

In-Line Inspection Standards, Methods & Tools

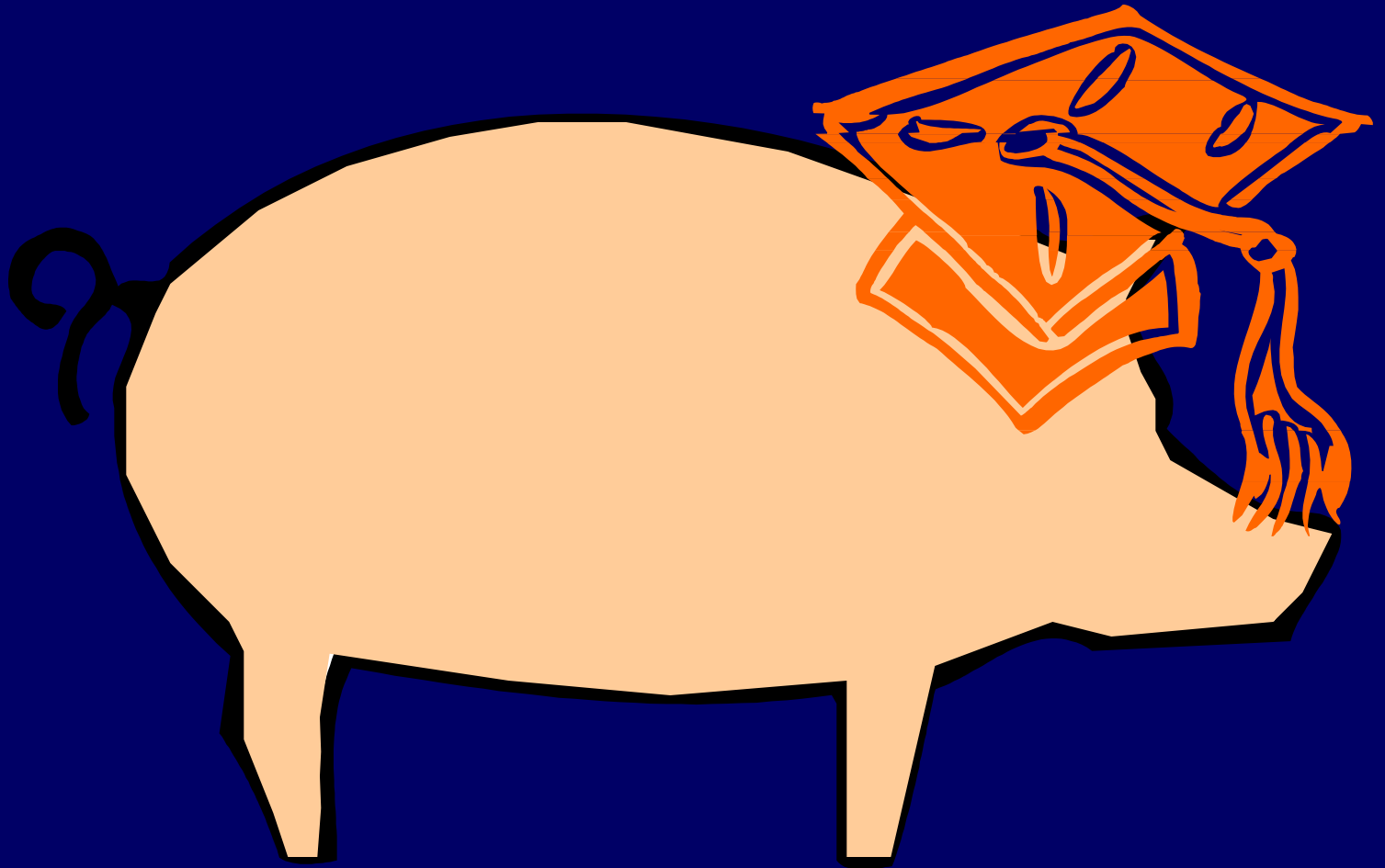
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AKA: Smart Pigging





In-Line Inspection

- Standards
 - Common Inspection Methods
 - Tool Add-Ons & Functionality
 - Tool Configuration
 - Tool Run Logistics
 - Information Management
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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
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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)
 - MFL-A (Axial) High Res (+/- 10%, 20% Confidence Factor)
 - MFL-A (Axial) Ultra High Resolution (+/- < 10%, 20% Confidence Factor)
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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
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Common Inspection Methods

- MFL-C (Circumferential) 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
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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
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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
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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
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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
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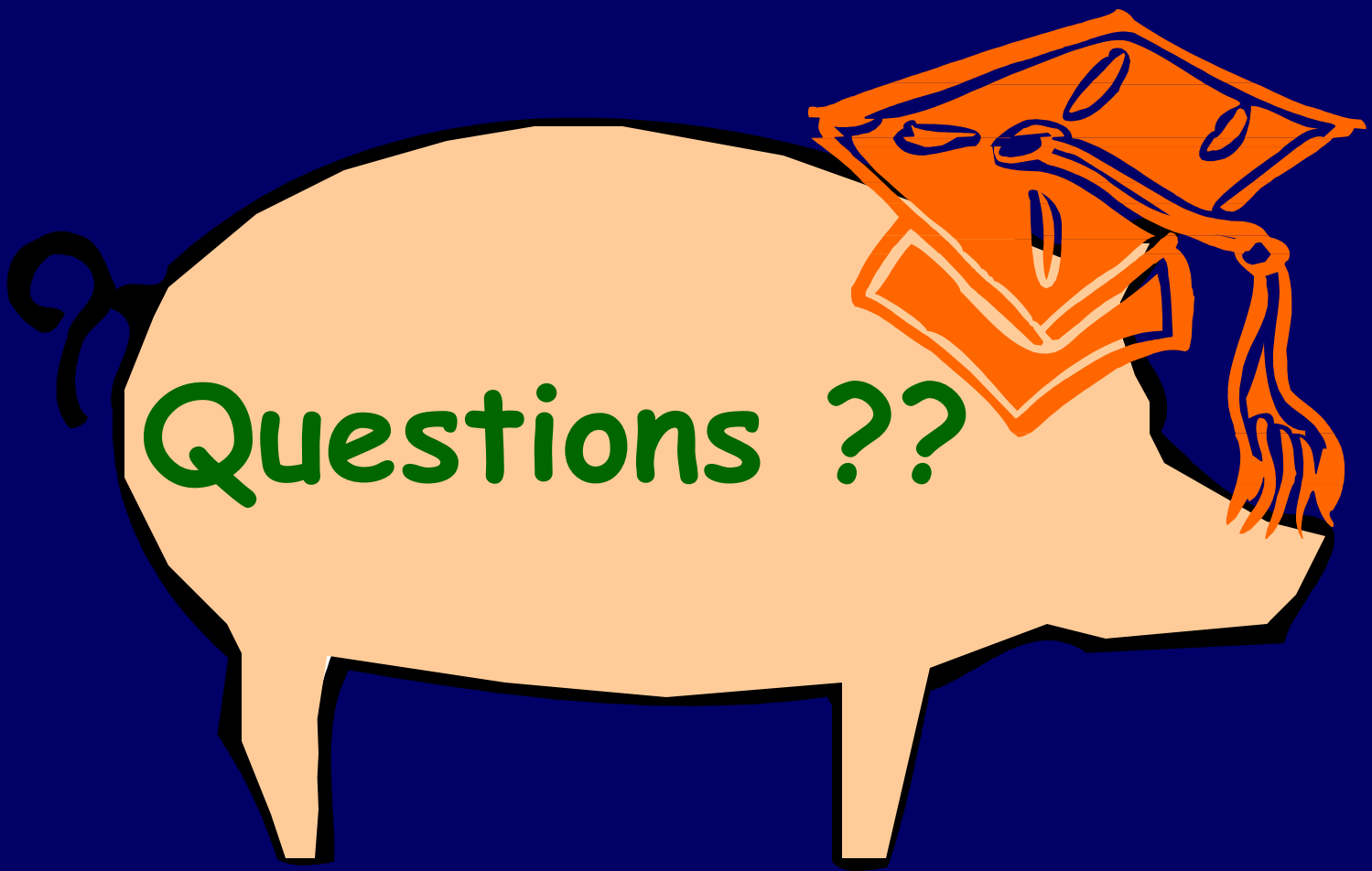
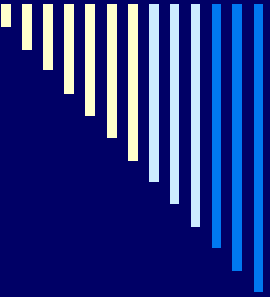
Information Management

- 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.
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Remember The First Rule !!!

3 TV !



Questions ??