In-Line Inspection Standards, Methods & Tools

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In-Line Inspection

- Standards
- Common Inspection Methods
- Tool Add-Ons & Functionality
- Tool Configuration
- Tool Run Logistics
- Information Management
First Rule of Any ILI Run

☐ 3TV

☐ Talk To The Vendor
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First Rule of Any ILI Run

- TALK to the VENDOR
  - Timing (Deadlines, Expectations)
  - Schedule (Who, When, Where)
  - Support (What, How much, Me vs You)
  - Equipment (Mine vs Yours)
  - Capabilities (My needs vs your ability)
  - Reporting (How soon, Early Crisis)
  - Data (Format, Copies, CD/DVD/Electronic)
Standards

- NACE Recommended Practice RP0102-2002: In-Line Inspection of Pipelines (how to do it)
- API 1163, In-line Inspections Systems Qualification Standard (qualifies the tool)
- ANSI/ASNT ILI-PQ-2005, In-line Inspection Personnel Qualification and Certification (qualifies vendor personnel including analyst)
- 49 CFR 192 – Subpart O
- 49 CFR 195
- Company Standards
Common Inspection Methods

- **Magnetic Flux Leakage**
  - Probably Most Commonly Used
  - Saturate Pipe with Magnetic Flux (Longitudinal)
  - Changes in Flux Field Are Interpreted
  - Corrosion Metal Loss (% Wall Loss)
  - Other Forms of Pipe Wall Abnormalities
  - Run in Dry or Wet Lines
  - Cleanliness Issues (pipe may require chemical cleaning)
  - Speed Sensitive
  - Wall Thickness Generally Limited to 0.75 inch (due to permanent magnets)
  - Standard Resolution (+/- 15%, 20% Confidence Factor)
  - High Resolution (+/- 10%, 20% Confidence Factor)
Common Inspection Methods

- Ultrasonic Thickness
  - Array of UT Heads to Cover Surface
  - Needs Liquid Medium as Couplant
  - Speed Sensitive
  - Not So Limited on Wall Thickness
  - Tends to Be More Expensive Than MFL

- Magnetic Eddy Current
  - Crawler Technology
Common Inspection Methods

- Transverse Flux Leakage
  - Circumferential Saturation
  - Looks For Longitudinal Cracks

- Spiral Flux Leakage
  - Hybrid of Standard and Transverse Flux
  - Little Bit of Both

- Hard Spot
  - Magnetic Flux Leaves Trace
  - Trace is Interpreted
Common Inspection Methods

- Geometry / Deformation / Caliper
  - Deformation - High Resolution
  - Caliper – Lower Resolution
    - Single Channel
    - Multi-Channel
  - Ovality / Out of Round / Expansion
  - % Dent
  - % Strain (Deformation tool)
  - Bend Radius
Tool Add-Ons & Functionality

- Inertial Navigation System
  - Path From A to B Linked through AGMs
  - Can Be As Accurate as Sub-Meter GPS
- Speed Control – Variable Bypass
- Flexibility – 3D vs 1.5D
- Wireline – Tethered – Bi-Directional
- Crawler
Tool Configuration

- Some are Segmented
  - Each Function Has a Separate Segment
  - Makes Total Tool Length Long
  - Trap Barrel Modifications

- Some Have Multi-Function Segments
  - Shorter Tool Length
  - Easier To Handle
Tool Run Logistics

- ILI Companies Need Various Levels of Support from Using Company
  - Not Much at All
  - Shop Space, Compressors, Cranes
  - Responsive to Pipeline Co’s Needs

- Pipeline Company
  - Normally Handles Tool In & Out of Barrel
  - Normally Runs Product Flow
  - Decontaminates
Information Management

- High Resolution Runs Provide Gigabytes of Data
  - Better Have a Database Handy
    - Schedule & Track Work (DOT Proof)
    - Compare Against CP Database or Excavation Records
    - Compare Against Previous ILI Runs
    - Determine Accuracy of Tool Run – Unity Plot
  - GIS Mapping System Integration
    - Overlay Pipeline Information with Corrosion Loss, Cathodic Protection, CIS, DCVG, ACVG, HCA, Class Location, One-Call, Leak, Damage, Excavations, etc.
Remember The First Rule !!!

3TV !
Questions ??