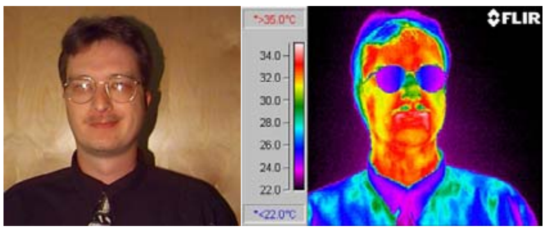
TEGG® FLIR®

Protecting Buildings Against Electrical System Failures

For TEGG Corporation -- which delivers electrical systems preventive maintenance to large commercial and industrial clients around the world -- keeping up with the latest technology has a direct benefit to the firm's bottom line.

"If TEGG certifies that an electrical component is in proper working order, and it breaks, then the firm will replace it for free," said Joe Demonte, Director, Technical Training and Support, TEGG Corporation, Pittsburgh, PA.



Joe DeMonte
Director, Technical Training and Support TEGG Corporation

TEGG Network

To provide such a high level of service, the 17-year-old company depends on a highly-trained network of independently owned electrical contractors. The TEGG network of professionals are armed with the latest tools to help them identify potential electrical system failures – faults that could lead to significant loss of business.

With thousands, even millions of components to analyze, infrared cameras are valuable tools for the company. The cameras help electrical professionals perform work faster and document results for clients.

"Training is key to our business strategy. The work we do requires careful attention to detail. We try to make it as easy as possible for our network of professionals," DeMonte said.

"The best emissivity tables are created by the end user of the infrared equipment, not by the general physics books or websites, or by using tables created by training organizations and camera manufacturers. The real world has complex geometry and emittance," DeMonte said.

Emissivity of Plant Electrical Systems

To get a better understanding of "Real World Emittance," DeMonte offers these tips about what to look for when performing IR surveys in a typical plant or outdoor distribution/transmission electrical environment:

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"Most low voltage and many medium voltage switchgear and components have high emissivity materials near the connection points. From molded case breakers to cable insulation, an emissivity of 0.95 should perform well."

"Higher voltage equipment may not always have the high emissivity surface nearby. Newer 640X480 cameras or 2X and 3X optical telescopes for 320X240 cameras will greatly reduce a thermographer's temperature error allowing more of the cavity/higher emittance target to be resolved."

"Corrosion and dirt are everywhere. Metals corrode over time and increased corrosion rates occur as the target heats up. When other types of metal are dusty or dirty, they could be in the mid .90's as well."

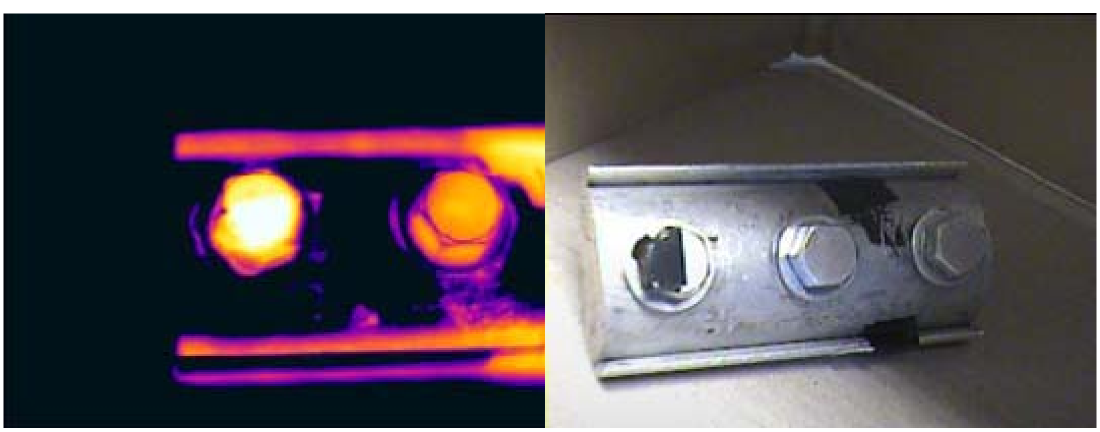
"As FLIR Infrared Training Center Director Bob Madding wrote in his paper, avoid attempts to measure temperatures of low emissivity targets, even when you know the emissivity. The reflected apparent temperature is so difficult to know and control, errors can be large. Different environments help keep corrosion rates low while others increase it rapidly. Across the world, there are some locations when you can view outdoor switchgear with ease due to the highly corrosive nature of the environment. Dryer climates may keep aluminum components free from heavy oxidation for years."

"Total radiant power as temperature increases, is an exponential rise as seen in the Stefan-Boltzmann equations. You cannot hope to measure accurate temperatures, accurate temperature rises between similar components, or trend accurately over time without inputting the actual target emittance/emissivity into your camera and software."

Emissivity in the Real World – Case Examples

Warning: Follow correct procedures when measuring a target's emittance. Failure to do so can result in large errors. Such a procedure can be found in ASTM E 1933 – 99a.

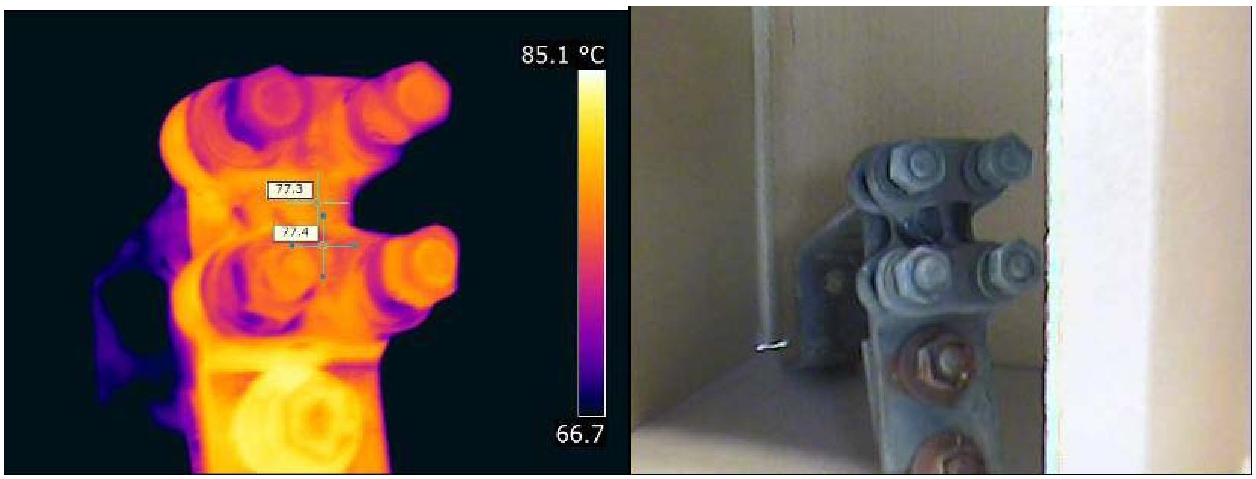
Aluminum bolt on an electric line clamp



"It takes an emissivity of 0.89 on the bolt to equal the temperature read on the high emissivity tape used as the constant (0.95 emissivity). Most infrared thermographers would expect the results on the bolt to be MUCH lower. However, visual looks are VERY deceiving in this case.

I have had the fortune of measuring this bolt with MWIR cameras and QWIP (8-9µm) cameras. The results? 0.36 with MWIR and 0.68 with the FLIR SC3000 QWIP. A very dynamic selective radiator and a very shockingly high emissivity value for a P65. If we used a value from a common emissivity table, we would find that a value of .09 would suit "clean, polished" aluminum. How wrong would we be in this example if we used a common emissivity table value? Actual value: 0.89, temp: 72.1 degrees C Table value: 0.09, temp: 266.7 degrees C Error: +194.6 degrees C (+192.6 to 196.6).

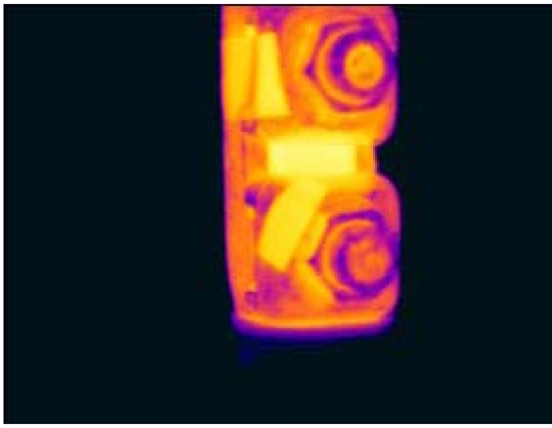
Weathered and corroded copper 250-500MCM cable clamp



"It is clear to see that the tape and the corroded/greenish copper blend together when heated above the surrounding temps. This would indicate that since the tape in use has a gray body emissivity of 0.95 to the LWIR camera in use, the copper has a similar 0.95 gray body emissivity for the same camera, DeMonte said. Again, let's compare the table versus our findings. Actual value: 0.95, temp: 77.4 degrees C Table value: 0.78, temp: 85.5 degrees C Error: + 8.1 degrees C (+6.1 to 10.1 for added camera accuracy.

Clean but used indoor copper clamp

"The side of the clamp, where geometry has no real effect on emittance, still has a modest emissivity of 0.73. Not the worst of conditions when performing infrared temperature measurement, but errors will be present if the camera/software emissivity setting is left at 0.95 or some other constant high value. Fortunately, the emittance will be higher when viewed from the front and in-between the bolted area. Although the test would be more accurate with the cable clamped in place, my results will at least show that emissivity will be even better when viewed normally from the front as shown in the following infrared images," DeMonte said.



To understand our error potential, we will again compare the table value with the actual for this single example. Side value: 0.73, temp: 58 degrees C Table value: 0.65, temp: 62.8 degrees C Error: + 4.8 degrees C (+2.8 to 6.8)
Cavity value: 0.98, temp 52.2 degrees C Table value: 0.65, temp: 62.8 degrees C Error: +10.6 degrees C(+8.6 to +12.6)

To get a bonus download: "Twelve Things to Know Before Buying an Infrared Camera," go to http://www.goinfrared.com/12things-ps3case.

For the latest FLIR news and offers, go to http://www.goinfrared.com/ps3case.

For more information about the TEGG Service Network, call 412-394-7400, email jdemonte@tegg.com, or visit www.tegg.com.

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