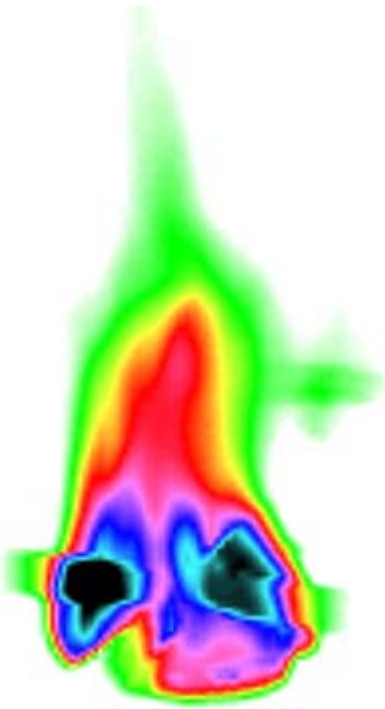
coldcurve

ELECTRICAL DESIGN

Thermography Services



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THERMAL SURVEYING

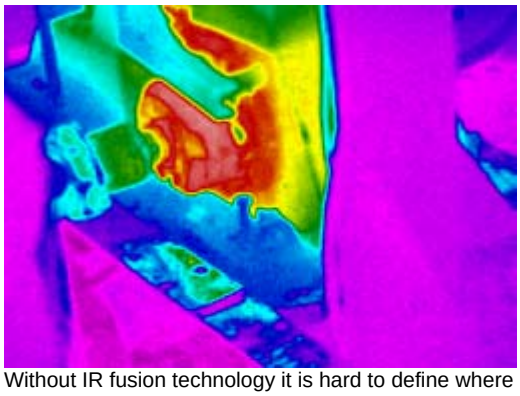
Temperature changes can indicate problems in many everyday applications and a thermal imager makes it quick and easy to visually check surface temperatures. Often problems can be discovered before the item malfunctions and causes a breakdown which stops production.

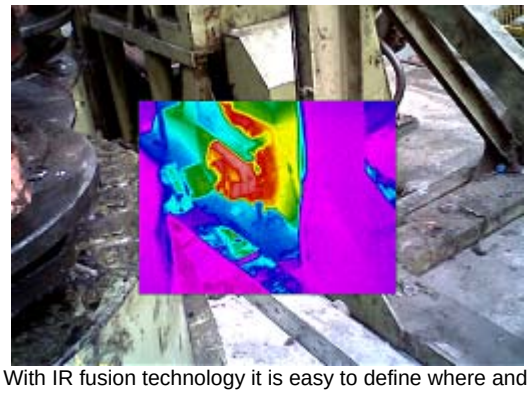
This allows planned time out with production to be set aside for preventative maintenance, inspection and testing.

Such preventative actions are important because when a critical system fails, it inevitably increases costs, requires the reallocation of workers and material, reduces productivity and, if not corrected, can threaten corporate profit-ability and, possibly, the well being of employees, customers and/or clients.

What is thermography?
A very impressive technology, thermography is a type of infrared imaging science. Thermographic cameras detect radiation in the infrared range of the electromagnetic spectrum and produce images of that radiation, called thermograms. Since infrared radiation is emitted by all objects based on their temperatures, according to the black body radiation law, thermography makes it possible to "see" one's environment with or without visible illumination. The amount of radiation emitted by an object increases with temperature, therefore thermography allows one to see variations in temperature. When viewed by thermographic camera, warm objects stand out well against cooler backgrounds; humans and other heat sources become easily visible against the environment, day or night. As a result, thermography's extensive use can historically be ascribed to the military and security services. This technology is now being extensively used in industry for many different applications and maintenance.

IR-Fusion technology
IR-Fusion technology simultaneously captures pixel-for-pixel infrared and visible light images and allows full image optimization. This allows to us to create a image that is blended with the IR image to allow very accurate analysis of the component. It is possible to only highlight the “problem area” in IR on the photo.


Without IR fusion technology it is hard to define where or what the component is.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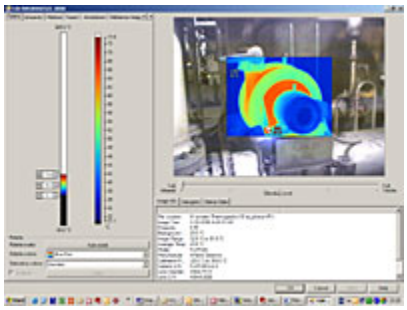
IR analysis and reporting software
This powerful software allows us to create reports (if required) on the component(s) imaged which allows advanced analysis by the customer. It is possible to display the temperature at any given point on the image. This can be an average/max/min of single points (there is 76,800 single individual points in one IR photo) or objects, areas, etc.



Thermal imager limitations

• Temperature limits:-	-20°C to +350°C (on two ranges)
• Accuracy:-	±2°C or 2% (whichever is greater)
• Minimum focus distance:-	Thermal lens: 15 cm (6in)
• Minimum span:-	2.5°C
• Pixels:-	640 x 480 LCD (in picture in picture mode off) 320 x 240 pixels (in picture in picture mode)
• Palettes:-	Ironbow Blue-red High contrast Amber Hot metal Grey

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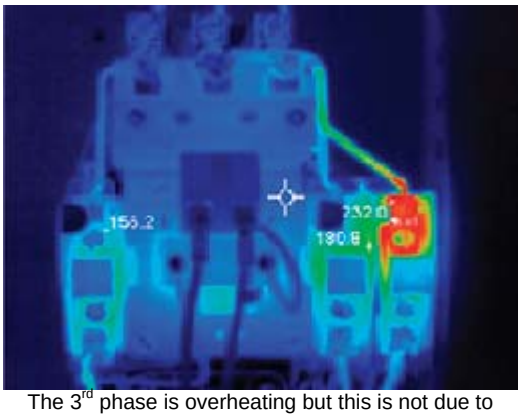
Common uses of thermal imaging:-

Detecting loose or corroded electrical connections

The reason thermography is so applicable to the monitoring of electrical systems is that new electrical components begin to deteriorate as soon as they are installed. Whatever the loading on a circuit, vibration, fatigue and age cause the loosening of electrical connections, while environmental conditions can hasten their corroding. Briefly stated, all electrical connections will, over time, follow a path toward failure. If not found and repaired, these failing connections lead to faults. Fortunately, a loose or corroded connection increases resistance at the connection and since increased electrical resistance results in an increase in heat, a thermal image will detect the developing fault before it fails. Detecting and correcting failing connections before a fault occurs averts fires as well as impending shutdowns that can be critical to manufacturing, commercial and institutional operations.

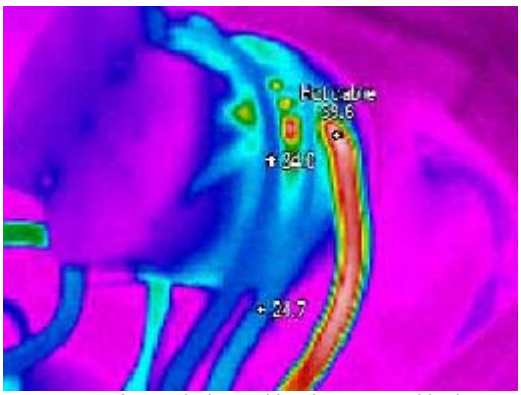


The 3rd phase is overheating but this is not due to end appliance(s) drawing an unbalanced load. It is possible to tell this with the use of a IR imager, as the heat is contained to one isolated area which indicates that the root cause of this problem is from a fault in this component/wiring and requires inspection.

Electrical unbalance and overloads

Thermal images are an easy way to identify apparent temperature differences in industrial three-phase electrical circuits, compared to their normal operating conditions. By inspecting the thermal gradients of all three phases side-by-side, it is possible to quickly spot performance anomalies on individual legs due to unbalance or overloading.

Image of the panel isolator with the unbalanced load.



IR Image, of an unbalanced load on a panel isolator.

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Inspecting electric motors
A program to avert costly failures in your facility will benefit from including thermal imaging as a condition-monitoring technique for electric motors. Using a thermal imager, it is possible to capture infrared temperature measurements of a motor's temperature profile as a two-dimensional image.

Thermal images of electric motors reveal their operating conditions as reflected by their surface temperature. Such condition monitoring is important as a way to avert many unexpected motor malfunctions in systems that are critical to manufacturing, commercial and institutional processes.

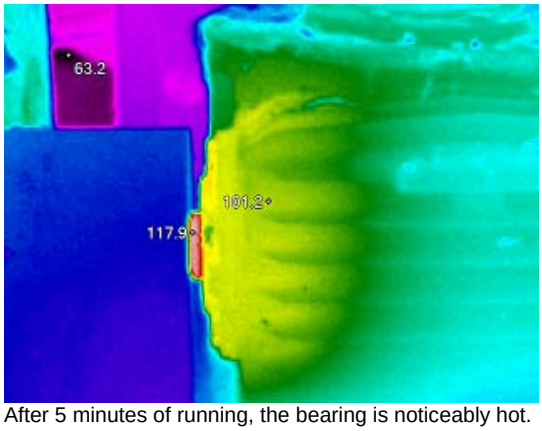
Industrial gearboxes
Many industrial machines use gearboxes to alter and/or vary the standard speeds of electric motors. The lifeblood of any gearbox is the oil within it that lubricates the gears. If the oil level in a gearbox gets too low or loses its ability to lubricate, the gearbox will eventually fail, preceded by overheating. That's where thermal imaging comes in.

It can then be arrange have the gearbox checked for:-

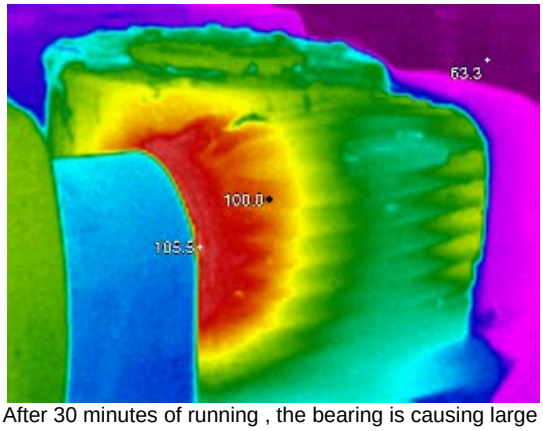
- Oil level.
- Oil quality and metal-particle content of the oil.
- Perform acoustical testing.
- Vibration analysis.

Inspecting bearings and moving components
Thermal images are an easy way to identify failing components. It is possible to identify temperature differences in bearings and operational equipment, by using these heat values detected to calculate possible failure and avoid equipment loss or downtime.

By using thermal imagers to capture two-dimensional infrared maps of bearing and housing temperatures, it is possible to compare current operating temperatures to benchmarks and detect potential failures.



After 5 minutes of running, the bearing is noticeably hot.



After 30 minutes of running , the bearing is causing large amounts of heat to transfer to the motor.

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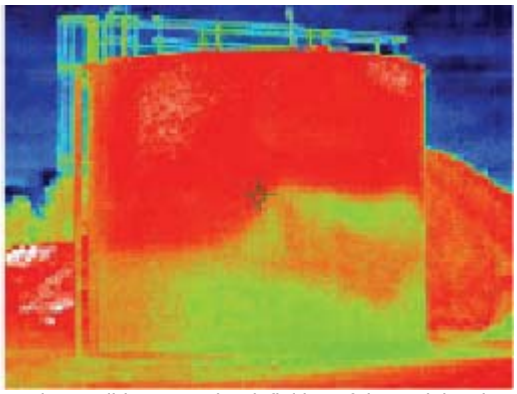
Monitoring transformers

Most transformers are cooled by either oil or air while operating at temperatures much higher than ambient. In fact, operating temperatures of 65 °C for oil-filled units and 150 °C for air-cooled transformers are common. Nevertheless, problems with transformers often manifest themselves in overheating or hot spots, making thermal imaging a good tool for finding problems.

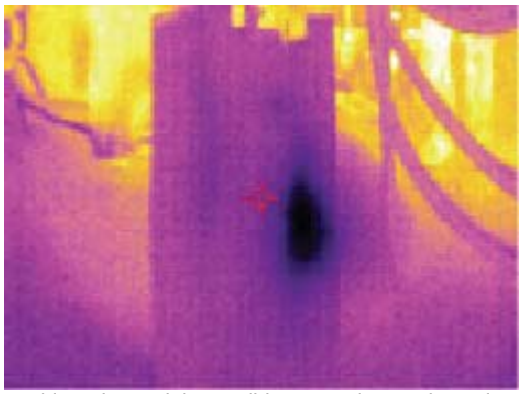
Thermal image blended with the standard photo of a transformer.

Examining levels of tanks and vessels

Commonly tanks are located outside and the tanks and their contents undergo thermal cycling. During the daylight hours the tank and contents absorb heat from the sun and the air, as well as from whatever processing might be taking place. During the night, the tank and the contents are giving up heat to the surrounding air. This thermal cycle and the varying thermal capacities of the materials involved all affect how accurately a thermal imager can measure product level.



It is possible to see the definition of the tank level, it shows an uneven dry bulk material or sludge deposited in the tank.



In this IR image it is possible to see the condensation in a process freezer.

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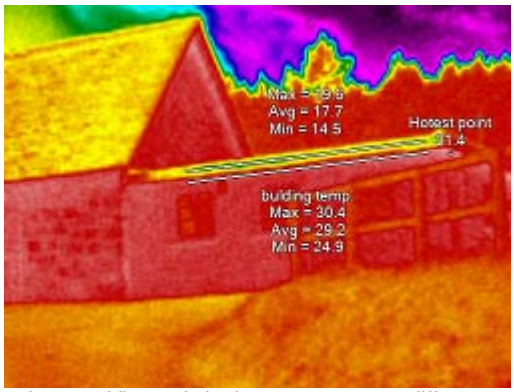
Moisture in buildings and energy waste in buildings

The presence of moisture in buildings, whether from leakage or condensation, can have serious consequences. For example, moisture in insulation reduces its insulating capability, causing heating and/or cooling losses and wasting energy. Moisture can also cause structural deterioration and foster the growth of mould, while a serious roof leak can damage or destroy a building's contents.

The easiest and quickest method of detecting energy waste in buildings is infrared thermography. This is a non-destructive, non-contact method of locating faults by measuring the infrared radiation emitted by surfaces. Viewing a thermal image immediately points users to anomalies which could indicate potential faults. It identifies a whole range of issues including missing or damaged insulation, air leakage, moisture intrusion in roofs and walls, actual and potential mould areas, thermal bridges and water leakages.



IR image of flat roof: the large temperature differences indicate a leaking roof. After further inspection it is possible to locate the leak and rectify.

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- **H**uman **M**achine **I**nterface.
- **S**upervisory **C**ontrol **A**nd **D**ata **A**cquisition.
- Automated industrial electrical control systems.
- Programming, installation, maintenance.
- Infrared thermal surveys.
- Consultancy service.