FLUKE®

High resolution infrared inspection power transmission and distribution applications

Application Note

Today's public and private utilities in the developed world face a number of challenges. The components of the power grid are getting older and need regular predictive maintenance (PdM) to keep them running efficiently and to avoid costly and dangerous failures. Utilities are running with leaner crews so staff technicians are stretched to their breaking points. A steady stream of widespread weather-related outages, take their toll on the aging power network and are challenging utility crews to keep up with repairs.

As a result, the need for PdM is growing and the resources to perform it are decreasing. Still, it is necessary to conduct regular inspections of all aspects of the power network quickly and accurately so that potential problems can be addressed before they become actual problems. At the same time, utilities need to meet increasingly rigorous safety standards for inspecting all phases of the power system. The tools they use for those jobs need to support the safety standards and be intuitive and versatile to keep training costs down and maximize the value of each tool added to their toolbox.

One tool for many utility applications

One tool that can help utilities meet all those objectives is a handheld infrared camera (also called a thermal imager). Infrared cameras allow you to capture two-dimensional representations of the apparent surface temperatures of electrical components and other objects without touching those surfaces and without interfering with target systems. The images and measurements from that testing can help you identify problems before they do a lot of damage.

However, not all thermal imagers are created equal. The new Fluke TiX1000, TiX660 and TiX640 infrared cameras—part of the Fluke Expert Series line—are ideal for utility applications because they allow you to work from a safe distance to inspect areas that you could not get close enough to inspect any other way. They go wherever you go—from inspecting transmission lines from a helicopter or truck, to scanning live substations on foot, or climbing down into a cramped transformer vault. They deliver ultra-high resolution and temperature accuracy from far a way or close-up, along with quick response, and several user-friendly features.

Top THREE

Utility inspection applications

For expert series infrared cameras

1. **Transmission line inspections**
2. **Substation or switchyard inspection**
3. **Vault inspection and troubleshooting**

FLUKE®

Expedite PdM and troubleshooting
These Fluke Expert Series infrared cameras with their high resolution images, long distance accuracy, thermal sensitivity, advanced focus systems, flexible viewing options, and other innovative features are particularly suited to the challenges of transmission and distribution applications, including:

Transmission line inspections
Loose contacts, corrosion, or internal defects in fittings and weakened or failing cable splices often cause hot spots that pose serious hazards to the integrity of a power transmission system. In areas subject to high winds and frequent wildfires this can have catastrophic consequences.

That's why utility companies are vigilant about inspecting their transmission assets to find hot spots before they can cause disasters. In the past, surveying miles of transmission lines through remote and difficult terrain required hiring a helicopter with a fixed mount infrared camera to survey the area. These cameras often only identified anomalies and provided no radiometric data. Getting the data to diagnose the problem often required a second trip or carrying a second, more sophisticated infrared camera.

Another challenge, if there were only a few towers to be inspected, was that the lineman typically had to climb into a bucket and be raised up to inspect connection fittings or contacts. This was time consuming and brought workers closer to dangerous high voltage.

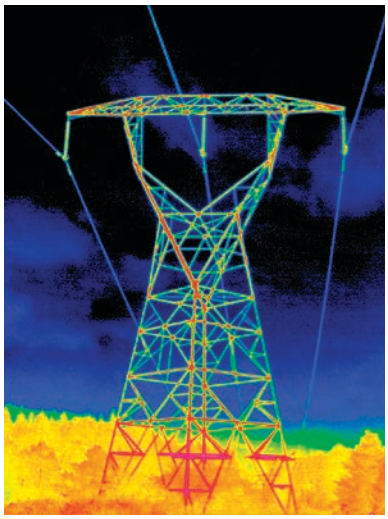
These Fluke Expert Series infrared cameras help to overcome both of those challenges.

They deliver high resolution images and radiometric information at a safe distance with less hassle. You can inspect fittings and splices from the ground, using a TiX1000 infrared camera with a telephoto lens to scan up to 115 feet (35 m) away and

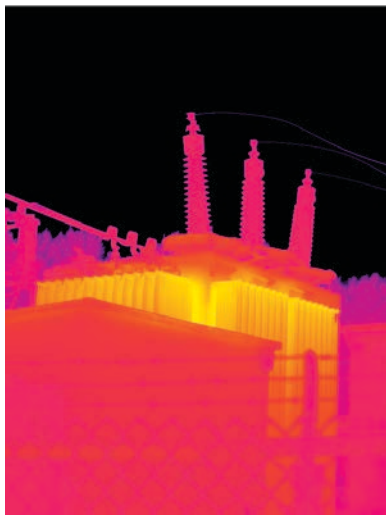
Gain inspection accuracy, versatility, and speed with the new Fluke Expert Series infrared cameras

- **More diagnostic information.** The more detail you can see in an infrared image, the more information you have to work with. These Fluke Expert Series infrared cameras give you both detail and information.
- **Super high resolution images.** Get four times the standard mode resolution and pixels (up to 3.1 million pixels on the TiX1000 and up to 1.2 million pixels with the TiX660) with Super Resolution mode for crisp images that deliver maximum detail.
- **Large 5.6 inch rotatable LCD display** lets you more easily inspect over, under, and around difficult-to-navigate equipment.
- **A tiltable LCoS color viewfinder display** with 800 x 600 pixel resolution provides great visibility in daylight applications.
- **Advanced focus systems** offer a choice of manual, auto focus and LaserSharp® Auto Focus and EverSharp multifocal recording features, for quick, accurate, in-focus image capture.
- **Maximum lens flexibility** with field replaceable optional lenses (2x and 4x telephoto lenses and two wide-angle lenses) you get the ability to capture high-resolution images close up or from a distance.
- **Gray scale and full color imaging** serve a variety of applications.
- **Video capture with voice and text annotations** makes it easier to document trouble points.
- **Fluke Connect™ wireless compatibility** allows inspectors to send images and measurements to smartphones and iPads with the Fluke Connect® mobile app for team collaboration*.
- **Handheld versatility** gives you the choice of carrying the camera in a helicopter, truck, or on foot, or mounting it on a tripod.

***Within providers wireless service area.**



Electrical utilities transmission tower.



Electrical utilities substation transformer bushings.

Electrical utilities broken strand and high resistance.

zoom in with the 32x zoom lens anywhere that you see an anomaly.

For aerial inspections you can carry these Fluke TiX infrared cameras on a helicopter and quickly scan miles of transmission lines, using gray scale to locate hot spots, and zooming in on suspect locations to collect high resolution infrared images with radiometric data. The built-in laser distance meter ensures that you are focusing where you intend to.

You can combine a digital visible light image an infrared image through Fluke IR-Fusion® technology to provide visual context for locating suspect components. You can also make text or voice annotations to add more details or location information. The removable SD card stores thousands of images which you can forward on to the supervisor back in the office for further analysis and reporting. Using the included SmartView® software you can adjust the emissivity, reflective temperature compensation, transmissivity, level and span, and palette of the image downloaded from the thermal imager or zoom into a particular area of interest and include the enhanced images in a report or work order.

Substation or switchyard inspection

Substations and switchyards have many complex electrical systems and equipment that handle very high voltage. Keeping this equipment running safely and efficiently is critical because a failure can lead to lost production revenue for end users and lost sales revenue and liability issues for a utility.

Keeping substations and switchyards online requires regular PdM to isolate conditions that indicate impending failure. Infrared cameras combined with the skills of an experienced inspector provide the predictive capabilities to fill this role well because overheating or abnormally cool operating temperatures may signal degradation of an electrical component. A substation transformer can cost hundreds of thousands of dollars so keeping just one from being destroyed could more than pay for the infrared camera.

Here again, these Fluke TiX Series infrared cameras provide an extra measure of accuracy and safety. You can perform the initial scan of the exterior of the substation from a distance of over 100 feet. The tiltable color viewfinder of the TiX provides a clear view of the image even in sunlight. You can move quickly through the components, scanning the transmission line feeding the station, the circuit from the transmission line, high side insulators (arrestors) and bushings on the transformer, and the regulators. Moving inside the perimeter you can inspect the bus work and its bypass switches for hot spots.

The EverSharp multifocal recording mode captures multiple images from varying focal distances with the push of a button. Using special algorithms, SmartView® software combines those images to create a single image with sharper detail of both the initial focal point, and of the elements around the focal point.

If you find temperature anomalies at any point, you can zoom in on those areas and assign a level of criticality using either spot markers or other annotations. Then you can use the images and measurement data collected to create a professional report to document your findings.

Vault inspection and troubleshooting

Transformer vaults are typically crammed full of equipment and located below ground level, which makes them difficult to access and even more challenging to safely troubleshoot

and maintain. However, PdM is absolutely necessary because failure within a vault can be costly, dangerous and a very visible mark against a utility's reputation.

In addition to auto focus capabilities provided by these Fluke TiX infrared cameras, there are some added features that make them very handy for cramped transformer vault applications. Wide angle lenses allow for the quick scan of large areas—ideal for tight spaces.

The large 5.6 inch articulating LCD display swivels as needed to see much of the vault from above ground. If there are areas you can't reach from that spot, then you can easily carry the camera down the ladder, using the included neck strap, to scan the remaining connections and switches.

See what you're missing

The common requirements for all of these applications are clear image resolution, temperature accuracy, speed, and flexibility to get high resolution images in areas that may be hard to reach. Those are the very capabilities that set these Fluke Expert Series TiX infrared cameras apart.

To find out more about how these versatile, high resolution, high accuracy cameras can help utility companies keep the power up and running smoothly, consult your Fluke sales representative or visit **www.fluke.com/TiX1000** for more information.

Multiply your resources with Fluke Connect® wireless capabilities

With the Fluke Connect mobile app you can transmit images and measurements from Fluke Expert Series infrared cameras in real-time to any smart phone that has the Fluke Connect mobile app. That makes it easy to share results with team members because everybody on the ShareLive™ video call can see the same images and measurements remotely that you're seeing on site. That can help you get approvals on the spot and expedite repairs.

You can also save images and measurements from your smart phone to EquipmentLog™* history in secure Fluke Cloud™ storage for easy access by all authorized users. In that way you can compare real time measurements to baseline data to identify problems and make better decisions faster.

You can also use SmartView® software included with all Fluke infrared cameras to document your findings in a report that includes thermal images, visible light images, and blended images to communicate problems you find and to suggest repairs.

Fluke Connect™ is not available in all countries.
***Within providers wireless service area.**

Fluke. *Keeping your world up and running.®*

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