



Step guide to integrating thermal imaging in preventive maintenance programs

Heat is often an early symptom of equipment damage or malfunction, making it important to monitor in preventive maintenance programs. Using thermal imaging preventive maintenance regularly to check the temperature of critical equipment allows you to track operating conditions over time and quickly identify unusual readings for further thermography inspections.

By monitoring equipment performance and scheduling maintenance when needed, these facilities reduce the likelihood of unplanned downtime due to equipment failure, spend less on “reactive” maintenance fees and equipment repair costs, and extend the lifespan of machine assets.

Here’s the trick: to save money, preventive maintenance should not create excessive additional maintenance efforts. The goal is to transition maintenance resources away from emergency repairs and into scheduled inspections of key equipment. Inspections take less time than repairs, especially if done with a thermal camera.

Return on investment and cost savings

Studies by the Federal Energy Management Program (FEMP), estimate that a properly working preventive maintenance program can lead to savings, to the tune of 30 to 40%. Other independent surveys show that, on average, sustaining an industrial preventive maintenance program results in savings:

- Return on investment: 10 times
- Reduction in maintenance costs: 25 to 30%
- Elimination of breakdowns: 70 to 75%
- Reduction in downtime: 35 to 45%
- Increase in production: 20 to 25%

You can share this information with your supervisor or clients. To calculate the savings at a facility, estimate the costs of unplanned equipment failures. Then factor in human resources, costs for parts, and lost revenue from specific production lines. It would be wise for the maintenance manager to keep a record of machine asset availability, production output, and the distribution of maintenance dollars and total maintenance costs over time. Those numbers will help you calculate the return on your thermal imaging and maintenance investment.

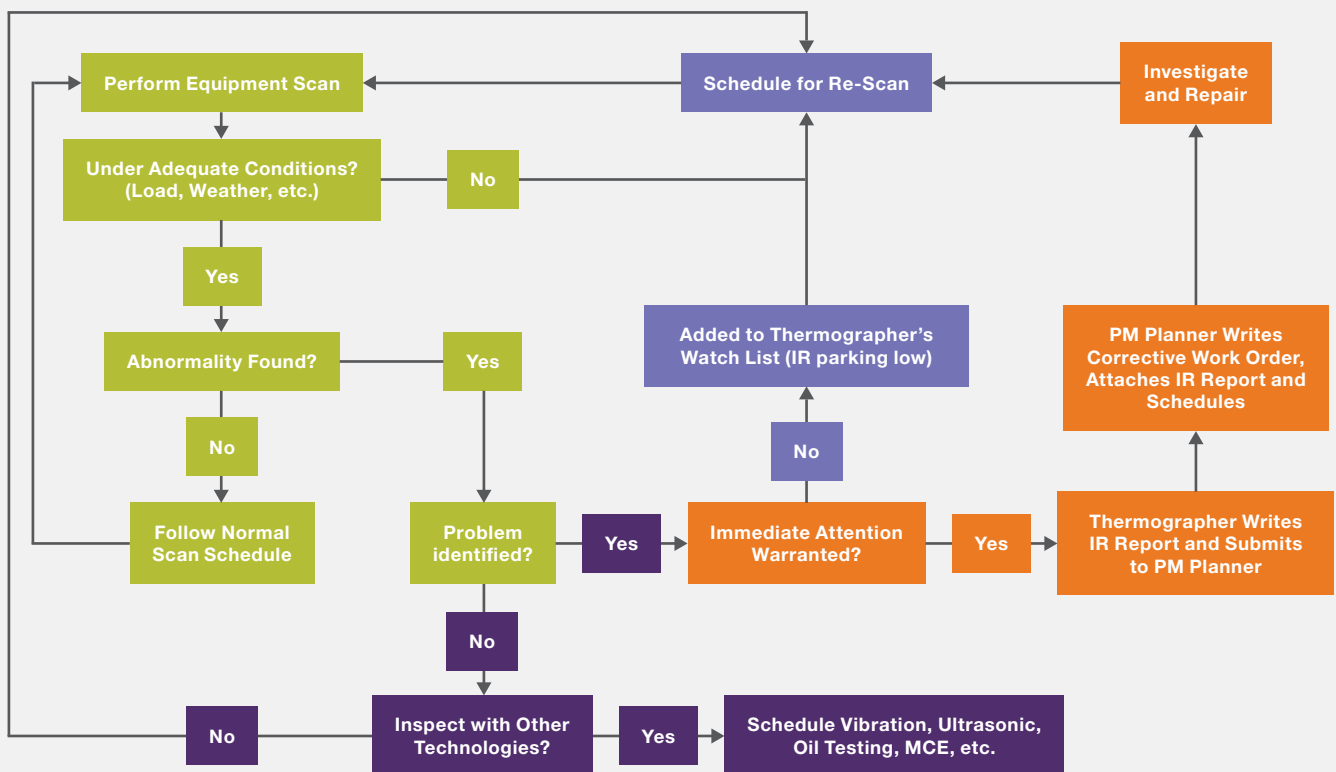
Integrating thermography into preventive maintenance

Thermal cameras are often the first inspection tool a technician thinks to use as part of their preventive maintenance program. They can swiftly measure and compare heat signatures for all equipment on the inspection route, all without interrupting operations.

If the temperature is noticeably different from previous readings, facilities can then use other maintenance technologies—vibration, motor circuit analysis, airborne ultrasound, and lube analysis—to investigate the source of the problem and determine the next course of action.

For best results, integrate all your maintenance technologies into the same computer system, so that they share the same equipment lists, histories, reports and work orders. Once the infrared data is correlated with data from other technologies, the actual operating condition of all assets can be reported in an integrated format.

IR Inspection Process



Applications

- Monitor and measure bearing temperatures in large motors or other rotating equipment
- Identify “hot spots” in electronic equipment
- Identify leaks in sealed vessels
- Find 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 switch gear
- Capture process temperature readings

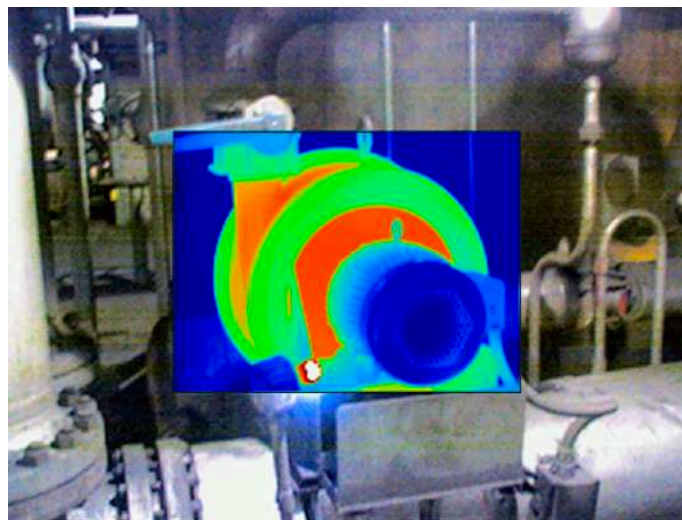
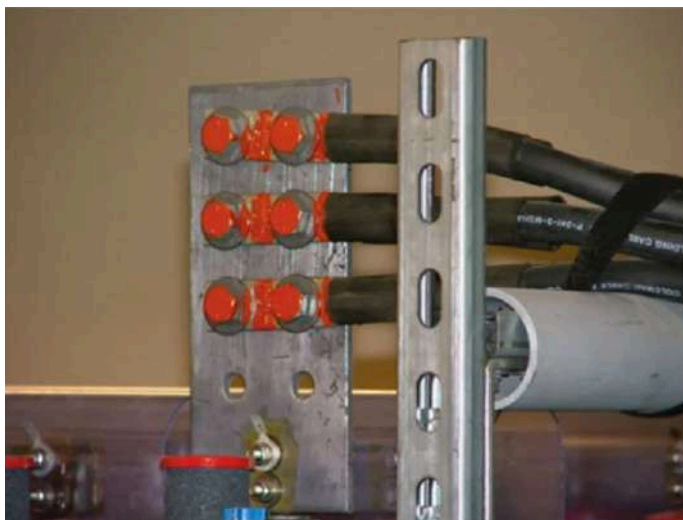
Inspection process

1. Use existing lists of equipment from a computerized maintenance management system (CMMS) or another inventory tool.
2. Eliminate items that aren't well suited for infrared measurement.
3. Review maintenance and production records. Prioritize key equipment that is prone to failure or often causes production bottlenecks.
4. Use a database or spreadsheet to group the critical equipment together, either by area or function, into roughly 2- to 3-hour inspection blocks.
5. Use your thermal camera to capture baseline images of each piece of critical equipment. Note: on some pieces of equipment, you may want to regularly capture multiple thermal images of key components or subsystems.
6. Download the baseline images into software and document your route with location descriptions, inspection notes, emissivity and RTC levels and alarm levels if appropriate.
7. When the next inspection is due, if your imager supports uploading, simply load the previous inspection images onto the camera and follow the onscreen prompts.

Measurement guidelines

To capture the best thermal images, follow these best practices:

- Verify that the target system is operating at a minimum 40% of load (lighter loads don't produce much heat, making it hard to detect problems)
- Get close to your target and don't “shoot” through doors, especially not through glass. When safety procedures allow, electrical enclosures must be opened, or infrared windows or viewports utilized
- Account for wind and air currents. These powerful convective forces cool the abnormal hot spots, often below the threshold of detection
- Account for ambient air temperatures, especially outdoors. In hot weather, the sun can heat up equipment while cold weather can mask the effects of overheating components
- Not all problems are hot! Blown fuses and restricted flow in cooling systems are just two examples of situations where a problem is indicated by a cooler than normal signature. In other cases, a cold component is abnormal due to the current being shunted away from the high-resistance connection. Thermographers must understand how a machine works and what its heat-related failure signatures are
- Consider sources for reflective infrared radiation. Items that have shiny reflective surfaces and are emissive will reflect infrared energy from other nearby objects, including the sun. This can interfere with target temperature measurement and image capture
- Unpainted metals are difficult to measure. To improve measurement accuracy and repeatability, consider affixing “targets,” typically paper stickers, electrical tape or painted spots, to such components
- Accumulate both numeric temperatures and thermal images, to facilitate long-term data analysis. Temperature trends will show you where to investigate more and where inspections can be less frequent
- Once you have a database of baseline images, associate an alarm temperature with each one. Upload the most recent version onto your camera before each inspection. If the alarm goes off when you take the new measurement, that indicates a significant change in temperature that needs to be investigated



(Left) With proper conditions, including direct access and normal loads, problems like this high resistance connector are often easy to locate. (Right) The upper bearing on the far motor is failing, causing the entire motor to overheat. (Photo courtesy Greg McIntosh, Snell Infrared Canada)

Inspecting motor bearings

Checking motor bearings is a relatable example. Start with a newly commissioned and freshly lubricated motor and take a “snap shot” of the motor bearing housing while the motor is running. Use this image as a baseline.

As the motor and its lubrication ages, the bearings become worn and heat-producing friction develops in the motor bearing, causing the outside of the bearing housing to heat up. Take additional thermal images at regular intervals, comparing them to the baseline to analyze the motor’s condition. When the thermal images indicate an overheating bearing, generate a maintenance order to replace or lubricate the bearing housing and reduce or eliminate the possibility of costly engine failure.

Spotting leaky seals and gaskets

Finding leaks in sealed vessels is a “snap” when using thermal cameras. Most leaks develop in or around a gasket or seal. Less often, corrosion will cause a weakness to develop and rupture the vessel.

Either way, a thermal camera can diagnose the problem. To find a leaky gasket or seal, scan the imager along the seal looking for thermal eccentricities. A large change in temperature along the seal or gasket indicates a loss of either heat or cold—the “signature” of a failure.

Find out more at thermofisher.com.au/fluke

Authorised distributor

Order Placement:

For customer service, call 1300-735-292
To fax an order, use 1800-067-639
To email an order, ordersau@thermofisher.com

Contact Us:

For customer service, call 1300-735-292
For service and calibration, call 1300-736-767
To order online: thermofisher.com.au

ThermoFisher
SCIENTIFIC

FLUKE®

This publication is reproduced by Thermo Fisher Scientific with the permission of Fluke Corporation™