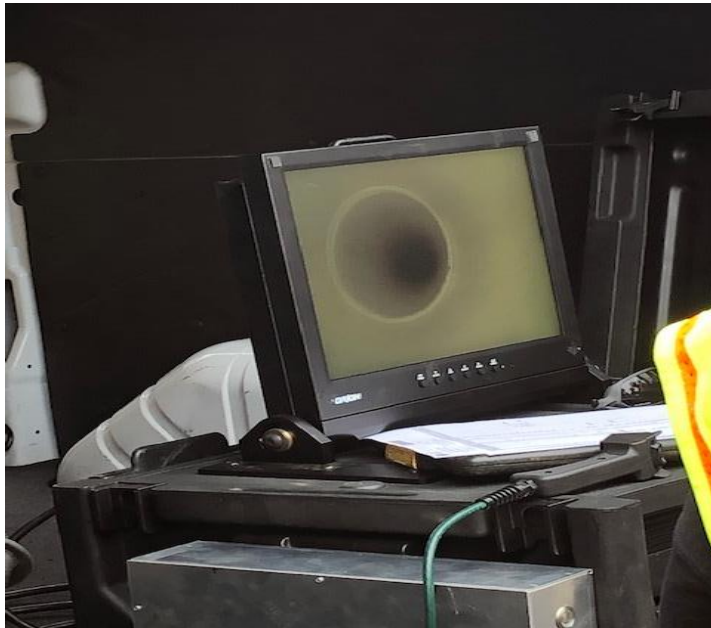




## IN-PIPE LOCATING:

# Locating PE Fittings and Fusions

- Identify and locate PE fittings and taps from inside the main, then mark above ground.
- In-Pipe Locating was used to locate and mark out above ground the location of two butt fusions in order to be able to conduct an analysis.





IN-PIPE LOCATING:

# Verify Proper PE Installations

**Any features visible within the pipe can be verified, located and marked out on the street surface**

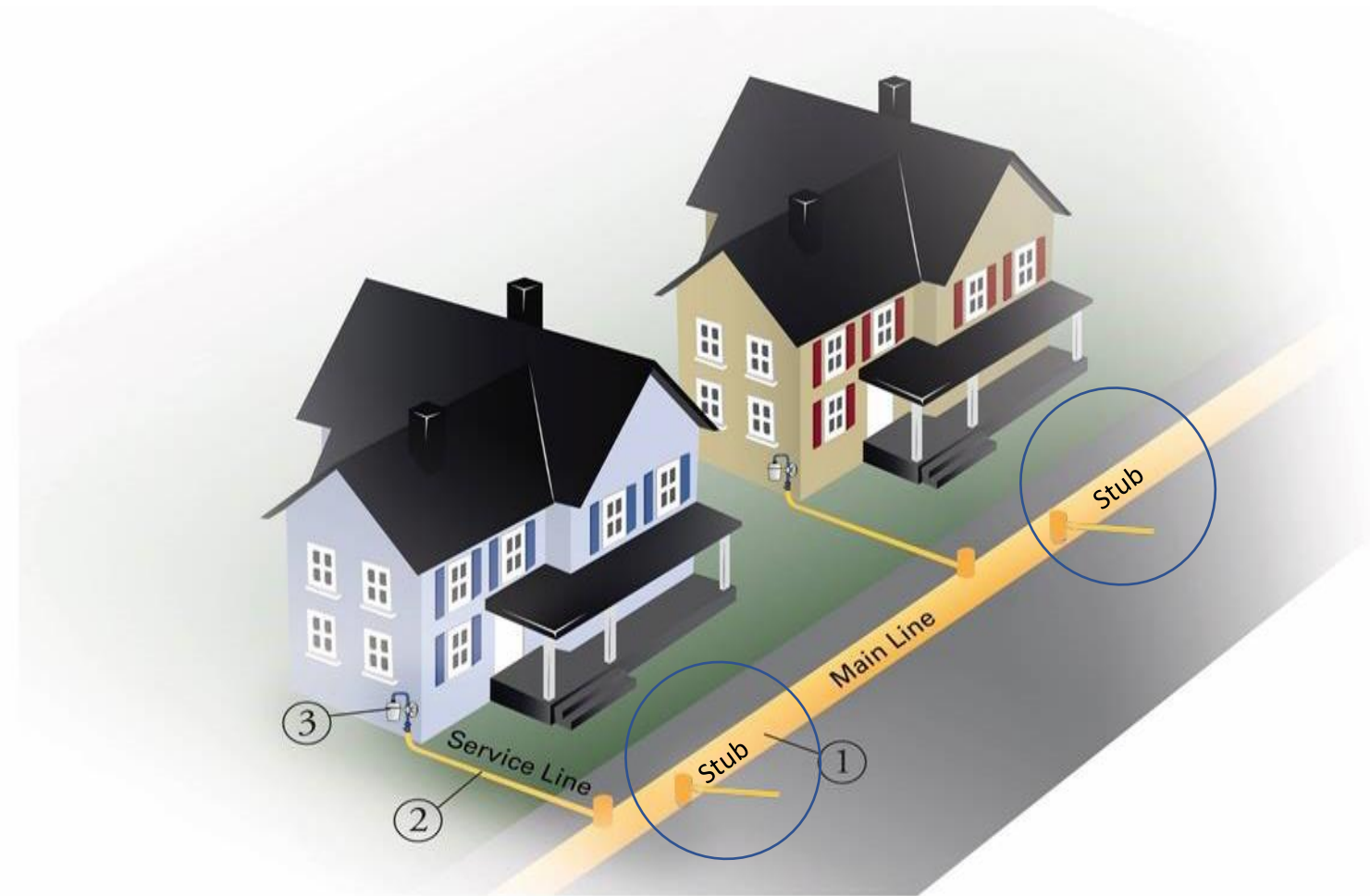
- In-Pipe Locating used to verify installation of tapping tees due to suspected installation issues
  - Client needed to validate proper fitting installations and precisely locate fittings from above ground
  - Inspected 286 tees through 38 excavations; 20,000' of PE main
  - 35% of tee installation failed the test and were able to be efficiently remediated.
  - Overall project resulted in a 50% reduction in excavation



# Locating Stub Services

## Industry Challenges

- Unknown stub services present a major issue in the gas industry.
- 3<sup>rd</sup> party damage to stubs and other features.
- Stub services are typically active with gas pressure which increases risk
- All Stub services should be located and accounted for prior to excavating or trenching

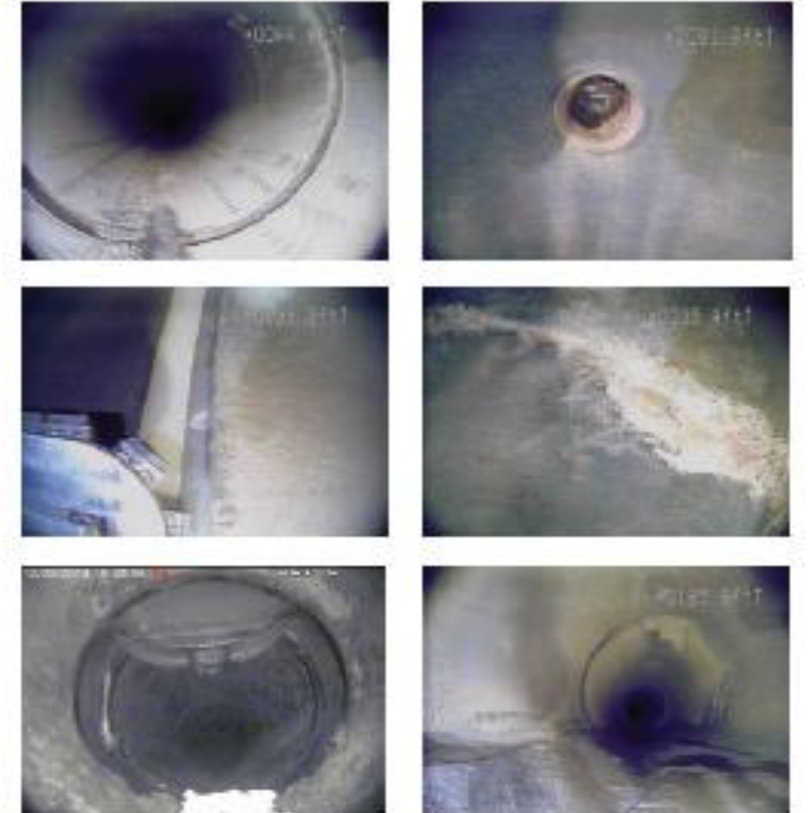


## IN-PIPE LOCATING:

# Live Gas Main Pipeline Pre-rehabilitation Inspections

Gas main rehabilitation projects can be hampered by unknown conditions that result in increased costs

- Safe, No-Blow Launch Into Live Gas Mains
  - Identify Unmapped Features
  - Improved Project Planning and Costing
  - Lower the Cost of Go/No-Go Decisions
  - Reduce Project Delays
  - Improve Project Mapping
- 
- Pre-Rehabilitation inspections deliver benefits to project planning and project costing by delivering critical project information before mains are taken out of service
  - Using traditional methods, these inspections are carried out after the main is put out of service leaving utility companies unprepared for unexpected challenges



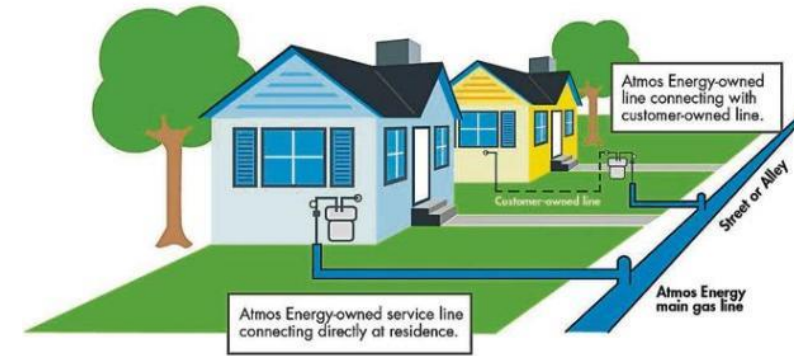


## IN-PIPE LOCATING:

# Pre-Uprating Inspections

ULC Robotics performs pre-uprate inspections to ensure all connected structures, pipeline connections, and features are mapped and accounted for before introducing elevated gas pressure.

- Identify and locate all services, branches, coupling, joints, welds, and fusions
- Each service Tee or branch identified within the gas main will be investigated and tied to a given home address
- Any service/home that cannot be identified will be pointed out as a possible hazard and communicated to the utility
- Detailed and accurate reports and mapping will be created for each pipeline inspected
- Review updated mapping with utility to ensure data is clear and understood



Distance (Feet)	Depth	Notes	Main Locations and Comments
7'	4'9"	Main Location	1'7" from South Curb
20'10"	4'7"	TAP	9" from South Curb
41'3"	4'3"	Main Location	1'7" from South Curb
51'4"	4'5"	TAP	3'4" from South Curb
61'5"	4'3"	TAP	3' from Wall
81'9"	4'	Main Location	2'5" from Driveway
101'6"	4'5"	Main Location	3' from Wall
120'3"	4'5"	TAP	3'2" from Wall
140'	4'5"	Main Location	3'8" from Wall
151'10"	4'5"	TAP	3'4" from South Curb
172'	4'5"	Main Location	3'7" from South Curb
183'2"	4'5"	Main Location	4'1" from South Curb

# Robotic Internal Cast Iron Joint Remediation

CISBOT OVERVIEW



# BACKGROUND:

**Large diameter cast iron gas mains (16"+ diameter) are a critical component of gas distribution networks in the US and UK**

- Located in dense urban areas; cities with older gas infrastructure
  - Challenges and high costs for replacement and conventional repair
- Substantial wall thickness resistant to
  - Cracks and fractures
  - Corrosion
- Leak prone joints are highest point of risk



# CISBOT

**CISBOT enters the main through a very small opening in the street and travels hundreds of feet in either direction to remediate the joints using a computer controlled anaerobic injection method.**

- Remediate up to 110 joints (1500ft) using a process proven to extend the life of the pipe by 50 years
- Gas stays on the entire time
- ULC has 13 robots working every day in the US and UK
- More than 25,000 cast iron joints sealed since 2010
- Considered a capital expense by utilities and part of approved rate cases





# CISBOT SITE FOOTPRINT

New York City

Reel, Turret Station, Control Room,  
Storage, and Maintenance Area

Only one truck  
required on site  
during sealing

CISBOT No-Blow  
Launch Tube

Small 6'x6'  
Excavation

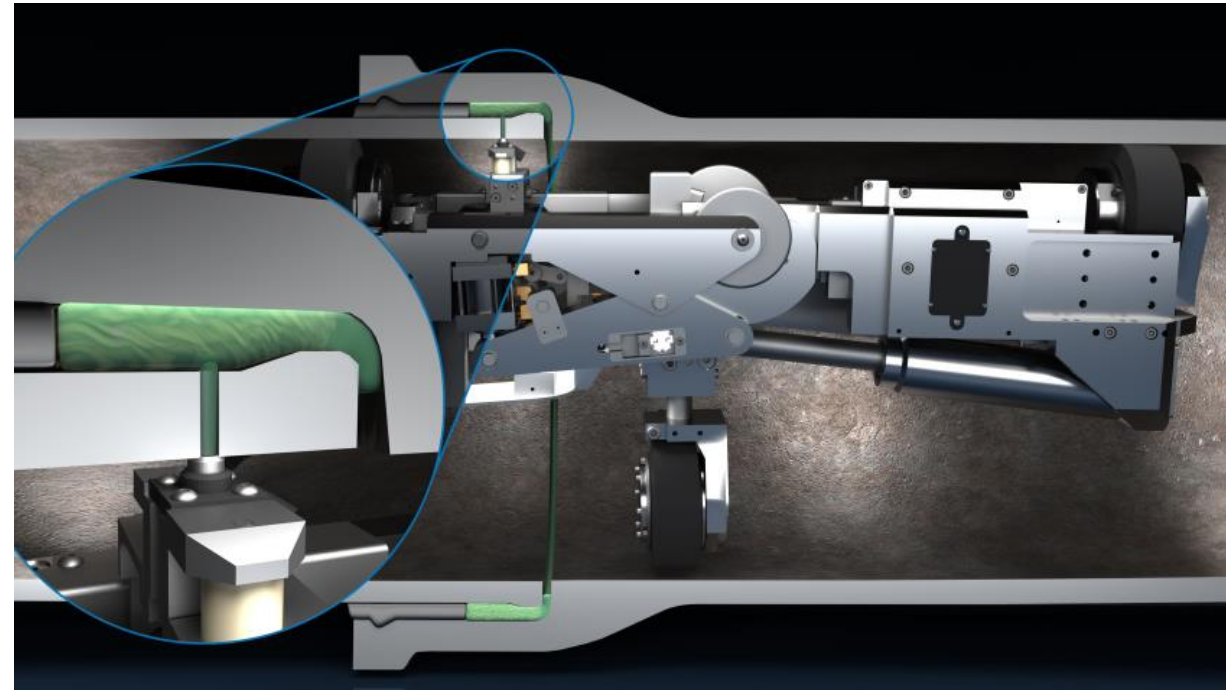
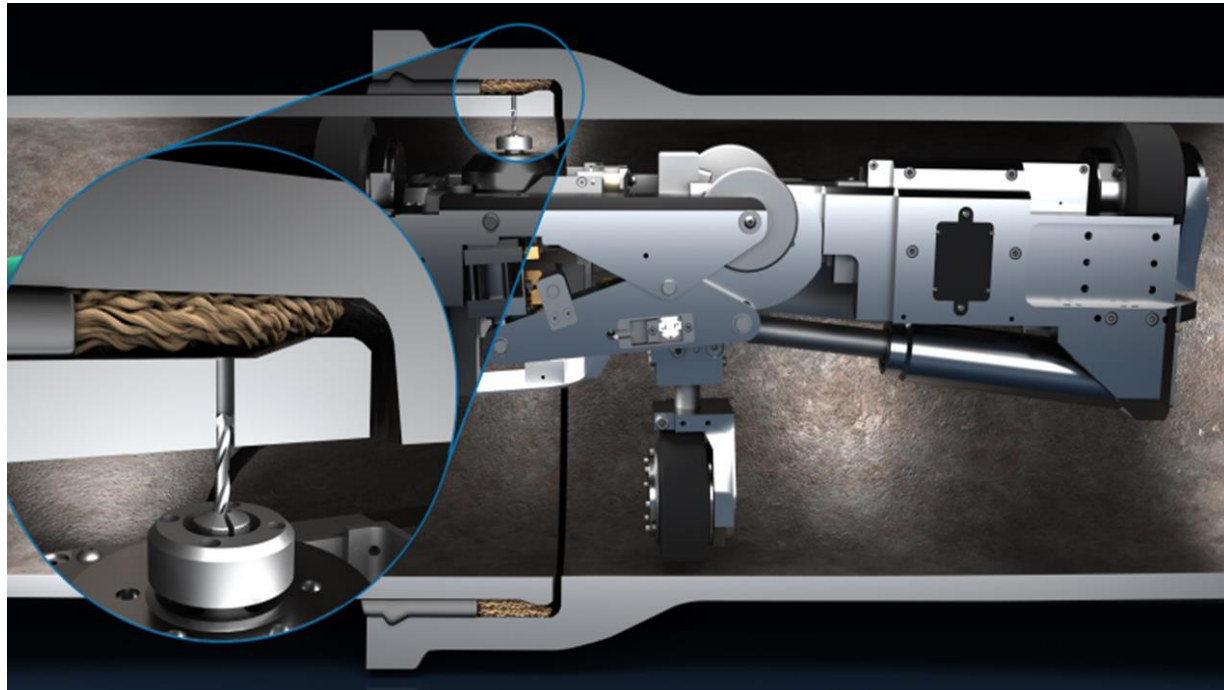
# CISBOT: HOW IT WORKS

- No blow launch into live gas mains up to 25 psi
- Launches through industry standard valves & fittings
- Articulating body allows vertical entry





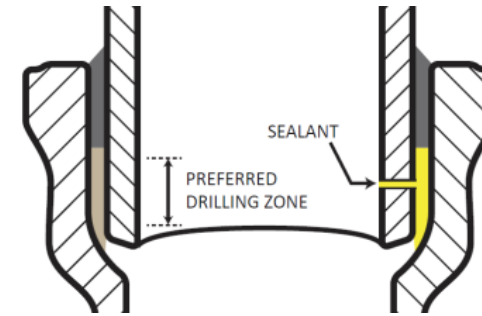
# CISBOT: HOW IT WORKS



# CISBOT: HOW IT WORKS

**CISBOT combines an advanced drilling and injection process with sensor feedback and remote monitoring to remediate joints:**

- Lasers assist the robot operator in identifying the joint gap and positioning the robot at the ideal location in the main
- CISBOT drills a small access port through the spigot
- Operator has control over drill speed and thrust



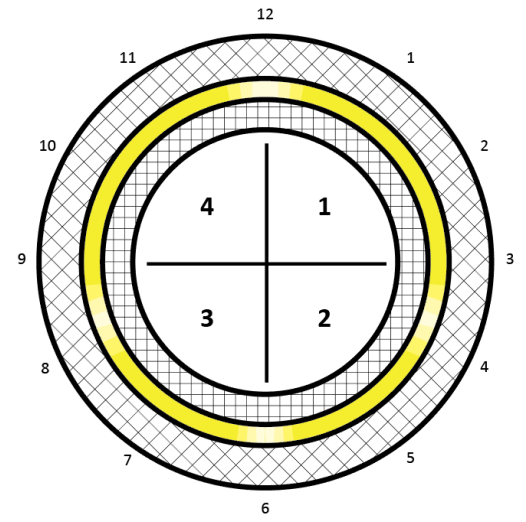
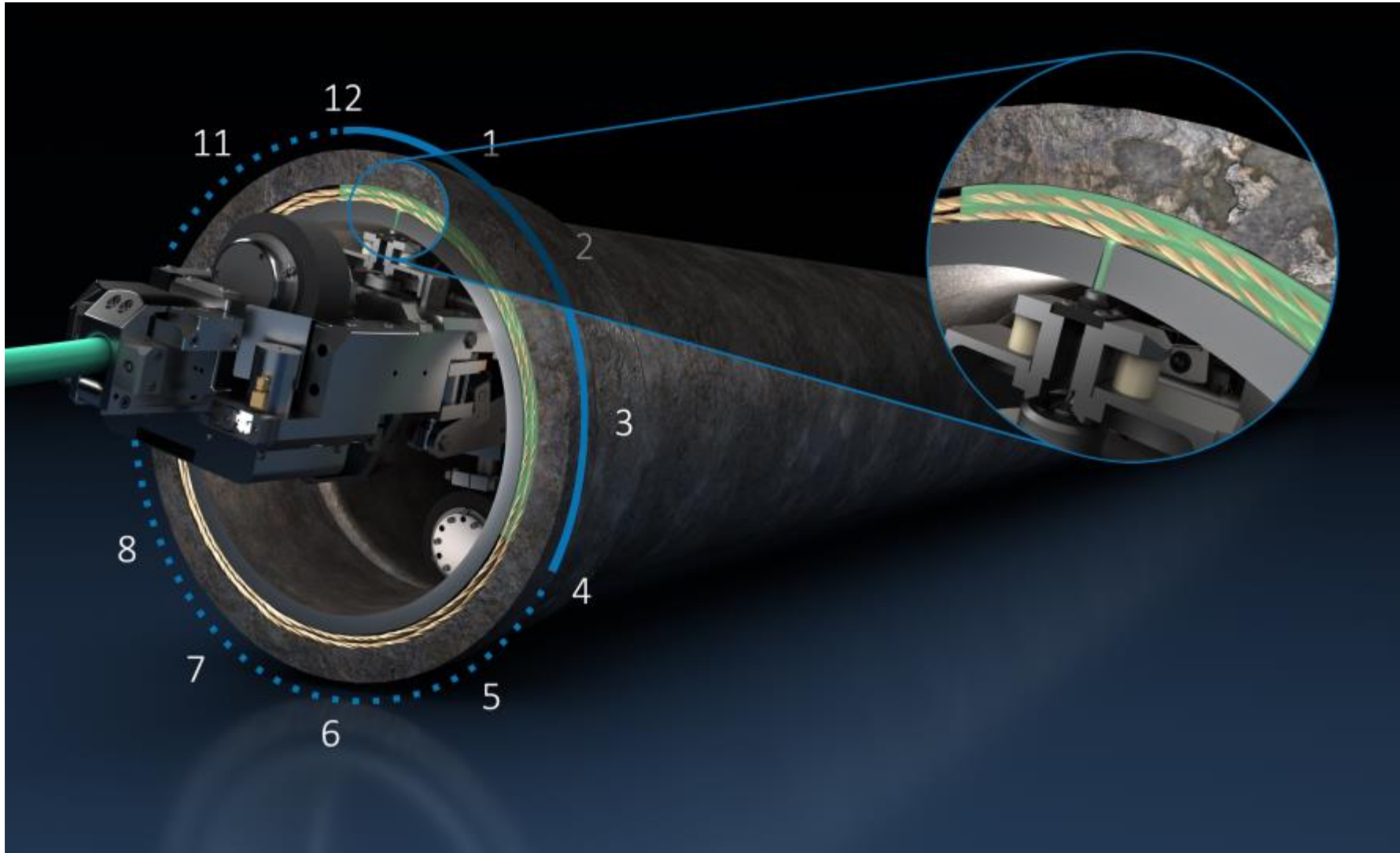
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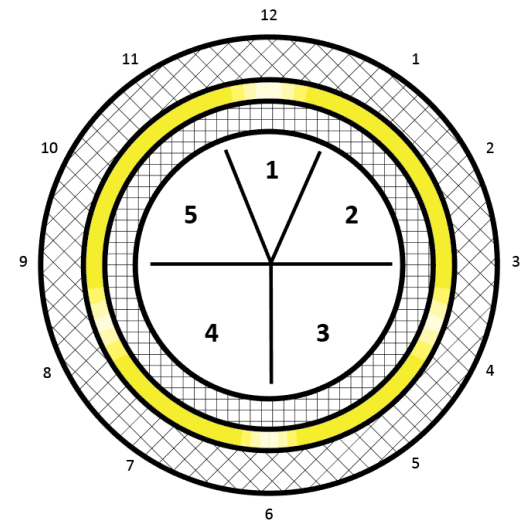
- A specialized nozzle injects an industry trusted sealant directly into the joint packing material through the access port
- Sensor feedback allows the robot operator to monitor the pump pressure and flow rate of the sealant until the prescribed volume of sealant is delivered into the packing material
- Six cameras on the CISBOT robot enable our robot operator to monitor the injection process and 'wicking'







DRILL REGIONS FOR  
16"-24" CAST IRON MAINS



DRILL REGIONS FOR  
30"-36" CAST IRON MAINS

# CISBOT: IMPACT ON INDUSTRY



“CISBOT has saved National Grid upward of \$30M in our Downstate New York territory alone—all while minimizing disruption to the public.”

*Ken Daly, President & COO, National Grid NY*

“The work with CISBOT on West End Ave cost \$400,000. To do the job the way such work used to be done would have cost \$1.5 to \$1.8M.”

*John Ciallella, Section Manager, Con Edison*

“In just one year CISBOT delivered \$11M in work for \$1.5M.”

*Duane York, Gas Maintenance, Spire Energy*



THANK YOU

# Any Questions?

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