TRUE “HOT SPOT” OR FALSE POSITIVE???

By

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During an electrical infrared survey apparent “Hot Spots” can be easily detected using modern infrared sensor systems. AES International Corporation (AESI) uses the FLIR 2000F long wave (8 - 12 micron) detector that is contained in a gimbaled pod that mounts to the bottom of any Bell series 206 aircraft. Long wave infrared detectors are much less susceptible to solar reflections and can be used at all times during the day. Short wave systems (2 - 5 micron) are normally best used from the ground and for diagnostic purposes. They are very affective when used in concert with a long wave airborne system. The airborne sensor can fly the lines fast and locate thermal anomalies which can be precisely located and turned over to a qualified ground systems operator to begin a trend analysis.

AESI has proudly served the electric utility industry since 1987 with the highest quality infrared inspections available today. It has been a combination of highly trained thermographers, experienced air crews, and the proper infrared sensors that gives AESI its competitive edge. At AESI quality infrared services and safety are a top priority. Since infrared theory as it applies to very specific tasks is critical to success AESI has worked diligently to match capabilities with customer requirements and desires. To this end, AESI has developed “on the spot” flight procedures which help to identify and eliminate false positives. This saves the customer valuable resources while promoting the true benefits of infrared inspection.

To provide you, the customer, a general understanding of the reasons for components to appear heated in the infrared band width the following is provided:

1. **Increased Resistance** - Increased resistance usually occurs at an electrical connection and is an actual problem for the customer. The heat is generated at the point of resistance change and is conducted away by the surrounding metal and the air. Anomalies due to high resistance develop with a known pattern toward failure. This “hypothetical fault cycle” makes it impossible to determine the seriousness of a “hot spot” by the amount of heat at any one point in time.
2. **Line Loading** - The heat generated in a conductor is proportional to the square of the current passing through it. Therefore, a small change is current flow can result in a considerable amount of heating difference. For example, “doubling the load results in a four fold increase in the temperature”. This will appear to the operator as a constant temperature along the length of the conductor, unless the cross-sectional area changes.
3. **Reflection** - Reflections from an object with normally a polished finish appear as a well defined anomaly with no evidence of radiation down the line. The method of diagnosing a reflection is to change the scanner position. If the hot spot appears to move, then it is a reflection; if it tends to remain the same intensity and stationary, reflection is eliminated as a possible cause.
4. **Solar Gain** - Solar gain will appear as a hot spot to the infrared sensor. However, the operator can eliminate this as an anomaly by changing the temperature window of the sensor.
5. **Emissivity Difference** - This anomaly can also be identified by an abrupt temperature change with no radiation to adjacent components. Normally, materials that have been heavily oxidized and/or dirty will have a higher emissivity. Different materials give off heat at different rates. The best way to eliminate emissivity as the cause for an anomaly is to make an “on the spot” comparison to a like component near the suspected fault. This should be done immediately after discovering the “hot spot” so ensure that the atmospheric conditions, line loading, sun angle, etc. are all nearly the same.
6. **Eddy Current Inductive Heating** - Inductive heating is a difficult condition to identify. An operator must first try to eliminate as many of the previous causes as possible. This condition is characterized by warm areas on components that are not in an established electrical circuit. It normally occurs in ferrous materials near coils and transformers.