



Using IR Techniques in Fixed Equipment Inspection Programs

by Randy Gray and Joey Poret

THE 2009 API
**INSPECTOR
SUMMIT**

Presenter

Randy Gray

■ 12 Years Experience in Infrared Technologies and Inspection. Work at the Pascagoula Refinery

- Hold FLIR Level III Infrared Certificate
- National Board Certified
- API 510
- API 570

Current job

- Support company operations world wide on Infrared Inspection Issues. Specific focus on Down Stream Fixed equipment.
- Active with on line inspections as well and shutdown inspections.



Setting the Tone

- Cover how Infrared technology can be used on evaluating fixed equipment.

- **Injection Points**
- **Fin Fan Plugging**
- **Tanks Inspections**
- **Stack Monitoring**
- **Refractory Lined Heat Exchangers**
- **Refractory Lined Vessels**
- **Refractory Lined Piping**
- **Stack Monitoring**

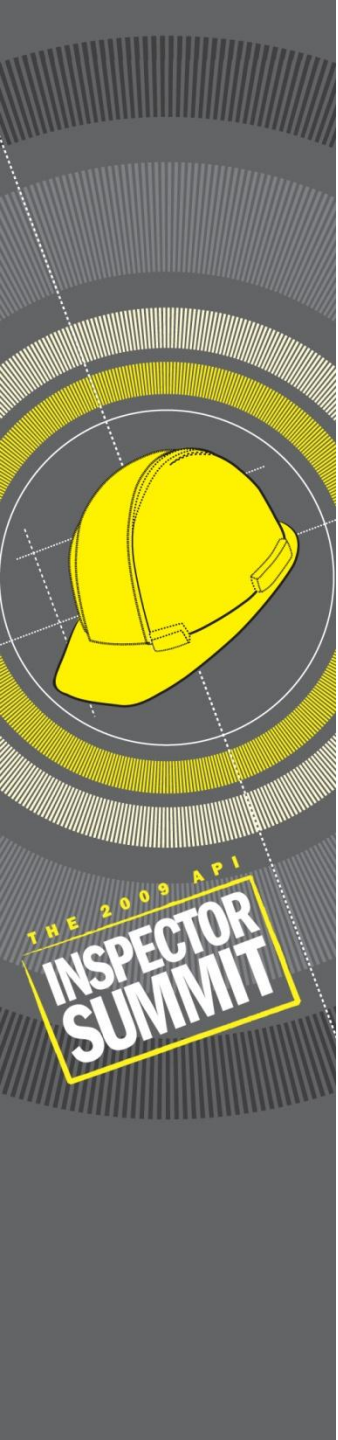
- Sources

- **HSE Report on Humber Refinery**



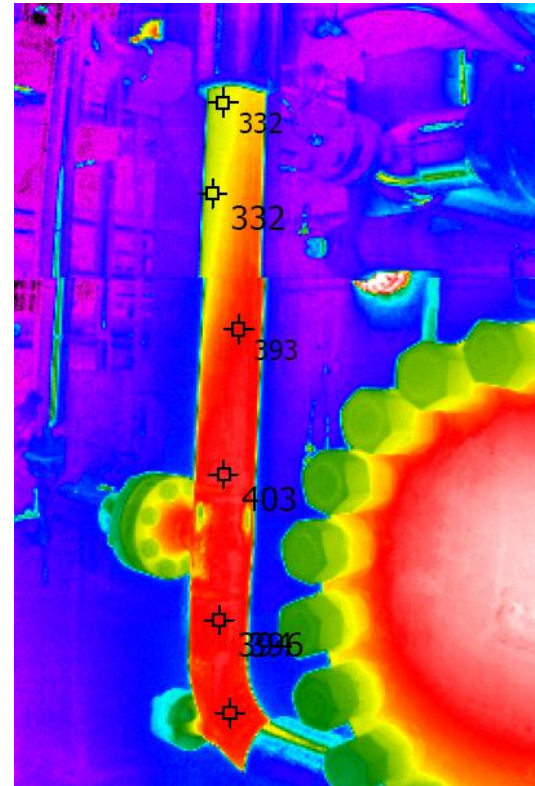
Injection Point Inspection

- History of significant failures at injection points
- Specifically addressed in API 570
- Inspection methods currently used:
 - UT
 - RT
 - ET

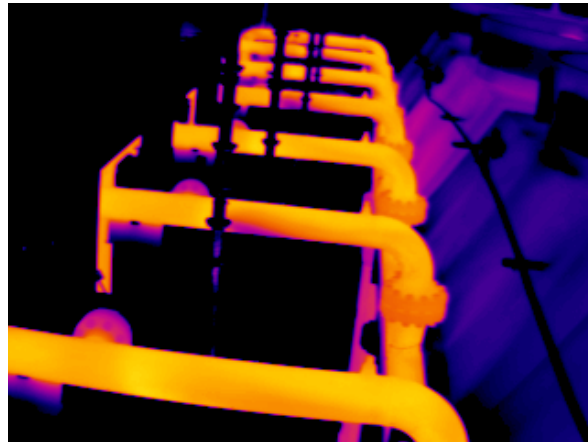
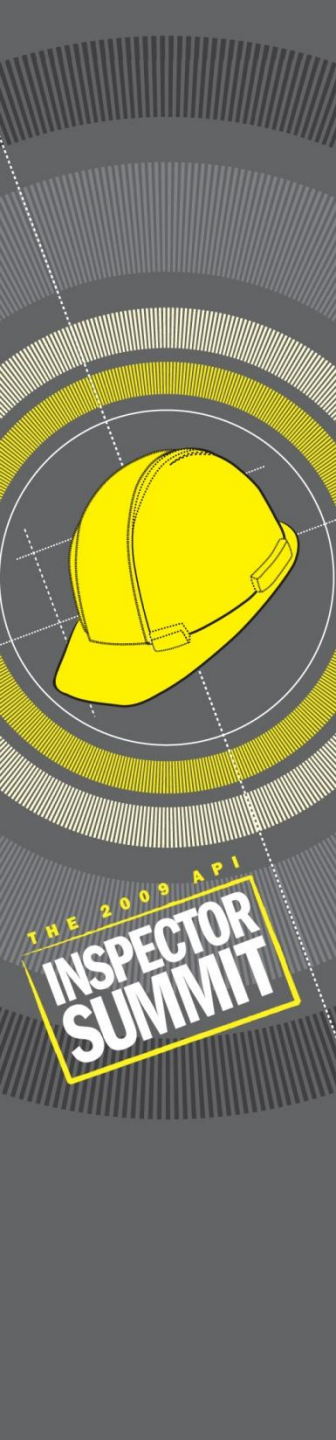


Injection Points

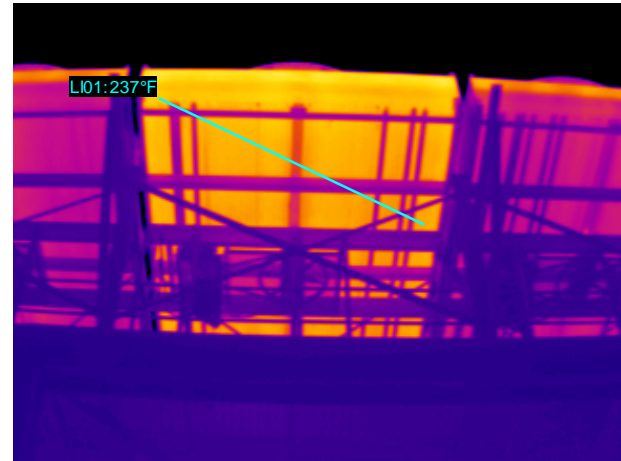
Verify Injection is Operating and Not Plugged and can identify localized impingement points



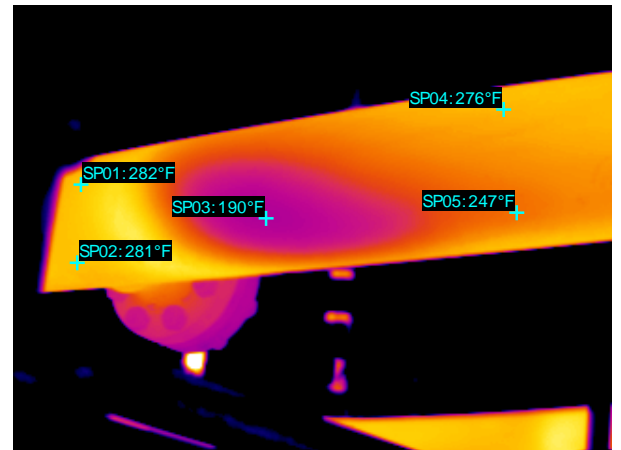
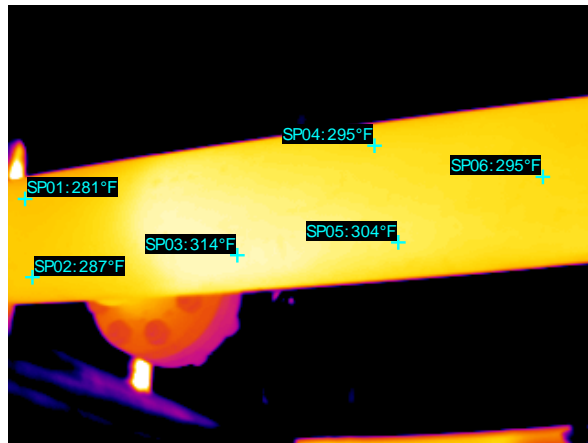
Condensate Injection Piping Eddied Current Inspection Verified Infrared Findings



North SIDE INLET

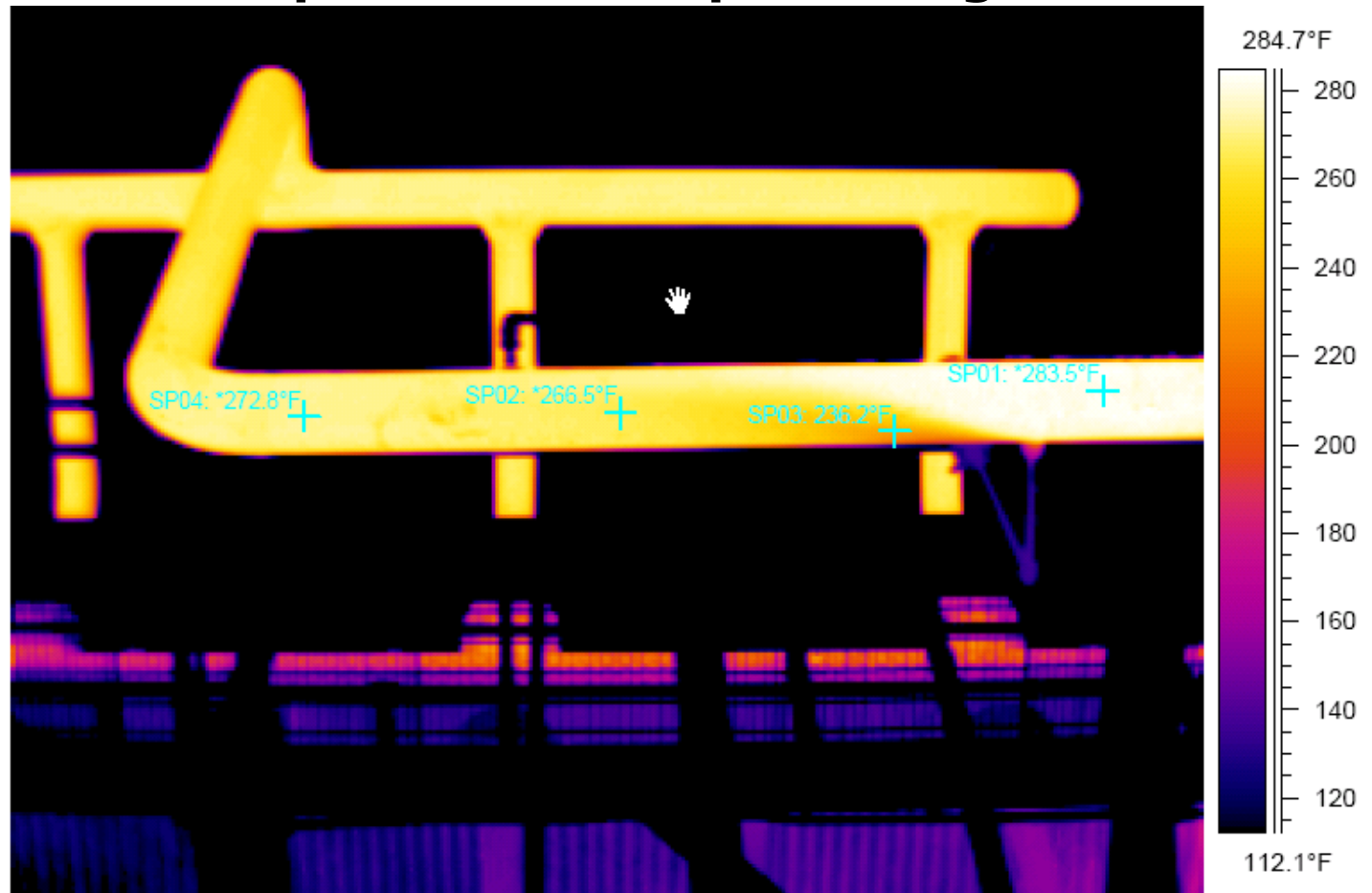


South Side Inlet

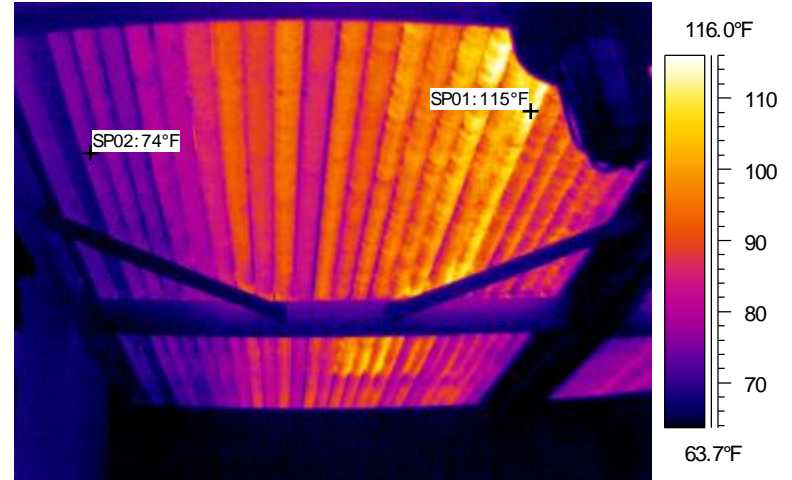
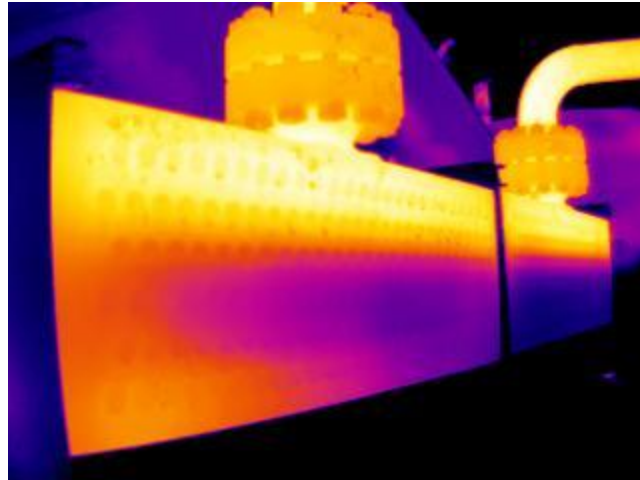


Condensate Injection Points / Down Stream Mixing

Most condensate injections are based on un-vaporized water percentages.



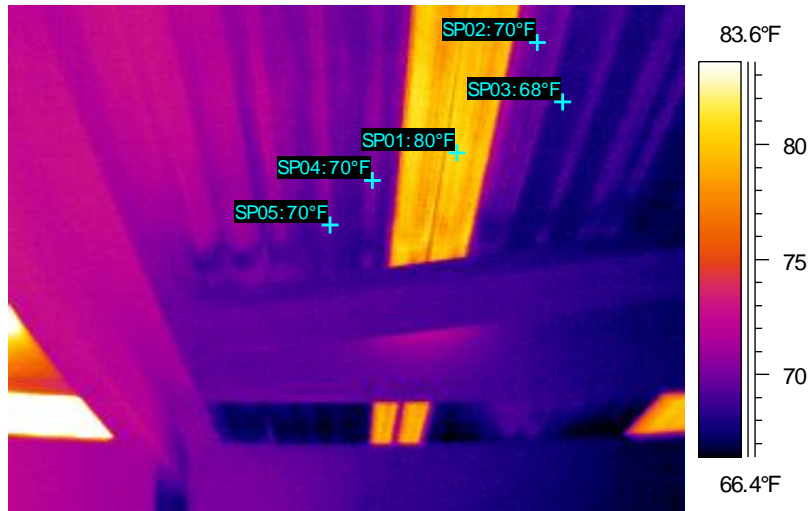
Fin Fan Plugging



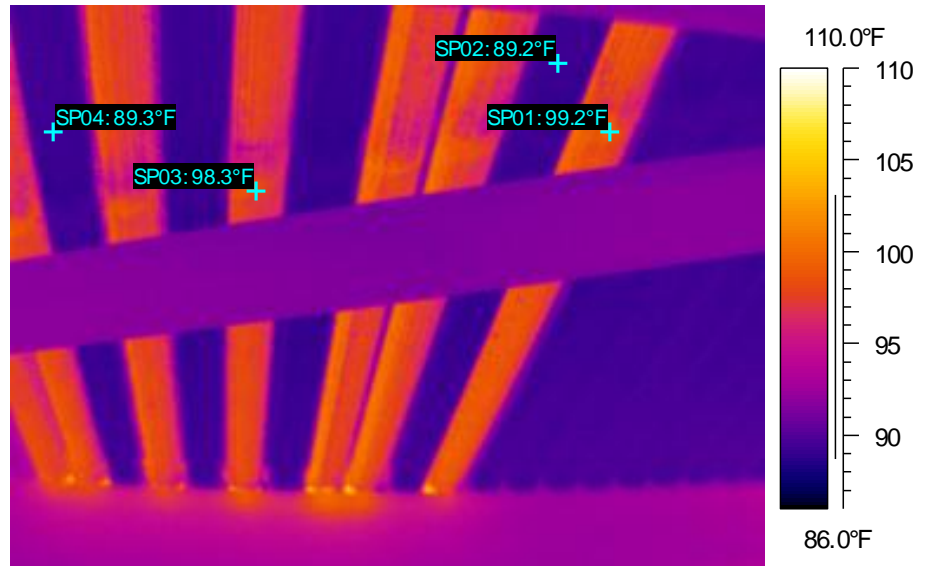
Possible ID and OD Fouling / plugging



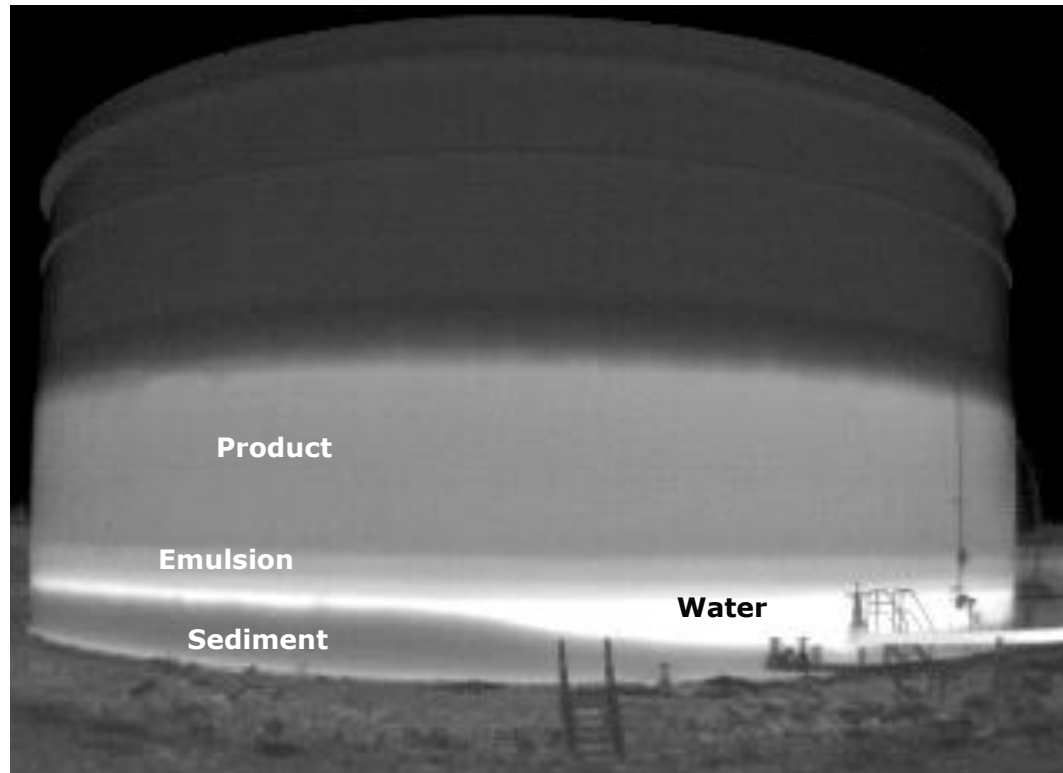
Fin Fan Plugging



ID plugging

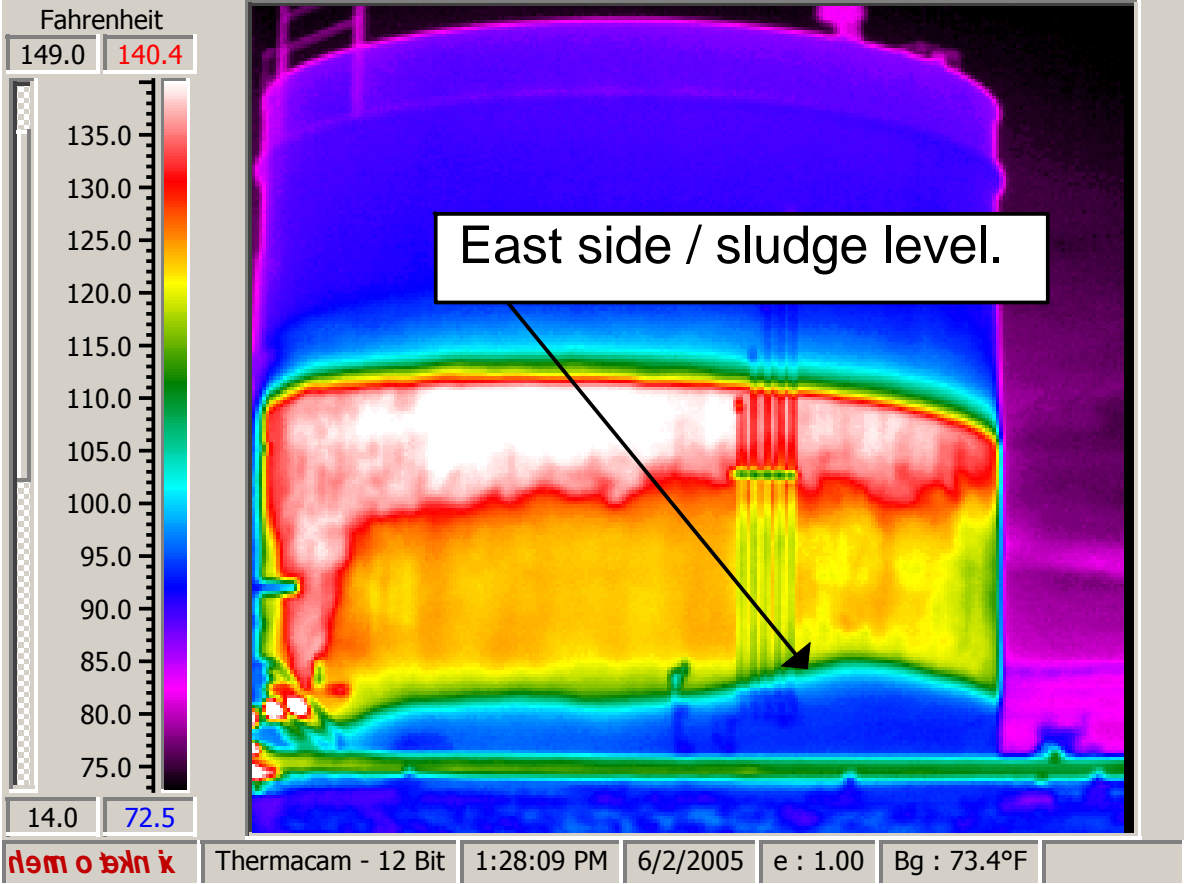


Tanks Inspections

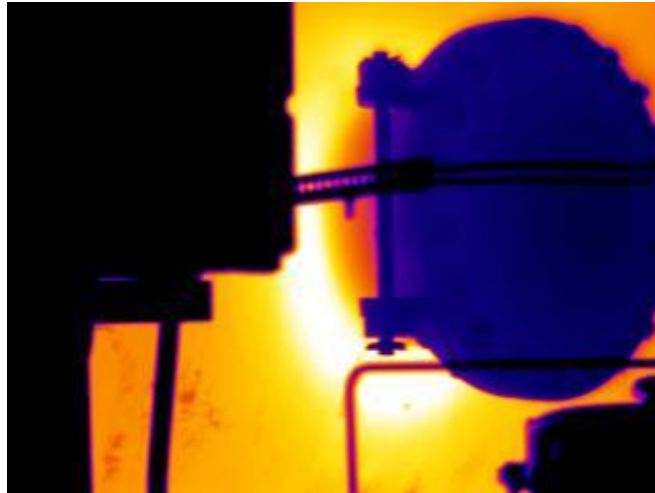


Can Identify Product levels, Sediment, Water level and Emulsion.

Determine Thermal Distribution of Product



Refractory Lined Vessels

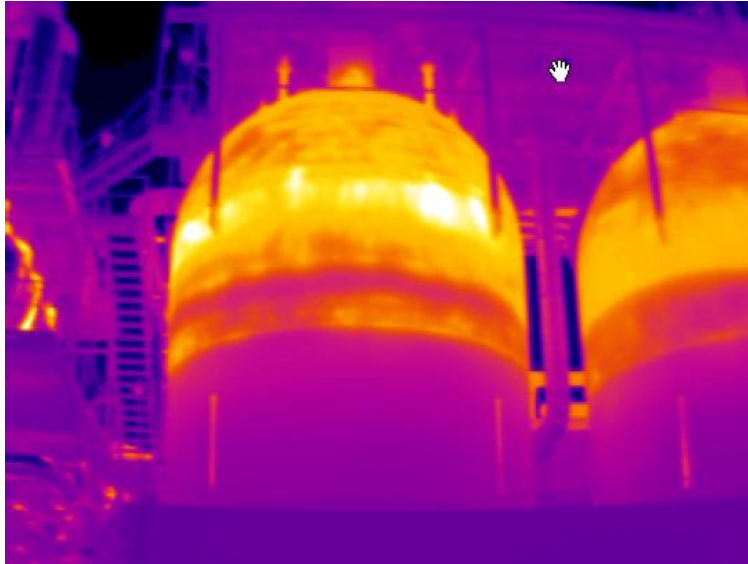


**Possible
Refractory
Damage**

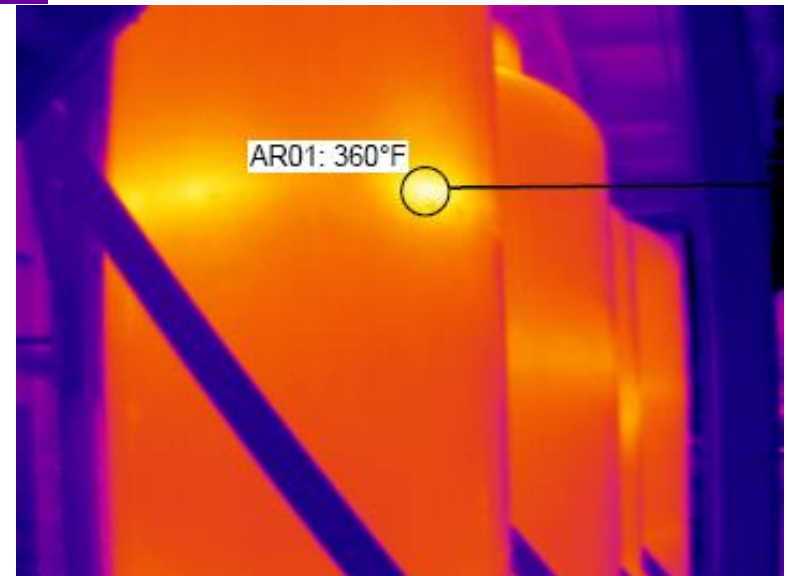
**Cost Control for
Outages /
Planning**



Refractory Lined Vessels

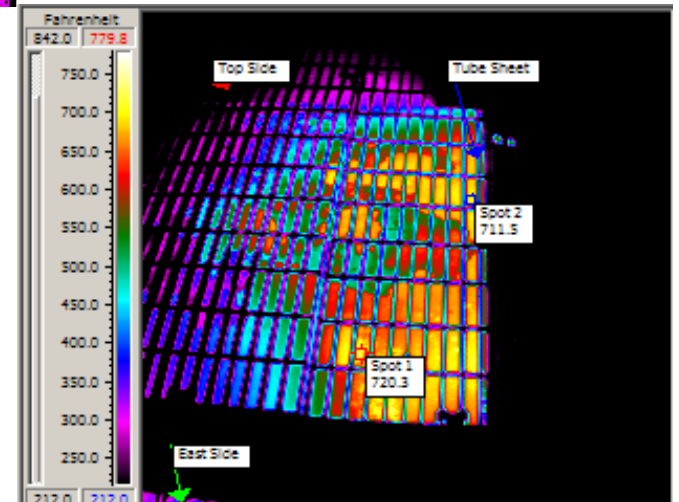
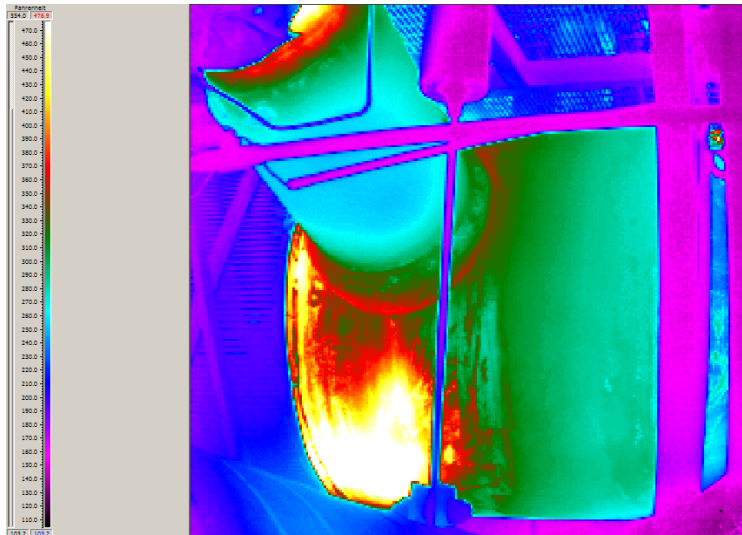


Cold Wall Vessels in Hydrogen Service can be Monitored based on Hydrogen Partial Pressure.



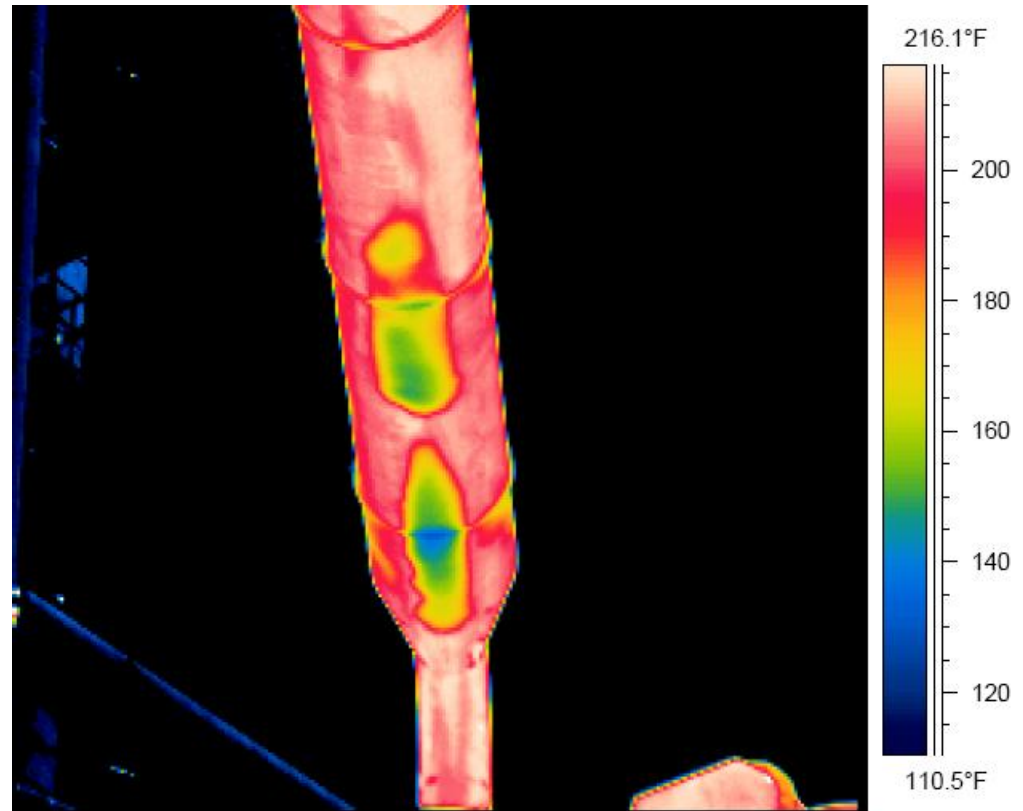
Refractory Lined Waste Heat Exchangers

Refractory Failure



Refractory Lined Piping

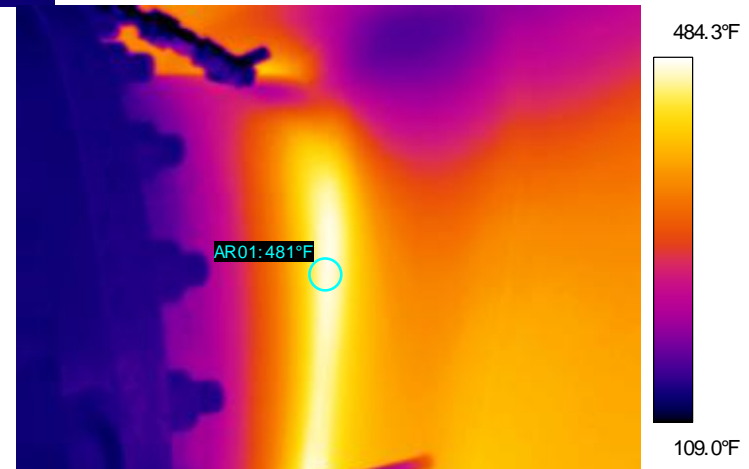
- A trained thermographer needs to be aware of how cold spots can also be a problem.
- This overhead line was condensing behind the refractory causing corrosion and was verified with UT readings.



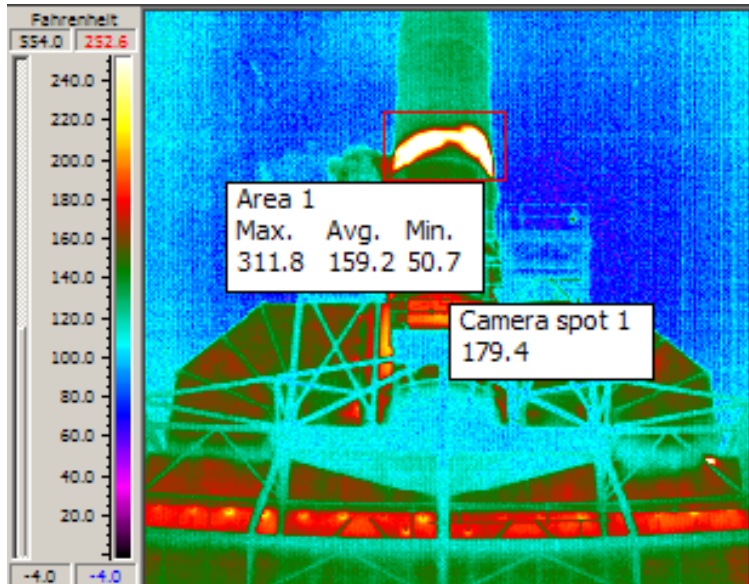
Refractory Lined Piping



**Over head Piping
man-way**

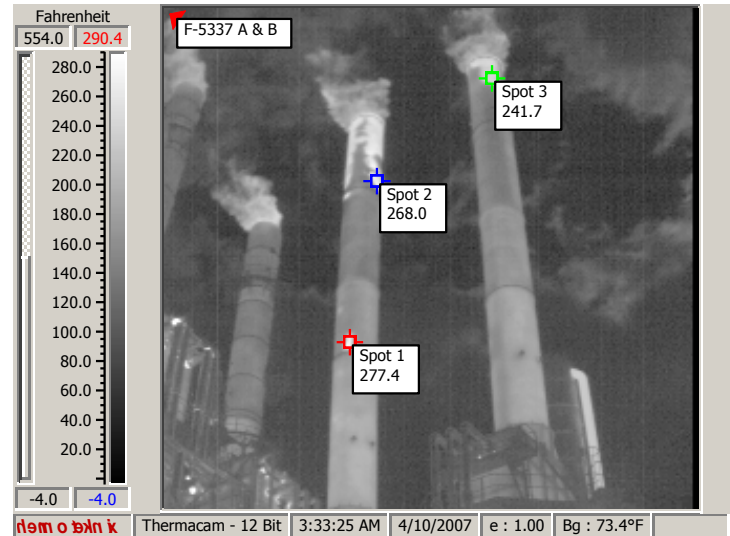


Stack Monitoring

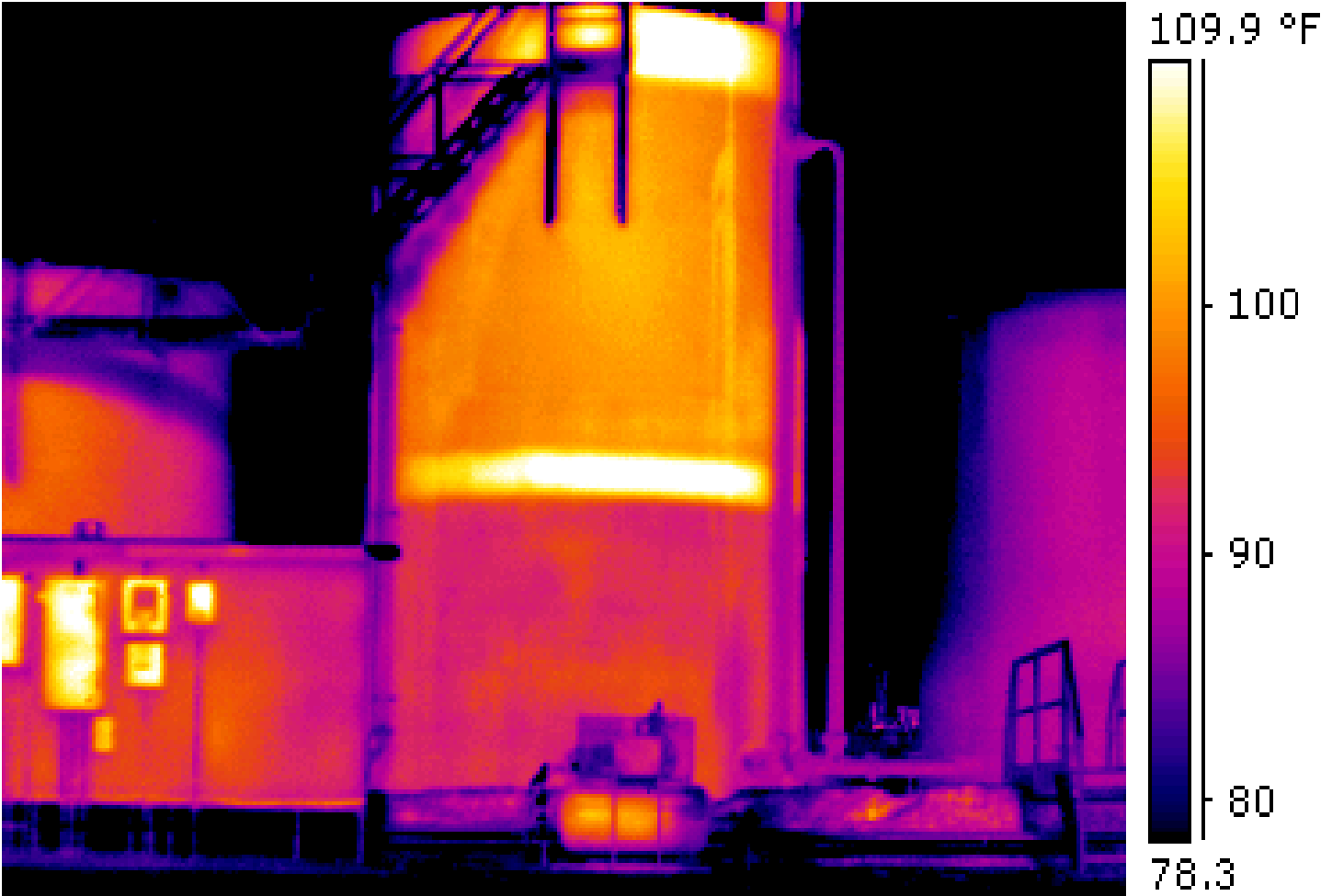


Monitor Refractory Damage

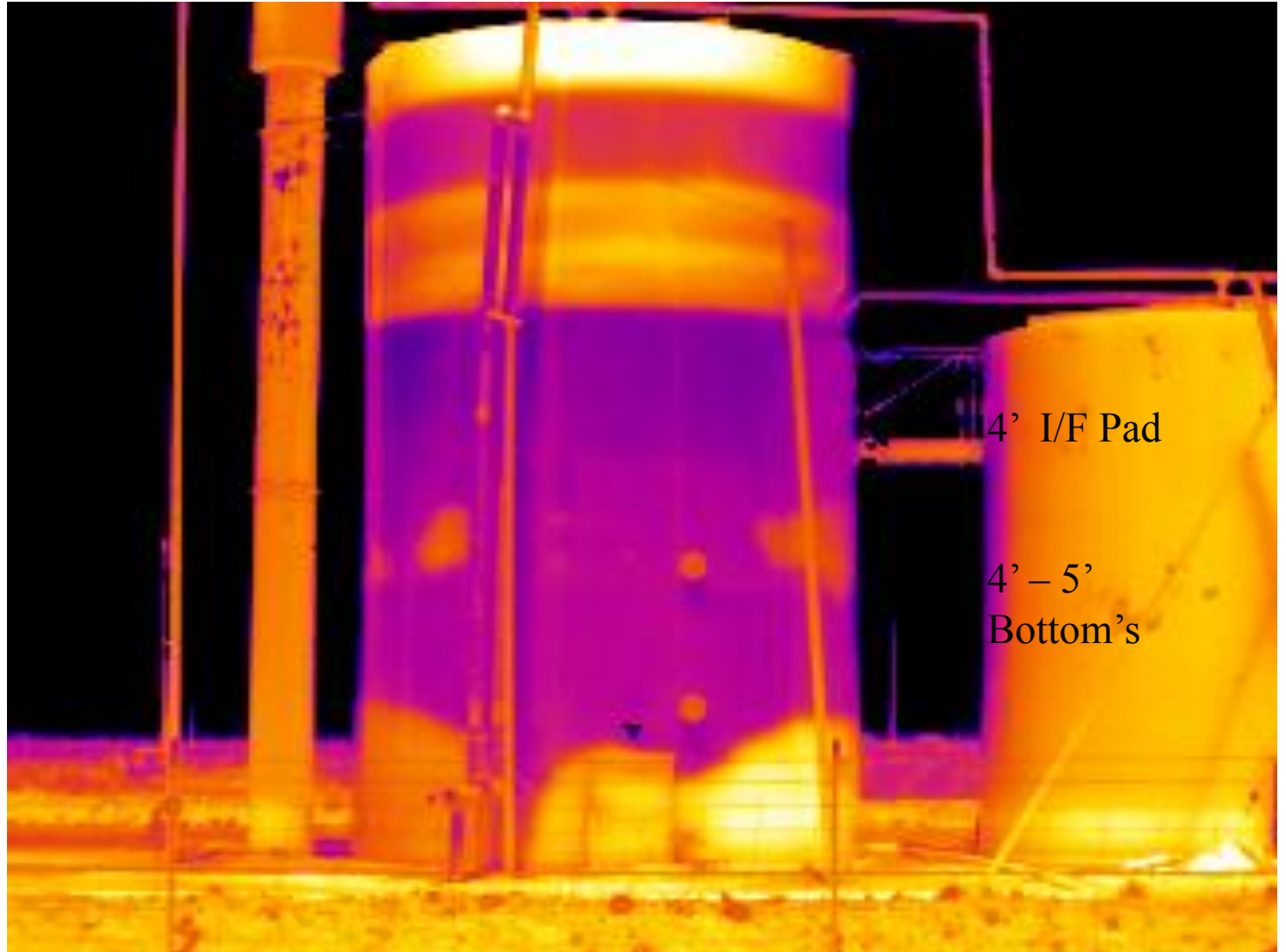
**Monitor Temperatures
Based on metallurgy**



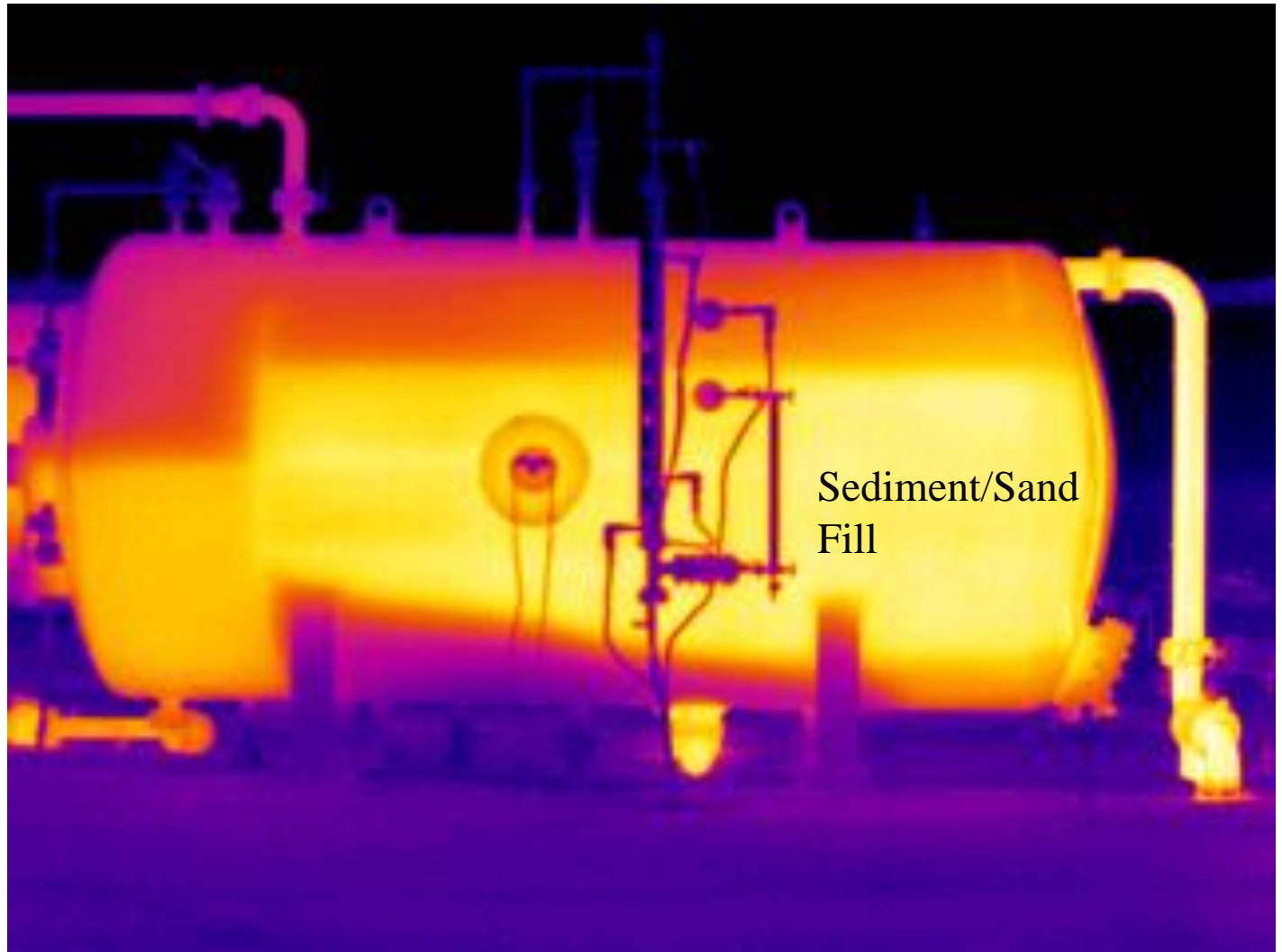
Gunbarrel Water/Oil Capacity Test



Production Gunbarrel



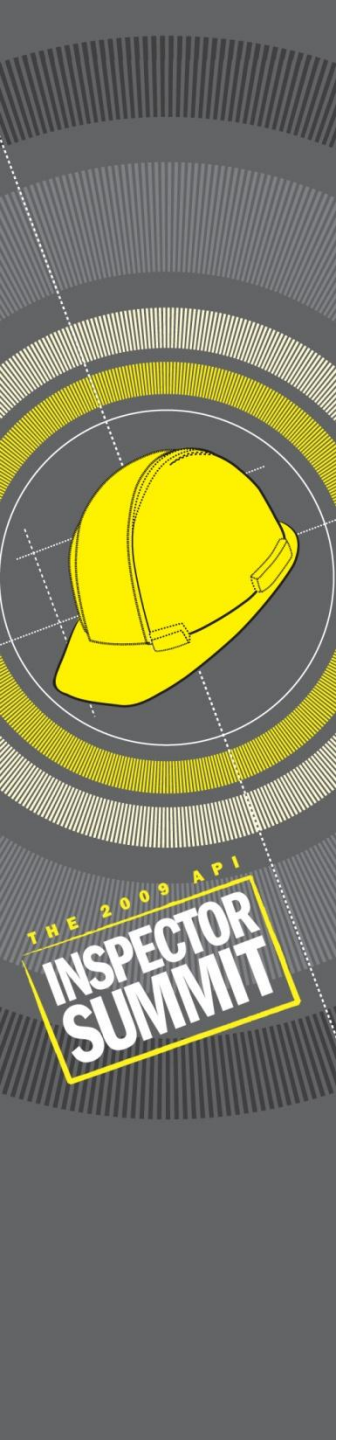
Production Free Water KO



Closing

All of the above inspections were conducted while the plants were online.

- Infrared Inspection is a great tool to use to help identify areas of concern,
- Helps mitigate unplanned down time.
- Helps with shutdown planning.
- Helps with cost control.
- Assist the Inspectors with Inspection plans.



Questions ???

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Chevron Corporation

