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# Level III Thermographer calls on Fluke IR cameras for speed, quality, and performance

**Application Note**

Testing Functions **Case Study**

**Tool:** Fluke Ti400 Infrared Camera

**Operator:** Brent Foster, Owner and President of Northwest Infrared

**Application:** Building science thermal imaging

## "We have to understand emissivity and we live and die by the weather"

Imagine you have a retail store customer who calls you about a moisture leak located somewhere on a 10,000 square foot (929 square meter) roof. Just to make it more interesting, they've already repaired what they thought was the problem...twice. So now it's your turn to find the real problem so it can be resolved once and for all.

If you're a Level III thermographer like Brent Foster, owner and president of Northwest Infrared in Olympia, Washington, that's just a typical day. A certified building analyst and building science thermographer, Foster started his thermography career about 15 years ago when he bought his first infrared (IR) camera for his inspection business. That camera, called a "drill cam" because it used the same batteries as a cordless drill, became indispensable in helping him find moisture and heat loss, and in helping him learn the value and complexity of thermal imaging.

IR cameras have come a long way since then and so has Foster, having sold his building inspection business in 2005 to focus solely on "building science" thermal imaging. Building science applications use thermal imaging to focus on moisture problems, heat and energy loss, and potential electrical problems in commercial, industrial, and residential buildings. These applications rely on detecting temperature differences between various surfaces.

An expanse of wall might look uniform, but an infrared camera can detect temperature anomalies.

Setting up a blower door.

An infrared camera can detect where is it wet and where is it not wet.

## Threading the needle between temperatures

Temperature deltas are much smaller in building science applications than in heavy industrial environments. Often these deltas have differences of six degrees or less. "Building science thermographers look for issues that are not blatant but are potentially very dangerous or very expensive," Foster says. "We have to understand emissivity and we live and die by the weather. If you're going to shoot a roof or the walls of a building, weather is everything."

Temperature differences point thermographers to moisture because a wet area should be a little colder than a dry area. In a wet area, the water should be evaporating, so it'll be colder than a dry area. However, if the water isn't evaporating the wet area could be the same temperature as the dry area, so a thermal imager can't pick up a temperature difference—or the moisture. "You have to find a way to make a temperature difference if you don't have one," Foster says. In those cases, he sets up a blower door or a fan, or waits until the sun moves around to that side of the building.

Another challenge is to make it clear to potential customers what an imager can and can't do. "People often call a thermographer when they have exhausted everything else on the planet," says Foster. "You have to explain to them that an imager is a 'where' tool, not a 'what' tool. It doesn't tell me where the leak is, but it tells me where the moisture is, and it narrows down the problem area of where to begin your destructive discovery [evaluation]."

## Adding new thermal imaging capabilities

After using his original drill cam for several years, Foster purchased a Fluke FlexCam TiR3 IR camera in 2007, which he still uses for some applications. "It is a workhorse. It has an articulated lens that twists so you can scan a factory ceiling that's a hundred feet high without having to walk around with your head tilted back," says Foster.

The only drawback to the TiR3 was that it was a bit heavy to carry 60 or 70 feet (18 to 21 meters) up a cage ladder. So in 2011, Foster got a Fluke TiR32 IR camera, which is smaller and has a handle he could easily hook onto his belt. "The TiR32 has fabulous horsepower and has fewer buttons so it's easier to use," says Foster. "It's one of the best field imagers I've ever had in my hand."

Foster upgrades his thermal imaging tools as he finds new features that help him get his job done more efficiently. "Fluke keeps coming out with features that I like and that are usable. I am not a techie. If I plug it in and it doesn't work, I'm calling somebody," says Foster. "Fluke thermal imagers are a breeze to use. You just plug them in and they work."

So when Fluke came out with the Ti400 IR camera, he decided to try it out. "With LaserSharp® Auto Focus and auto capture, Fluke has automated the weak parts of imaging," Foster says. "They've made a tool with a lot of capabilities and very few confusing buttons."

In addition to the automated features in the Ti400, Foster also is hooked on voice annotations that eliminate the need to carry a notepad. This functionality comes in particularly handy when he has to scan a large expanse of roof or wall that all looks the same. He simply makes a grid of the area and when he finds an anomaly he records it along with the grid number and any other details related to that image.

On a roof with Fluke TiR32 Infrared Camera.

## Thermal imagers help fight crime

You probably don't think of a thermal imager as a "go-to" tool for criminal investigations, but you might be surprised by how useful it is for those situations, as Brent Foster has learned. In addition to his building science projects, from time to time he gets calls for his services on crime-related jobs.

One such case involved a shooting. A suspect was in custody, but the police couldn't find the gun. They knew generally where the gun was but they couldn't locate it; and if they didn't find it soon they were going to have to release the suspect. It had been eight months since the shooting, so Foster was skeptical about whether he would be able to find the weapon, but was game to try.

So at the end of a warm sunny day, right before sundown, he met police at the location where they thought the gun was. He climbed a tall tree with the Fluke TiR32 and scanned down into the field with a wide angle lens in the area they thought the gun might be.

"It took us 20 minutes but we found it," says Foster. "We simply let Mother Nature change the dynamics of the potential target by heating up the metal on the gun. I then used the infrared camera to pick up an image of the radiant energy that came from that heated metal as the area around it cooled."

Another case Foster was called in on required detective work as well. An owner of a storage facility suddenly saw his power bill increase by more than 600 percent for no apparent reason. He suspected there was perhaps a grow operation of some sort in some of his storage units, but to get a warrant to search each of the several hundred units would have been impractical, if not legally impossible.

The facility owner called Foster, asking whether he might be able to narrow down suspicious units by scanning the outside of units. Armed with his TiR32, Foster arrived at the location toward evening on a winter day and walked up and down the rows of storage units, scanning the front of each one. "It didn't take long. When I found heat on a door, I captured the IR image along with the digital image of the location that showed the number of the unit being scanned," says Foster. "The facility owner used those images to get a warrant, and sure enough found illegal growing operations in some of the units."

Besides his thermography business, Foster teaches the basics of thermal imaging to field tradespeople, such as insulation contractors and home inspectors. In those classes and also for trade show presentations, Foster uses the Ti400's live HDMI streaming video capabilities to show real-time results on a large video screen.

## Smart software saves time

In the field, Foster uses the SmartView® Mobile App to send real-time images of problem areas to clients on their iPhones to alert them to potentially critical situations. In one case he captured and sent an image to a plant manager that turned out to be a breach in an industrial oven, which needed immediate attention.

Foster relies on the SmartView software that comes with Fluke thermal imagers to create reports for his clients. "For an average structure under 10,000 square feet, if I start first thing in the morning, I can deliver their report in email by midnight," says Foster. "I can't have any downtime. The SmartView software works every time. You don't get halfway through a report and have it crash. And you don't have to go through a learning curve every time you want to do something differently."

The Ti400 is designed for both quantitative and qualitative thermography. The former involves taking the apparent temperature of a target and using that to determine whether or not a problem exists. However, as a building science thermographer, Foster focuses more on qualitative thermography.

"In qualitative thermography you're comparing temperatures. It is much harder to do when the temperature differences are slight, so image quality means everything," says Foster. "The resolution and image quality on the Ti400 is fantastic."

Foster does a lot of heat loss studies and moisture intrusion mapping of the inside of a building or home. "If you were on vacation and a water pipe broke behind your refrigerator and you came home to 3 feet (.91 meters) of water, the first thing you'd want to know is 'Where is it wet and where is it not wet?' " says Foster. "I come in and thermal map the whole house in an hour, give you pictures of it by midnight, now you know what to tear out tomorrow. You've got data that you couldn't get any other way."

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