

# How using high resolution infrared cameras for predictive maintenance can save time and money

## Application Note

Predictive maintenance involves measuring key indicators on critical equipment at regular intervals, documenting those measurements, trending those results over time, and looking for changes—particularly those that cross a threshold known to damage equipment. This approach is designed to help predict a failure before it occurs so that it can be headed off with scheduled maintenance. Preventive maintenance doesn't use trending and threshold alarms to the same degree, but does involve regular, planned equipment inspection and maintenance and, in some cases, planned equipment replacement.

In the past, industrial facility maintenance programs based their level of preventive maintenance based on the degree of risk and consequences. Basically that meant "How likely was a failure, and how much damage would it cause?" If the answer to either was "little", many facilities opted for a more casual and reactive approach to maintenance.

Part of the reason for taking this approach was because predictive maintenance required significant expertise and complex equipment and software. However, two things have changed since then. One, manufacturing now runs so lean that the impact of downtime is high enough—even on average—to incentivize at least preventive maintenance practices. Two, inspection technology has improved significantly, lowering the cost and the skill set required for meaningful predictive maintenance (PdM) programs.

Many companies are finding that predictive maintenance is more cost effective and efficient than preventive maintenance

because they don't have crews performing unnecessary preventive maintenance on machines that don't have a problem. PdM is still a relatively new practice, but it has already produced results. According to the U.S. Federal Energy Management Program, unplanned downtime due to equipment failure costs manufacturers up to 3% of their revenue. Predictive maintenance can achieve an 8 - 12% savings over typical reactive maintenance methods. A predictive maintenance program employs several different inspection techniques, ranging from thermal imaging to vibration testing, ultrasound, condition-based monitoring, basic electrical testing, and more. This article specifically addresses PdM applications for infrared cameras (also called thermal imagers).



### Top FIVE

**Areas where PdM can have a significant positive impact where practiced.**

1. Utilities
2. Chemical processing
3. Nuclear power plants
4. Data centers
5. Financial operations
6. Discrete manufacturing

**More effective PdM**

Fluke TiX Expert Series cameras enhance your results at every stage of the PdM process.

- **Capturing images.** Higher quality images deliver important details that you might miss with a lesser camera. The high resolution delivered by the Expert Series can make the difference between catching a potential problem early, and finding it when it's already caused damage and outages. With focus distances ranging from 20.3 cm to 30.5 m (8 in to 100 ft), you can cover a broad area quickly with these

cameras and then zoom in for the detail you need.

- **Storing images.** You can store captured images to the removable SDHC memory card, or transmit images and measurements from Fluke Expert Series infrared cameras to any smart phone that has the Fluke Connect mobile app. That makes it easy to share results with authorized team members. 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 team members.



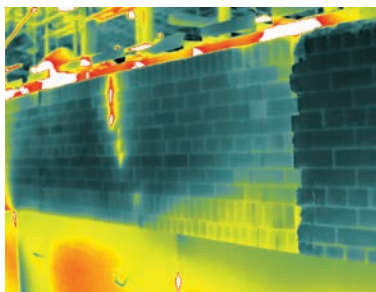
**Start with the big picture with the Fluke Expert Series infrared cameras**

For predictive maintenance inspection applications in critical and/or potentially hazardous situations such as utilities, chemical processing, nuclear power plants, data centers, and financial operations, you need as much diagnostic information as you can get to identify subtle changes. That means you need a high resolution infrared camera such as the Fluke TiX Expert Series line of infrared cameras. Recognizing the challenges in those extreme environments, these new Expert Series cameras were designed to provide a high level of detail as quickly and easily as possible with:

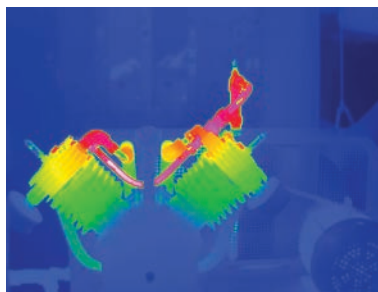
- **High resolution images** with up to four times the standard mode resolution and pixels (up to 3.1 million pixels on the TiX1000 and up to 1.2 million pixels with the TiX660) with SuperResolution mode for crisp images that deliver maximum detail.

- **A large 5.6 inch rotatable LCD display** that 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.
- **Versatile focus options** including manual, auto focus and LaserSharp® Auto Focus and EverSharp multifocal recording features, for quick, accurate, in-focus image capture.
- **More diagnostic information.** The enhanced image quality and temperature measurement accuracy of these Fluke Expert Series infrared cameras give you the detail you need to monitor subtle changes.

- **Fluke Connect™ wireless compatibility** (where available) that allows inspectors to collaborate with other team members by sending images and measurements to authorized team members' smartphones and Apple® iPads with the Fluke Connect mobile app.
- **Maximum lens flexibility** with field-replaceable optional lenses that allow you to capture high-resolution images close up or from a distance.
- **Quick response** with the subwindowing mode option (selectable camera option at time of camera purchase) that allows users to document and analyze many frames of data per second to better understand sudden temperature changes



Monitoring potential areas of refractory brick deterioration



Compressor head



Monitoring insulation

### High resolution cameras in action

Applications such as petroleum, chemical, electrical, nuclear power, cement and steel manufacturing that involve extreme temperatures and potentially hazardous conditions can all benefit from the level of detail provided by high resolution infrared images. Some specific examples include:

- Refractory insulation inspection. The heat emitted by refractory structures keep inspectors at a distance, but you still need to be able to see small changes to predict when repairs are needed. A high resolution infrared camera is critical to being able to see those minute changes over time while there's still time to take action before confronting a much bigger problem.

Because these structures tend to be very tall, you need a camera that can deliver clear crisp images of the entire structure, including the very top. The TiX 640, 660, and 1000 infrared cameras with their 32x zoom and scanning distance of more than 100 ft. (30.48 meters) are up to the task. With these cameras you can scan the entire structure from the ground and then zoom in wherever you find an anomaly. The high resolution images ensure that you see clear crisp detail of the anomaly such as fissures in structural elements to help you decide whether it needs immediate attention.

### Other application areas for infrared cameras include:

- Monitoring and measuring bearing temperatures and condition in large motors or other rotating equipment.
- Identifying leaks and determining fluid levels in sealed vessels and tanks.
- Monitoring insulation performance in process pipes or other insulated processes.
- Finding faulty connections in high power electrical circuits and equipment.
- Locating overloaded circuit breakers in a power panels.
- Identifying fuses that are at or near their current rating capacity or that are improperly installed.
- Identifying problems in electrical switch gear.
- Trending process temperatures.
- Monitoring overall performance of specialized production equipment and systems

### The value of using infrared cameras for PdM

The key reason more companies are moving to PdM is that it improves the quality and reduces the cost of maintenance. Infrared inspection is a common place to start. That's because the first indicator of many common electrical and mechanical problems is an increase in temperature. A thermographer can quickly detect potential problem areas by scanning the entire electro-mechanical system with an infrared camera from a safe distance, without interrupting the operation.

### Benefits from infrared inspection include:

- **Reduced downtime.** Infrared inspections are done with the equipment running so it saves downtime. Also, problems are typically found early so there is less emergency downtime.
- **Increased production capacity and quality.** Processes are optimized because subtle problems are found and addressed before they have a major impact on production.
- **Safety.** Regular inspections with a high resolution infrared camera can quickly find a wide range of potentially hazardous problems before they cause catastrophic results.
- **Increased revenue.** More uptime means more revenue. And with less maintenance on good components and faster repairs of faulty components, reduced maintenance costs leading to a better bottom line.
- **Reduced parts inventory and spare parts carrying costs.** By better understanding the likelihood and timing of repair or replacement needs, parts inventory can be managed and carrying costs reduced

More reliable predictions. Finding problems early allows the facilities staff to properly schedule corrective maintenance activities when personnel and resources are available.

**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 authorized smart phones or tablets that have the Fluke Connect mobile app.



You can easily monitor a process remotely and share results with authorized team members all over the world through a ShareLive™ video call. That can enhance collaboration and help you make adjustments faster. You can also use SmartView® software included with all Fluke infrared cameras to quickly document findings in interim reports that include thermal images and data.

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

**See what you're missing**

Whether you're designing the next mobile device, scaling down passenger vehicles, or developing a new stronger, lighter polymer, make sure you have the best thermal data you can get. The Fluke Expert Series cameras deliver the image resolution, temperature detail and accuracy, speed, and flexibility to help you succeed.

To find out more about how these versatile, high resolution, high accuracy cameras can help you develop better products faster, consult your Fluke sales representative or visit [www:fluke.com/TiX1000](http://www.fluke.com/TiX1000) for more information.

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

**Fluke Corporation**  
PO Box 9090, Everett, WA 98206 U.S.A.

**Fluke Europe B.V.**  
PO Box 1186, 5602 BD  
Eindhoven, The Netherlands

**For more information call:**  
In the U.S.A. (800) 443-5853 or  
Fax (425) 446-5116  
In Europe/M-East/Africa +31 (0)40 267 5100 or  
Fax +31 (0)40 267 5222  
In Canada (800)-36-FLUKE or  
Fax (905) 890-6866  
From other countries +1 (425) 446-5500 or  
Fax +1 (425) 446-5116

Web access: <http://www.fluke.com>

©2014 Fluke Corporation. All trademarks are the property of their respective owners. Smart phone, wireless service and data plan not included with purchase. First 5 GB of storage is free. Compatible with iPhone 4x and up running iOS 7 or higher, iPad (in an iPhone frame on iPad) and Galaxy S4, Nexus S, HTC One running Android™ 4.4.x or higher. Apple and the Apple logo are trademarks of Apple Inc. registered in the U.S. and other countries. App Store is a service mark of Apple Inc. Google Play is a trademark of Google Inc. Data subject to change without notice. 11/2014 6004043a-en

**Modification of this document is not permitted without written permission from Fluke Corporation.**