EPRI ELECTRIC POWER RESEARCH INSTITUTE

UPT NDE Technology Update

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NRC/Industry UPT Meeting

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EPRI UPTI NDE Technology Update Overview

- 2014 UPTI NDE status and research results
- 2015 UPTI NDE research portfolio
- EPRI NDE Reports

2014 UPTI NDE Research Results – Phased Array

- Ultrasonic Phased Array Technology for Corrosion Applications
  - Demonstrated phased array probe can be used on various piping geometries and corrosion types
  - Documented capabilities and limitations
  - Developed a method to map ultrasonic thickness data
  - Very high resolution ultrasonic thickness maps and readings
- Can be used to examine piping and tanks
- Report Development of Ultrasonic Phased Array Technology for Corrosion (3002004401)

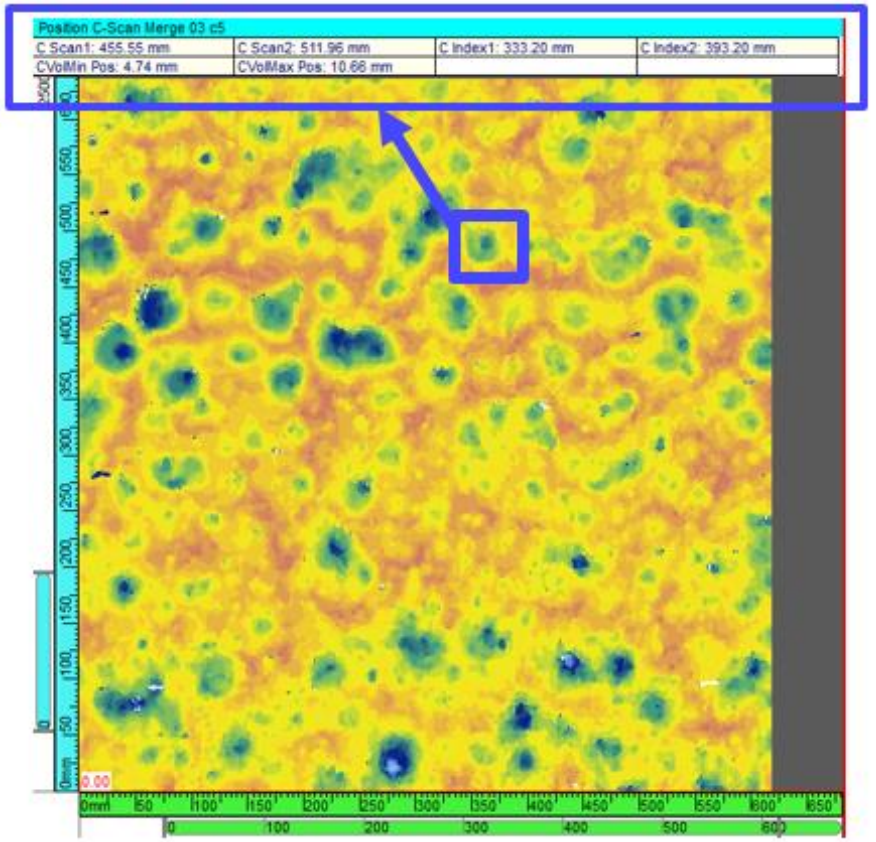
2014 UPTI NDE Research Results – Phased Array

Area scanned – 20-in by 26-in

- ~80K measurements
- Results can be extracted to a spreadsheet for analysis

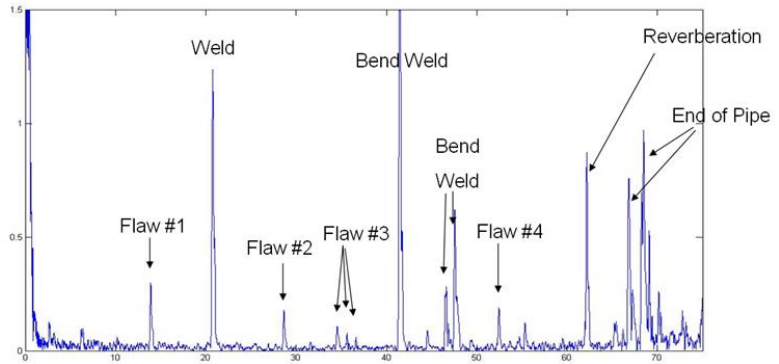
Data analysis readouts

- Minimum Wall thickness – 5.83-mm
- Maximum Wall thickness – 9.26-mm



2014 UPTI NDE Research Results – Credit for Guided Wave Examinations

- Develop industry consensus for using guided wave as a “Direct examination”
  - Research conducted to identify key guided wave variables
  - Published results in “*Guidelines for Obtaining Credit for Buried Pipe Guided Wave Examinations*” (3002000468)
  - Conducted peer review with nuclear power and guided wave industries subject mater experts
    - Resolving comments
  - Meet with NRC staff

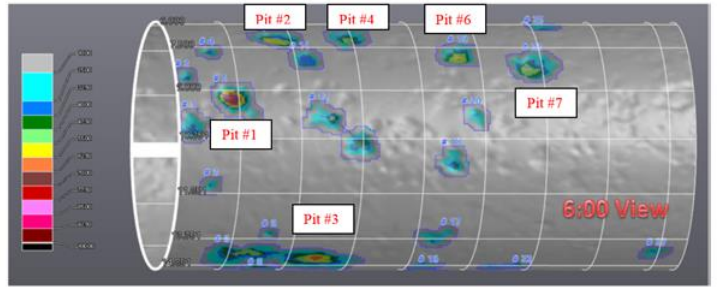


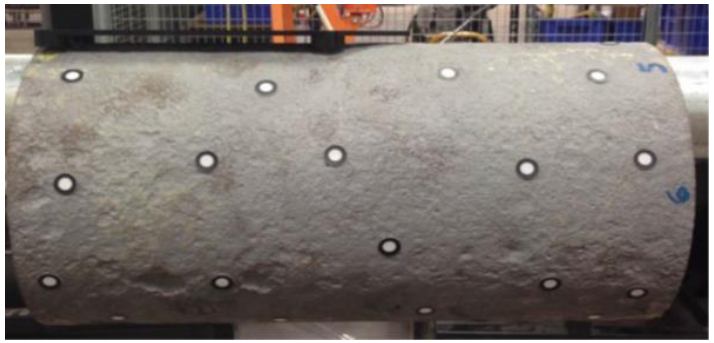
2014 UPTI NDE Research Results – New revision to the Buried Pipe Nondestructive Evaluation Reference Guide

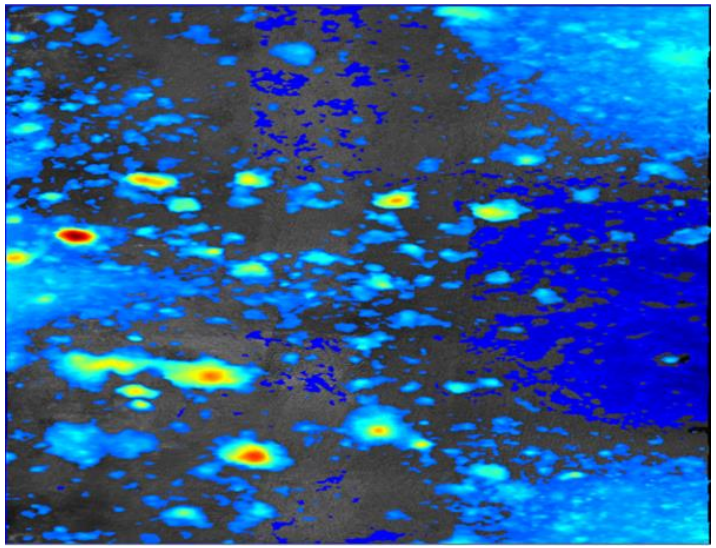
- Report 3002004395 – Nondestructive Evaluation: Buried Pipe NDE Reference Guide—Revision 3
  - Added information throughout document
  - New sections on microwave and RADAR technology
  - Added information on white light (commercially available) and laser technology
  - Captured industry experience data

Additional 2014 UPTI NDE Research Results

- Investigation of new techniques for permanently mounted guided wave sensors
  - Nondestructive Evaluation: Novel Ultrasonic Sensor Technology for Structure Monitoring (3002003031)
- Capabilities of NDE for quantification of real corrosion in buried piping
  - Nondestructive Evaluation: Quantification of Real Corrosion in Buried Piping (3002003023)
- Technique development for HDPE pipe butt fusion weld strength evaluation
  - Nondestructive Evaluation: Technique Development to Evaluate the Joint Strength of High-Density Polyethylene Butt Fused Pipe Joints (3002003032)
- Quantifying NDE capabilities through various coatings







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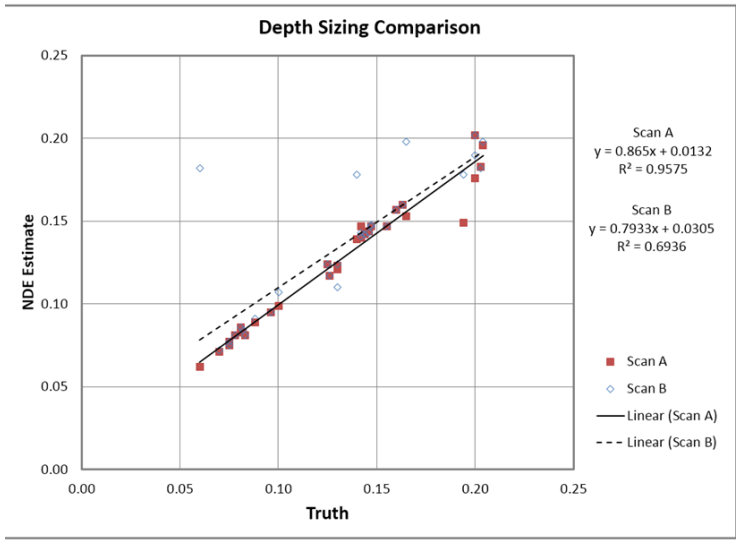
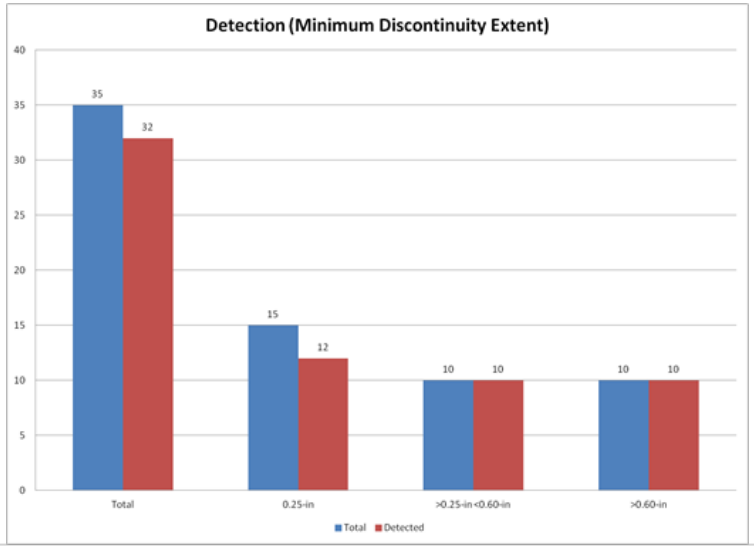
2015 UPTI NDE Research – Assessment and Development of Buried Pipe NDE Technology

Purpose

- Benchmark buried pipe NDE capabilities
- Provide resources for vendors to tweak procedures
- Provide utility support in implementing technology
- Identify new NDE technologies





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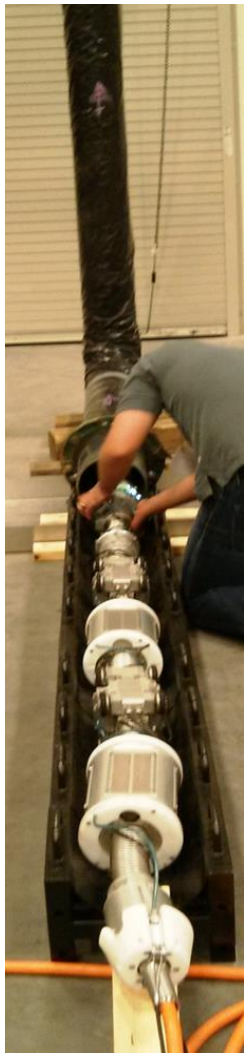
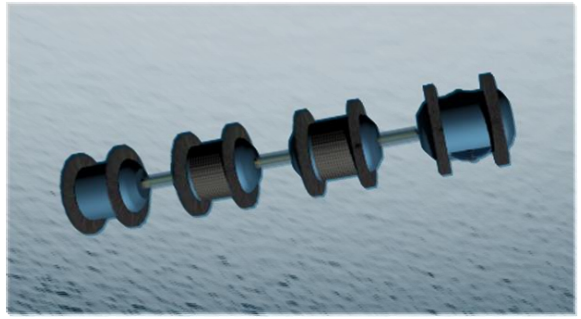
2015 UPTI NDE Research – Assessed NDE Technologies Being Used in the Field

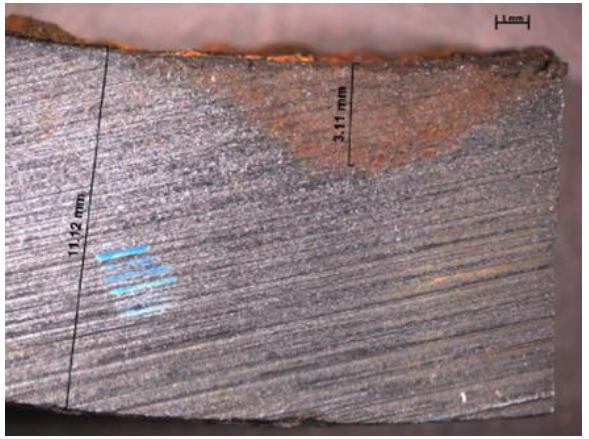


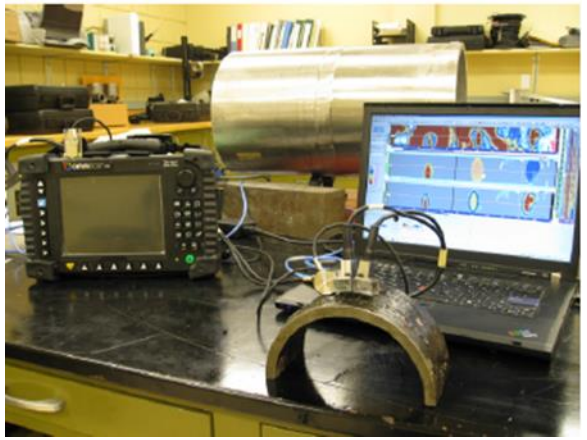
- Ultrasonic in-line technology
  - Robotic driven array
  - Flow through rotating mirror
  - Flow through array
  - Robotically driven EMATS
- Tethered remote field eddy current
- Robotically driven saturated low frequency eddy current
- Portable ultrasonic phased array



2015 UPTI NDE Research – Selective Leaching

- Goal
  - Develop, validate, and deploy NDE method(s) for detection and characterization of selective leaching in gray cast iron
- Scope
  - Survey potential NDE methods for detecting and characterizing selective leaching
  - Meet with outside nuclear-power experts
  - Acquire selective leaching samples
  - Investigate deployable NDE solutions
  - Report survey findings and results of deployment and validation efforts





2015 UPTI NDE Research – Guided Wave Structural Health Monitoring

- Develop and assess structural health monitoring (SHM) technology for corrosion/erosion in piping (co-funded by PRCI)
  - Buried pipe mock-up built and installed
  - A piezoelectric guided wave system and acoustic based system installed on mock-up
  - Magnetostrictive to be installed in January
  - Data will be collected throughout 2015 and assessed for ability to detect changes in pipe flaws
  - Engaged with major oil company and National Lab on new technology
  - Final report to be published in 2015

Additional 2015 EPRI UPTI NDE Projects

- Continuing
  - Assessment and evaluation of NDE for tanks and containment liners
  - Provide UPTI Industry support
  - Leveraging other industry resources – EPRI engaged with PRCI NDE technology development
  - Assessment of NDE technologies and practices from other industries
  - HDPE pipe weld strength evaluation
- New
  - Develop tools for managing ultrasonic wheel probe data
  - NDE capabilities in concrete

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EPRI UPTI Related Reports

Report Title	ID Number
Nondestructive Evaluation: Buried Pipe NDE Reference Guide—Revision 3 Nondestructive Evaluation: Buried Pipe NDE Reference Guide—Revision 2	3002004395 1025220
Development of Ultrasonic Phased Array Technology for Corrosion	3002004401
Guidelines for Obtaining Credit for Buried Pipe Guided Wave Examinations	3002000468
Nondestructive Evaluation: Assessment and Development of Buried Pipe NDE Technology (NDE)	3002000463
Buried Pipe Guided Wave Examination Reference Document (NDE)	1019115
Nondestructive Evaluation: NDE for Tanks and Containment Liners (NDE)	3002000462
Buried Pipe Direct Examinations Through Coatings	1025228
Nondestructive Evaluation: Buried Pipe In-Line NDE Depth Sizing Procedure	1025231
Nondestructive Evaluation: Quantification of Real Corrosion in Buried Piping	3002003023

EPRI UPTI Related Reports

Report Title	ID Number
Buried Pipe Guided Wave Examination Reference Document	1019115
Nondestructive Evaluation: Novel Ultrasonic Sensor Technology for Structure Monitoring	3002003031
Guided Wave Analysis Tools for Buried Pipe	3002000466
Nondestructive Evaluation: Guided Wave Analysis Tools	1025212
Nondestructive Evaluation: Guided Wave Status Report	1022929
Nondestructive Evaluation: Further Developments of Guided Wave Examination Application 2009 Status Report	1019116
Nondestructive Evaluation: Further Developments of Guided Wave Examination Application	1016675
Nondestructive Evaluation: Buried Pipe Structural Health Monitoring	1025213

EPRI UPTI Related Reports

Report Title	ID Number
Remote Field Technology Assessment for Piping Inspection Including Buried and Limited Access Components	1021153
Catawba Field Trial of EPRI's Large Diameter Buried Pipe Instrumented Vehicle	1016676
Intermediate Diameter Buried Piping Instrumented Vehicle--Evaluation	1022926
Nondestructive Evaluation: NDE for Tanks and Containment Liners	3002000462
Inspection Methods for Tanks and Containment Liners	1025215
Inspection Methodologies for Buried Pipes and Tanks	1021561
Nondestructive Evaluation: High-Density Polyethylene NDE Technology	3002000439
Nondestructive Evaluation: Technique Development to Evaluate the Joint Strength of High-Density Polyethylene Butt Fused Pipe Joints	3002003032

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