

INFRARED THERMOGRAPHIC INSPECTION

Infrared Thermography and Distribution System Maintenance

By: Jeff Lebold

Many factors have changed over the last few years that have altered the way electrical distribution companies look at the maintenance of their electricity distribution infrastructure.

Over the last decade, a large amount of electrical supply companies have switched over to a competitive system where the bottom line is money and profit. All dollars spent to maintain the system are under constant review as expenditure departments want funds directed where they are needed most. Traditional spending is frowned upon and expense justification is almost always required. In addition, many distribution systems are aging to a point where maintenance and upgrades are badly needed.

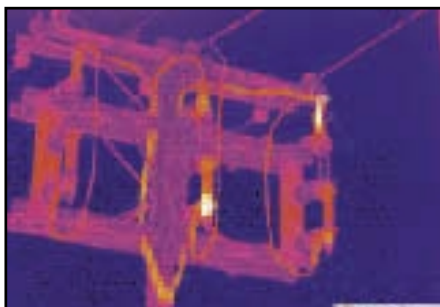
The challenge for most maintenance staff is to provide service to these systems in a very efficient manner, keeping system reliability in tact, and keeping cost below the department budget amount. Infrared thermographic inspection of electrical distribution systems is quickly becoming a standard procedure. The technique offers a pinpoint location of system deficiencies and “hot-spots” while at the same time remaining very affordable to company budgets.

Background

Infrared thermography is the science of seeing heat. Thermal imagers have the ability to produce a visual representation of thermal patterns as heating systems' components are identified and recorded. Maintenance strategies are then planned and carried out before system breakdowns occur. Heating components are generally noted as white or lighter coloured areas in an infrared image. The following are ten examples of unwanted conditions that thermography can locate and provide early warning signs for maintenance departments.

Heating Connection Location — Utility Pole

Because thermography inspection is



Infrared Thermographic Inspection image demonstrating several heating connections non-contact, each inspection can be completed with the system live and in normal operating conditions. Pole inspection can be performed from ground level and even while moving in an inspection vehicle.

Transformer Secondary Line Connections

All voltage levels within a system are inspected. Just about all voltage levels are capable of producing unwanted heating conditions. Today's infrared equipment can detect subtle temperature differences, typically as low as 0.1°C.

Transformer Overheating

In addition to heating connections, thermography can also detect overheating components. Transformers and other inline devices operating at higher than expected temperatures can be identified.

Switches and Reclosing Devices

As with any electrical connection switches, breakers and other reclosing devices operate with contacts. If these contacts wear, get dirty or otherwise increase in resistance, many problems can develop. Thermography can locate these conditions before failures occur.

High Voltage Insulator Breakdown

Without designed insulator values, any electrical system will be subject to flashovers, catastrophic failures and troublesome faults. As insulators age and become dirty, their insulating properties weaken. Thermography has

proven useful to detect insulator breakdown before disasters occur.

Ground Currents

All electrical systems rely on proper grounding and bonding. Ground current leakage in the wrong area can be dangerous and inefficient, but this wire heating can be detected with thermography, and corrective action developed.

Fuse Connection or Internal Heating

Fuses and other inline devices must work properly to provide system overload protection. Thermography can locate fuse connection heating as well as internal fuse heating due to an approach in load-to-fuse rating values.

Transformer Bushing Heating

Transformer insulator bushings breakdown over time. If not replaced in sufficient time, catastrophic failures can develop. Thermography can locate overheating transformer bushings to provide early warning so that repairs can be planned before failure.

Utility Connection Box Break Elbows

In residential areas, many underground connection and switching locations are in utility box enclosures. If required, break elbows provide a point of disconnection. If these break elbow connections are not installed properly, or if the connection resistance goes up, heating and open circuits can occur.

Breaker Connection Heating

Electrical distribution systems rely on a series of breakers that control and protect against short circuits and overload conditions. These breakers are also employed to provide alternate current paths to supply the systems. A breaker failure in any capacity can spell system downtime and damage.

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