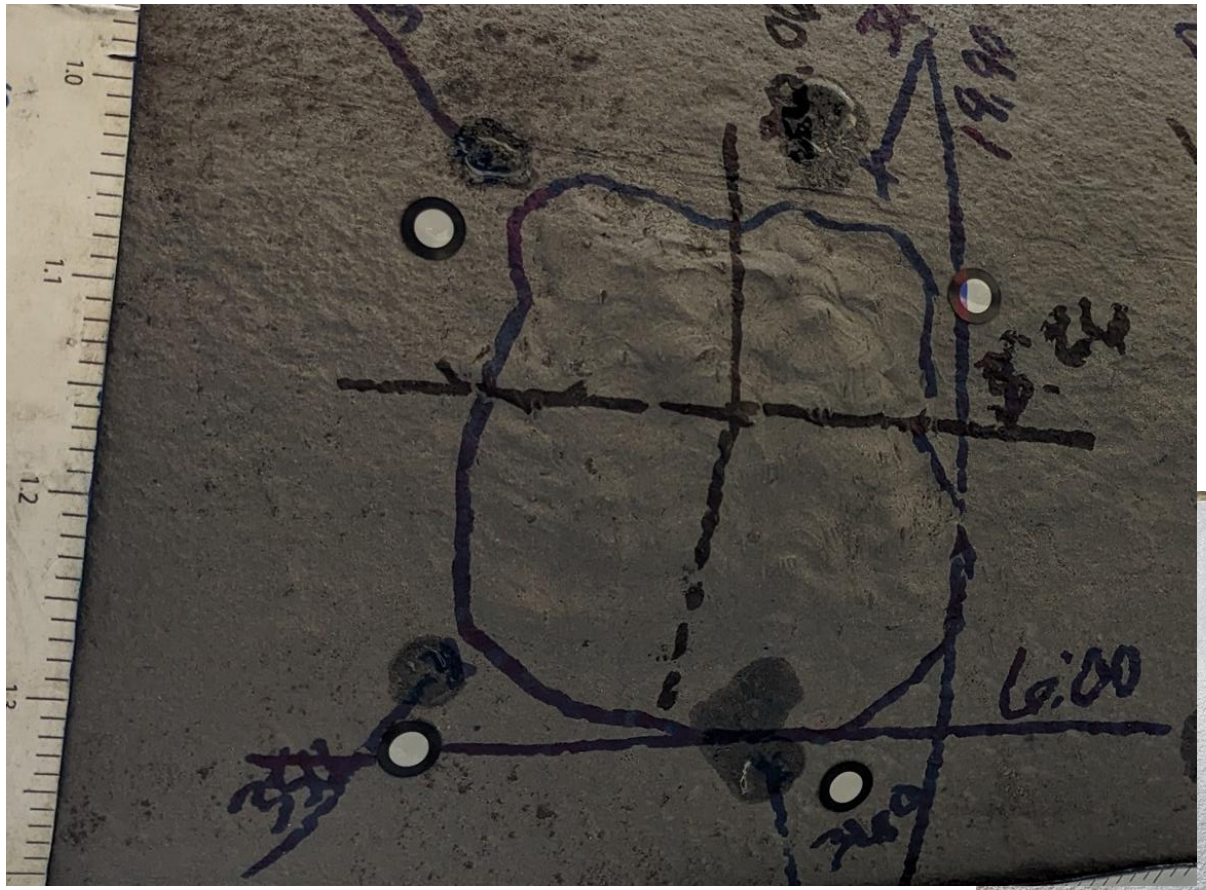
WHAT IS THAT?!



NDE METHOD SELECTION

Matt Taylor

ASNT Level III MT/UT

LAKE SUPERIOR CONSULTING

AGENDA

- NDE TERMS, ERRORS, AND DEFECTS
- VISUAL
- ELECTRICAL
- ULTRASONIC
- RADIATION
- Q AND A

NDE TERMS, ERRORS, AND DEFECTS

COMMON TERMS AND ERRORS

Direct Inspection
vs
Indirect Inspection

Destructive Testing
vs
Non-Destructive Testing

Method
vs
Technique

Anomaly
vs
Defect/Flaw

Reporting
Thresholds

Technological
vs
Physics limitations

NDE TERMS, ERRORS, AND DEFECTS

TYPES OF DEFECTS ASSESSED

- External Corrosion
- Internal Corrosion
- Erosion
- Gouges
- Dent or Deformation
- Buckles and Wrinkles
- Linear Indications (SCC)
- Long Seam Anomalies
- Manufacturing Defects
- Girth Weld Anomalies

NDT TECHNIQUES

VISUAL TESTING (VT)

1 | Rulers and scales are the primary tools considered

2 | Direct measurement of defects

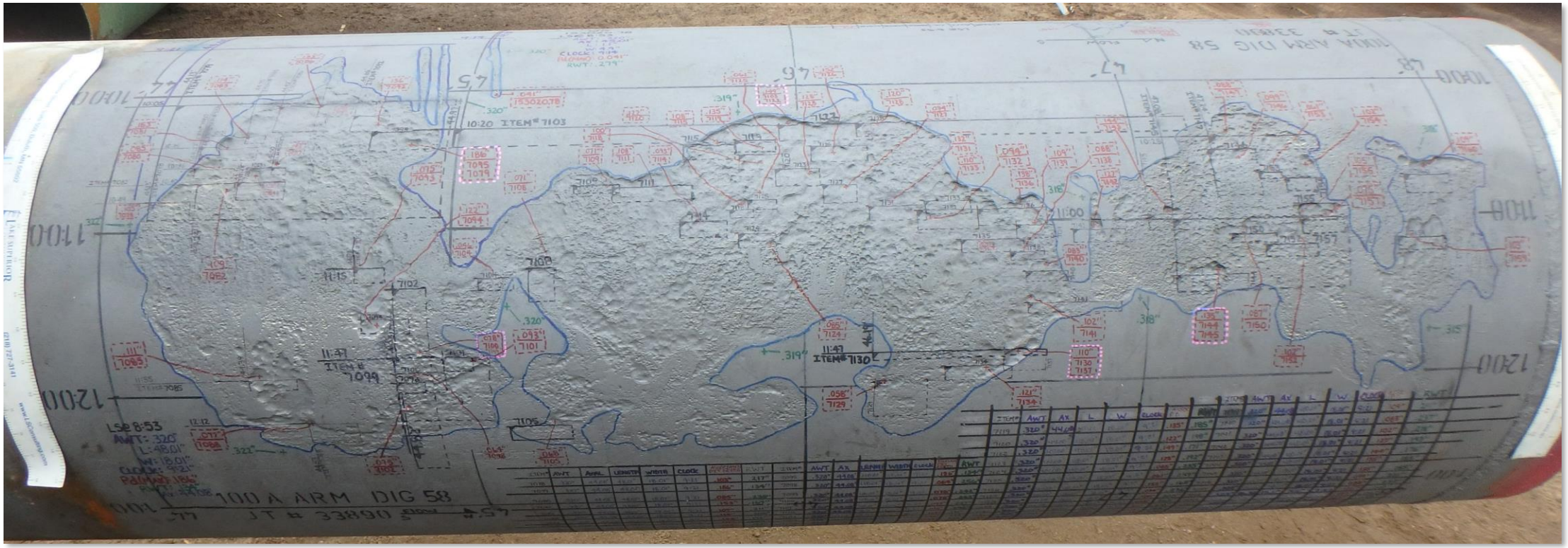
3 | Use advanced technologies for precision

Primarily Used To Assess

+ External Metal Loss
+ Deformations

NDT TECHNIQUES

VISUAL TESTING (VT)

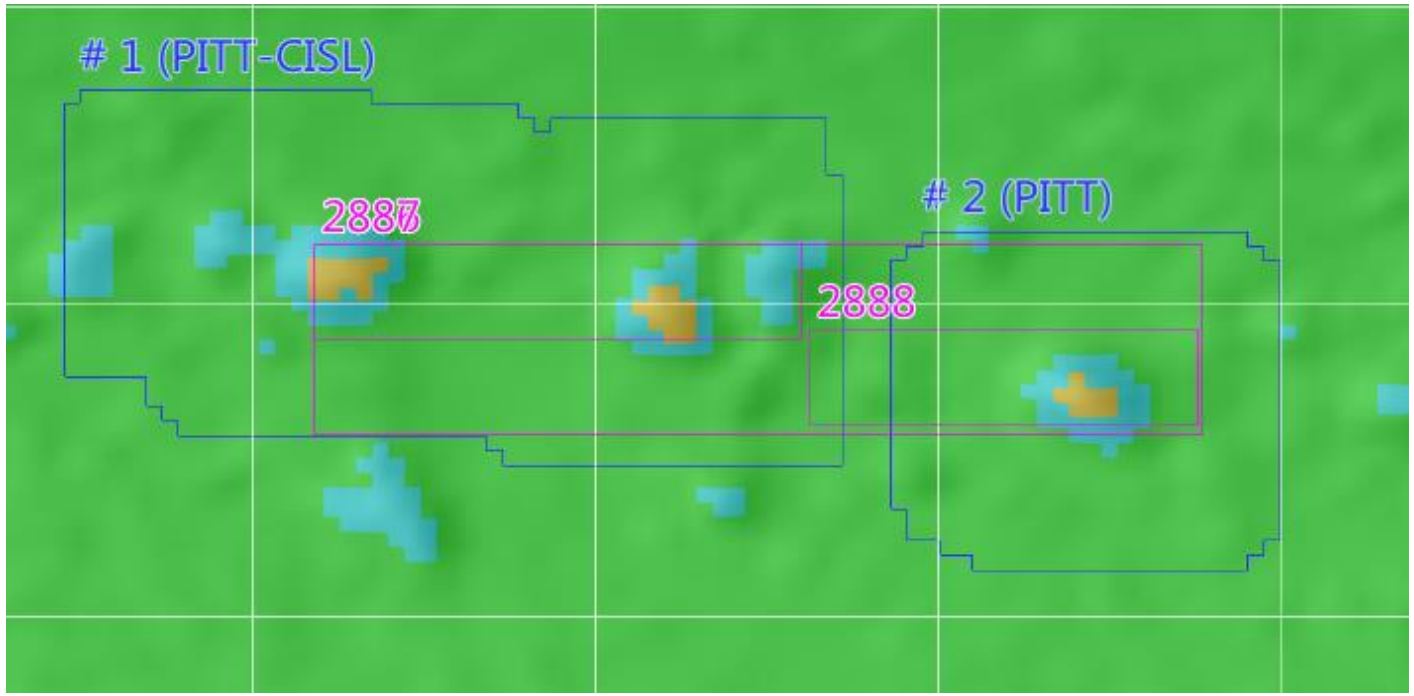


NDT TECHNIQUES

LASER SCANNING

1 | Surface is prepared with reference arrows and dots

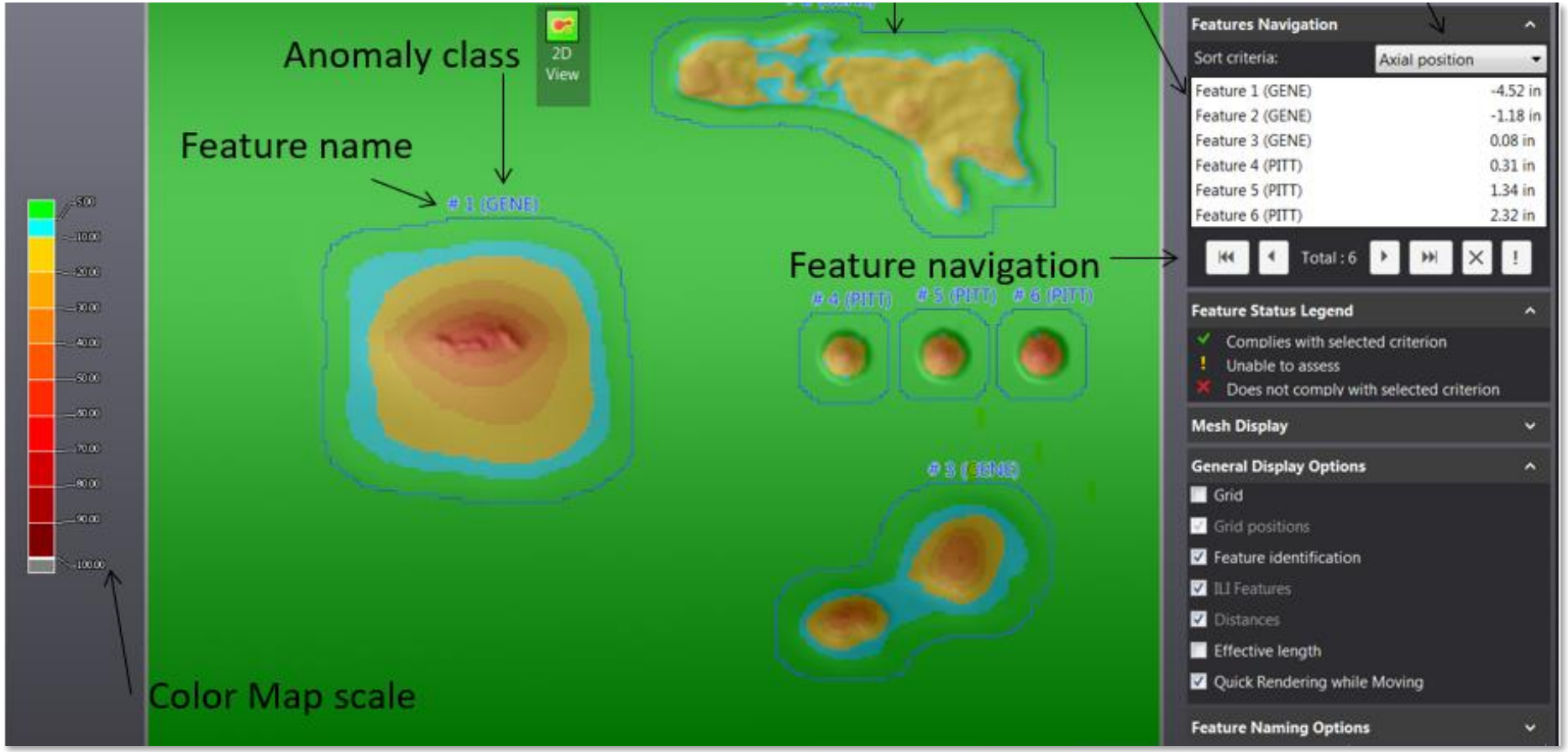
2 | Lasers and software are used to create a 3D model of the surface



Primarily Used To Assess

+ Buckles and wrinkles
+ Dent or deformation
+ External corrosion
+ Gouge

LASER SCANNING



NDT TECHNIQUES

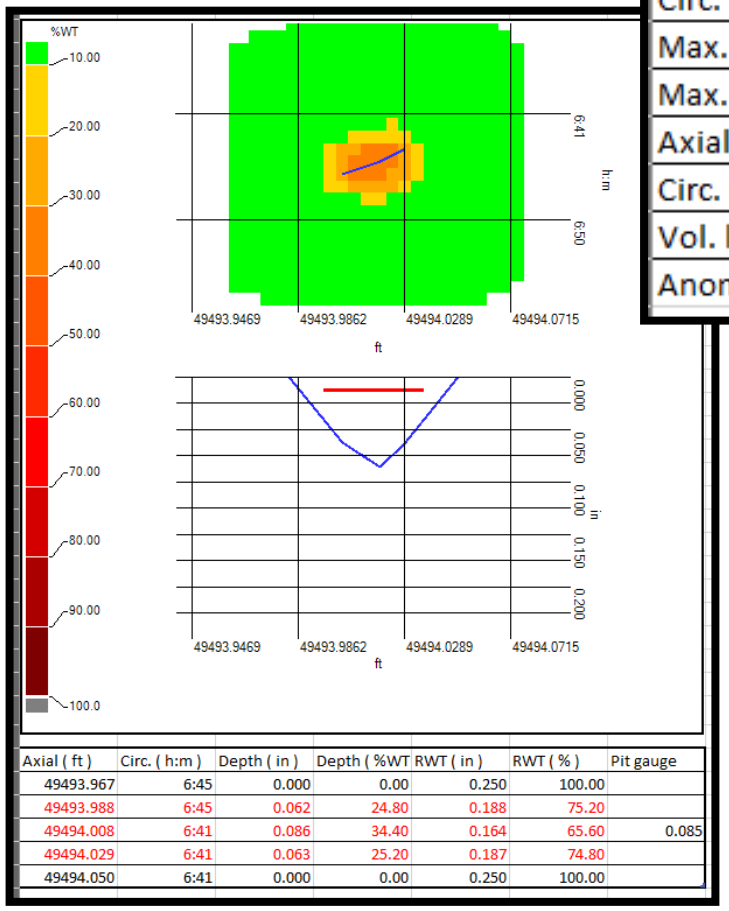
LASER SCANNING

ADVANTAGES

- ✓ Rapid assessment of surface defects
- ✓ Automated correlation with ILI defects
- ✓ Documents the surface of the pipe

DISADVANTAGES

- × Only assesses the surface of the pipe
- × Can take longer on small inspection areas



Axial (ft)	Circ. (h:m)	Depth (in)	Depth (%WT	RWT (in)	RWT (%)	Pit gauge
49493.967	6:45	0.000	0.00	0.250	100.00	
49493.988	6:45	0.062	24.80	0.188	75.20	
49494.008	6:41	0.086	34.40	0.164	65.60	0.085
49494.029	6:41	0.063	25.20	0.187	74.80	
49494.050	6:41	0.000	0.00	0.250	100.00	

Results for Feature 8 (PITT)

Axial start	49493.997	ft
Axial end	49494.037	ft
Axial length	0.472	in
Circ. start	6:41	h:m
Circ. end	6:48	h:m
Circ. width	0.414	in
Max. depth	0.086	in
Max. depth	65.60	%RWT
Axial pos.	49494.020	ft
Circ. pos.	6:45	h:m
Vol. loss	0.007	in^3
Anomaly	Pitting	

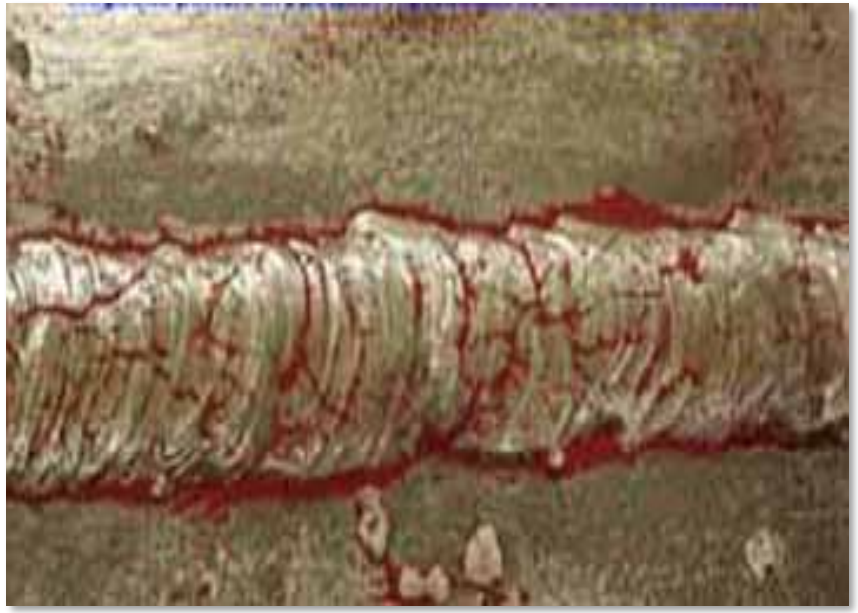
NDT TECHNIQUES

MAGNETIC PARTICLE TESTING (MT)

1 | Clean surface is sprayed with magnetic particles

2 | Test surface is magnetized

3 | Magnetic particles build up over discontinuities



Primarily Used To Assess

+ Linear Indications
+ Cracks

NDT TECHNIQUES

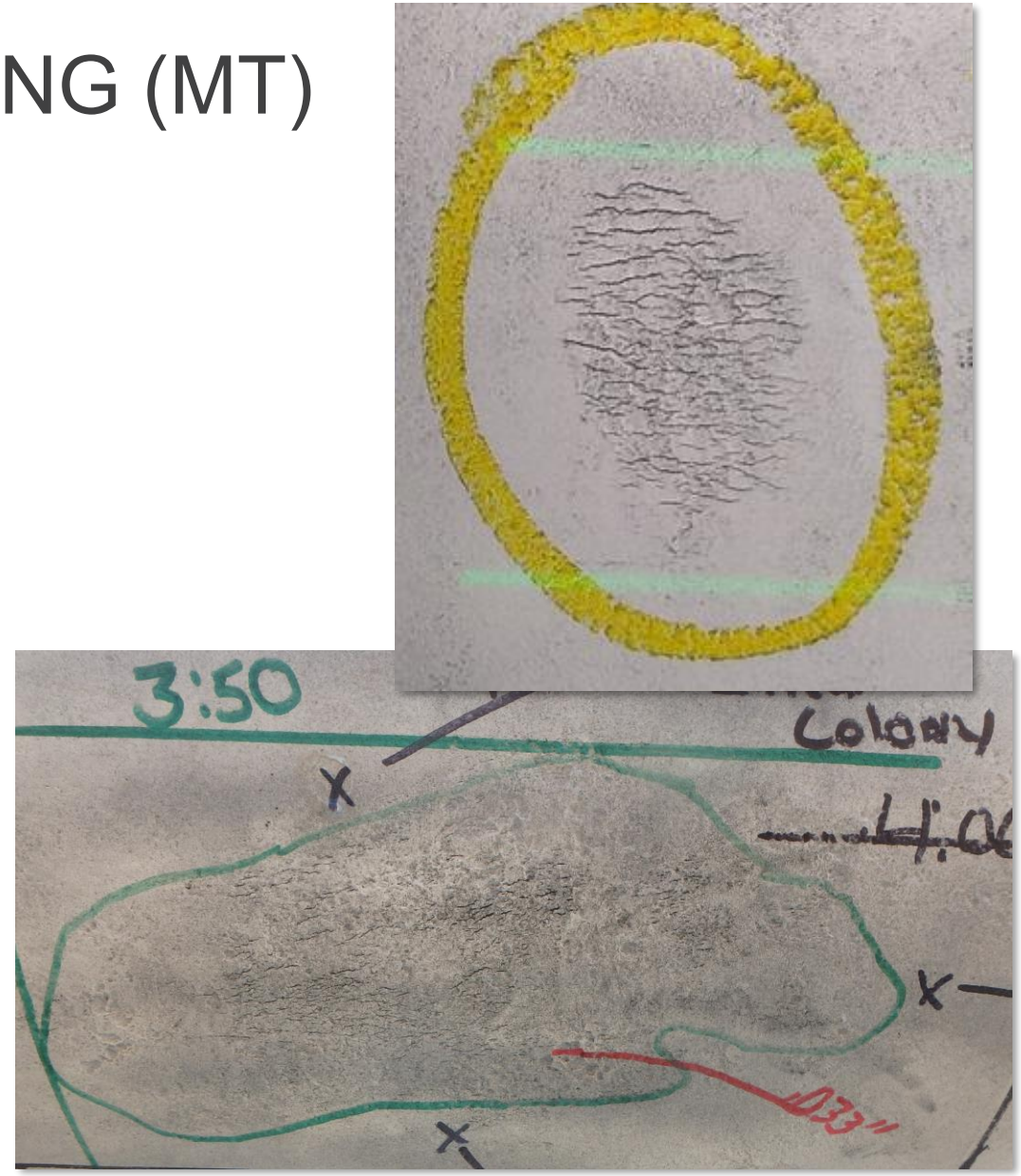
MAGNETIC PARTICLE TESTING (MT)

ADVANTAGES

- ✓ Good for assessing surface linear anomalies
- ✓ Portable, inexpensive, simple

DISADVANTAGES

- × Only detects surface anomalies
- × Requires a ferromagnetic test surface

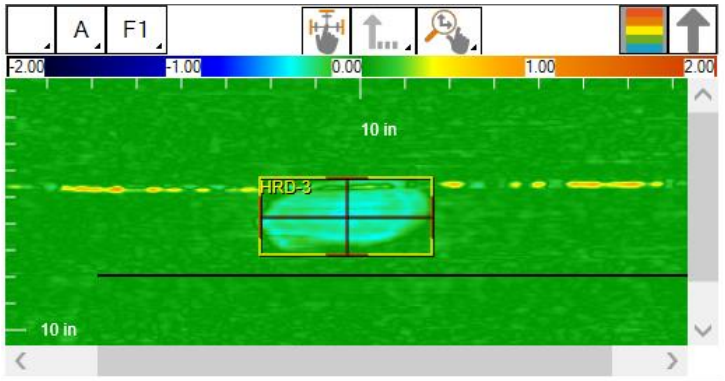


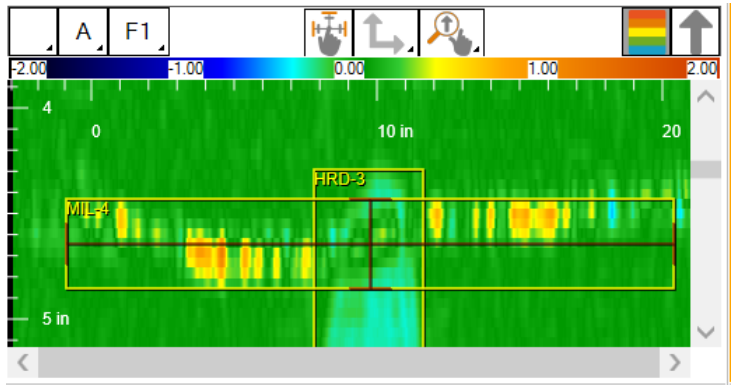
NDT TECHNIQUES

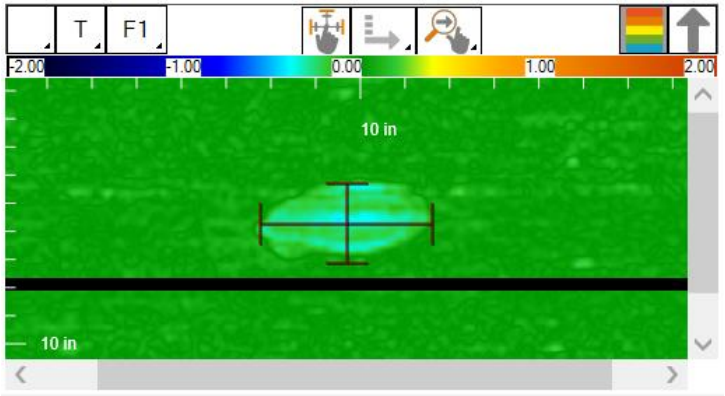
EDDY CURRENT TESTING (ET)

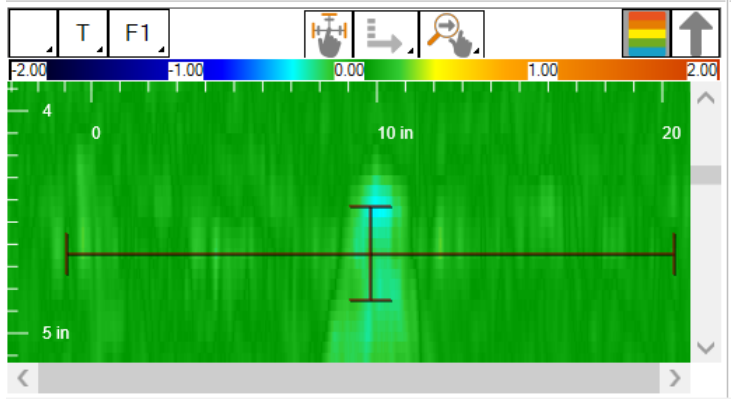
1 | Array of eddy current probes moved over the prepared surface

2 | Sensors and software are used to create a 2D model of the surface







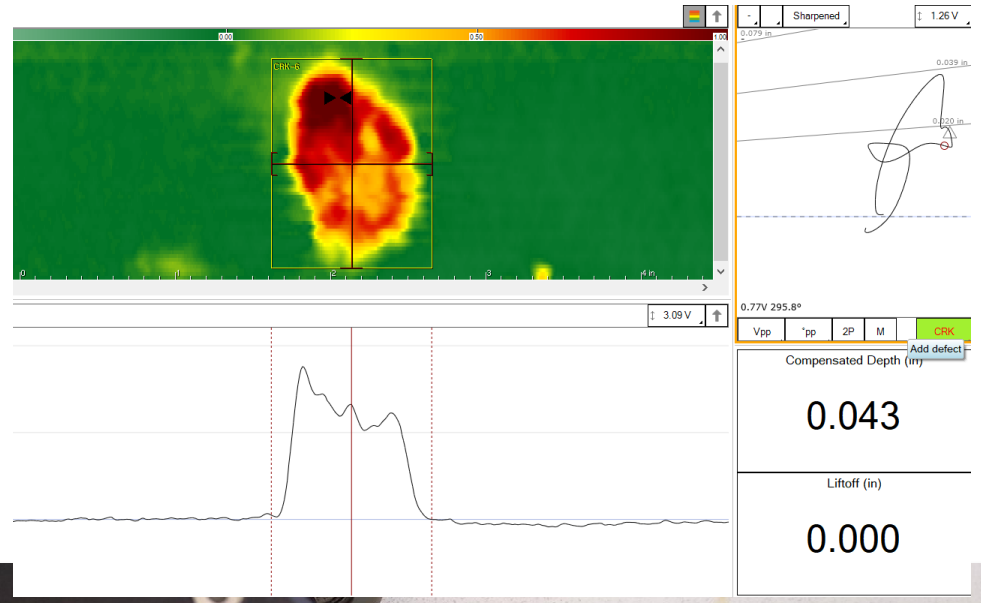


Primarily Used To Assess

+ Linear Indications and Cracks
+ Gouge
+ Long Seam Anomaly
+ Manufacturing Anomaly

NDT TECHNIQUES

EDDY CURRENT TESTING (ET)



ADVANTAGES

- ✓ Sizes cracks up to 118 mil deep and detects hard spots
- ✓ Non-ferromagnetic materials
- ✓ Documents the surface of the pipe
- ✓ Faster than MT and gives more data

DISADVANTAGES

- ✗ Few units available
- ✗ New technology (not yet widely adopted)

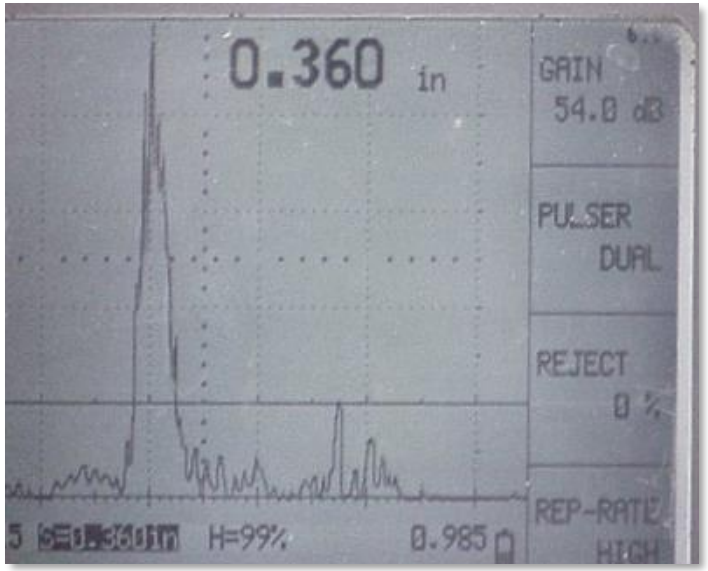
NDT TECHNIQUES

ULTRASONIC TESTING (UT)

1 | Sound wave induced in the pipe

2 | If there is a discontinuity in the wave path, part of the energy is reflected from the flaw surface

3 | The reflected wave signal is transformed into an electrical signal by the transducer and is displayed on a screen

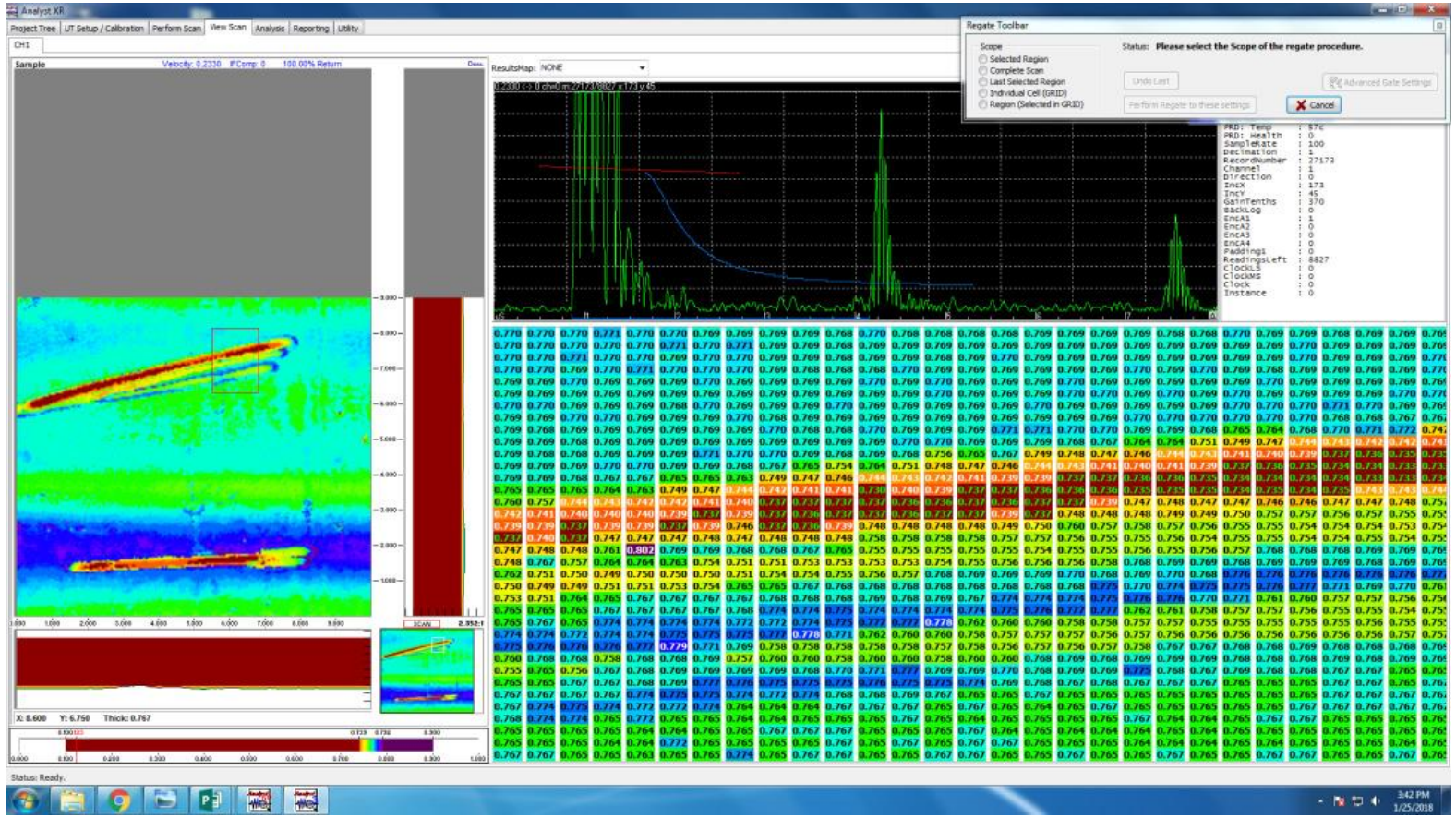


Primarily Used To Assess

- Buckles and wrinkles
- Dent or deformation
- External corrosion
- Gouge
- Long seam anomaly
- Metal loss
- Girth weld anomaly
- Manufacturing anomaly
- Linear indication/crack
- Internal corrosion

NDT TECHNIQUES

ULTRASONIC TESTING (UT)



Types of Ultrasonic Testing

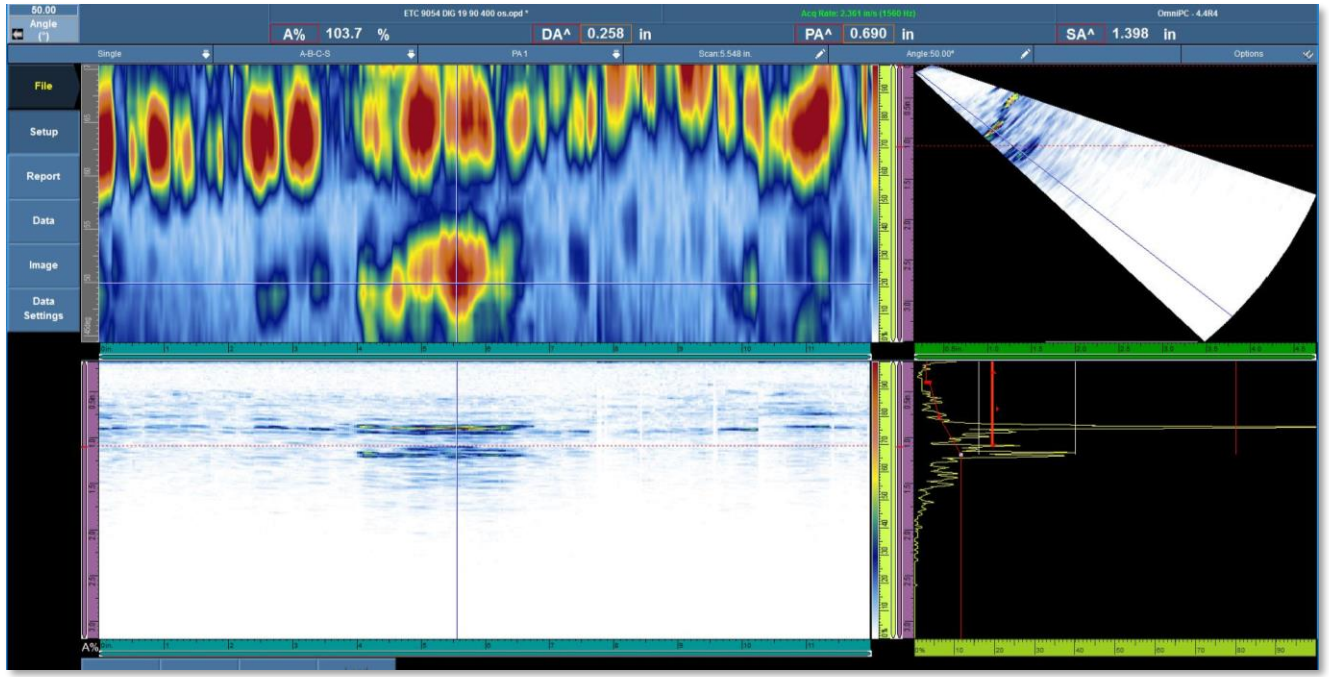
+ Straight beam
+ Shear wave
+ PAUT
+ AUT
+ TOFD

NDT TECHNIQUES

ULTRASONIC TESTING (UT)

ADVANTAGES

- ✓ Full volume inspection
- ✓ Single-side access
- ✓ Accurate size and shape estimations
- ✓ Instantaneous results



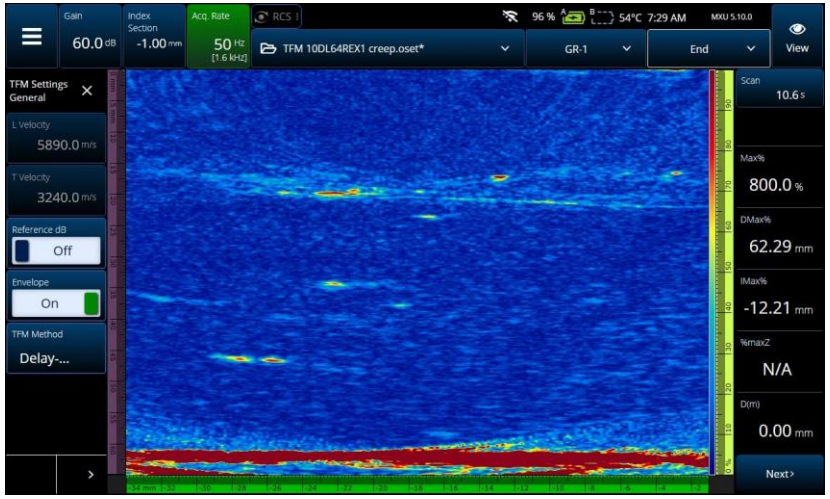
DISADVANTAGES

- × Surface must be accessible
- × Requires coupling agent, skill and training, and reference standards
- × Cannot detect flaws parallel to sound beam

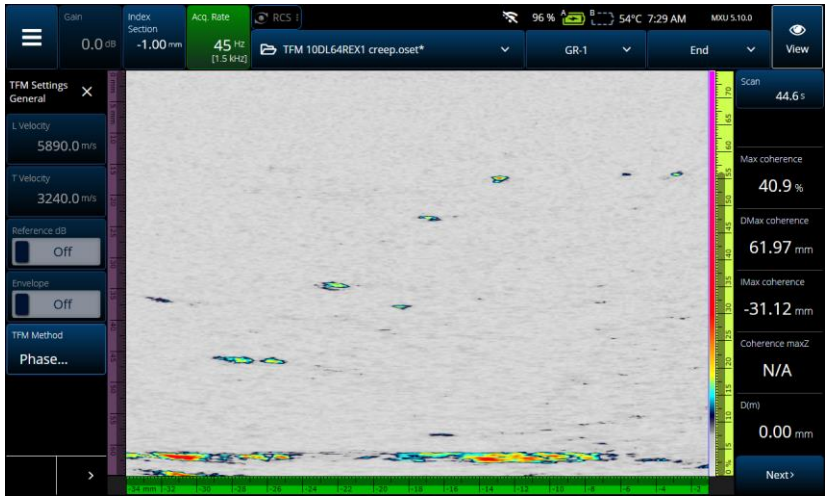
NDT TECHNIQUES

ULTRASONIC TESTING (UT)

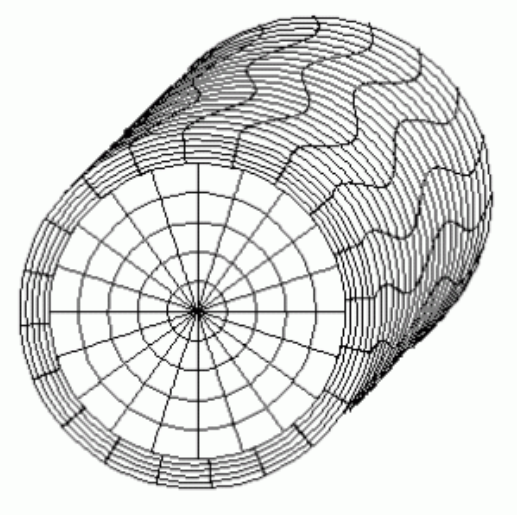
TFM/FMC



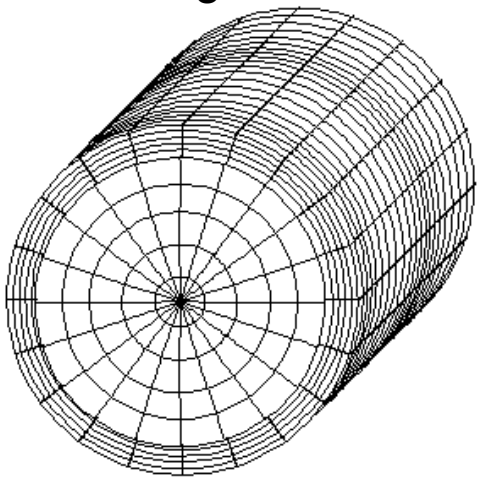
PCI



Torsional



Longitudinal



Advanced Techniques

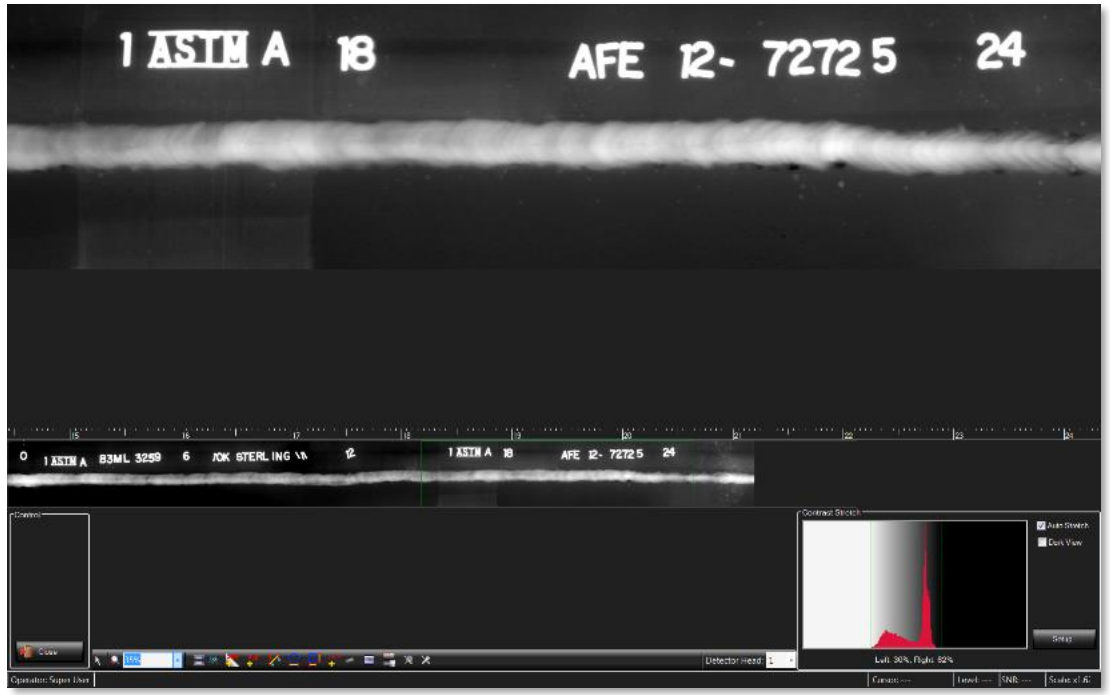
+ TFM/FMC/PWI
+ PCI
+ Guided Wave
+ Short Range GWT

NDT TECHNIQUES

RADIOGRAPHY (RT)

1 | Radiation is emitted from the source

2 | Specimen absorbs a portion of the radiation; the remaining radiation interacts with the film or the sensor



Primarily Used To Assess

+ Long seam anomaly
+ Girth weld anomaly
+ Manufacturing anomaly

NDT TECHNIQUES

RADIOGRAPHY (RT)

ADVANTAGES

- ✓ Sensitive to both surface and subsurface discontinuities
- ✓ Common, well-understood, inexpensive

DISADVANTAGES

- ✗ Unlikely to detect voids not in-line with the path of radiation (such as laminations)
- ✗ Radiation is hazardous to human health

CLOSING

QUESTIONS?