Think Thermally®

Practical news for practicing thermographers

September 2003

See inside:

Thermal Solutions® 2004

Florida's beautiful west coast is once again the home of Thermal Solutions®, the infrared industry's largest independent conference for thermographers. This year's event is scheduled for January 26–29, 2004 at the newly renovated Radisson Suite Resort on Sand Key Island in Clearwater Beach.

Only at Thermal Solutions are all camera manufacturers, industry publishers and related technology vendors welcome to display their products making the Thermal Solutions experience one of a truly friendly infrared community. Attendees enjoy an open and inclusive atmosphere that encourages the promotion of all technologies and ideas from the world of infrared and beyond.

Thermal Solutions showcases the industry's latest developments and innovations in a variety of paper presentations, vendor exhibits and short courses. New for this year, participants will enjoy additional networking time to meet, speak and learn with other industry professionals during a special conference dinner cruise and reception.

Once again, the presentation of papers at Thermal Solutions provides conference attendees with an array of relevant information, covering the most current subjects found in predictive maintenance. Participants witness proven techniques and intriguing case histories from real-life experiences of other industry professionals.

On Monday, January 26, a series of short courses presented by industry leading thermographers offers another valuable learning experience. Each session includes a course manual that participants may take with them and use as a future reference. Topics covered at past conferences have included work with electrical and mechanical applications, building inspections and non-destructive evaluation of materials.

This year's Thermal Solutions Exhibit Hall plans to showcase state-of-the-art imagers, complementary equipment, publishers and service companies from the predictive maintenance industry. Previous vendors have included All-Test Pro, AVCAN, CMC Electronics, FLIR, Indigo Systems, Infrared Solutions, IRCameras.com, Janos Technology, Land Instruments, Logos Computer, Ludeca, Maintenance Technology, Mikron, MSA,

Oberon, Ox Creek Energy, PdMA, Raytheon, ReliabilityWeb.com, Rockwood Industrial, SDT, Specialized Camera Sales, Square D Services, Stockton Infrared, Thermal Wave Imaging and UE Systems. Already this year we have three camera manufacturers who didn't exhibit last year committed to exhibit, creating a dazzling array of equipment available at no other conference.

Thermal Solutions is for everyone, not just practicing thermographers, but consultants, contractors, materials engineers, technicians, skilled tradespeople and managers. For more information on Thermal Solutions 2004, please contact Snell Infrared directly at 800-636-9820 or the conference web site at www.thermalsolutions.org.

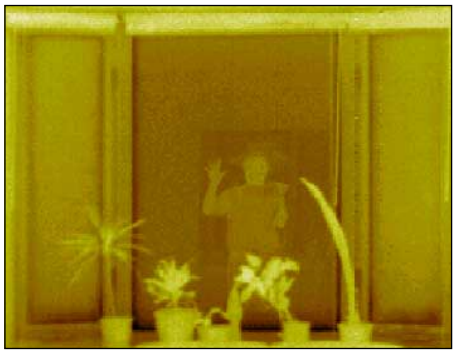
Windows and Glass

Are you thinking about using infrared to conduct building inspections of your home, office or plant? If so, don't miss Snell Infrared's upcoming Building Applications specialty course November 12–13 in Toronto, Canada. Greg McIntosh of Snell Infrared Canada, a professional engineer specializing in heat transfer and thermodynamics with over 25 years of experience in building thermography, conducts this two-day course. Those in attendance learn about the wide-range of building applications most commonly inspected with infrared.

Participants quickly discover that buildings can be very complicated structures whether you are looking for conductive losses through insulation or convective losses in and around windows. Problems are not as easily diagnosed as a hot electrical connection is, for example.

Properly trained thermographers who inspect electrical connections on a regular basis are aware of the issues regarding emissivities. What they may not know is that when it comes to using infrared for building diagnostics, windows could quite possibly be considered the "shiny metals" of building applications.

It is important for thermographers who are evaluating windows during a building inspection to understand that glass has



A reflection of the thermographer and an opposing window can be seen in this inside thermogram of a double-glazed window.

some very unique infrared properties. First, we know that glass is partially transparent to short wave thermal energy while opaque to long wave radiation. Glass is also highly reflective and has a varying reflectance value with wavelength in the long wave band. Being a smooth surface, glass may also be specular in both wavebands. These variables can pose special challenges when inspecting windows using either short or long wave imagers.

To better illustrate how glass reacts to infrared radiation, it is helpful to understand how a greenhouse operates. A greenhouse works because short wave solar radiation is able to pass though glass and is then absorbed by objects on the inside such as plants, pots and air. Thanks to the First Law of Thermodynamics, these objects heat up and infrared radiation is then emitted by them, but at a longer wavelength. This long wave infrared radiation is not able to pass back through the glass and instead is reflected back into the structure, warming up the interior. This is also known as the Greenhouse Effect.

It is because of these properties that a thermal image of glass in either short or long wavelengths is usually not a reliable way to measure the surface temperature of a window. So, unless otherwise stated in a thermographic report, not much significance should be placed on the imagery of the glass surface itself.

If you are using a long wave camera and are outside conducting a heat loss inspection, know that the imager is not necessarily reading the surface temperature of a window and is being influenced by reflection. Depending on the angle of the window or the thermograher in relation to the window, the surface might appear to be cooler if the window is reflecting more of the sky or warmer if affected by a nearby building.

In short wave, glass becomes partially transparent and will usually create an image that appears to be correct when in fact some of that infrared radiation may be coming from behind the glass. It is possible, in certain situations, for thermographers to accurately obtain temperatures of a windows surface with specific camera configurations including the use of a filter. If this is the case the methodology, camera, and glass specifications should be specifically detailed in the proposal or report.

While thermal imaging of the glass surface itself may be suspect, it is often the areas around the glass which we are most concerned about when inspecting windows. Thermal bridging, condensation, air leakage and water penetration are all often associated with areas immediately adjacent to the glass and window. Thermography

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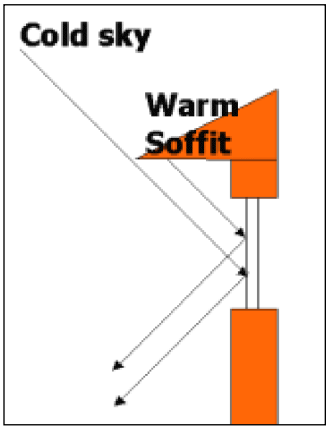

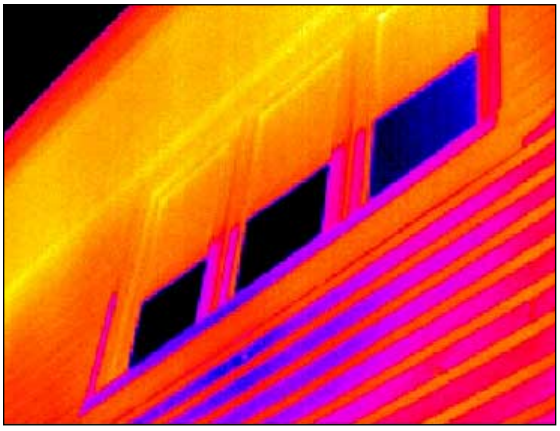

Camera operators require both training and experience! This thermogram would seem to show the bottom of the windows are much cooler than the top, perhaps indicative of some insulated shades? As can be seen from the diagram at left, in reality the glass at the top of the window is reflecting the warm soffit, while the bottom of the window is reflecting the very cold sky.

Energy, Food and Calories

For those of you who have taken a Level I or Level II course, you know that we are constantly talking about heat and energy. Simply defined, heat is a quantity of energy that is measured in British Thermal Units (BTU's) or Calories. In reality though, what is this stuff called energy?

The universe is really made up of two things; matter and energy. Some people may say three when you include space, but for the purposes of this demonstration, all we need to know is that matter is the "stuff" of the universe while energy is what "spices" it up.

Without energy the world would be devoid of any activity, for it is energy that puts atoms and molecules into action. The total absence of energy, that is when an object has no molecular motion, is what we use to define absolute zero. Add some energy and the object's temperature begins to rise.

Have you ever asked "How warm is it today?" Of course, but what you were really asking is "How much energy is in the air today?" The more energy stored in

the air, the warmer the air will be. Same thing with the age-old question of "When's dinner going to be ready?" which is really asking "When will our food be finished absorbing enough heat energy for its temperature to rise to the degree that has changed it to a point where we enjoy eating it?"

Energy can exist is many forms, but in thermography we are most concerned with heat or thermal energy. When it comes to our consumption of food, though, another form of energy, chemical, comes into play. It is why we are still able to get energy from something that is much colder than our bodies. Take, for example, eating an ice cream cone.

A person can digest 10-degree ice cream and yet still convert that food into providing additional energy to a 98-degree body. The ice cream's chemical energy is locked in molecules that are then released through the process of digestion. The byproduct of this energy conversion is heat that keeps us at a steady 98.6 degrees F, making the body an amazing thermal machine.

The amount of stored energy in food is measured in Calories. The definition of a food Calorie is the amount of heat energy needed to raise one kilogram of water one degree Celsius. It is with these principles that nutritionists figure out how many Calories are in food. Using a device called a Bomb Calorimeter, scientists burn a sample mass of food that is surrounded by water under controlled laboratory conditions and calculate how much the water is warmed up by the fire. The more calories in the food…the hotter the water gets.

So there you have it. Now go ahead and enjoy that extra ice cream cone, because after all, you're only giving yourself more energy, right? Only if it were that simple…

Windows and Glass, *continued from previous page*

will often identify many of these problems without the thermographer having to obtain the surface temperature of a window. Of course, if the windows have aluminum mullions we're back to the same problems as with shiny electrical bus. All of these topics and more are covered during the Snell Infrared Building Applications course. To find out more about this class and others, please visit the Snell Infrared web site at www.snellinfrared.com.

Looking for more information on building applications? Contact Matt Schwoegler at Snell Infrared at 800-636-9820 or via e-mail at mschwoegler@snellinfrared.com. Send us your complete contact information and we will be happy to forward you a free article on another application where infrared located double glazed windows that were collapsing and imploding due to the loss of argon gas. Originally presented by Rob Spring of Snell Infrared at our annual Thermal Solutions® conference, *A Unique Thermal Problem Found in Certain Double Glazed Windows* demonstrates how infrared, when properly utilized by trained and qualified thermographers, is used to help find these windows prior to failure.

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Snell Infrared Remaining 2003 Course Schedule

Level I ($1,495)

Pittsburgh, PA	October 6–10
Charlotte, NC	October 20–24
Toronto, ON, Canada	October 20–24
San Antonio, TX	November 3–7
Edmonton, AB, Canada	November 17–21
Montpelier, VT	December 1–5

Level II ($1,495)

Toronto, Canada	October 27–31
San Antonio, TX	November 3–7
Edmonton, AB, Canada	November 3–7

Courses in Research & Development, Process Monitoring, NDT/NDE of Materials & Prep Course for ASNT Level III T/IR Exam are available. Call for details!

Specialty Courses ($750)*

Mechanical Applications:

Detroit, MI	October 7–8

Electrical Applications:

Phoenix, AZ	October 7–8

Building Applications:

Toronto, ON, Canada	November 12–13

* Level I or extensive thermographic experience is a recommended pre-requisite for these two-day Specialty Courses.

Register to attend Thermal Solutions®!

800-636-9820

All courses can be presented on-site at your facility... call us for more details!

Snell Infrared

Training, Certification and Support for Thermographers

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