

Damage Prevention Technology Research Distribution Sector

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Challenges for Damage Prevention

- Damage prevention for Distribution Sector means sensing in dense, noisy, and highly populated environments
- Any approach needs to minimize excavation frequency and size
- Implementation must be economically feasible
- Monitoring/Prevention systems need to be available 24/7
- Sensing systems need to have minimal false positives

Challenges for Damage Prevention (cont.)

- Technology should have NO negative impact to gas operations (e.g. interference with CP system)
- Any warning communications need to be reliable and secure
- Sensing systems need to filter out benign conditions
- Construction equipment generate a wide variety of frequency signatures that are further complicated by different soil types and mechanisms of wave propagation
- Straight runs of pipe are limited in footage which can make application of some systems uneconomical

NYSEARCH's Strategy for Damage Prevention

- Program with Multiple Projects; both Transmission and Distribution
 - Initial focus: Transmission; easier application
- Initially targeted proactive warning before encroachment
- Expanding search for prevention by warning both in ground and at sources of damage



Relevant Research Projects

- Pipe Location Technologies
 - GPR
 - Handheld/Portable
 - Combination Pipe/Cast Iron Joint Detector
- Damage Prevention Sensing Techs
 - Seismic
 - Acoustic
 - Fiber Optic
- Previous Analysis of RTP
- Pilot Test of ProFuse/Peelable Pipe

Handheld Pipe Locator

- Objective: To develop a low-end construction crew check tool that is portable and used strictly for on-site mark-out of facilities
- Product Features:
 - Low end construction crew check tool
 - Air-coupled antenna, shoulder mounted battery pack and display
 - Optional Ground-coupled antenna that can integrate with same display and control unit
 - Plan and cross section views to be provided on site; no off-site processing



Handheld Pipe Locator

- Status
 - R & D near complete
 - Two series of utility-sponsored field tests complete
 - FCC issues addressed
 - Negotiation with commercial partner underway
 - Ergonomics/Advanced Engineering to take place on Monostatic antenna
- Targeted commercialization: 2007



HT Ultra-Low Frequency Pipe and Joint Imaging System

- Objective: To develop and commercialize a combination pipe/joint locator
- Product features:
 - Light-weight cart-based system; future vision of handheld system
 - Unique approach works in all soils
 - Unique approach for automatic calculation of dielectric constant yielding accurate depth predictions



HT Ultra-Low Frequency Pipe and Joint Imaging System (cont.)

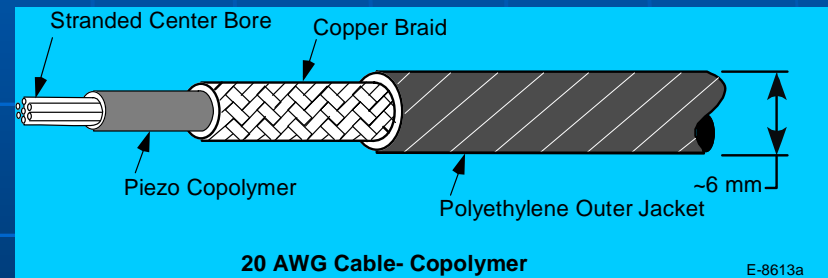
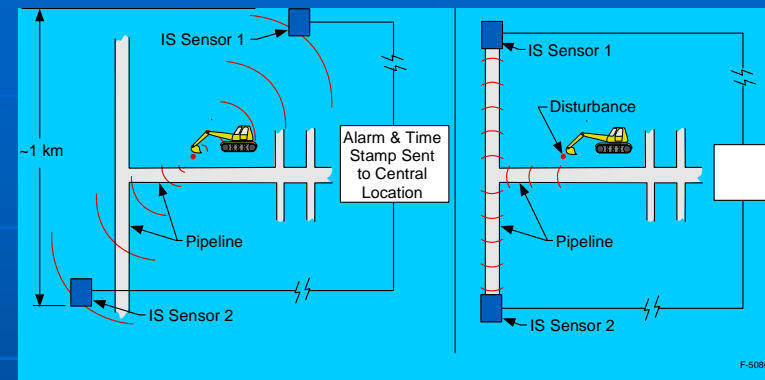
■ Status

- NYSEARCH's Phase I Proof-of-Concept near complete; second set of field tests pending
- Improvements in antenna design have been proven in lab and in initial field tests
- Antenna has been miniaturized
- Results for cast iron joints are positive based on tests at BG & E
- Industry sponsors are supportive and growing in number
- PHMSA/OPS cofunding Phase II development and pre-commercialization effort



PIGPEN – ProActive Damage Prevention

- Low Frequency Seismic Sensor
- Objective:
 - Develop an infrasonic sensor system that will
 - Detect potential third party threats
 - Pinpoint threat location
 - Identify type of equipment involved
 - Provide a warning in time for permit termination of excavation prior to pipe disturbance



PIGPEN – ProActive Damage Prevention (cont.)

■ Status

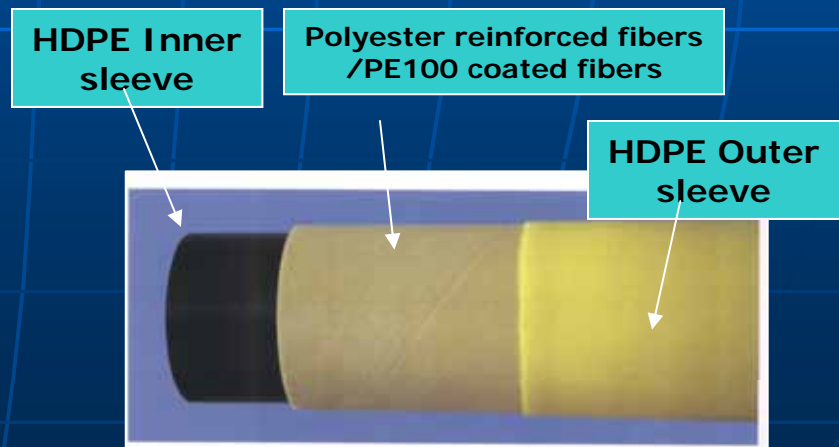
- Proof-of-Concept achieved
- Alpha System prototypes tested
- Beta sensors and algorithms tested
- Currently addressing concerns about location accuracy for distribution applications
- More testing needed particularly in complex soils
- Additional work funded thru SBIR
- DOT/OPS & NYSEARCH jointly addressing commercial potential



Resistant Materials

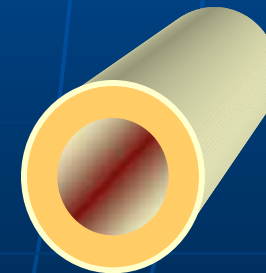
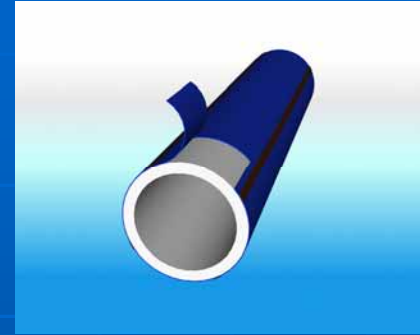
Technology/Economic Assessment of RTP

- RTP – Reinforced Thermoplastic Pipe
- Objective: To determine resistance to Third Party Damage & technical/economic feasibility
- Product Features:
 - Pressure Rating: 600 psi (42 Bars)
 - Size Availability: 4" & 5"
 - Length Coils: 200' to 400'



Other Resistant Pipe Materials

- Profuse/Peelable Pipe
 - NYSEARCH member testing Profuse for scratch resistance and cost savings
- PE/PEX Composite Pipe
- Edgeplast - PE100 pipe with Toughened PE covering
 - Tested/marketed in Europe – resistant to scratches, gouges, rock impingement



Two layer pipe
ELTEX® TUX100 /
PE100

Potential Future Research Efforts

- NYSEARCH issuing RFP in Spring 2006 for Damage Prevention
 - Monitoring Systems
 - Sensors for placement on Construction Equipment
 - Innovative Excavation Technologies/More Effective Digging Practices
- Previous evaluation on Microsensors in pipe material; can innovation lead to order of magnitude improvement in economics?

What Technology Needs, if addressed could provide significant advancement?

- Innovative, economical approaches for damage prevention challenges presented by Distribution sector
- Attention to prevention by utilities as well as construction companies and small diggers
 - Proactive sensing systems
 - Sensors on tools
 - Soft Digging equipment that can get through all types of soils/rocks

Summary

- Several of the Damage Prevention challenges are being addressed by R & D
- More R & D is necessary in this area
 - Pipe location – advanced engineering and tech transfer/commercialization are needed
 - Proactive warning systems for distribution – Development and multi-pronged approaches are needed