Infrared Thermography: Yesterday and Today

As the workforce ages it becomes more and more important to record—for posterity if nothing else—what things used to be like. “When I was…” or “Remember when…” are both common lead lines for many water cooler discussions in shops around the country. Often the “olden” ways were actually better! In other cases, we’ve just forgotten how bad they really were or we are too “crusty” to admit the new ways are, in fact, better.

As many NETA members are graying—and even retiring—infrared cameras are turning younger and even more “red hot” than ever before. They are also getting smaller, cheaper, and easier than ever to use, and the trend is definitely going to continue. Today’s thermographers can’t really appreciate how good they have it. That’s not all bad because they are already pushing today for an even better tomorrow.

That said, real men (and a few real women too) remember earning their stripes in the “good old days.” Maybe we should just think of it as an early form of “seat-of-the-pants certification.”

Perhaps you recognize yourself in one of the following scenarios:

• Do you remember waiting ten minutes for a single image to be created by this amazing “new and modern” infrared scanner (1968).

   Thankfully, cameras today operate in “real time,” at anywhere from 9-2000 frames per second.

• Don’t you miss lugging 30-50 pounds of camera, processor, batteries, coolant, cables, and other assorted stuff around?

   No need to become an “infrared bodybuilder” anymore! Nearly all cameras on the market today weigh less than two pounds.

• It is hard to believe, but we had to use “gray scale step levels” and a programmable scientific calculator to determine temperature from the thermal image.

Today? Most cameras are actually powerful handheld computers that are fully radiometric allowing for very sophisticated temperature analysis to be done with just the push of a button or two.

• Probably the single most dramatic change over time, however, has been price. Even five years ago nearly all the systems on the market were priced at $40,000 or more.
Thanks to competition and manufacturing innovations, today there are many excellent choices for cameras under $20,000 and even a few very good systems for under $10,000.

In the “good old days” only a few of us were in this business. It was a big deal to buy the camera and learn what we were doing. Training was not easy to get and, honestly, sometimes I wondered how much any of us, students or instructors, really knew about the very complex subjects (heat transfer and machine failure) we were dealing with.

Nowadays? Anyone can buy an infrared camera on eBay and even more people are jumping into the market to buy brand new cameras. Some of them know what they are doing and many, many others do not. I predict it will get worse before it gets better. Unfortunately in the rush to market, the label “certification” has lost almost all of its real meaning. There are few, if any, regulations on who can use thermography or how they use it. NETA members should be protective of their credentials in a market where differentiation is critical to success.

Has our vision of how to use infrared changed as much as the equipment? Too many who are involved in maintenance still perceive this as an expensive technology best used to measure temperatures of hot spots during an annual inspection. Others have progressed beyond this thinking. The bottom line is they are using the technology to get new customers and to keep their existing customers happy! There are few tools better at either than these.

Infrared cameras are now so accessible that many use them on a daily basis. One day they may provide baseline thermal data about a new installation or a repair of electrical equipment, either for the customer or the contractor. The next day a technician may be troubleshooting a machine with a variety of tools and the infrared camera helps show the “big—thermal—picture” with details filled in by other tools. Regular inspections are still a part of how thermography is being used, but they are no longer done only on an annual basis to find problems. Inspection statistics and return-on-investment calculations drive the frequency of inspection to ensure the availability of reliable electrical assets at all times.

A commonly used inspection protocol in “days of old” was to open up a long line of enclosures put your tools down and come back to inspect all of them with the infrared camera. No more!! Safety alone has caused us to open only one at a time, and then only after we have looked at the outside and, perhaps, listened to it with airborne ultrasound to detect possible problems. We also discovered that the equipment cooled off waiting for us with the doors open! By the time we looked at the thermal image, many problems had cooled below the threshold of detection and others that we did find were cooler than they had been before we came along. We now get much more accurate and representative inspections than in the past, and, of course, all done with a much higher level of safety.

While all of us hope to not find “hot spots” during our work, when we do, we now think of them in a different manner than we did in the past. First, we know thermography can help us determine the root cause of a problem. For instance, a large number of problems found in a particular brand of fused disconnect switch caused one large company to go back to the manufacturer about it. They worked together to find the root cause (dried grease) and better routine preventive maintenance strategies (cleaning and regreasing) that drastically reduced future occurrences.

When we find a hotspot nowadays, we don’t just quickly look at the temperature, classify it in a temperature-based category, and move on. First we ask ourselves “Are conditions such that if a problems exists, I’ll see it?” If the answer is “yes,” we can continue with confidence. But if not, for instance if loads will be getting much heavier in the near future, then we know some problems may not be detectable at this time. We can either proceed cautiously or reschedule the work to a time when loads are higher and any problems can be detected. This remarkable technology, it turns out, is best used as one of many tools rather than an end to itself! And it certainly is not a substitute for good, critical thinking, a skill essential to the work of electrical specialists.
Reporting has gotten much easier since the days of Polaroid pictures and typing reports on the old IBM Selectric! Digital images can be adjusted and analyzed in the computer and then quickly dropped into a report template and “PDFed” (that did not even used to be a word) and emailed to the customer, often before you leave the jobsite. The time savings is stunning!

Another huge change in the way we use thermography is around personnel safety. I’m embarrassed to remember standing around with a bunch of people looking at a transformer bushing — so hot you could smell it — talking about what we thought the problem might be. Of course, we wore no flash protection to speak of and had no idea about flash boundaries.

Today I would not even think of working without proper PPE. Some activities require such a burdensome level of PPE that we’ve changed our entire inspection procedure so that we can work safely. That may include powering down or using airborne ultrasound instead of infrared. Regardless of the situation, we get in, get the image and get out of the flash zone to do our analysis so that we stay out of harm’s way as much as possible.

In more and more cases we see customers installing and using view ports and/or infrared transparent windows. I remember hours spent helping remove the covers of enclosures before we could even begin the infrared inspection. It was both dangerous and time consuming. Ports and windows, properly installed and used, make inspections much easier, faster, and safer.

We used to think we could measure the temperature of anything if we just set our emissivity correction properly. We now know that is not true. When we are looking at any metal surface that is as shiny as the dirtiest coin in your pocket, accurate temperatures are hopeless! Of even greater concern than measuring the temperature is whether or not we’ll even see the hotspot in such a case. Although standard procedures do not yet exist for it, we are seeing more and more customers apply some sort of high-emissivity target material to low-emissivity surfaces. This allows for a much higher certainty of detection and measurements accurate to within a few degrees.

So much has changed both with the tool we use and with how we use the tool. I suggest if you are still using old tools, check out the new ones. While your old system may still “work just fine,” you will probably get much better results upgrading to one of the new systems. And if you are still using this technology the old way, think again! Sometimes I still catch myself writing 19—on a check or a letter (yes, I still hand write some letters!) and then I remind myself the way we do many things has changed, including writing and using infrared. Welcome to 2006—a great New Age for thermography and thermographers! ☀

John Snell of Snell Infrared, Montpelier, VT has trained thousands of people to use this remarkable technology in the past 20 years. His company works with all the major suppliers of IR systems to provide their customers with training, while remaining 100 percent independent of the sale of any particular product. To learn more about IR cameras, call them at 800-636-9820 or visit the their website at www.snellinfrared.com, to view links to suppliers as well as a very active messageboard.