Infrared Technology for Moisture Investigations!

Have you noticed? Good IR cameras are not as expensive as they were a few years ago. That puts the thermal imaging technology within the reach of many more small companies. Good IR cameras still cost thousands of dollars, so the decision to buy or lease requires some serious thinking. Some of you already have a thermal imaging camera and you are probably hoping that your competitors never get one. But you can't stop progress and eventually most everyone in the cleaning and restoration business will be using this technology as much as we use moisture meters and thermohygrometers.

So, for those of you who are not yet using the thermal imaging technology, let's go over a few things that might help you decide what's best for you. And then we'll talk about camera features.

The Technology.

Just to clarify what this technology does, let's review a few points about the physics of infrared. Infrared radiation is an energy wave that is a little longer than the visible light wave. On the electromagnetic spectrum infrared is just "beyond" the red part of the visible light band width, thus the designation infra (beyond) red. It is no more dangerous than radio waves, which are energy waves longer than infrared waves. Hollywood has departed from the science of this technology and portrayed it as something that can see through clothing and walls. Thankfully, IR cameras do not see through walls. If we could see through walls the technology would probably be useless for us because we would not know which surface we are looking at: the interior wall? exterior wall? building next door? Where would it stop?

For the purposes of this discussion we are talking about radiation in a band width with wave lengths between 7 to 15 microns. So, what does the camera "see"? A good guide to remember is that the IR camera "sees" the same surface that your eye sees. It is detecting, with few exceptions, only infrared radiation coming <u>off of</u> and <u>from</u> the specific surface that your eye is seeing. All surfaces that we look at emit and reflect infrared radiation. And in some cases infrared radiation transmits <u>through</u> a surface. An example would be thin plastic, regardless of the color. Does IR transmit through class in the 7-15 micron band width? No. This means that your IR camera cannot pick up radiation from objects on the other side of glass. Learning to use an IR camera is not hard. It is different, though, and therefore requires training in the physics of infrared and the principles of thermodynamics.

Does this technology identify moisture? Does it identify missing insulation? Does it identify air leaks? NO! Then what does it do for us? The great advantage of a good thermal imaging camera is that it is incredibly sensitive to thermal differences. Is there a thermal difference where evaporative cooling is taking place? YES. Is there a thermal difference where there is missing insulation? YES (under the right conditions). Is there a thermal difference where there are air leaks? YES (under the right conditions). Excessive moisture, missing insulation and air leaks in building envelopes constitute "problems", expensive problems. We are in the business of solving commercial and residential building problems. The faster and more

accurately we solve those problems, the more successful we are. And there you have it: the IR camera has turned out to be a highly successful tool for those in the water damage restoration industry.

Solving the Moisture Problem

The principle for locating moisture on the interior walls is evaporative cooling. Evaporative cooling can be very slight. There could be only a 1°F temperature difference from wet to dry. A good IR camera will easily show that slight temperature difference.

Let's say a customer calls and is in a panic. They just arrived home from being gone a couple of days. A pipe froze and due to a small crack there is water standing in the family room at about a depth of 1 inch. Step one is easy: extraction. Is that the end of the matter? No. What about the walls? We can not solve a matter until we know where to look. The process of finding all areas that have moisture issues can be a long and tedious task when using only a moisture meter. Even then, it is possible to miss spots. The thermal imaging camera quickly and accurately shows thermal differences. Proper use of a moisture meter is then used to verify the presence or absence of moisture. The investigation results in the determination of the problem. It might be moisture; it might be missing or compromised insulation on a cold day; it might be an air leak on a cold day. All three of these issues look the same on the thermal imaging camera when investigating the interior of the building on a cold day. So, the IR camera is used in conjunction with the moisture meter to quickly and accurately identify moisture. Take another look at the title of this article: Do I Really Need a Thermal Imaging Camera? Do you really need to quickly and accurately locate moisture issues? Of course you do. Do you really need to monitor and speed up the dry down process? Of course you do. Do you really need to document your work to protect you from future litigation? Of course you do.

Once the moisture in the walls has been located and verified the process of drying begins. With the use of air movers, that nice horizontal moisture line begins to develop peaks and valleys. There's no better tool to monitor the dry down than an IR camera. The peaks and valleys are easily located; the air movers are readjusted; and the drying process continues more quickly. And don't forget to let the customer see the moisture patterns as seen through the camera. Customer confidence is a valuable thing. And, as the old saying goes, "seeing is believing". When the customer observes you using the IR camera their confidence level goes up immediately. They know that nothing will be missed. Happy customers pay faster, too.

Have you ever had a customer call you a couple of years later with a mold issue? And they think the problem is due to an incomplete dry down? How's your documentation? Do you have "before" and "after" IR images showing that the job was completed? Those images can save you a lot of stress, not to mention a lot of money. So, maybe at this time you are convinced that you need to shop for an IR camera.

Things to look for when choosing an IR camera

Since good IR cameras range from $4,500 and up, what features do I need? What do I need to consider? Although there are many feature differences between cameras, some of the major things to look for are:

NETD: This is **N**oise **E**quivalent **T**emperature **D**ifferential. It means temperature sensitivity. The lower the NETD number, the better. 0.07º C is more sensitive than 1.0º C. 1.0º C is more sensitive than 1.5º C. Why is that important? Evaporative cooling results in a small temperature differential, especially toward the end of the drying process. The faster the moisture evaporates, the larger the temperature differential (about 4ºF or 5ºF). As the evaporation slows down the temperature differential becomes smaller (about 1ºF or 2ºF) and you'll need a very sensitive camera to monitor it. The higher the NETD, the more grainy your image will appear and it's possible to miss some very slight thermal differences.

Detector size: Should I get a 160x120 array or a 320x240 array? I recommend that you avoid a camera that has less than a 160x120 array. The 160x120 array with 19,200 detectors will give you the detail needed to locate moisture issues. If your budget allows for the 320x240 array with 76,800 detectors you will gather even more detail and be able to present sharper images in your report.

IR plus visible light: The latest and greatest technology is IR Fusion. This technology incorporates both a visible light camera and the infrared camera so that you can see both images. Why is that helpful? Infrared, being a thermal image, can be challenging for the thermographer and customer when trying to identify exactly where the issue is. Much of that confusion has been eliminated for those with IR Fusion. It also eliminates the challenge of standing in the same spot and trying to take another picture with a digital visible light camera.

Voice memo recorder: Not all cameras have this feature but it is very practical from the standpoint of documentation and speed.

Radiometric: Most all cameras now provide you with a temperature reading on the camera. Some have a center point temperature; some have hot and cold readings on the camera; and some show the temperature where ever your cursor is positioned. It's important to have at least a center point temperature reading.

Software: Be careful about the software that comes with the camera. It's best to get a full post analysis software that enables you to work with the palettes, the level, the span bar, comments, annotations, and reports. Some cameras come with very basic software and you must pay extra for a full post analysis software. Be sure to find out exactly what you are getting.

Training: Another expense to take into consideration is training. You can read the user manual and become a "camera operator". "Camera operators" can easily make costly mistakes. I strongly urge you to take a training course in the physics of infrared and the principles of thermodynamics so that you can use the camera responsibly and not get into

trouble. You don't need a course in industrial and electrical applications. You need a course in moisture investigations and building envelope investigations.
Screen size: Although we tend to get excited about how small a computer is or a phone is, etc; the thermographer's job is harder as the screen decreases in size.

Warranty and service: Check out the warranty. Some cameras have a one year warranty. Some have a two year warranty. Where is the camera manufactured? How fast and how easy will service be?

Other features: The above are just a few of the most important considerations. There are many other features to consider: number of palettes; level and span adjustments, battery time, method of saving images, weight, drop test ratings, etc.

In summary, to be competitive the professional water damage restoration company will need to consider seriously the addition of the IR technology. It might be that the most expensive thing you can do is to decide not to use IR.

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