



The Global Leader in Infrared Cameras

T H E R M A C A M[®]
INFRARED CAMERAS

ELECTRIC POWER INDUSTRY
FIND PROBLEMS
SAVE MONEY
DELIVER RELIABILITY



| S E E I T

| M E A S U R E I T

| R E P O R T I T |

Find problems, save money and deliver reliability

For over 30 years, thousands of utilities worldwide use infrared to avoid costly failures, improve service reliability and prevent electrical fires. Today's infrared cameras are more powerful, capable of monitoring remote substations or critical assets 24/7 over the web, all at more affordable prices.

The results are impressive for all sectors of the utility industry. A recent study in *Transmission & Distribution Magazine* analyzed seven different methods and technologies for doing electro-mechanical inspections – and established infrared as the leading diagnostic technology (see table below).

Another study presented in *Maintenance Technology Magazine* reported that for every \$1 spent on electrical inspections, there is a \$4 return on the investment made in materials and labor from fixing problems before failure.

Why do more people buy FLIR infrared cameras than all other manufacturers combined? Because FLIR offers the widest selection of the most powerful, robust and reliable cameras in the world not to mention the best post-sale technical support and the world's largest and most experienced staff of training professionals.

All FLIR cameras—portable/handheld, fixed- or vehicle-mounted—feature real-time (60 Hz) video rate imaging, ideal for scanning miles of power lines accurately without compromising thermal sensitivity or image quality. The professional grade cameras for the utility industry also offer visible and thermal image capture, while the Laser LocatIR™ highlights problem areas with a red laser, blending precision, non-contact problem identification with best-of-breed innovations to dramatically improve worker safety.



Benefits of Infrared Inspection

- Deliver uninterrupted power
- Validate repair work
- Inspect equipment under load
- Quantify lower risks for insurance auditors
- Document problems for corrective action
- Measure temperatures without contact
- Avert unscheduled shutdowns
- Verify new equipment installations
- Maximize equipment life, make timely repairs
- Reduce costs of component replacement and/or repair
- Manage grid reliability
- Dramatically improve worker and public safety
- Improve reliability
- Save tens of thousands of dollars!

INVESTMENT RETURN CONTRIBUTION PER METHOD/TECHNOLOGY

Infrared	59%
Visual	21%
Ultrasonic (Airborne) — 40 kHz plus	10%
Dissolved Gas-in-Oil Analysis	3%
Ultrasonic (Contact) — 40 kHz to 250 kHz	3%
Sonic — 20 Hz to 20 kHz	2%
Vibration — <1000 kHz	2%

M. Goff, T&D World, November 2002

A ThermaCAM® P60 Infrared Camera Includes:

- IR camera with visual camera, Laser LocatIR, remote control with LCD display
- Carrying case
- Lens cap, shoulder strap, hand strap
- Manual (multi-lingual)
- Batteries (2)
- Power supply
- Battery charger
- Head-set
- Video cable RCA-plug
- USB-cable
- S-video cable
- Flash Card
- ThermaCAM® Connect™ Software

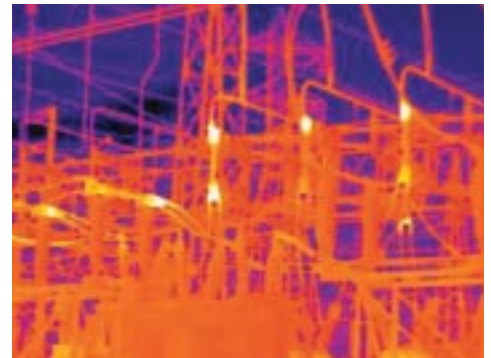


Inspect electrical systems SAFELY with non-contact infrared inspections

Overheating contacts inside this load tap changer on a main power transformer has caused a dramatic increase in the temperature of the oil inside, posing a potentially dangerous situation. A normal load tap changer is usually cooler than the main tank.



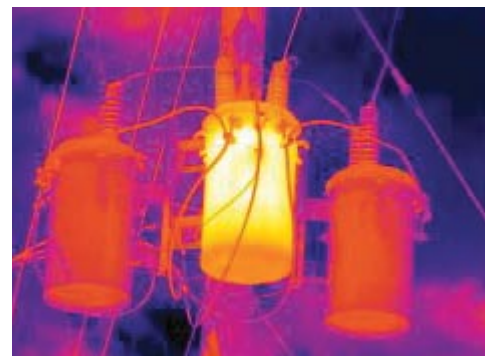
A wide view of a substation can quickly show areas where unwanted high resistance connections exist. Electrical current passing through a resistive connection produces heat; electrical systems get hot when connections loosen or corrode and power is not properly transmitted — no other predictive maintenance technology is as effective for electrical inspections as IR thermography.



This thermal image shows a hot connection—measuring 437°F when viewed with a telescope lens — in a substation that supplied power to a hospital and nearby residential neighborhood. The infrared camera pinpointed the anomaly immediately. An electrical connection had "blown off" during a lightning storm and had re-welded itself to the support bracket of the insulator.



Excess heat on this distribution transformer was attributed to internal damage plus low oil level.



WHAT UTILITY CUSTOMERS SAY:

About FLIR Systems

With over 30 years experience and more than 30,000 of its IR cameras in use, FLIR is the undisputed global leader in infrared systems. From industrial to military applications, thermography professionals have made FLIR their number one choice. No other company offers such a wide range of infrared cameras, software, service, training and support.

FLIR's ThermoCAM series of thermal imaging cameras have long set the standard for thermographic testing and analysis. Today they are the most widely used non-contact temperature measurement infrared cameras in the world.



The Global Leader in Infrared Cameras

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IMPORTANT TARGETS for IR!

Substation inspections – indoor and outdoor	Oil circuit breakers	Oil filled transformers	Radiators	Cooling pumps	Load tap changers	Bushings	Air blast circuits	Breakers	Breaker tanks	Coupling capacitors	Switches	Insulators	Transformers	Fuses
Electrical panels	Bolted connections	Motor control centers	Bus ducts/cable trays	Cable inspections	Motor windings	Generator brushes	Loose connections	Tight connections	Friction connections	Phase (load) imbalances	Faulty components			

Within the power of infrared technology, it is by far the most revealing technology we have out there. Out of all them, all the technologies, including vibration and ultrasonics and sound level and things like that. Infrared finds probably 60 percent or better of your anomalies.

*John Giesecke
Electric Power Research Institute (EPRI)*



John Giesecke
Electric Power Research Institute (EPRI)

Infrared gives you a way of non-destructive testing. You're able to go in and look at a piece of switchgear and actually check the integrity of the bus connections and the tightness without actually putting your hands on it. We inspect a lot of substations and by looking at 4160 bushings, we can detect if a problem exists and then fix that problem in a timely manner without the substation actually being taken out of service.

It's also nice in mechanical settings where you've got machinery that you have questions on bearings, or some parts and you can quickly go in there and give them a diagnostic evaluation of whether they do need to shut the machine down and work on it.

*Ron McNabb
Journeyman Wireman*



Ron McNabb
Journeyman Wireman

Oh, it's just a fantastic tool! We use infrared technology for a lot of different things in a power plant. The situations where we use infrared technology are endless. They go from electrical systems to mechanical systems, piping systems, insulated systems, pipes on buildings, boilers, piping systems throughout the plant, tank levels, underground steam leaks, roof situations where we have roof leaks. But mainly the big use is our switchyard or electrical gear within the power plant and anytime we take the camera out of the office, we just see many things that pique our attention. And they aren't necessarily problems that particular day where they're going to fail, but they are problems that could be problems and you catch them early and that's what's great about it.

Jim Zelch



Jim Zelch

In our jobs we're judged on how well we're doing our jobs by our customer minutes interrupted. If we can find hotspots with infrared thermography, we can prevent outages before they occur, we can keep the power on to the customers, keep the reliability of the system up. That's our main goal with the infrared thermography.

We use infrared thermography to find hotspots in our substations, transmission lines, so we can fix things before they fail. The FLIR camera is a very versatile tool for us to use because we can take the temperature, we can compare it against ambient, the other objects in the picture, and see how much temperature rise, which the FLIR camera has a nice convenient way of doing that with the spots. And we can also take a digital still picture at the same time and then we'll know exactly what we're looking at that time. So the FLIR camera is a very versatile camera for us to use.

*Michael Brown
Florida Power and Light*



Michael Brown
Florida Power and Light

The best thing about using an infrared product from FLIR, the first thing that stands out is their high quality. They've got an incredible reputation because they've been in the market for so many years. The benefit for dealing with a company like FLIR is that you have a high degree of confidence they're going to be around for a long time to come to support their products.

*Terrence O'Hanlon
ReliabilityWeb.com*



Terrence O'Hanlon
ReliabilityWeb.com

