Damage Prevention Technology Research Distribution Sector

PHMSA/OPS Mechanical Damage Forum
Houston, TX
February 28, 2006

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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
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