

Infrared Inspection on Electrical Installations at Hospitals

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ABSTRACT

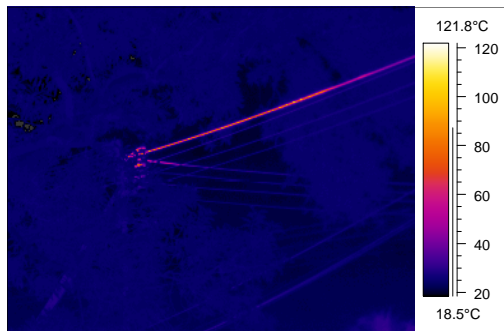
Infrared (IR) thermography is one of the most valuable diagnostic tools for predictive maintenance. It is a cost effective solution available in varying capabilities, depending on how many technological options one can afford. IR systems can run the gamut from simple thermal sensors, to sophisticated imagers with built-in color cameras complete with reporting software. With an infrared camera, it only takes minutes to look at systems and equipment to evaluate their current condition based on thermal patterns. Infrared thermography provides a non-contact, online or real-time evaluation of systems and equipment. For electrical systems, infrared thermography can identify problems such as overheated components, poor connections, overloading, unbalanced loads and overheating breakers, which if left unattended could lead to major breakdowns.

INTRODUCTION

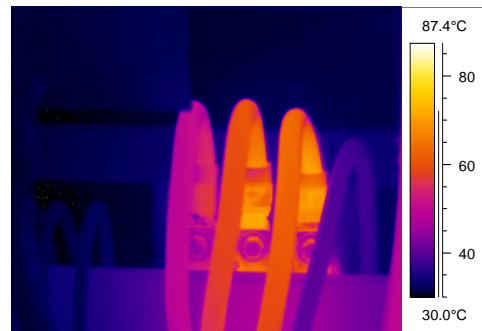
Based on historical infrared inspection data we have collected and archived on electrical systems in hospitals, we have found that poor or loose connections are the most frequently findings we detect.

CASE HISTORIES

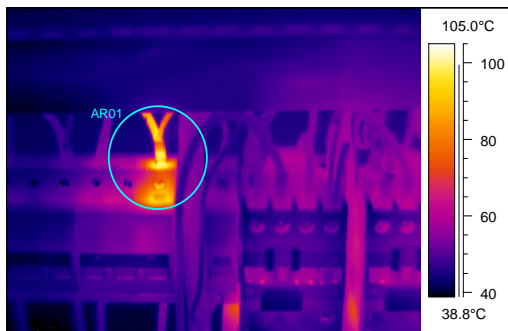
The thermograms below show some sample infrared images of electrical installations at some of our hospitals.



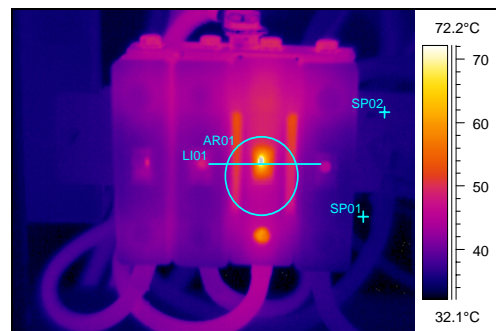
Overhead lines: Insulation deteriorated



Main Switchboard: Unbalanced load



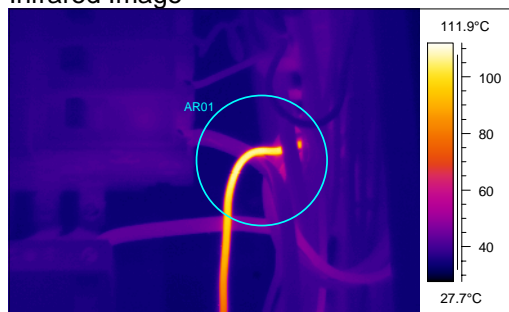
Distribution Board: Loose cable connection



Distribution Board: Overload at Fuse

Figure 1: Examples of electrical distribution images at our hospitals

Infrared Image



Thermal Profile

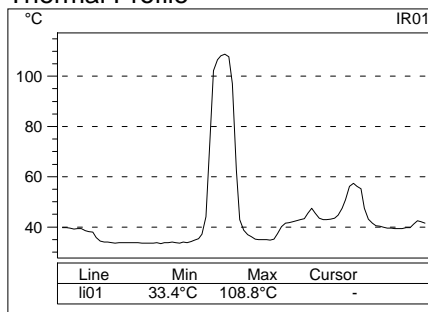


Figure 2: Pre-repairs: loose connection creates excessive heat on cable end, thus producing a spike in the thermal pattern

The infrared image and thermal profile in Figure 2 shows a hot spot (at temperature 108.8 deg Celsius) on a cable connection at the distribution board. The overheating was caused by a loose or improper cable connection.

After corrective measures have been executed, the infrared image (Figure 3) shows no hot spots and the thermal profile shows the normal operating temperature under working conditions.

Infrared Image



Thermal Profile

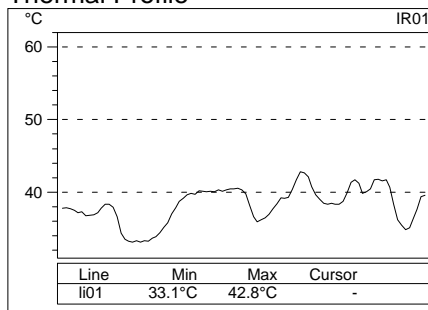
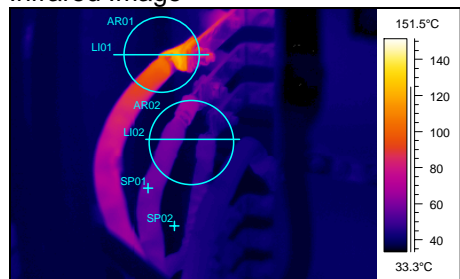


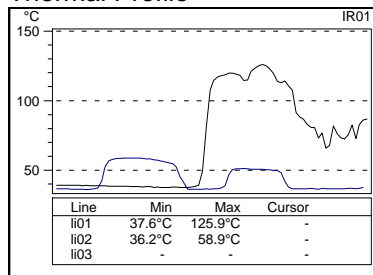
Figure 3: Post-repairs: The thermal pattern is uniform

The infrared image and thermal profile below (Figure 4) shows hot spot (at temperature 125.9 deg Celsius) on the cable connection at the main switchboard. The overheating was caused due to deteriorated cable insulation. Arrows show where the red and yellow phase cable insulation has deteriorated.

Infrared Image



Thermal Profile



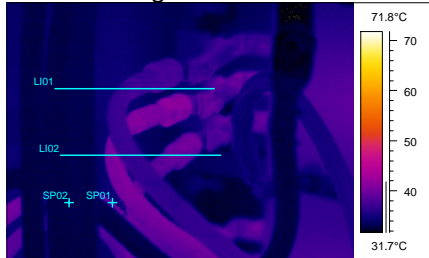
Photo



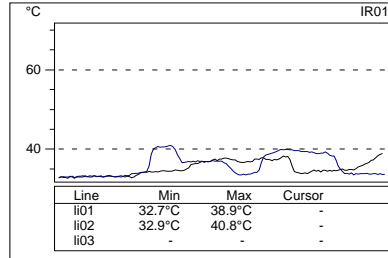
Figure 4: Pre-repairs: High temperatures on cable were detected. Cable heated due to deteriorated insulation at the main switchboard

After repairs to the cable, the infrared image reveals no hot spots and the thermal profile shows normal operating temperatures under working conditions.

Infrared Image



Thermal Profile

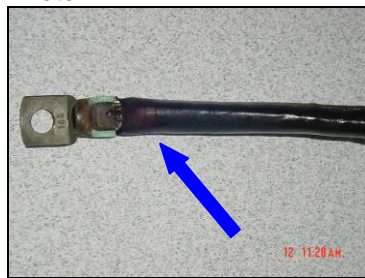


Photo



Figure 5: Post-repairs: The thermal pattern is uniform

Photo



Photo



Photo

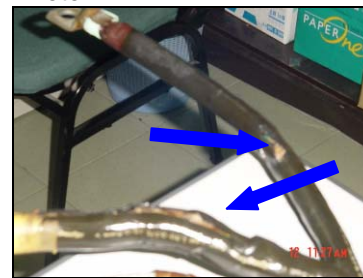


Figure 6: Photos show the damaged cable after installation of a new one

SUMMARY

The situation outlined in this paper, if not corrected, would have either led to fire, a short circuit or tripping of the circuit due to excessive heat on the cable; thus, leading to serious downtime in critical areas. By employing infrared imaging techniques, we can actually predict the problem beforehand, thereby enabling us to rectify it, and the infrared images taken after corrective action shows them to be effective.

It is very difficult to place a monetary value on the benefits realized from an infrared inspection program because the faults are found and repaired before failure occurs. The failure could be from a simple circuit tripping to a major fire due to excessive heat. By establishing a proper infrared inspection program, the benefits are easily realized, as the reliability and safety of electrical installations are ensured. At Faber Medi-Serve (FMS), we think of our infrared program as one of our key implementations.

ACKNOWLEDGEMENTS

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