



FLUKE®

Reliability

How 'connected' thermography builds sustainable asset health management

Michael A. Watson CMRP, CRL

Accelix™
Webinar Series



Michael A. Watson, CMRP, CRL

Fluke Reliability

- Product Application Specialist at Fluke Corp. (3 years)
- Previously worked at Caterpillar for 30+ years
- Focused on the company's reliability and condition monitoring solutions (Accelix)
- 25+ years of experience in asset management, PM, and reliability



**Certified Maintenance & Reliability
Professional (CMRP)**



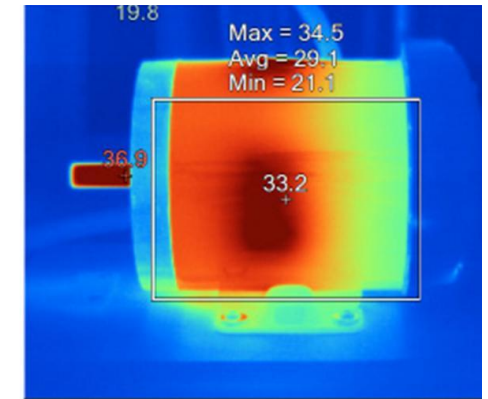
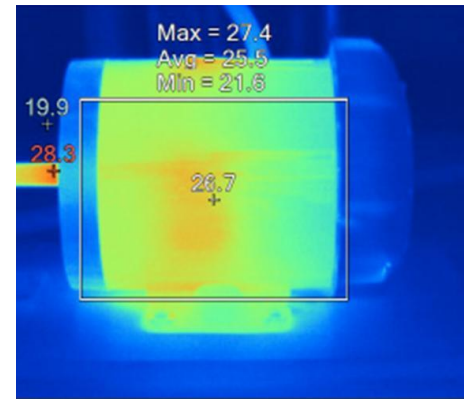
**Certified Maintenance & Reliability
Professional (CRL)**



**Thermal/Infrared Thermography
Level I certified**

Agenda

- Getting started with asset health management
- Program rights
- Qualitative asset screening
- Connected Thermography
- Sustainability
- Q&A



POLL QUESTION No. 1



Are you currently using Thermography in your asset health management?

(Click only one answer)

- Yes, we are
- Not yet, but actively planning to use it in the future
- Still deciding on whether to use it
- No plans to use thermography

The maintenance and reliability journey

Reactive

Corrective work orders after failure

- ✗ Can be expensive
- ✗ Shorter asset life
- ✓ Appropriate for some assets

Preventive

Calendar & meter-based scheduling

- ✓ Increased efficiency
- ✓ Less downtime
- ✗ Can perform too much / too little maintenance



Predictive

Work orders from real-time asset data

- ✓ Increased uptime
- ✓ More productivity
- ✓ Data-driven maintenance decisions

Maintenance-centric

Asset-centric

Disruption in the year 2020



- **82%** of organizations are considering how to add/increase digitalization technologies
- **35+%** of organizations have seen at least a quarter drop in production
- Only **15%** of organizations are operating as “**normal**”
- **80%** of organizations actively determining how, where, and when to use connected data to drive maintenance activity

Asset health management with Connected Thermography



CHALLENGES



- Limited resources for planned maintenance and a desire to move to asset-centric condition-based maintenance
- Asset health management for building envelope, electrical cabinets, electrical motors, and mechanical components

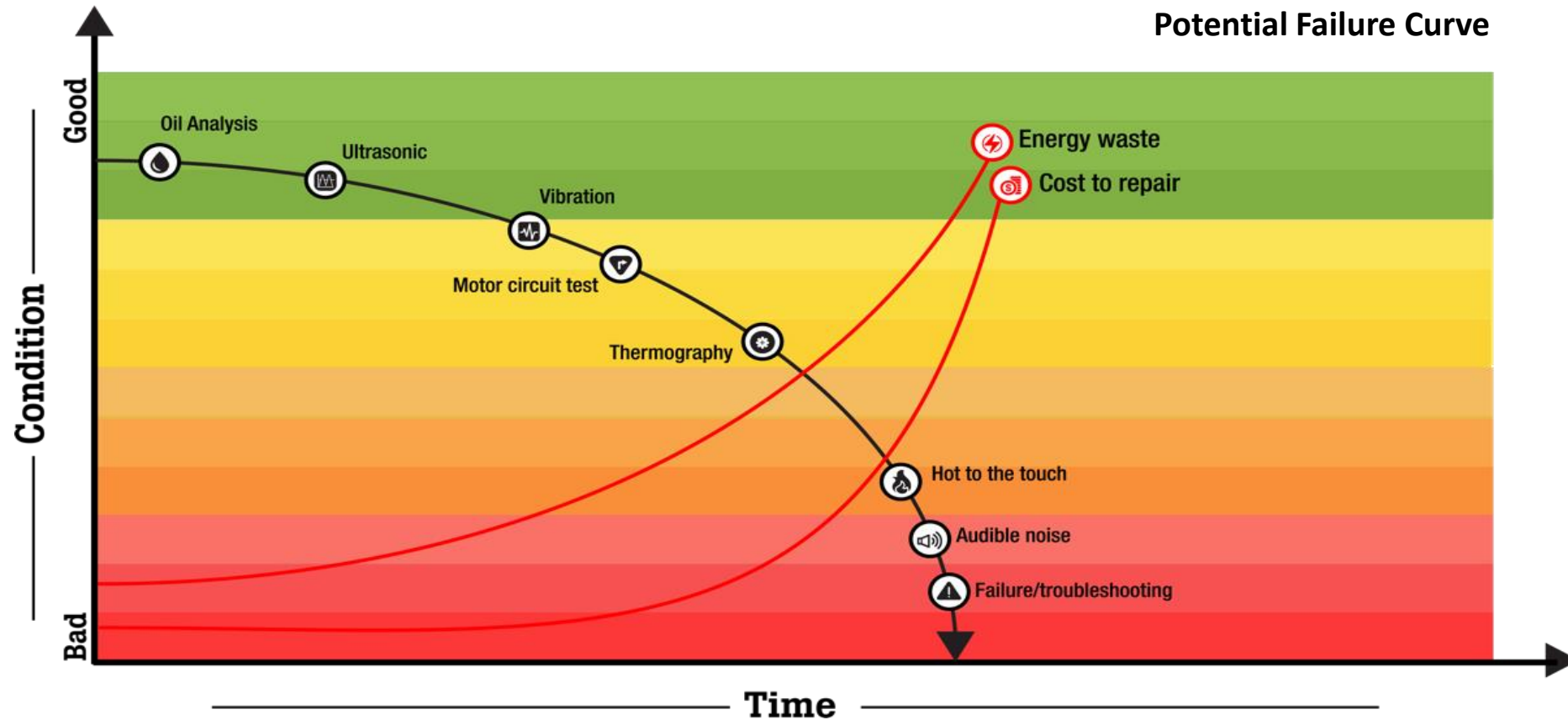
SOLUTION



- People
- Process
- Technology
- Culture

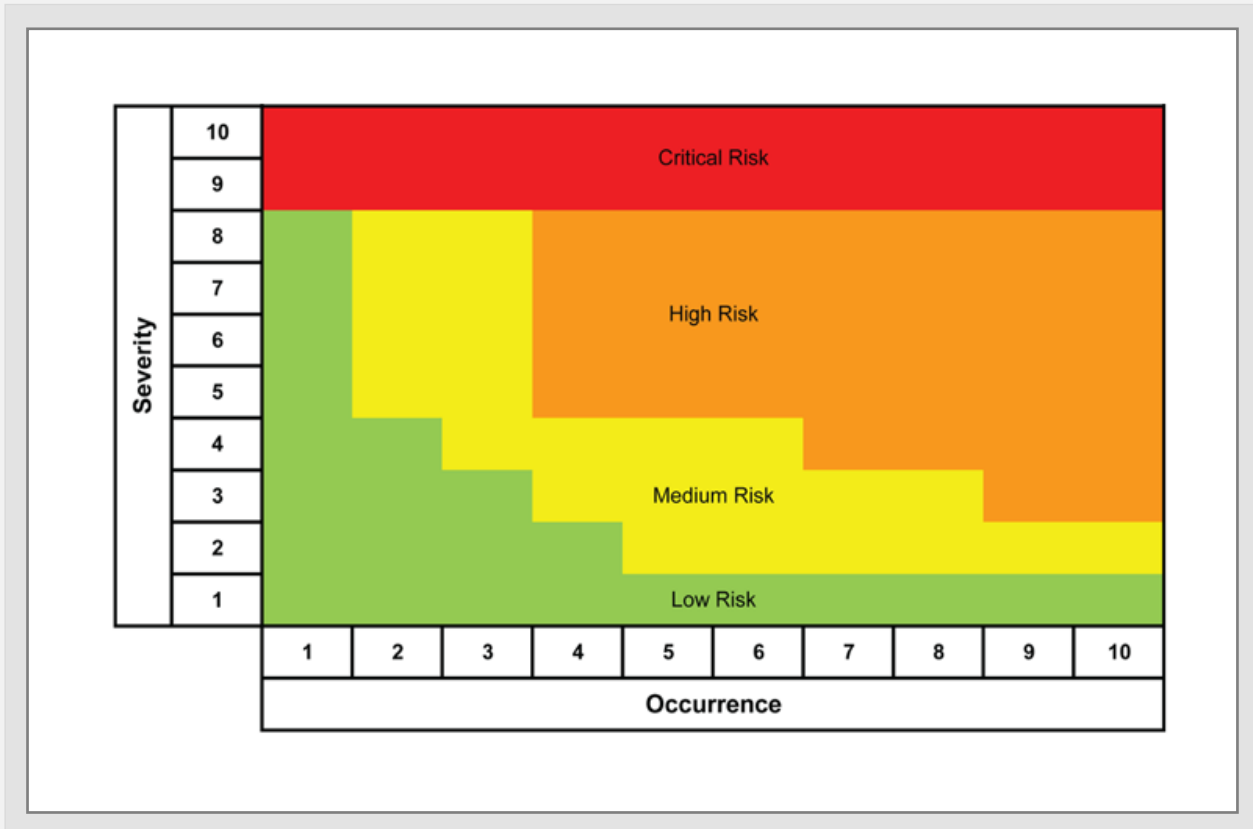
Condition-based maintenance with Thermography

Why Thermography: Multiple failure modes will generate heat as the component degrades. Screening assets on a regular basis provide insight to asset condition



Launching a Thermography program

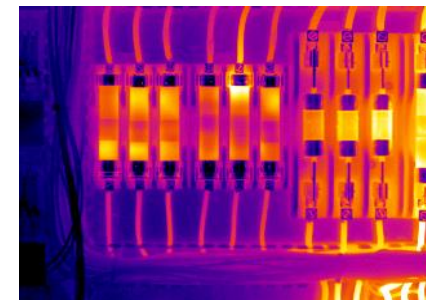
- Asset criticality
- Failure modes
- Technology selection



Picking the right Thermography Camera

An in-focus image is needed to see details and accurately measure temperatures— both of which are critical in identifying asset health.

- Distance – accessibility
- What is object size of the component
- Safety – PPE
- Fixed, manual, or auto focus
- Image storage
- Software for reports



Fluke technology: full range of camera choices

TiS20+ IR Camera



- 120 x 90 IR resolution
- 752F Max temperature
- D:S 130:1 0.2" @ 5 ft
- Fixed Focus
- FC Connect
- MSRP \$1749

Ti401 PRO IR Camera



- 640 x 480 IR resolution
- 1202F Max temperature
- D:S 1065:1 0.06" @ 5 ft
- Laser sharp Auto Focus
- FC Connect
- MSRP \$6999

TiS60+ IR Camera



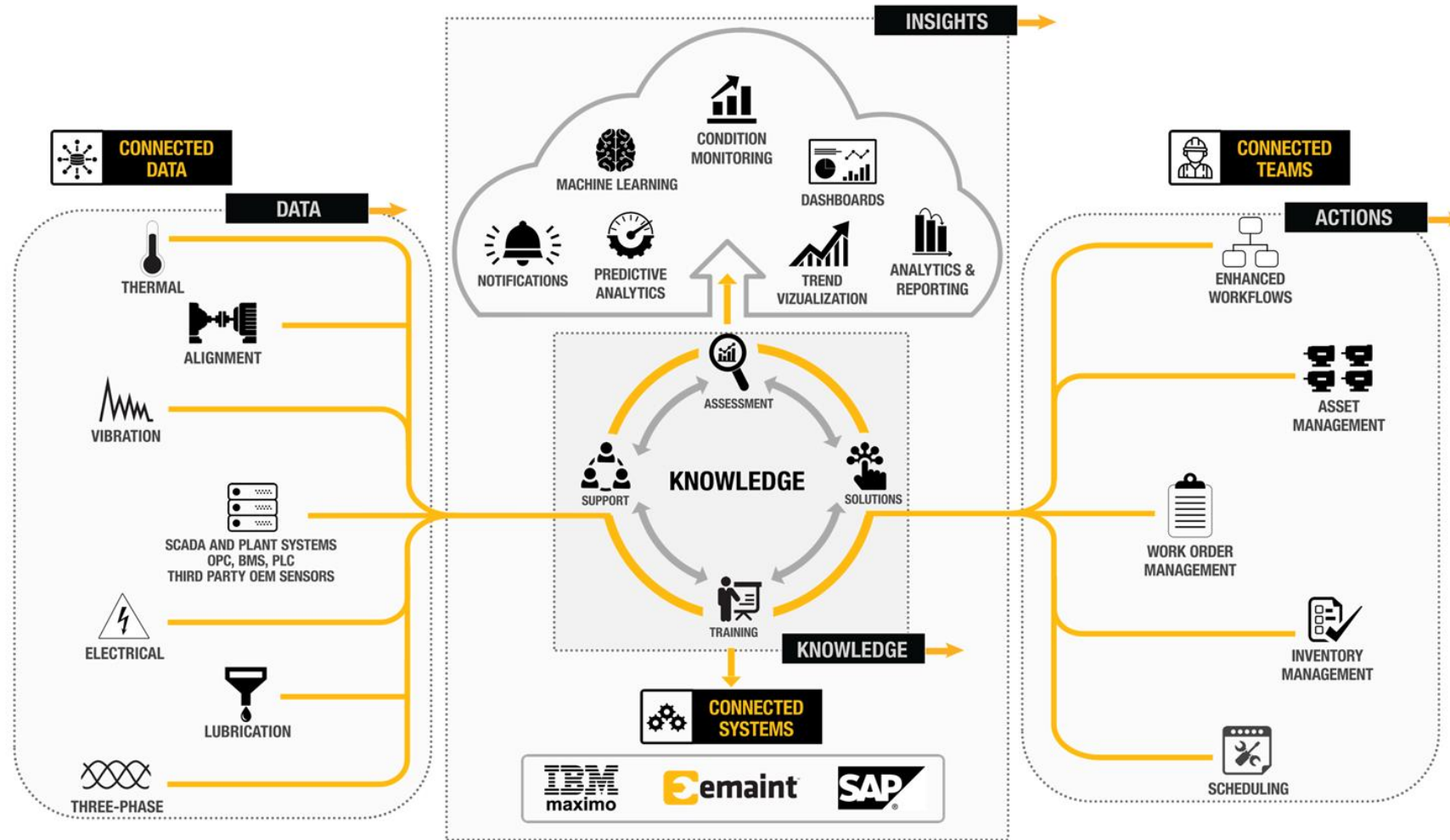
- 320 x 240 IR resolution
- 752F Max temperature
- D:S 532:1 0.12" @ 5 ft
- Fixed Focus
- FC Connect
- MSRP \$3499

Ti480 PRO IR Camera



- 640 x 480 IR resolution
- 1832F Max temperature
- D:S 1065:1 0.06" @ 5 ft
- Multi sharp Auto Focus
- FC, Video capable
- MSRP \$9999

Our Connected Reliability ecosystem



Enabling the Right Actions on the Right Assets at the Right Time

People and processes of Fluke Connected Thermography



People

- Level II trained Reliability Engineer
- Trained Maintenance Technicians

Route Based Asset Screening

- Detailed Work Order
- Standard Work description and Procedures
- Markings on Assets

Comparative Review

- Baseline and compare to nameplate rating
- Alert with 10C increase, and Alarm with 20C increase

Build a program and scale

Standard work in asset health management

- Detailed work order
- Standard procedures

- Ensure repeatability
 - Mark assets for Ti
 - Mark location

- Camera settings
- Emissivity
 - Paint marker on asset

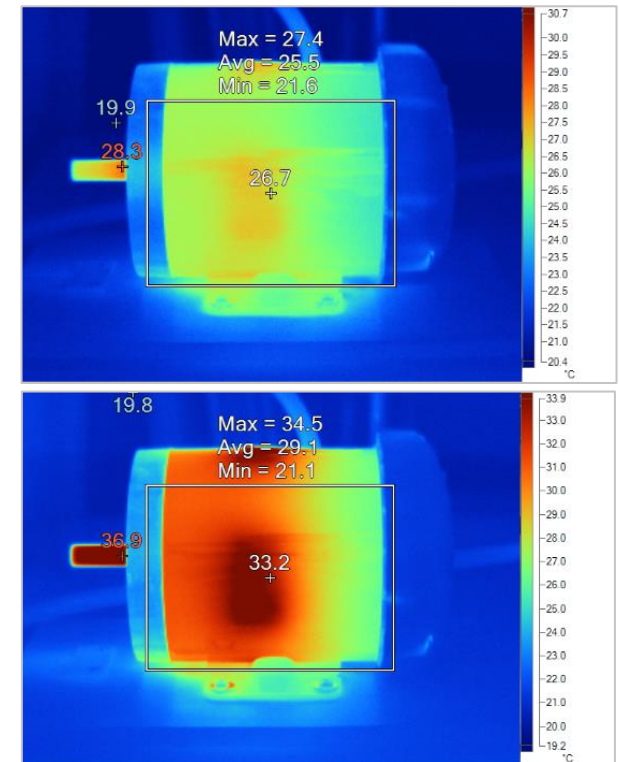
- Tag image with asset ID and work order



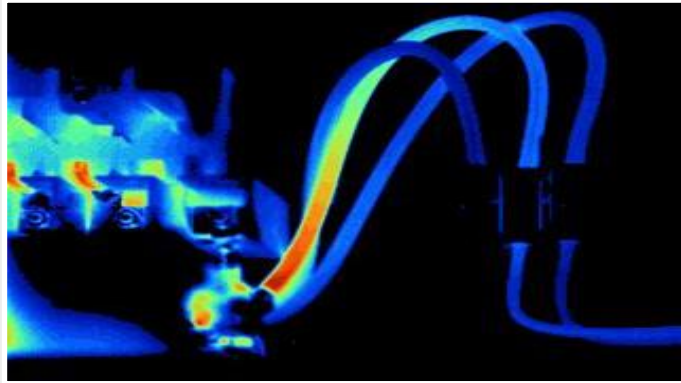
Baseline asset condition

Quickly measure and compare thermal condition for each asset in the inspection route without disrupting operations

- Measure bearing temperatures in motors or rotating equipment
- Identify “hot spots” in electronic equipment
- Identify leaks in sealed vessels
- Identify faulty insulation in process pipes or other insulated processes
- Find faulty terminations in high power electrical circuits
- Locate overloaded circuit breakers in a power panel
- Identify fuses at or near their current rated capacity
- Identify problems in electrical switchgear
- Capture process temperature values



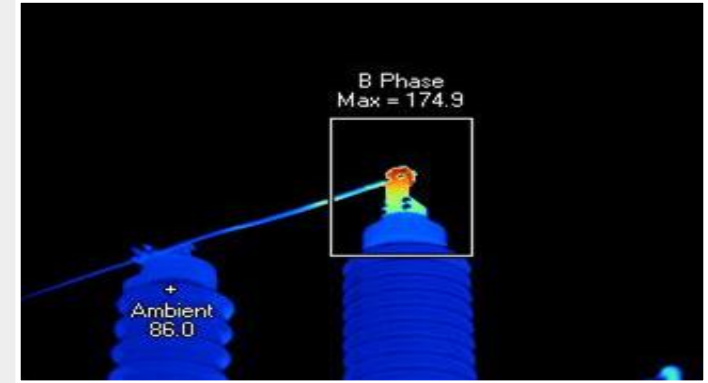
Electrical applications for infrared



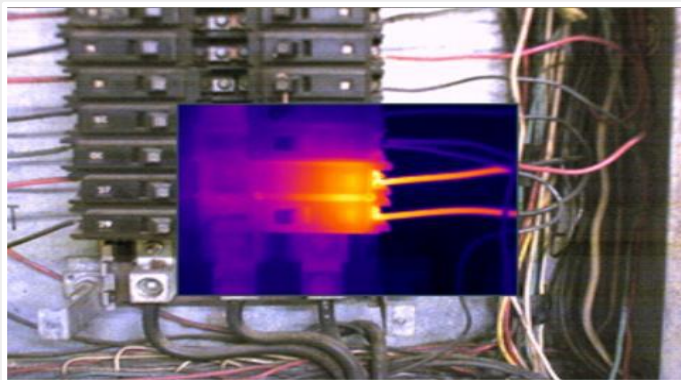
Hot phase



Motor control center



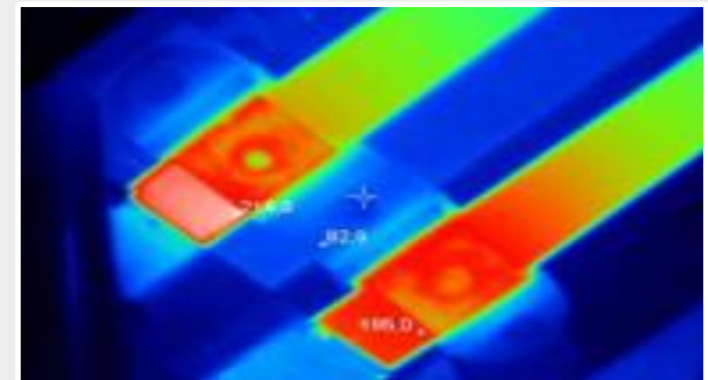
Substation



Lighting circuit



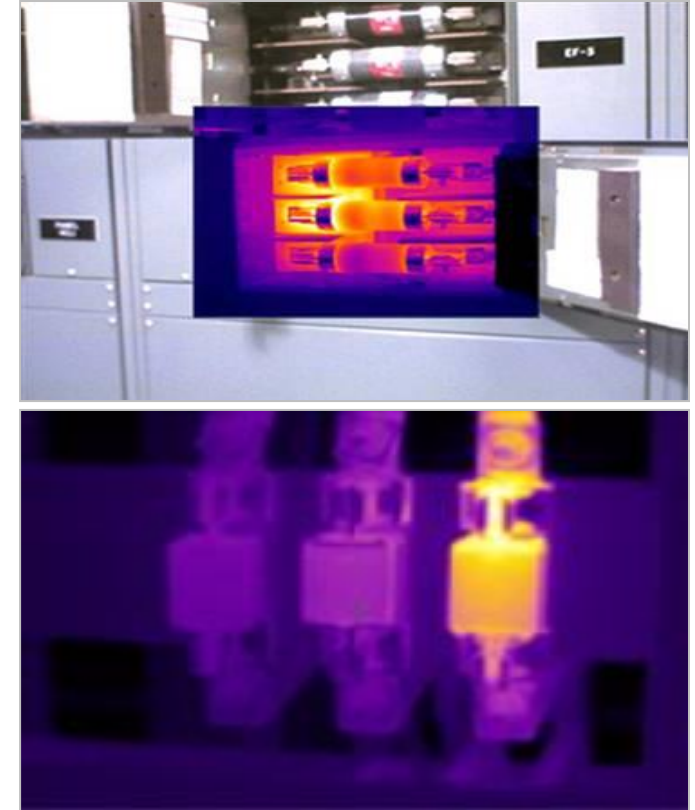
Fuse disconnect



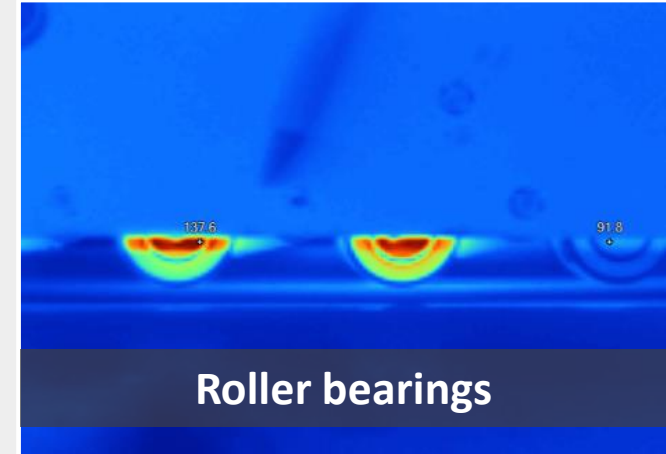
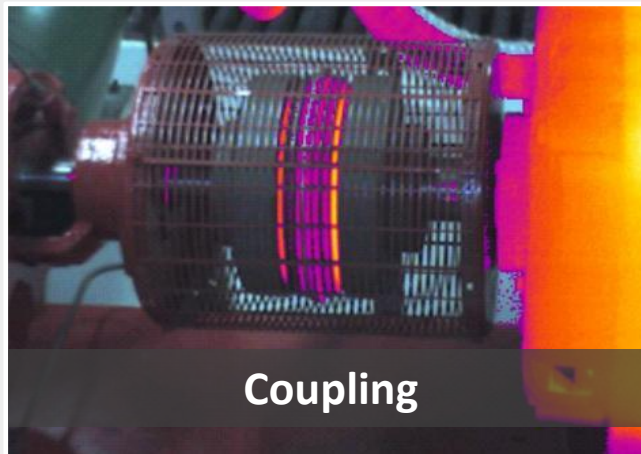
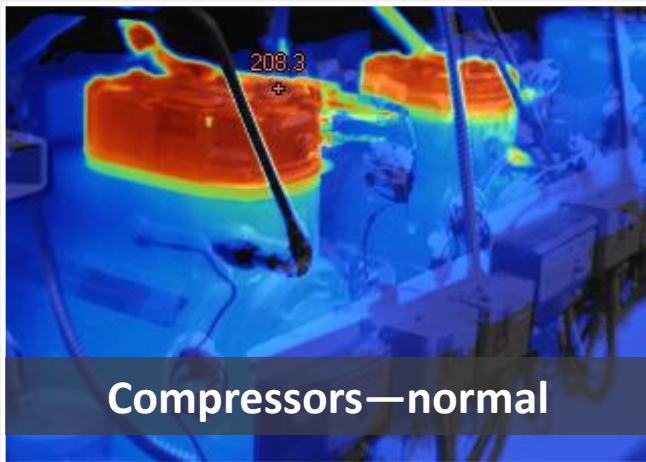
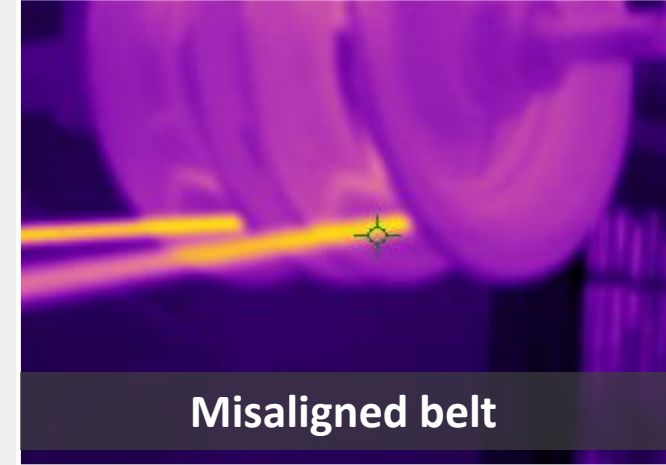
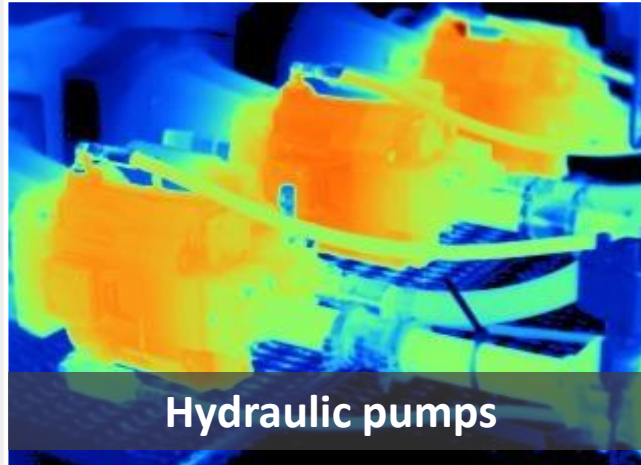
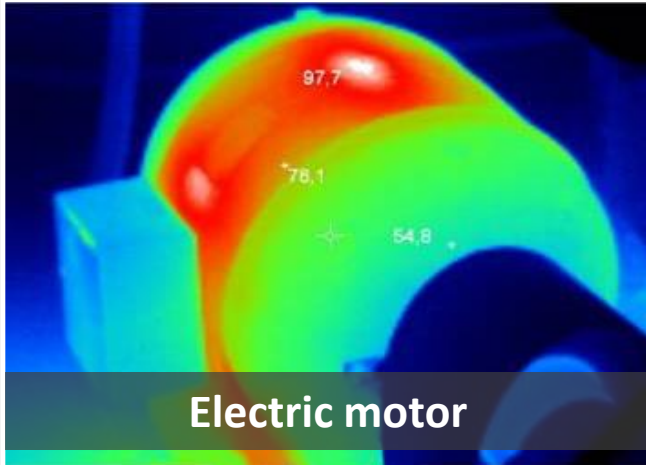
Bus

Causes of electrical hot spots

- Unbalanced loads
- Harmonics (third harmonic current in neutral)
- Overloaded systems/excessive current
- Loose or corroded connections increased resistance in the circuit
- Insulation failure
- Component failure
- Wiring mistakes
- Underspecified components



Mechanical applications for infrared



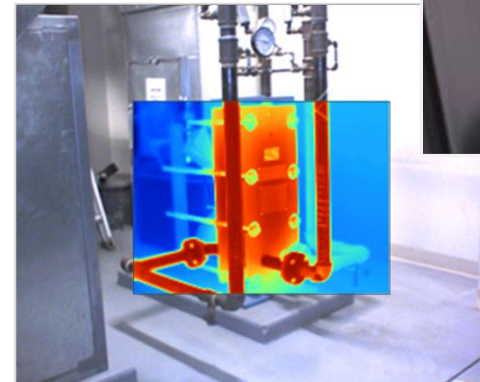
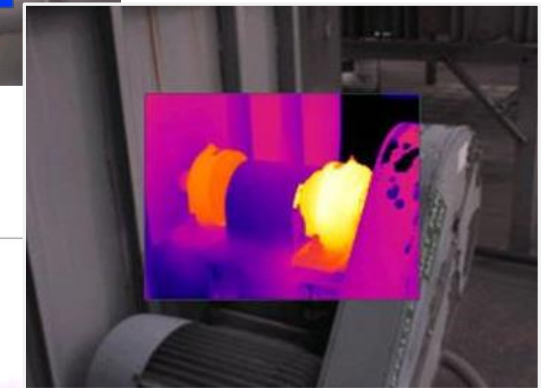
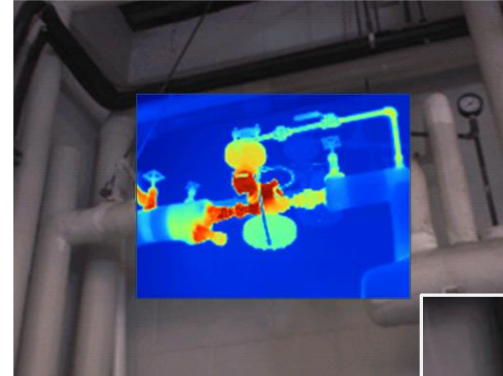
Mechanical hot spot and issues

Commonly inspected components

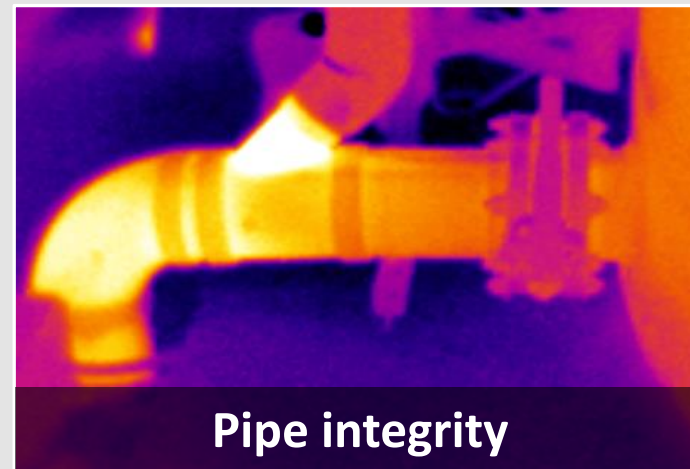
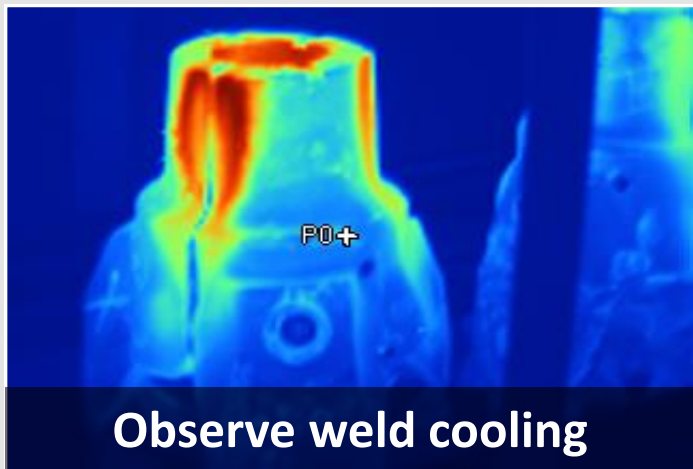
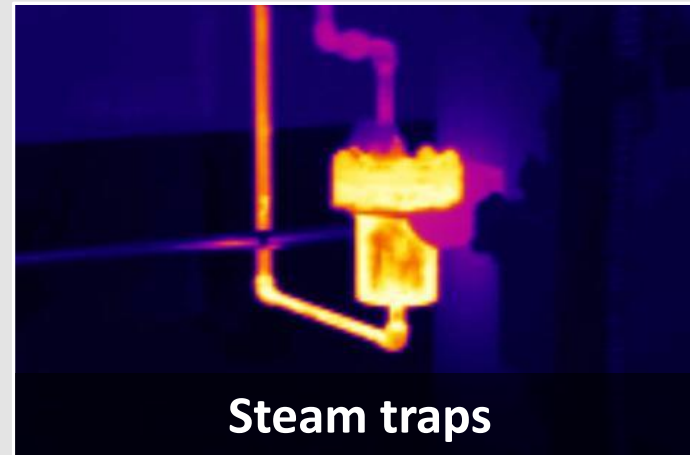
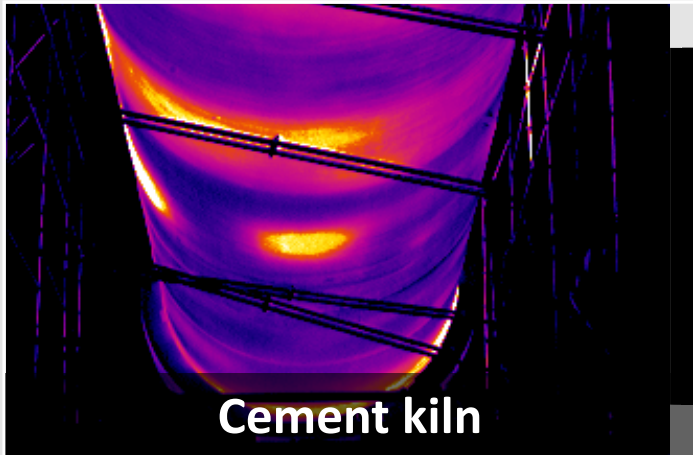
- Motors
- Pumps
- Heat exchangers
- Steam traps
- Conveyors

Typical reasons for temperature hotspots or deviations

- Bad cooling -- due to reduced airflow
- PQ problems -- unbalance, overload, harmonics
- Bearings/misalignment
- Motor windings – insulation resistance
- Undersized components



Process applications for infrared



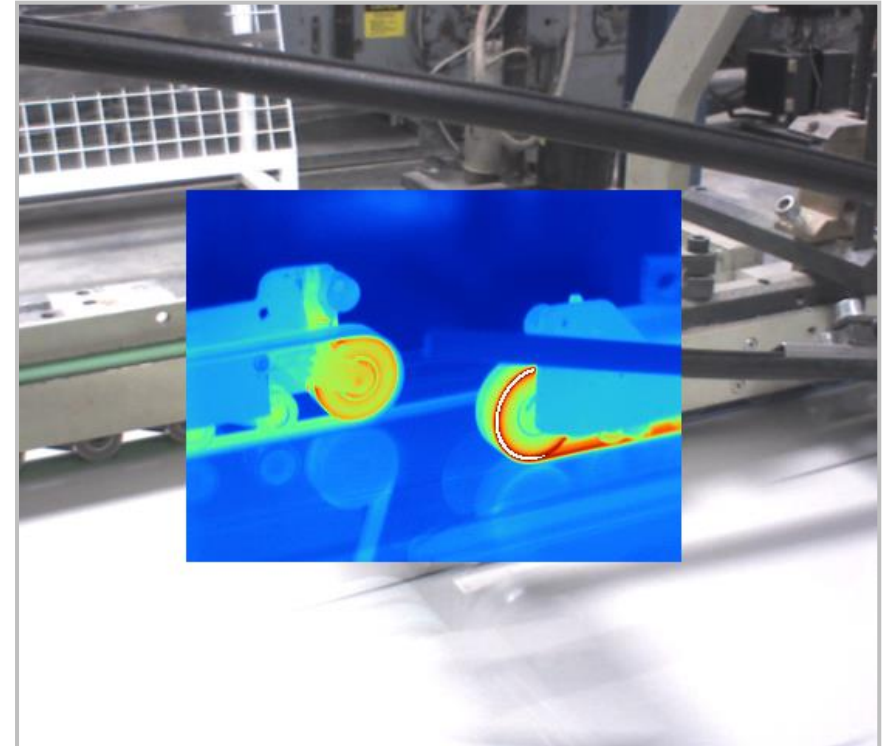
Process hot spot and issues

Commonly Inspected Components

- Refractory insulation
- Tanks and vessels
- Steam systems/traps
- Pipes and valves
- Heaters/furnaces
- Manufacturing equipment
- Boilers and reactors

Typical Reasons for Temperature Hotspots or Deviations

- Damaged structures caused by worn pipes, etc.
- Abnormal heat flow/heat gradients
- Gas or steam leakage
- Failed components
- Corrosion



Managing data and reports



All Fluke Infrared Cameras are Fluke Connect

- Cloud storage of images. Save it / Share it across organization
- Access images on any device using automatic FC cloud storage
- IR PhotoNotes voice or text notes attached to image
- Capture Digital and Infrared Image at once

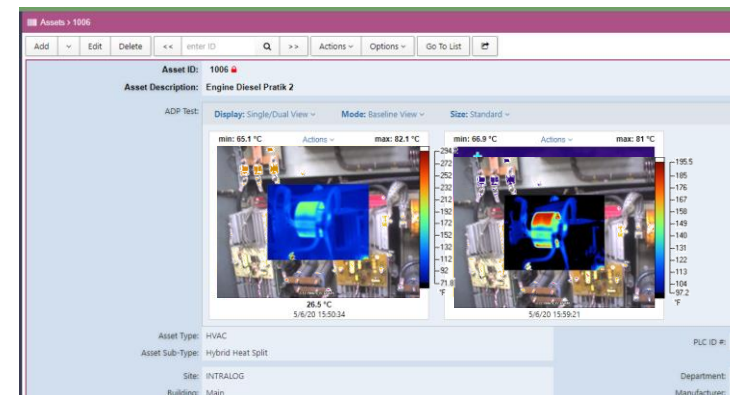
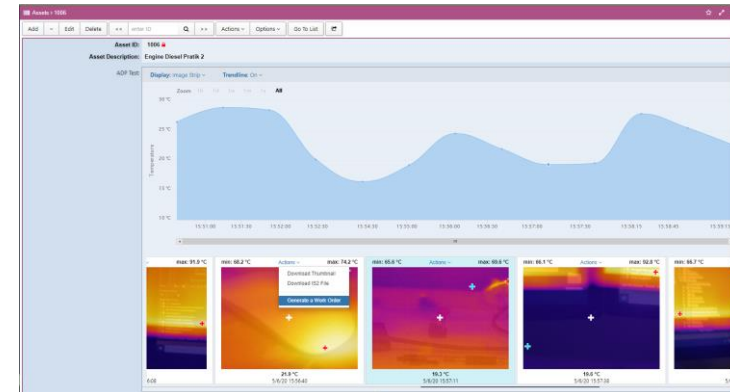
FC Desktop software for Analysis and Reports

- FC Desktop Templates to drive report standardization
- Easily edit and optimize images to visualize equipment status
- Organize images and search by asset, severity, and title

Fluke Connected Thermography data in eMaint CMMS

Fluke connected data with integration into eMaint CMMS enables qualitative asset health management.

- **Asset Health View with Ti Images**
 - History view of image thumbnails
 - Trend line graph of centerpoint temperature
 - Dropdown: Download image, or thumbnail
 - Action: Generate corrective work order
- **Thermal Images in Asset View**
 - Single image in asset view
 - Dual image of two most recent images
 - Most recent image and baseline image



Asset Health Management with Connected Thermography



Connected Data Workflow

- **Schedule route based thermal measurements** of all critical equipment in order to capture thermal problems
- **Integrate/Upload measurements** in Fluke Connect Cloud software
- **Provide a detailed report of thermal images** captured during asset screening and provide actionable results for the maintenance team
- **Develop asset health knowledge and continuously improve**

Outcomes – avoid costly downtime by:

- Capturing “hot spots” during regular PM routes
- Extending the life of equipment
- Eliminating a misdiagnosis

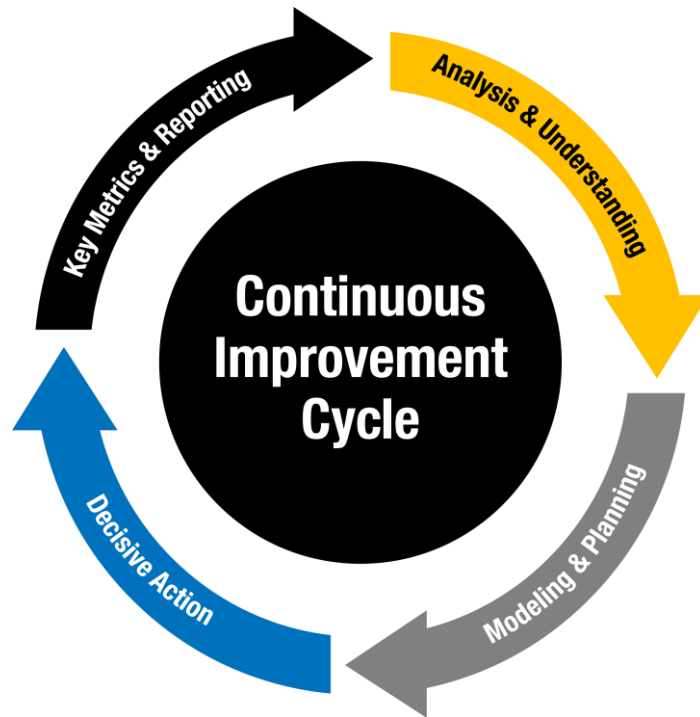
POLL QUESTION No. 2



What is the biggest barrier you're facing in growing your asset management program? **(Click only one answer)**

- Lack of resources
- Lack of expertise in putting together such a program
- Lack of effective change management
- Complications because of the COVID-19 pandemic
- Something else

Making the Connected Thermography program *sustainable*



- Build a program and scale
- Standard work
- Visual management
- Ensure repeatability
- Sustain with continuous improvement

QUESTIONS?



Thank you!

Michael A. Watson

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Fluke Reliability

Next webinar: Best Practice Guide to Condition Monitoring and Vibration Analysis

BEST PRACTICE WEBINAR | Wednesday, Nov. 11, 11 a.m. ET

Best Practice Guide to Condition Monitoring and Vibration Analysis

Condition monitoring and vibration analysis are separate processes, but both are vital indicators of machine health and require the collection of accurate data to analyze issues and trends.

Colin Pickett is a consultant and former Prüftechnik engineer with 35 years of reliability and vibration analysis experience. He takes us through these processes, describes what to expect, and addresses how to handle potential roadblocks and snags to get readings and measurements you can trust.



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Date: Nov. 17-19, 2020



Place: Where you are!



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Xcelerate20 Virtual is your source for premium maintenance and reliability training, innovation and education. Join fellow maintenance professionals working toward improved reliability.

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DEMO

Visit [Accelix.com](https://www.accelix.com) for a free demo of our Connected Reliability Framework.



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