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RCM-2008 Brochure Inside

The Living, Breathing Facility

Using Thermography as Preventive Therapy

by Jeffrey Gadd

With so much responsibility - coupled with shrinking budgets and a lack of qualified, motivated manpower - it's easy for a maintenance professional to become overwhelmed at times (Figure 1). The old adage "do more with less" has never been more applicable than it is today for many maintenance managers. Since infrared surveys have proven time after time to save money by preventing electrical failures, having your building's electrical system scanned once a year only makes good sense. To help you get the most out the infrared inspection, follow an ordered list of equipment and in an organized fashion. No need jumping all around the building and it is not efficient to look at every last piece of equipment. The following is a general outline for planning your next infrared inspection, common for most facilities.

The Heart of the System

Figure 1 - Manufacturing plant full of electrical equipment that must be maintained.

Incoming power from your electric utility such as utility feeds, service poles, switches & transformers and the plant's main switchgear (Figure 2) are absolutely critical to your operation for obvious reasons. So, I am surprised by some of my customers' opinions that, since it is owned by the utility company, the utility equipment is not a priority on the schedule. This thought is partially correct; it is the utility company's responsibility to maintain this equipment. However, if it fails, the lights go out on your operation. Although repercussions from an unplanned outage vary, they are all bad, ranging from total loss of power and production, to single-phasing all the VFD's (variable frequency drives) in the plant and having them all end up in the dumpster. Your utility company will not pay you for your losses unless you have an agreement to that effect or your infrared thermographer has handed you a documented finding (with an IR image) and you notified the utility company prior to the failure. Now that you've avoided disaster, pat yourself on the back and don't forget to let the plant manager know you've just saved the company. Hopefully he/she will show you ample gratitude during your next review.

The Arteries

The system of arteries of the electrical system is the main distribution system, including buss ducts (Figure 4) and main wiring which distributes the power to all the panels in the plant. This equipment absolutely must be surveyed thoroughly and, importantly, under a normal load. If half the plant is going to be off-line, schedule the survey for a different day. Distribution equipment, like the arteries that feed your critical organs, must be maintained since the distribution system feeds all your critical equipment and interruptions in power are not acceptable. The health of these systems is especially important to a facility when just

Figure 2 – Utility company-owned transformers and the main switchgear are the heart of the electrical system.

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Figure 4 – Main buss duct with major heating problems.

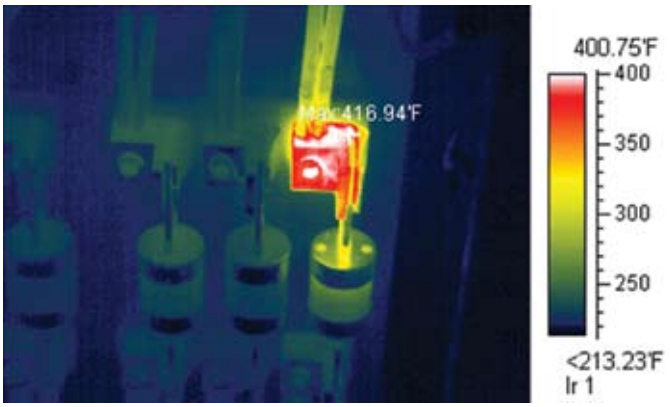

Figure 6 – Main disconnect for an important air compressor.

in time production and 24/7 availability of power is the expectation. A small problem with a disconnect, fuse clip or termination on one of the main distribution circuits can lead to a failure of critical operations.

Figure 5 – Data center power distribution unit (PDU).

The Brain

Data centers, like the brain, must be nourished 100% of the time or catastrophe occurs. A loss in power to a data center can cost millions. The power, cooling and support systems are vital to the continuous flow of information and infrared predictive maintenance is a must. The power distribution panels (Figure 5), uninterruptible power supplies, automatic transfer switches, server farms and cooling systems must be checked with infrared thermography on a regular basis to insure excellent reliability.

Since data center systems often cannot be tested on-line, they must be tested during "maintenance windows" or planned outages when the impact of testing is low, so that simulations can be run. By pulling power from a load bank, resistive load testing is used to fully simulate and test all equipment on the floor. Any problems that are encountered during an infrared survey should be repaired immediately and the system rechecked before putting the equipment back on-line.

The Organs

The critical equipment, similar to the organs of the human body, is an area where many maintenance professionals focus well-deserved attention. What is defined as critical equipment is unique to your operation. I can generalize a little, which may lead you down the right path. In my experience, plant infrastructure such as boilers, chillers & air compressors all make the critical equipment list. Next is where your specific knowledge of your plant is crucial. Any equipment needed for the production of your product or process should be considered critical. I like to call this A-equipment, meaning that you have to have it, there is no back-up and/or your product or process would cease without it. No one wants to see a hot connection on their A-equipment (Figure 6). This example was caught before it failed, which is good, but damage had already occurred causing a need for extensive repairs.

Non-Critical Equipment

If the critical equipment is A-equipment, then this type of equipment would be B & C equipment – typically either not critical to operations or there are several pieces of back-up equipment in place. I have had many clients want to take valuable survey time to inspect these non-critical items that have little impact on overall plant operations. If you are working with time constraints, for instance, an 8-hour day in which to perform the survey, you do not waste the first couple of hours looking at small, less important electrical equipment like welders, battery chargers (Figure 7) or small control panels (Figure 8). This equipment should only be surveyed if there is time left after finishing the vital organs. That said, some B & C equipment has a way of shutting down an operation, but it is certainly not the a high priority. I am not saying these items should never be inspected, but they can be inspected say, every three years or every other year. Generally, every finding takes about the same amount of time to document, so it is wise to spend your time documenting important equipment first, then move to the less important equipment. In the case of multiple day

Figure 7 – DC charger disconnect for a fork lift battery.

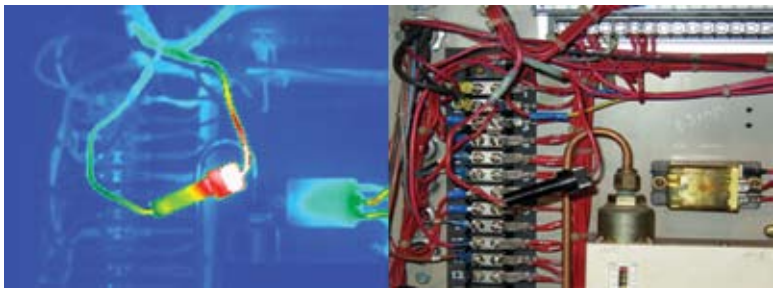

Figure 8 - Fuse block on a small control panel.

surveys, an alternative way to perform the service is to move to a semi-annual inspection, where summer and winter loads/equipment can be inspected every other survey. This also gives you an opportunity to insure that any repairs that were made from the previous survey are re-checked, as well as allows time to get your less important equipment inspected.

Summary

In a perfect world, every piece of electrical apparatus would be constantly monitored for heat. For now, that is not a reality because we all have constraints of time & money. With limited resources, why not make the most of your next IR survey? Do not spend all day inspecting redundant circuit breaker panels and not have enough time to look at your main switchgear or major buss ducts. It is important to create a priority list of what is to be inspected well in advance of inspection day. Creating it on the spot will only delay the process and short-change survey time for important equipment. Your plant's operation depends on the health of your equipment, so have it inspected at least once a year and do it efficiently.

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