

# Seam Welds and In-Line Inspection

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# Seam Weld Anomaly Characterization

- Well known list of anomalies per pipe vintage and weld type
- Given variety of inspection tools
  - Best options for anomaly sizing and discrimination may be covered by a single tool or may require multiple technologies

# Seam Welds Types

- Butt Welds, Lap and Hammer
- Electrical Resistance
  - Low Frequency
  - High Frequency
  - Flash
- Submerged Arc
  - Single
  - Double

# ILI Technology Types

- Magnetic Flux
  - Axial
  - Circumferential
  - Helical
  - Eddy Currents
- Ultrasonic
  - Compressed
  - Shear
  - Guided



## ILI vs Anomaly Characteristics

- Metallurgical Variances
  - Best suited for MFL tools
- Volumetric Anomalies
  - MFL and Compression Wave UT
- Planar Anomalies
  - Shear and Guided Wave UT
- Geometric Anomalies
  - Geometry Tools but Shear Wave UT may falsely identify as a planar anomaly

# Butt Welded Pipe, Lap Welded and Hammer Welded Pipe

## Most Probable Issues

- Oxides or foreign material trapped between weld surfaces
- Poor quality welds, Lack of Fusion
- Typically Metallurgical and Volumetric issues WRT In-Line Inspection

# Butt Welded Pipe, Lap Welded and Hammer Welded Pipe

## Anomaly Identification

- Oxides and foreign bodies provide a very noisy ILI response
- Difficult ILI interpretation for all technologies
- Many false positives

# Electric Resistance Welded (ERW) and Flash Welded Pipe

## Most Probable Issues

- Hook Cracks
- Lack of Fusion/ Stitched welds
- Oxides or foreign material trapped between weld surfaces
- ID/OD Trim Issues
- Contact Marks
- Preferential Corrosion



# Electric Resistance Welded (ERW) and Flash Welded Pipe

All anomaly types must be considered

- Metallurgical Variances
- Volumetric Anomalies
- Planar Anomalies
- Geometric Anomalies

# Electric Resistance Welded (ERW) and Flash Welded Pipe

## Anomaly Identification

- Hook Cracks, Lack of Fusion, Stitching and Surface Breaking Laminations are planar
- Oxides and foreign bodies, Contact Marks are metallurgical and volumetric
- Preferential Corrosion are volumetric
- ID/OD Trim are geometric

# Electric Resistance Welded (ERW) and Flash Welded Pipe

- Multiple technologies provide for greater discrimination of anomalies
- Less false positives

# Single Arc Welded and Double Submerged-Arc Welded Pipe

## Most Probable Issues

- Shrinkage Cracks
- Toe Cracks
- Offset Welds
- Weld Metal Porosity



# Single Arc Welded and Double Submerged-Arc Welded Pipe

## Anomaly Identification

- Typically newer, cleaner steel
- Shrinkage and Toe Cracks; Planar
- Occasional Laminations and Impurities; volumetric

# Pipeline Integrity Management

Every joint of pipe is questionable to a certain degree until proven fit for service.