CALIFORNIA RURAL WATER ASSOCIATION
MEMBERGUARD
Serviced by Glatfelter Public Practice

RISK COMMUNIQUÉ

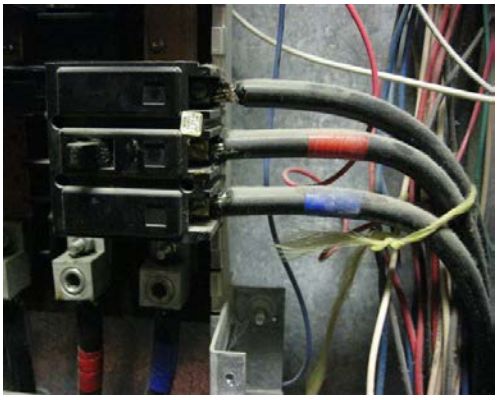
A technical reference bulletin by the Risk Control Services Department of the Glatfelter Insurance Group

Infrared Thermography

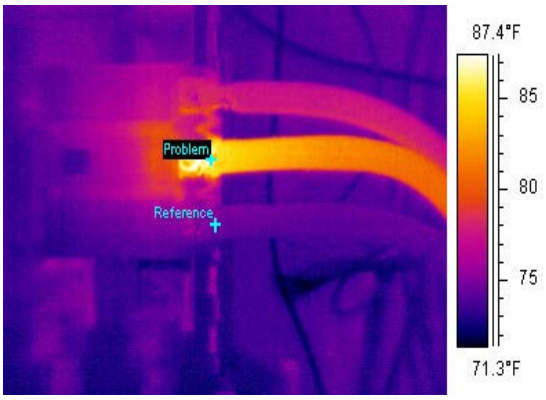
Sewer, water and irrigation operations face severe equipment losses. Such losses historically are often related to electrical and mechanical system deterioration. These losses can be a result of heat, lack of maintenance, loose connections, overloaded equipment, wiring mistakes, insulation failure and lack of inspection and testing. Electrical equipment failure can lead to an equipment loss, fire, and interruption of public services.

The infrared inspection of an electrical distribution system is a low cost, highly effective means to detect conditions that will cause property damage and jeopardize the continuation of operations. Infrared thermography is a noncontact and nondestructive way to detect problems in an electrical system.

Infrared thermography is an important preventive measure in an electrical maintenance program. Thermography can include routine infrared scanning of motors, switches, breakers and other electrical equipment. By establishing an electrical maintenance program, significant equipment, property, and out of service losses can potentially be averted.



Three phase conductors



Three phase conductors – middle one is "hot"

Infrared Thermography Basics

Thermal scans are used to identify and measure any 'hot spots' within electrical equipment. Hot spots are typically the result of high resistance or poor electrical connections. They can reach temperatures sufficient to initiate an electrical fire. All objects emit an infrared image measured off an electromagnetic spectrum. Thermal scanning techniques measure the energy emitted, a process known as thermal imaging. Specialized equipment is used to determine the 'heat signature' of various electrical and mechanical components and provide a temperature reading. With this capability, if a unit (fuse, breaker or other component) is at a temperature 'higher' than it is intended, the resultant readings can provide notification of potential equipment malfunctions or failure.

Overloading equipment, worn parts or inadequate lubrication also increase the operating temperature. Infrared scans help identify possible problems with equipment fluids, equipment 'load' issues, reliability of system components and other electrical-related issues so preventative action can be taken prior to breakdown.

This is a sample guideline furnished to you by MemberGuard. Your organization should review it and make the necessary modifications to meet the needs of your organization. The intent of this guideline is to assist you in reducing risk exposure to the public, personnel and property. For additional information on this topic, you may contact your Risk Control Representative. www.MyMemberGuard.com

To enhance the reliability of infrared scanning, trained & certified technicians with suitable testing equipment should be utilized. The interpretation of the observed temperature readings should take into account equipment operating variables as well as potential external environmental conditions. The readings should be performed by trained and certified technicians who are cognizant of the impact of field conditions upon the measurements taken.

Older equipment in poor condition may have a greater electrical failure potential.

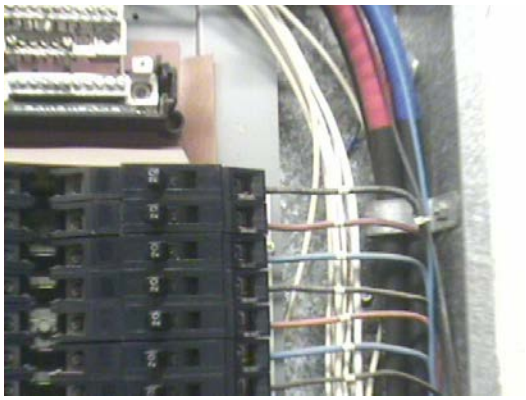
A key point is to ensure new measurements are conducted after corrective actions have occurred so the new infrared signatures that are documented can be compared to the prior readings in order to verify all "hot spots" have been addressed.

Infrared Thermography Frequency of Inspection

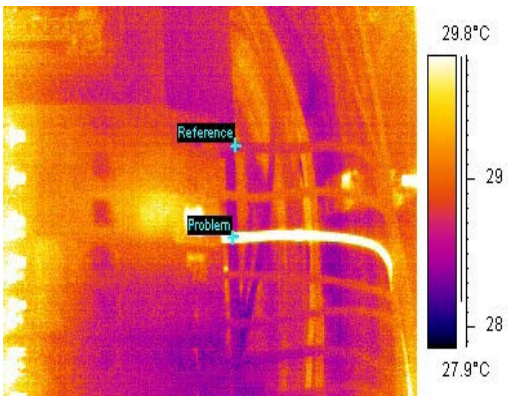
The type of equipment installed, the mode of operation and the environment it is exposed to are factors that impact the frequency of infrared scanning. While every three years can be considered a common cycle, there is no one size fits all inspection frequency. Considerations that impact the chosen frequency of infrared scans include:

- Type of equipment (possible different failure potentials)
- The status of the equipment (wear & tear on the equipment)
- Power usage (frequency of 'stop/start' mode changes)
- Equipment connections (condition and suitability of cabling and wiring to the unit)
- Maintenance (type and adequacy). This should also include an evaluation of existing maintenance staffs' expertise and ability to monitor and maintain the equipment. The maintenance staffs' record keeping in regards to electrical equipment oversight is a key factor.
- For operations such as water/sewer districts, municipalities, school districts and other moderate power usage operations, infrared scanning & testing should not exceed three year intervals for major power equipment. The testing could be more frequent based on the use, age and environment in which the equipment is operated.
- Records of testing should be maintained and evaluated by trained personnel.

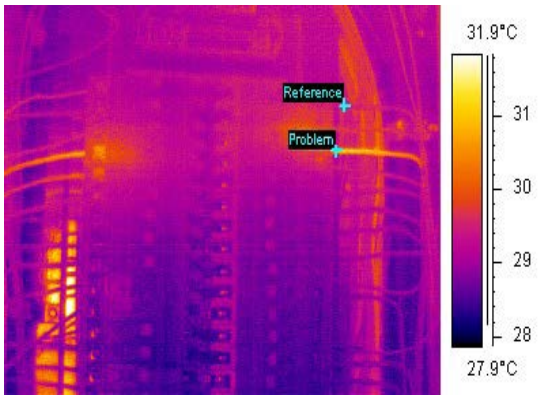
The photos below depict how infrared thermography was used to identify conditions that lead to heating of electrical equipment. In this case the one loose connection was identified, tightened and the over heating issue was resolved.



Common branch circuit breaker



Branch circuit breaker showing hot spot



Connection cooled down after connection was tightened

Conclusion

To reduce equipment breakdown that can disrupt the delivery of public services, knock out processes or result in a fire, infrared scanning is one technique to identify equipment and machinery that may be at increased risk for failure. Once the at-risk equipment is identified, proper preventive measures must be initiated to reduce electrical equipment problems.

***References*:**

Introducing HSB Electrical Risk Management, Com-369, September 2010, The Hartford Steam Boiler Inspection and Insurance Company

What is Infrared and What is the Benefit of a Survey? 2010, The Hartford Steam Boiler Inspection and Insurance Company

National Fire Protection Associate 70, National Electrical Code

National Fire Protection Associate, Fire Protection Handbook, Nineteenth Edition, Vol. 1, Ch. 6-15.

Zurich Risk Engineering Risk Topics: Infrared Thermography