Asset Integrity

Fuel Ethanol Production Facilities

ERI SOLUTIONS INC.™

Thank you!

Nebraska Ethanol Board

Learning Objectives

- Requirements
- Best Management Practices (BMPs)
- Testing & Inspection Methods Utilized
- Asset Preparation Requirements
- Examples of Common Findings
- Benefits of Asset Integrity Testing & Inspection
- Questions & Answers

Requirements

Reference:	29 CFR 1910.119 – Process Safety Management (PSM)
Summary:	Operations that process or store a listed Highly Hazardous Chemical (HHC) and/or gases or liquids in excess of 10,000 pounds in one location that have a flashpoint below 100° F.
Applicability:	• The flash point of 20p ethanol is 120° F and 40p ethanol is 97° F representing the range of beer mash entering the beer column. • The flashpoint of 200p ethanol is 61.88° F • Anhydrous Ammonia (NH3) is a listed Highly Hazardous Chemical (HHC)

Reference:	29 CFR 1910.119(j)(4)(iii) – Process Safety Management (PSM) / Mechanical Integrity (MI)		
Summary:	The frequency of inspections and tests of process equipment shall be consistent with applicable manufacturers' recommendations and good engineering practices, and more frequently if determined to be necessary by prior operating experience.		
Applicability:	Recognized And Generally Accepted Good Engineering Practices (RAGAGEP) would default ethanol production facilities to follow inspection standards consistent with their design standards.		
	Asset:	Design Standard:	Inspection Standard:
	Floating Roof Storage Tank	API 650	API 653
	Pressure Vessel	ASME Section 8 Division 1	API 510
	Process Piping	ASME B31.3	API 570

Requirements

Reference:	40 CFR 68 – Risk Management Plan (RMP)
Summary:	An owner or operator of a stationary source that has more than a threshold quantity of a regulated substance in a process, as determined under §68.115, shall comply with the requirements of this part.
Applicability:	• Ammonia is a listed chemical with a 10,000 lb threshold for anhydrous and 20,000 lb threshold for any substance with greater than 20% concentration. • Several components of natural gasoline typically used as denaturant at ethanol production facilities are also listed chemicals with a 10,000 lb threshold.

Reference:	40 CFR 68.73 (d) (3) – Mechanical Integrity (MI)		
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Best Management Practices (BMPs)

Testing and inspection of critical assets outside of PSM/RMP covered processes such as:

Sulfuric Acid Tank	Sulfuric Acid Piping
Caustic Tank	Caustic Piping
Fermenters	Slurry Tanks
Electrical Connections	Gas Fired Equipment

NOTICE: Although your facility likely has a conservative specific design run-rate, be aware of process changes and increased production rates that can increase the erosion rate and/or stress of the materials in your facility.

Testing & Inspection Methods Utilized

- Visual Testing (VT)
- Dye Penetrant Testing (PT)
- Magnetic Particle Testing (MT)
- Eddy Current (ET)
- Magnetic Flux Leakage (MFL)
- Ultrasonic Testing (UT)
- Radiographic Testing (RT)

Testing & Inspection Methods Utilized

API 510 – Pressure Vessel Inspection

Minimum Interval	Inspection Type	Typical Inspection(s)
5 Years	External	VT – Visual Testing UT – Ultrasonic Testing PT – Penetrant Testing MT – Magnetic Particle Testing
10 Years	Internal	VT – Visual Testing UT – Ultrasonic Testing PT – Penetrant Testing MT – Magnetic Particle Testing ET – Eddy Current Testing

Testing & Inspection Methods Utilized

API 570 – Piping Inspection

Type of Circuit	UT – Ultrasonic Testing (External)	VT – Visual Testing (External)
Class 1	5 Years	5 Years
Class 2	10 Years	5 Years
Class 3	10 Years	10 Years
Class 4	Optional	10 Years

NOTE: Any suspect areas identified by a thorough visual inspection should have a follow up Magnetic Particle Testing (MT) or Penetrant Testing (PT) if determined to be necessary by the API 570 Inspector

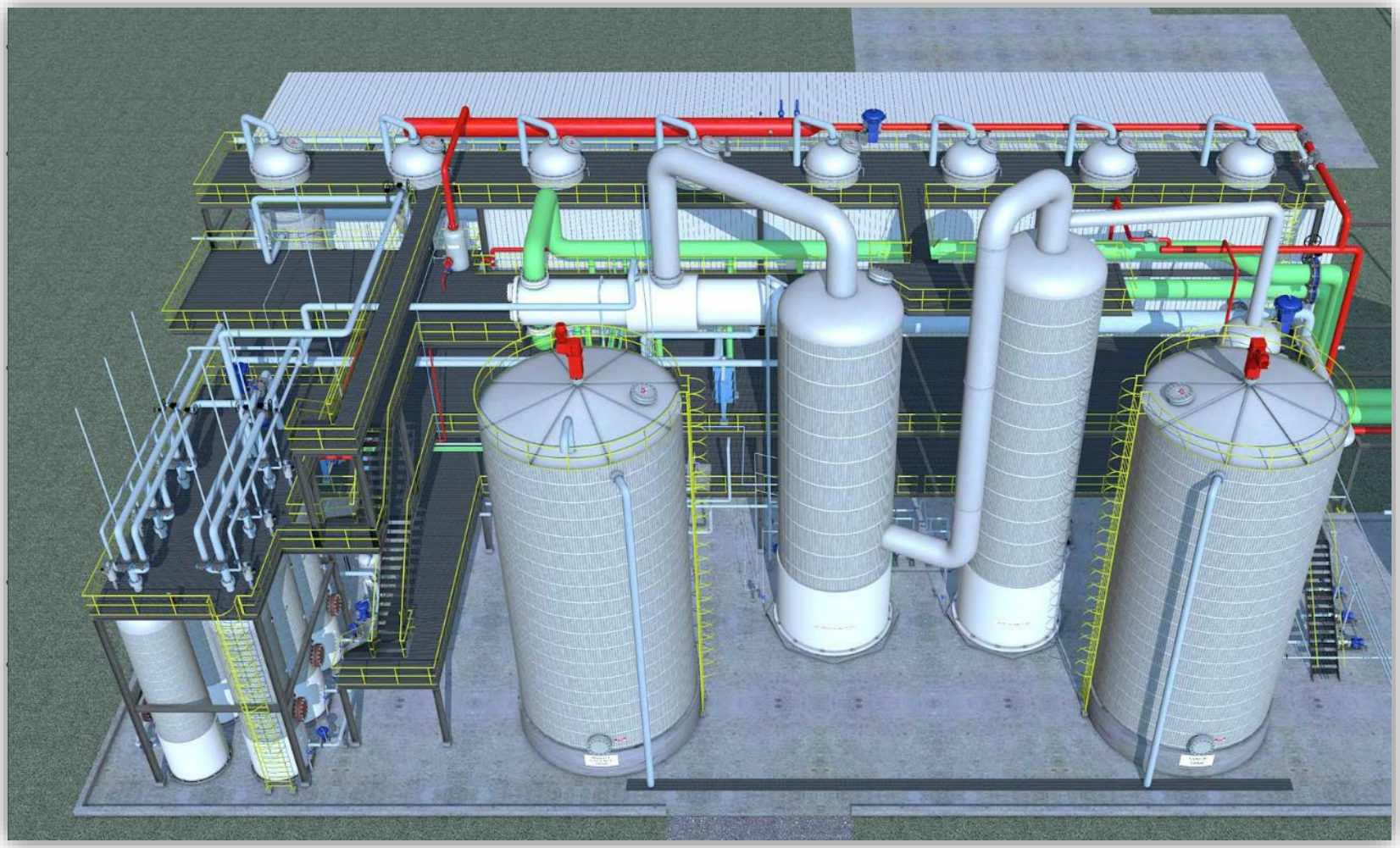
Testing & Inspection Methods Utilized

API 653 – Floating Roof Storage Tank Inspection

Minimum Interval	Inspection Type	Typical Inspection(s)
5 Years	External	VT – Visual Testing UT – Ultrasonic Testing PT – Penetrant Testing MT – Magnetic Particle Testing
10 Years	Internal	VT – Visual Testing UT – Ultrasonic Testing PT – Penetrant Testing MT – Magnetic Particle Testing MFL – Magnetic Flux Leakage Testing

Asset Preparation Requirements

Pressure Vessels

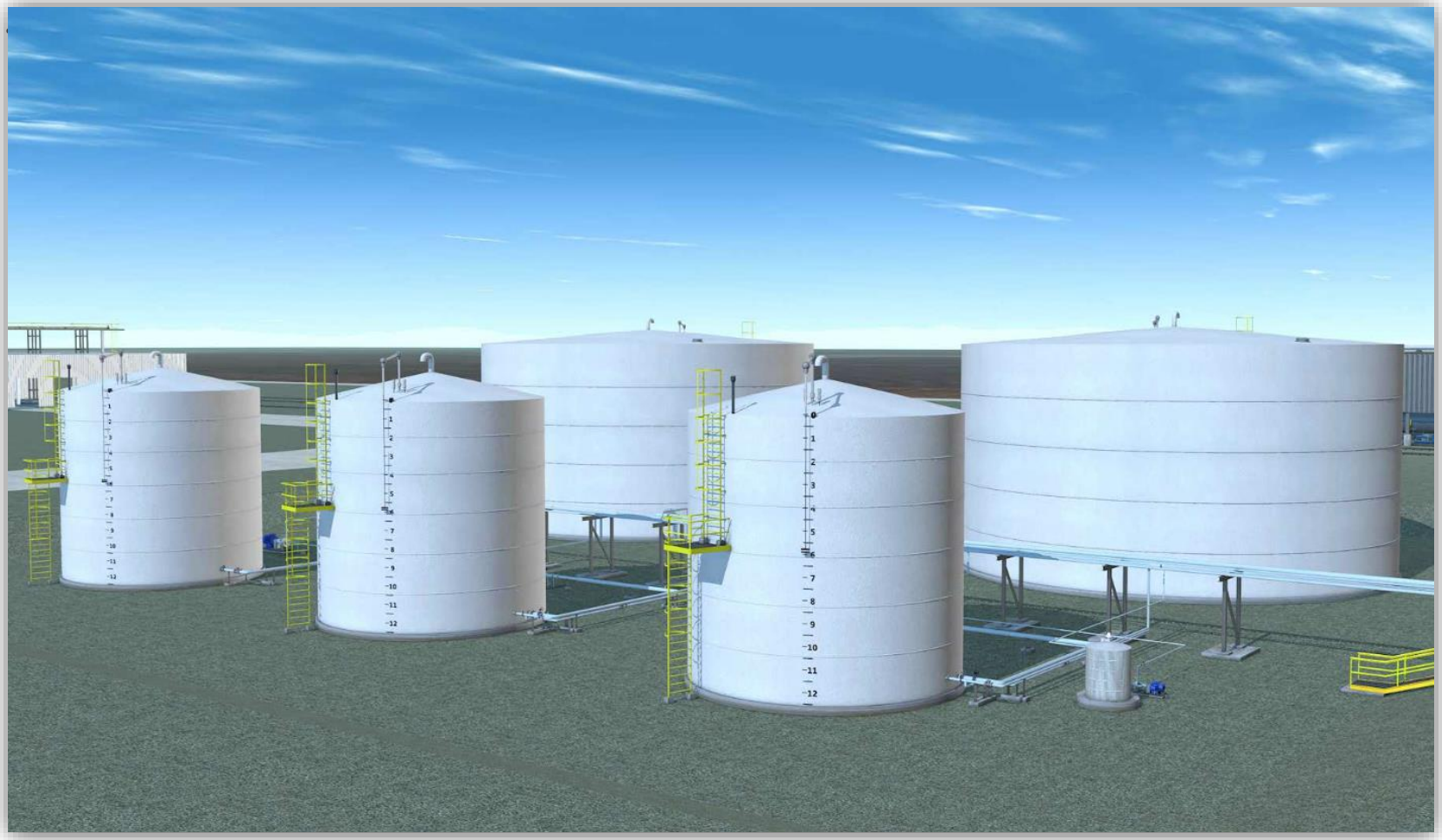


Asset Preparation Requirements

Tube & Shell Heat Exchangers

Asset Preparation Requirements

Internal Floating Roof Storage Tanks



Asset Preparation Requirements

Internal Floating Roof Storage Tanks

- Mechanical
  - Pin internal floating roof legs in the maintenance position with a minimum of a six (6) foot clearance to allow Non-Destructive Testing (NDT) field personnel to operate the equipment effectively and accurately.
  - Open all other available inlets such as top man-ways, internal floating roof hatches, etc. to aid in proper and expeditious ventilation.
- Safety
  - Ensure all incoming and outgoing piping has been blinded or pancaked with the first valve locked in the closed position.
  - Utilize a calibrated air monitor to perform air monitoring to check/confirm atmosphere is safe for work without supplied air or respirator.
  - Complete proper Lockout/Tagout and Confined Space Entry procedure.
  - Ensure you have notified your confined space rescue team if the space will remain a permit required confined space.
- Environmental
  - Notify environmental regulator(s) at least 30 days in advance or as directed by your air permit to advise them that you will be opening and venting the tank(s).
  - Ensure method of draining, transferring or collecting contents meets all environmental regulations.
  - Ensure any tank farm containment area drains are shut and locked prior to tank draining and cleaning to prevent possible release of spills.
- Maintenance
  - Consider having a qualified repair crew present to repair tank floor due to underside floor corrosion/loss.
  - Consider stocking spare floating roof seal(s).
  - Consider stocking other critical (pertinent to safe operation) spares.

Inspection Duration

Internal Floating Roof Storage Tanks

Inspection Method	Time
Magnetic Flux Leakage Testing (MFL)	175 Square Feet/Hour
Visual Testing (VT)	1 Hour
Ultrasonic Testing (UT)	2 – 4 Hours
Penetrant Testing (PT)	As Needed
Magnetic Particle Testing (MT)	As Needed

Pressure Vessels

Inspection Method	Time
Visual Testing (VT)	2 Hour
Ultrasonic Testing (UT)	2 Hours
Penetrant Testing (PT)	As Needed
Magnetic Particle Testing (MT)	As Needed

Inspection Duration

Tube & Shell Heat Exchangers

Inspection Method	Time
Eddy Current Testing (ET)	2,400 Linear Feet/Hour
Visual Testing (VT)	1 Hour
Ultrasonic Testing (UT)	1 Hour
Penetrant Testing (PT)	As Needed
Magnetic Particle Testing (MT)	As Needed

Piping

Inspection Method	Time
Visual Testing (VT)	100 – 500 Feet/Hour
Ultrasonic Testing (UT)	50 – 200 Feet/Hour
Penetrant Testing (PT)	As Needed
Magnetic Particle Testing (MT)	As Needed

Examples of Common/Recent Findings

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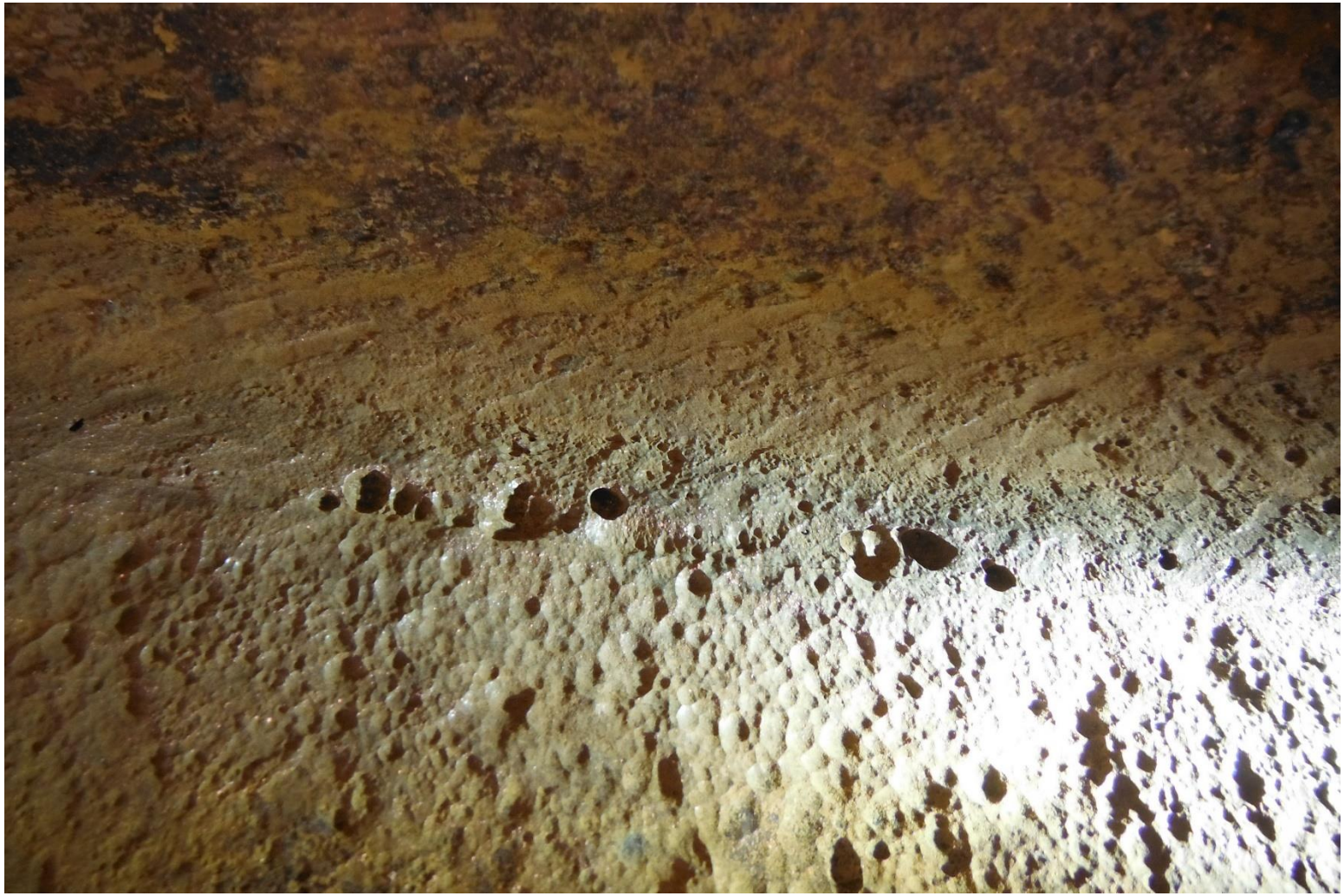

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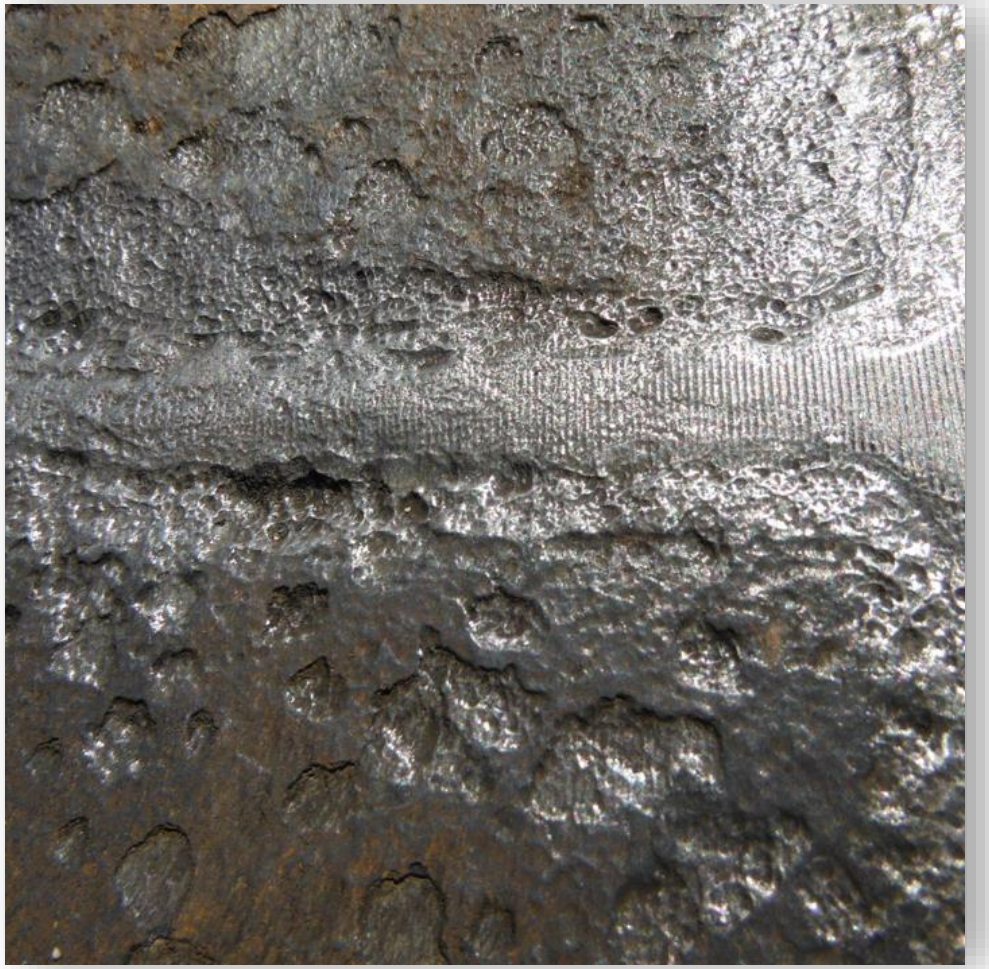

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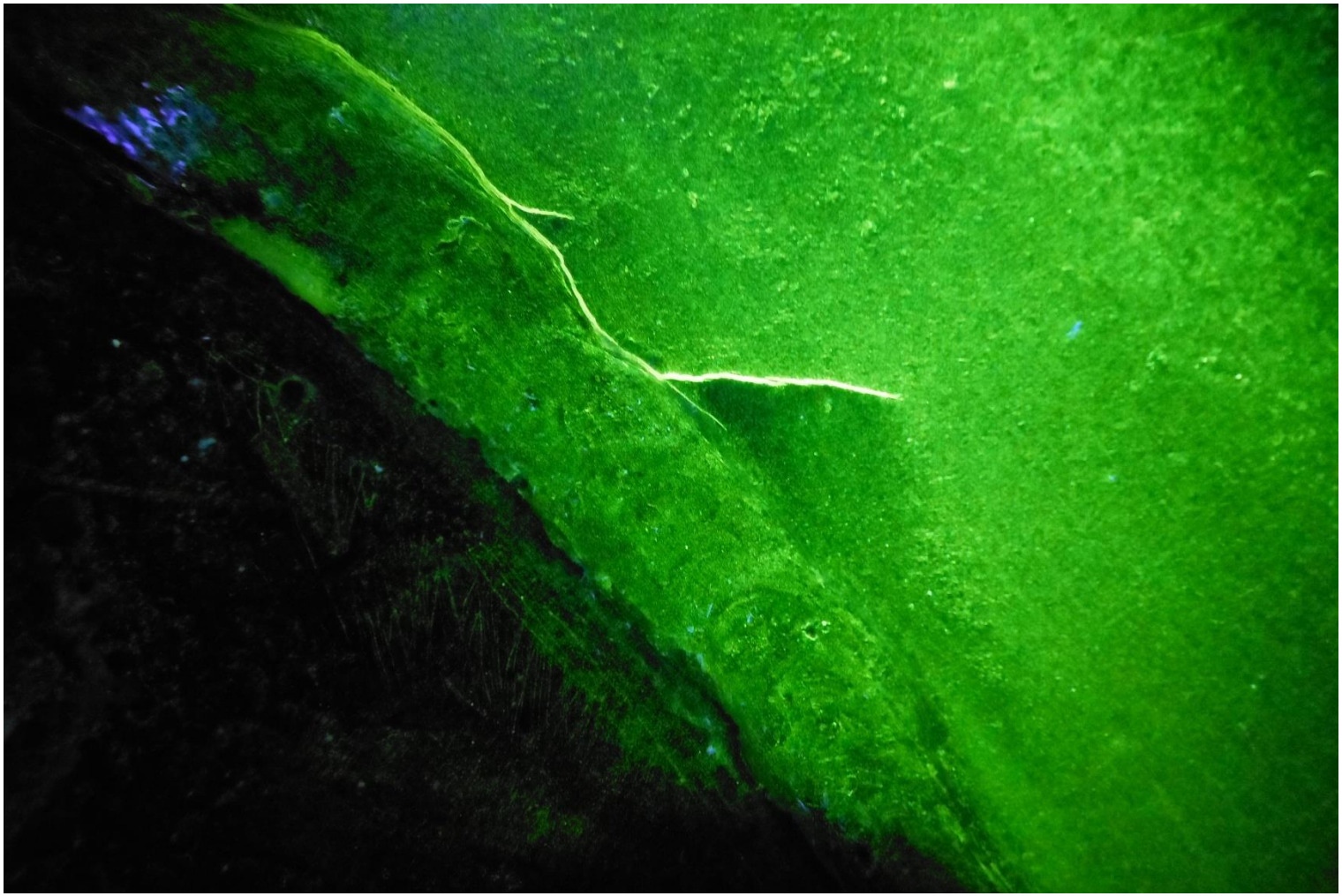

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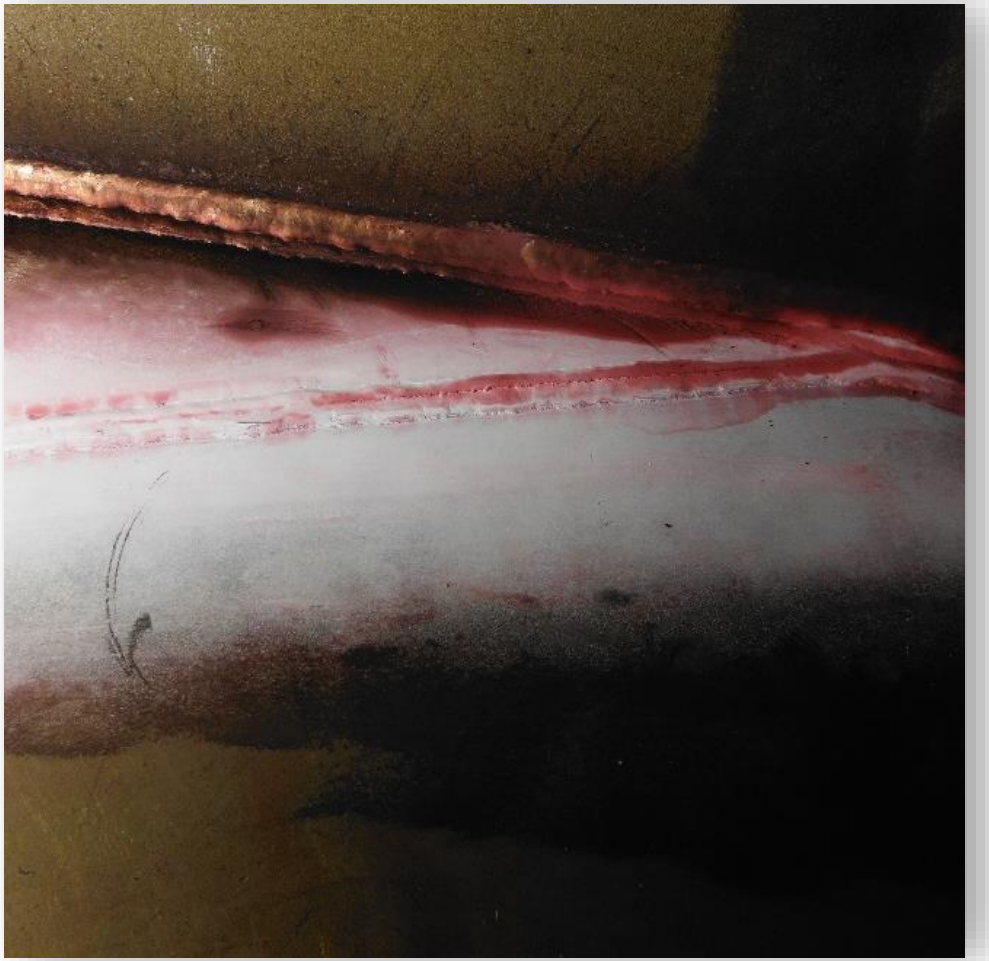

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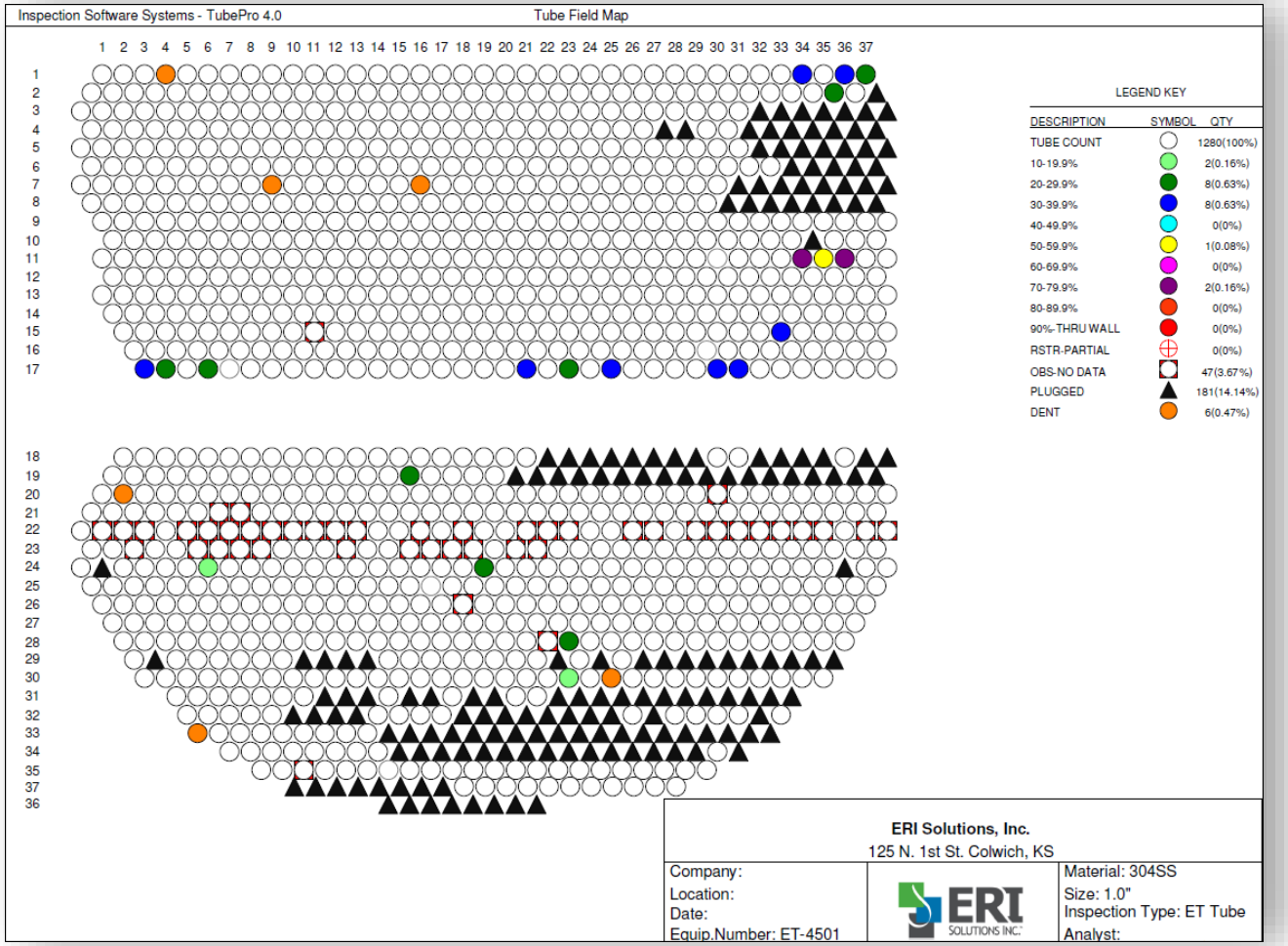

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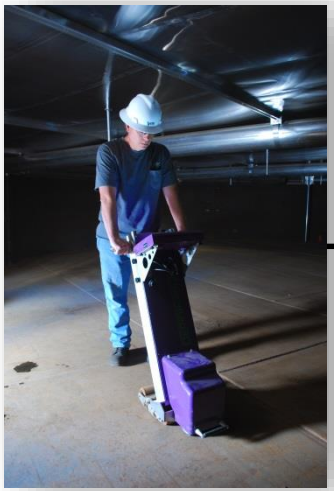

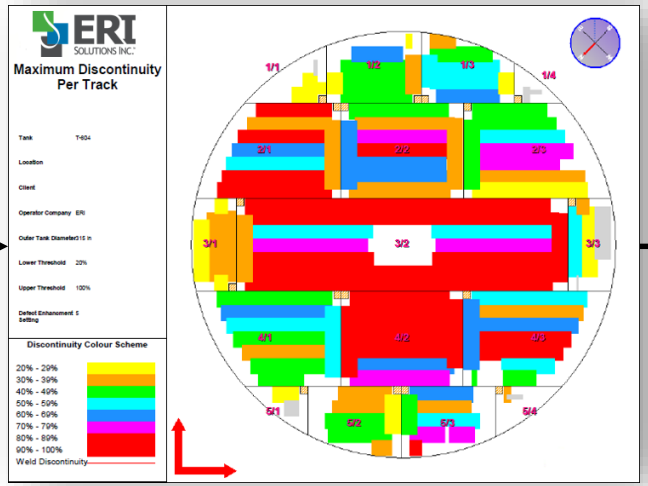

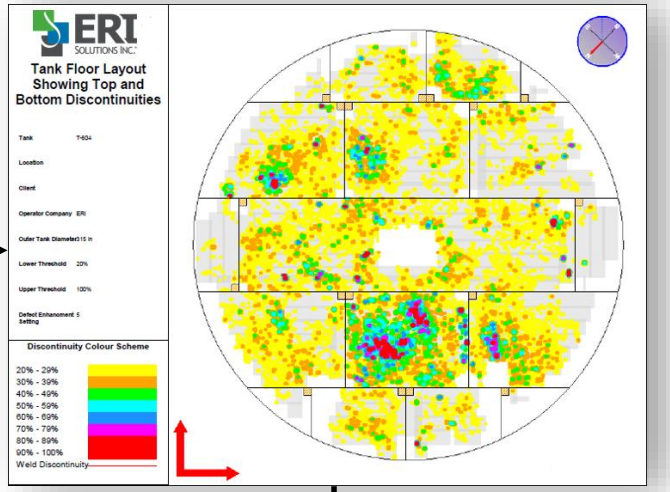

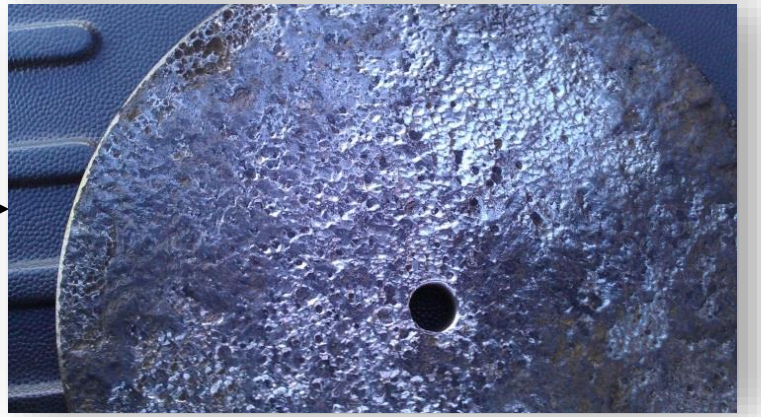

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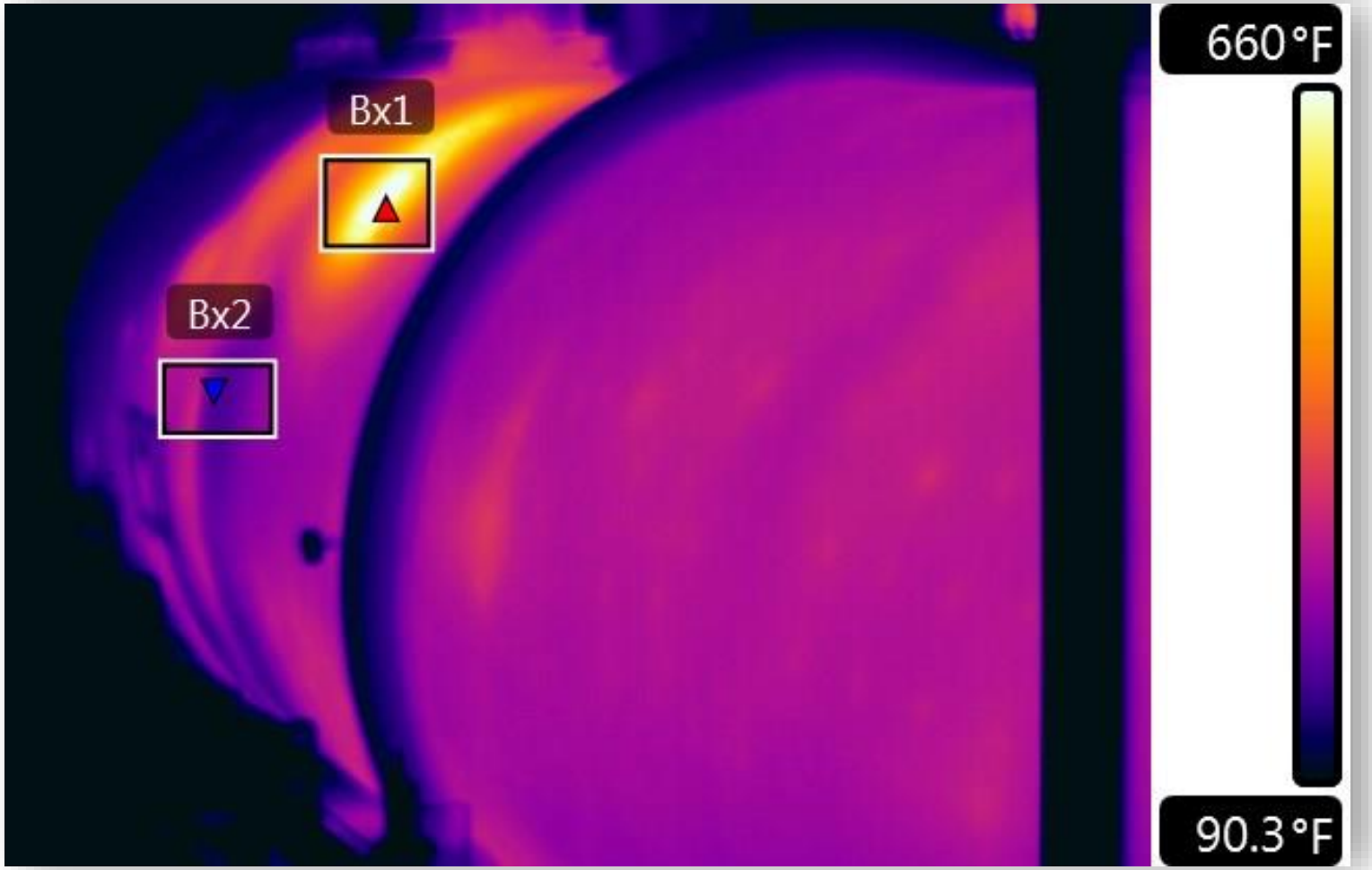

Benefits of Asset Integrity Testing & Inspection

Need More Information?

Name:	Jay Beckel CSP, CHMM, API 510, 570, 653, STI-SP001
Title:	Vice President
Contact Info:	(316) 927-4288 – Office (316) 250-1238 – Mobile Jay.beckel@erisolutions.com - Email

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