

Advancements in Plastic Pipe Locating



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3M Safety, Security and Protection Services

We produce products that increase the safety, security, and productivity of workers, facilities, and systems around the world

Safety



Occupational Health & Environmental Safety

Security



Security Systems

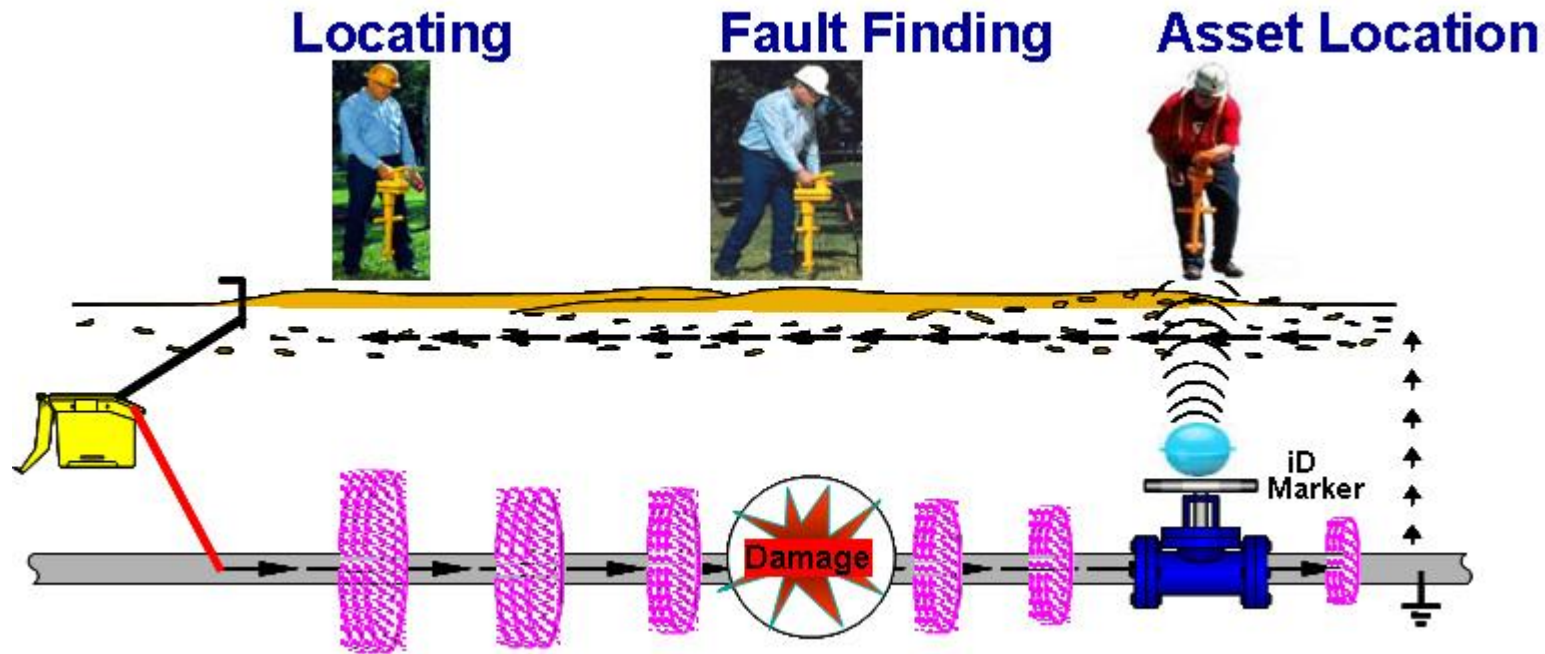
Protection



Industrial Mineral Products
Infrastructure Protection
Products
Building & Commercial
Services



3M Locating & Marking



Provides solutions for locating, fault finding, and accurate marking of buried utilities for companies committed to ensuring safety, quickly restoring outages, minimizing operating costs and efficiently managing assets.



Telephone

Gas

CATV

Power

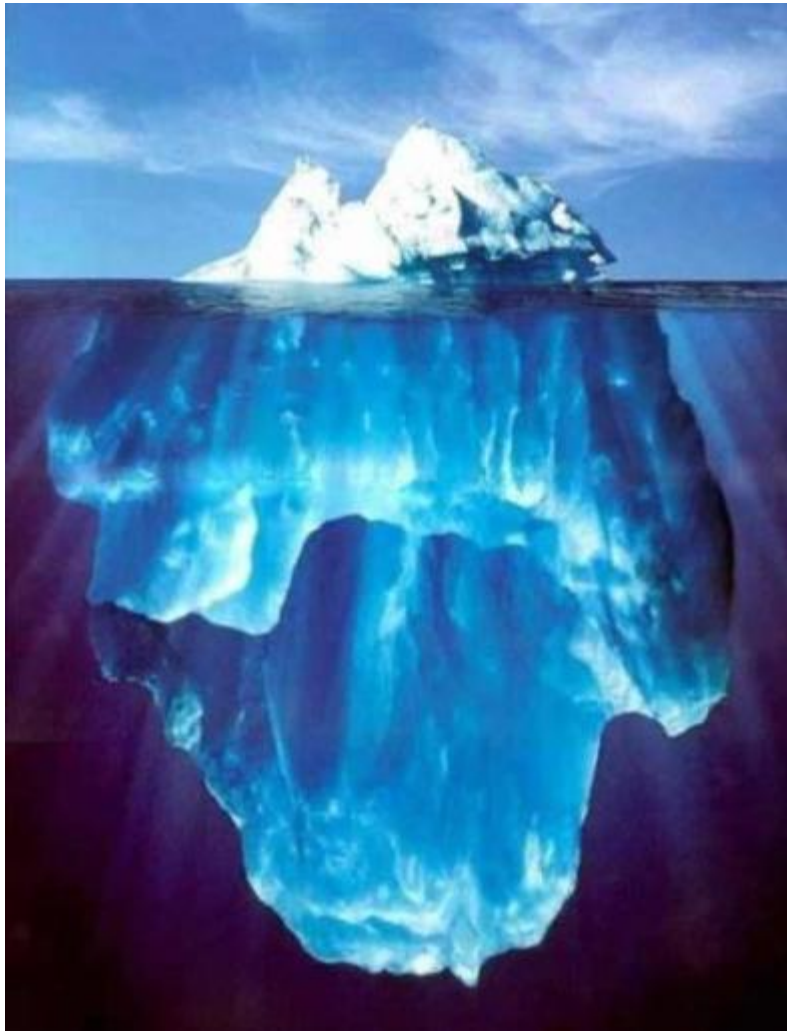
Water

Wastewater

GP/Rec Wtr



Cost of Accidents – Damage Prevention is Critical for Gas Utilities and Pipelines



Repair Cost

Consequential
Costs

Death/Injuries
Property Damages
Emergency Services
Repair Cost
Lost Time
Lost Material
Lost Sales
Lost Taxes
Lost Production
Machinery Damages
Secondary Emergency
Spoilage
Legal Cost

Significant Locating Challenges to Mitigating this Threat

Documentation

- Inaccurate, incomplete records, maps
- Un-mapped, abandoned facilities



Environment

- Congestion
- Grounding
- Common Trenches
- Soil condition or type
- Facility access limitations
- Multiple utilities of same type
- Absence of metallic conductor(s)
- Corroded or cut tracer wire



Situation Analysis

Current Gas Pipeline Threats.

- 165,000 unintentional strikes of underground pipes (gas, telco)
- 27% rise in damage incidents (2009 – 2010)
- \$1.1B US cost to damage to underground pipes
- One state reports 32% of gas pipeline damages were due to poor locates (gas only)
 - 50% of those were due to unlocatable facilities



Customer Pain Point in Gas Markets

The use of plastic pipe in gas pipeline networks is booming in the US and rapidly replacing ductile iron.



Plastic pipe is difficult if not impossible to locate in some environments.

Use of tracer wire, the primary method of marking, is problematic if not unsafe with significant life cycle issues in many applications.



Utilities and pipelines need a simple, cost-effective, long life, safe method to provide continuous locability that minimizes asset damage and provides for the safest possible workplace.

Current Methods of Locating Plastic Pipe

Tracer Wire Systems (most prevalent)

A wire is located with the pipe. When location is needed, a signal is impressed on the wire.



Ground Penetrating Radar (GPR)

High frequency radar signal is used to map the structure below grade. Penetration is limited (<0.3 m) with wet and sandy soil conditions. Devices can be bulky, expensive with variable performance.



Sonic Detection

Devices are attached to the pipe and produce a mechanical vibrations on the pipe or in the water, oil, etc. inside the pipe. Works for short distances only.



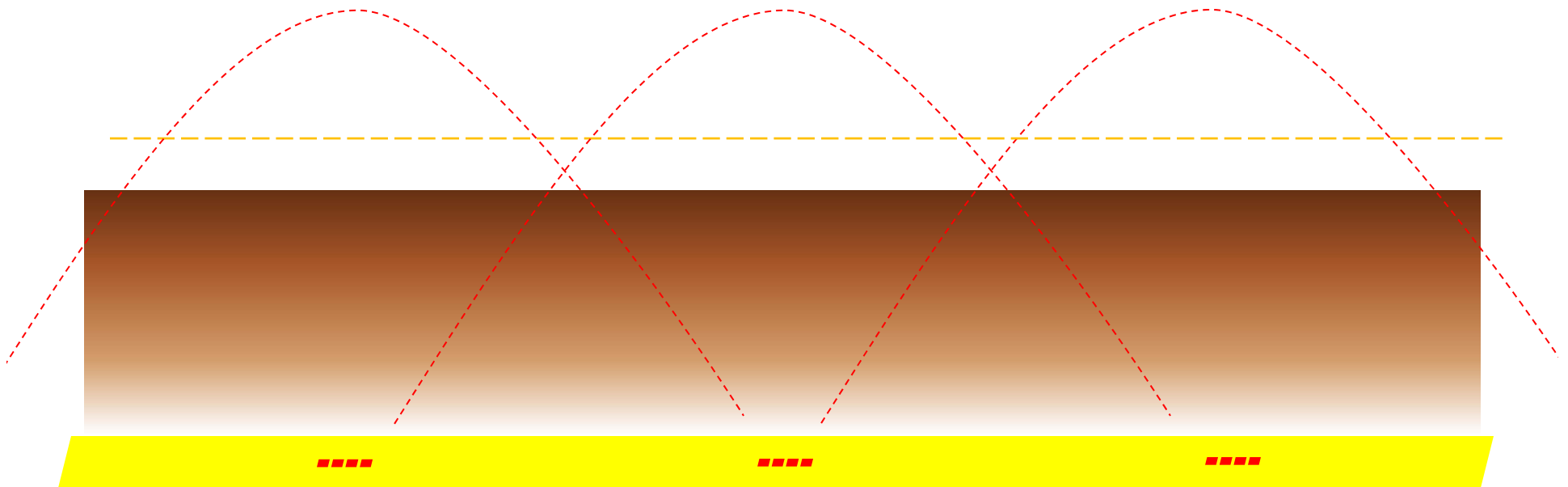
The challenge to mitigate this threat

What if?

- Tracer wire were not required for non-metallic facilities
- The risks of corroded or cut tracer wire were eliminated
- The means to locate the facility does not require end to end continuity to function
- No issues with metallic wires that could attract lightning or cause other safety issues
- No issues associated with electromagnetic locating, congestion of utilities, and bleed over
- No issues with installation errors or neglect
- No need for access points
- A simple, continuous method of locating and identifying plastic pipes in gas networks
- The means to locate the facility has an equivalent life span of the facility

A potential project might look like this

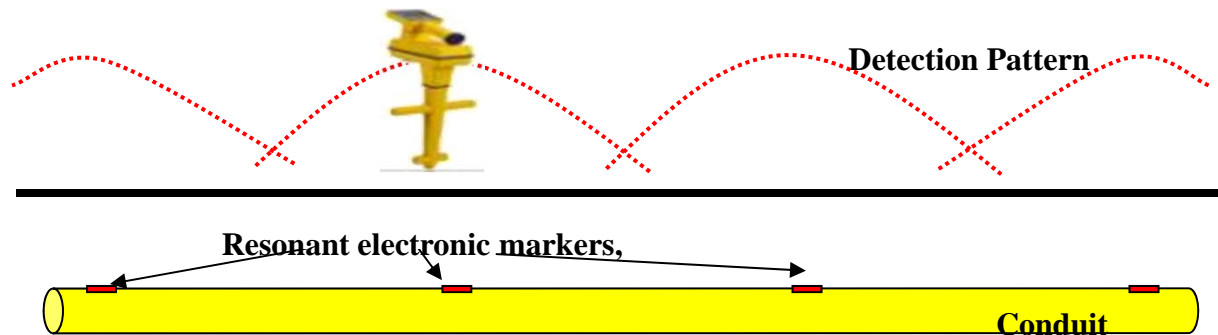
- A method of installing electronic markers into the manufacturing process of plastic pipes
- A determination of which type of attachment (tape, adhesive, weld) best meets the challenging requirements and threats of the work environment
- A cluster of electronic resonant markers that, when activated by locator, work together to produce a signal which can be detected above ground.
- A demonstration trial(s) that challenges and proves the efficacy of this program



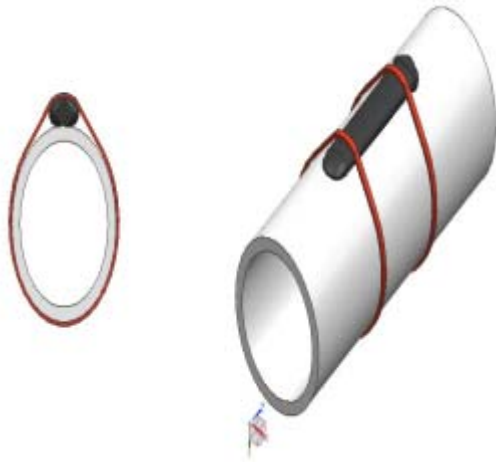
Continuous locability manufactured onto the plastic pipe without the risk of being corroded, broken, or inoperable tracer wire.

Project Technical Constraints and Challenges

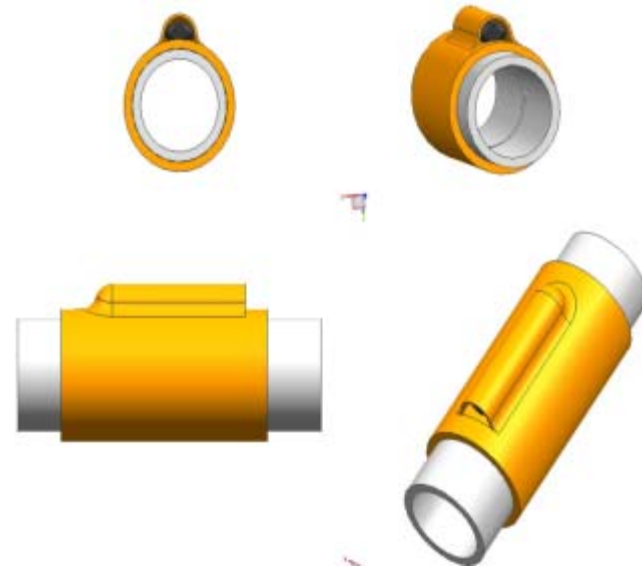
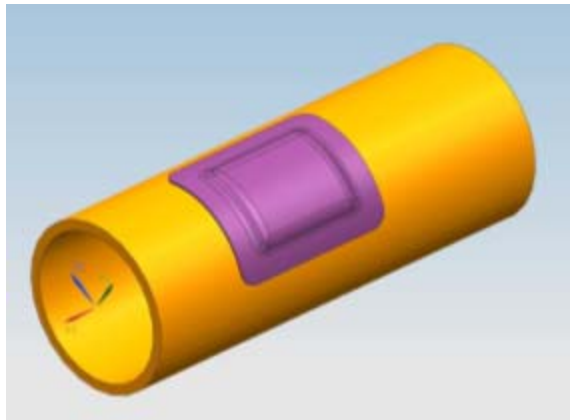
- Achieving desired depth of locability of pipe
- Achieving continuous locability
- Developing robust attachment that will withstand the challenges of the gas pipeline environment
- Manufacturing process that meets supply chain process challenges (durability, installation, shipping)



Potential Product Attachment Concepts



A taped or banded solution overlaid upon itself to secure marker in a mechanical attachment.



A coupler or sleeve would provide for simpler attachment using common manufacturing processes.

Weld or adhesive attachments could provide more robust manufacturing method.

Potential benefits of a Locatable Plastic Pipe Program

Locatable Plastic Pipe

- Solves a critical pain point for gas industry
- Significant improvement to worker and area safety
- Corrosion resistant, permanent, completely sealed resonators with life expectancy lasting that of facility
- Significant productivity gains for utilities and contractors
- Significant reductions in contractor and customer liability
- If a cluster of tags is removed, the other sections continue to function uninterrupted.
- Eliminates need to install tracer wire
- No access points or connections required
- Tape does not provide a path for lightning



Goal of Program

- A cost effective solution that allows for widespread usage by improving safety and at lowest cost/value
- Solution that comes to work site already attached minimizing risk of installation errors
- Ability to demonstrate solution at number of field installation sites for metric review versus current methods
- Significant improvement in worker safety, productivity with a demonstrable reduction in third party asset damage