

Automation of ILI Robotics and NDE Technology

PHMSA R&D Forum 2020

February 19, 2020

WG#3: Automation Solutions for Integrity Management Challenges

Presented by: NYSEARCH, a part of the Northeast Gas Association
(NGA)

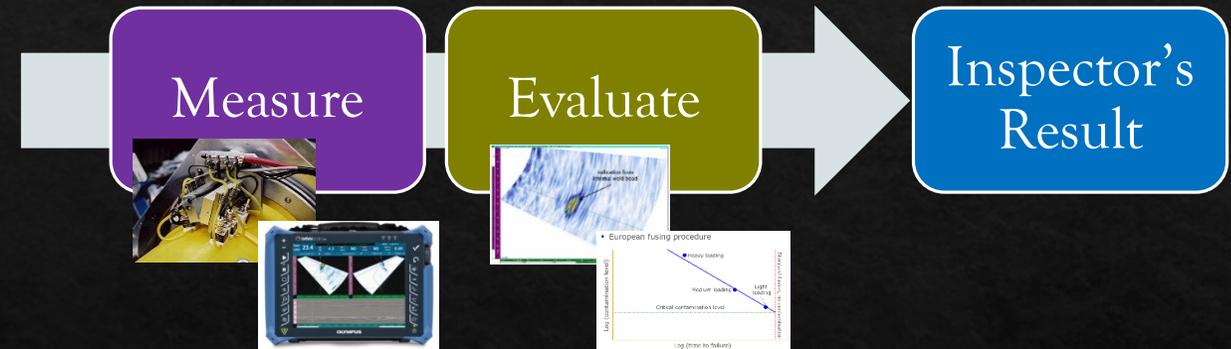
Explorer Robotics Automation

- ◆ Objective: Reduce the level of operational complexity associated with deployment of Explorer while increasing its overall capabilities. By adding automation to the control aspect of Explorer's technology, we aim to lower deployment costs, improve pipeline data quality, and increase robot robustness
- ◆ Feature Recognition (using depth camera and algorithms built into camera software)
 - ◆ Bends and bend plane
 - ◆ Tees and takeoffs
 - ◆ ID changes
 - ◆ Obstructions
- ◆ Drive Assist – control software
 - ◆ Reduce complexity of control required to drive Explorer
 - ◆ Navigation module capable of processing feedback from Feature Recognition module and controlling robot through features via Drive Assist module
- ◆ Automation computer module developed for real-time feature detection and robot control
- ◆ Pipeline mapping
 - ◆ Uses combination of various technologies to achieve desired accuracy
- ◆ Successful first field trial completed at NYSEARCH test bed in Johnson City, NY, in 2019
- ◆ Next Milestone: Test pre-commercial system in live, pressurized pipeline in late 2020/early 2021

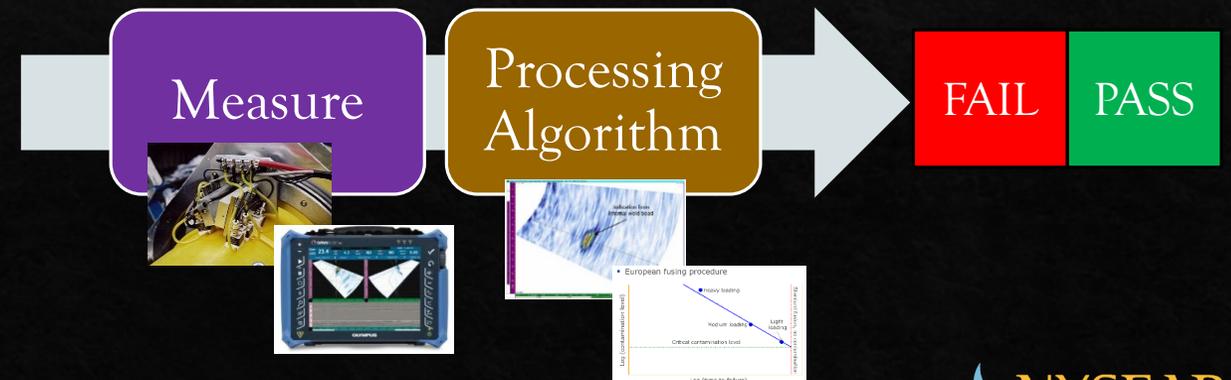
Automated NDE Red/Green Light Tool for PE Pipe Butt Fusion Joints

- ◆ Objective: Develop an automated non-destruction examination (NDE) technique for interrogation of PE pipe butt fusion joints using Phased Array Ultrasonic Test (PAUT).
- A field tool that allows a non-NDE expert with proper training to inspect a butt fusion to determine joint integrity.
- Establish PE pipe butt fusion acceptance criteria
 - based on establishing critical characteristics through NDE PAUT and destructive testing
- Develop NDE signal/image processing algorithm using artificial intelligence/machine learning
 - agnostic to NDE technique outputs (PAUT, THz, X-ray, microwave)
- Develop Red/Green light tool using acceptance criteria and processing algorithm

NDE Trained Level III



NDE Automated Tool



Technology Gaps

- ◆ Enhanced ability to automatically identify features in pipeline
- ◆ Fully automated operation
- ◆ Artificial Intelligence for defect identification
- ◆ Artificial Intelligence for defect sizing
- ◆ Automation of energy harvesting management systems
- ◆ Expanding all above to plastic pipe