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HOW YOU CAN EFFECTIVELY IMPLEMENT A COST SAVINGS THERMOGRAPHY PROGRAM

What is Infrared?
Infrared energies are all around you but not visible to the human eye. In the visible light spectrum, the human eye can only see to the color, red. Energy beyond that is invisible. Infrared.

Various Wavelengths
Infrared is categorized as it proceeds from the visible light spectrum. You have near infrared which is normally measured in low micron wavelengths to short wave, 3 to 5 microns, and long wave, 7 to 12 microns. Various projects lend themselves to different wave length application such as roof scans are best performed in short wave.

Emissivity
This is probably the most confusing issue for people involved in precise temperature measurement. Objects emit and absorb energies. Perfect absorption is referred to as “black body” and carries a value of 1.00, indicating it absorbs all energy and reflects none. An example would be a piece of black masking tape.

Various materials normally have a certain amount of reflectivity. An example of the highest level of reflectivity would be gold. Aluminum is also quite reflective.

Any infrared device, may it be a handheld spot radiometer, or an imaging camera, has onboard a manual setting for emissivity.

It is safe to say the vast majority of items would fall between .80 and .90, indicating a high level of absorption and a minimal amount of reflection.

Most thermographers would set their device at .90 and proceed. There are some simple ways of detecting reflection as opposed to true hot spots. For example, if you are using an imaging camera and you see what appears to be a hot spot, but suspect it as a reflection, you can move from side to side and normally a reflection will move. A true hot spot will not.

Where is emissivity important?
When temperature measurement is most critical. Normally, people are looking for temperature variation, more so than very precise temperature measurements.

If you are using an incorrect emissivity value, your precise temperature measurement may be off a few degrees. But, once again, most operators are looking for variation.

Everyone will ask, “How hot is hot.” But few truly understand the normal temperature operation of the device being viewed. It is normally more critical to note the variation temperature, as an example a three phase electrical condition.

Infrared imaging devices will tell you or show you actual temperatures. It is up to a trained operator to understand really what they are seeing. Normally, that would require a general understanding of the application or methodology. Once again, let’s look to electrical as an example. A novice could view a dry transformer and indicate a problem, not knowing that the normal operational characteristics of the equipment lends itself to operating hot. Or, you can look at a three phase panel or fuse connection and see a heating condition but further diagnostic work is necessary to determine, for example, a load imbalance and implementing a simple digital clamp-on ampmeter will advise actual load on each leg of the three phase device, which in turn could affect the temperature of a particular phase.

Imaging cameras are considerably more effective than spot radiometers.

A spot radiometer averages temperatures and each device may have a different size target. For example, a 30 to 1 device at 30 inches away would measure the entire temperature of a one-inch circle and give you the average temperature of everything within that circle and your target itself could, in many cases, only represent a small portion of that circle. The same would apply at a target 30 feet away. In order to make this technology more effective in this type of hand held device, most manufacturers are using a laser pointer or a laser cluster circle to physically show the operator the area in which temperatures are being taken. It is important not to construe the actual target as being that exact temperature, knowing that the temperature being displayed is an actual average of everything within the circle.

To demonstrate the effectiveness of an imaging device over a spot radiometer, you can put a person in a room with a hot spot. It would take a very long time for someone using a spot radiometer to locate a hot spot. The individual using a viewer can quickly scan the area in normally less than a minute to detect the target area. One of the most

commonly heard statements from a viewer operator is, “I never would have looked there,” demonstrating the effectiveness of a viewer over a radiometer.

Why is Infrared so Effective?
It is noninvasive. It is nondestructive. Which means an operator can view an application, a process, or equipment under load, at a safe distance without coming in contact with it.

The technology can be applied in any situation where temperature variation is meaningful, and that is almost unlimited. This makes infrared imaging the number one tool in it’s effectiveness in so many applications.

Take a few minutes and let’s think about areas where you can apply infrared imaging.

We see the military using thermography for ground troops, weapons systems, etc.

They use thermography in medical, looking not only for hot spots but cold spots. Cancer, for example, generates heat. So, does trauma within the body. Circulation problems such as fingers, toes, feet, ears, nose, all show up cold. At Hopkins, they use thermography, not only in their oncology department, but also in heart transplants, when the flow of blood curtails, the temperature drops.

Process control can be enormously affected by temperature. Temperature affects the molecular strength of, for example, a molded product. Many companies implement thermography as a quality control system using temperature as a determining factor relative to a good product or a bad product, and implementing an automatic rejection system. Plus, they can automatically trigger corrective action where needed as in heating or cooling elements.

Furnaces and Boilers. Using thermography you can examine the skin of a boiler or furnace and determine the integrity of the refractory material extending run time before it requires service.

Internal to boilers, you can look through flames and inspect tubes.

Circulating Systems. You can easily pinpoint blocked or impeded systems for needed repair.

Steam Traps. A malfunctioning steam trap can be measured in actual dollars lost. Some operators use ultrasonic to detect if a trap is functioning properly. Others use

thermography to determine if a trap is blocked or blowing through. The payback in this application is considerable.

Building Envelope. Roof Scans. A thermographic scan of a roof can pinpoint precise areas in need of repair as opposed to a total roof replacement. Insulation in walls can be evaluated to determine their effectiveness in controlling energy loss.

Electrical. Possibly the number one application. Why? Because before you have an electrical problem that results in down time, destruction to equipment, and heaven forbid, possible injury to personnel, you have a heating condition that develops. Early detection of that heating condition can result in corrective action, representing considerable cost savings to the company.

Many companies and corporate giants look toward annual infrared inspections of their facilities, many of which also benefit by reduced insurance premiums.

It is important to note that infrared technology measures surface temperature. It will not look through walls. And glass, for example, is a solid surface and an infrared viewer will actually measure the surface temperature of glass. Having said that, there are many situations where actual temperature will migrate to the surface. I would like to share an example with you. We had a university that knew of existing underground steam leaks. Their methodology was to wait for the first snowfall and run around campus detecting and marking areas where the snow was melting, realizing the steam line that was ruptured was at least below the freeze line of 36 inches, but the heating condition was migrating to the top of the soil or blacktop or cement, and there was a temperature variation present. It wasn't necessary to wait for snowfall. An inspector using an imaging camera would quickly detect these temperature variations.

Most operators recognize a solar buildup or the result of bright sunlight bearing down on an outside target such as substation structures, building envelope, roofs, surfaces and materials above underground pipes, example blacktop which is prone to solar heating. Recognizing the need to eliminate this solar interference, an operator will normally elect to perform an infrared inspection either on an overcast day or during the evening hours allowing the dissipation of solar energy from the target area.

It is amazing how unlimited infrared technology can be. In fighting forest fires, they look through smoke to determine the actual fire for placement of retardants. Firefighters use handheld devices to rescue people. The government flies rivers to detect industrial polluters. Military use thermography to count people or targets. Fishermen plot the movement of the gulf stream to look for preferred fishing areas.

Race car teams measure tire temperatures. Security personnel can detect concealed weapons or biological threats or individuals operating at a high level of anxiety, all based on temperature variations.

In closing, you just have to open up your mind and think infrared, and how it can benefit both you and your company.

Thank you.

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