



## **The use of Thermal Imaging in Power Utilities Applications**

The efficient operation of plant and facilities is only achieved by the implementation of effective maintenance management regimes; this is especially true in the utility industries where failures can be unacceptably expensive. Although there are many different branches of utility in the public service infrastructure (gas, water, electricity, transport etc) the full benefit of thermography to these industries is best illustrated by considering the electrical supply industry.

Over recent years, thermography has developed from a specialized tool to be being acknowledged as a vital non-contact inspection method for inspecting and assessing plant condition. The claimed results of utilizing this technology are reduced maintenance costs, increased utility system reliability, improved system efficiency, improved safety, lost production and downtime due to outages and increased utility customer retention.

### **Thermography**

Infrared thermography is one of the most important sensing technologies to be applied to the detection and monitoring of manufacturing and production equipment. Until recently this sophisticated technology was prohibitively expensive, being driven primarily by military applications; over the last few years, however, the technology has improved and it has been introduced to high volume commercial and professional applications by innovative companies such as Wahl. This has brought the price down to a level, which is opening up a host of new applications.

Thermal imagers measure the infrared energy emitted by surfaces remotely and are consequently extremely simple to operate as no physical contact is necessary. Many facilities have employed thermographers to carry out inspections every 6 or 12 months; the cost of the equipment and its ease of use mean that these inspections can now be carried out as and when required by the organizations own maintenance staff. Appropriate thermal imagers no longer need to cost \$45,000 or more; for example the comprehensive range of imagers from Wahl starts from less than \$2,500 – less than the cost of a single survey from a thermographer.

### **Electrical Systems**

Thermal imagers can be used for all types of electrical inspections. Loose connections, load imbalances and corrosion are examples of common problems, which cause an increase in temperature; this increase in temperature can in turn cause component failure, possible power outages and system losses. The hot spots caused by these defects can be easily located by a thermal imager, the temperature measured, and the appropriate action instigated. Thermography can be used, both indoors and outdoors, night and day, and in all areas of the power utility system – generation, transmission and distribution. Thermal imagers are now widely employed in generating stations (whether gas, fossil, nuclear or hydroelectric), in switchyards, all types of substation and switchgear through to transformers, regulators, switches, circuit breakers, transmission lines, and capacitors. They are also used to detect leaks, to monitor pylon connections, and to check distribution panels, fuses and piping systems. The success of this approach is leading to the creation of planned preventive maintenance regimes

in the power plant and along the entire system of distribution of the power.

### **Predictive/Preventive Maintenance**

Over recent years advances in instrumentation technology, and the requirement to reduce operational costs and increase operation efficiency, has resulted in the more progressive industries abandoning traditional routine maintenance programs in favor of condition monitoring and predictive maintenance strategies.

Conventional maintenance programs are driven by equipment failures or by the regular, but often arbitrary 3, 6 or 12 monthly, routine maintenance. Little attempt is made to monitor equipment performance or to track historical maintenance information; little is therefore achieved in terms of minimizing the equipment downtime, extending the useful life of the equipment or reducing the overall lifecycle costs. In part this is due to either the unavailability or affordability of the necessary instrumentation.

The appropriate instruments such as infrared Thermal Imaging Cameras and vibration analyzers are now becoming available. Handheld equipment can be used to simply check the condition of critical equipment; microprocessor based versions of these instruments are increasingly being used to provide continuous condition monitoring. Trend analysis can in many circumstances be more important than for example, a spot absolute temperature measurement. Those organizations employing these strategies are already reporting dramatic reductions in operational downtime and costs, and as a result are predicting increased capacity, improved quality of service and increased returns on investment.

Thermal Imaging is an extremely powerful predictive and preventive maintenance tool that can help identify problems in utility generating stations and on their transmission and distribution systems. Its use in an effective regime can help avoid emergency restorations, identify issues to be addressed during routine maintenance, minimize component deterioration (and thereby increase life cycles) and verify both work performed and bad work practices. These benefits lead directly to reduced maintenance costs, increased reliability, increased revenue (for both utility and customer) and increased customer satisfaction.