The Benefits of Fixed Thermal Imaging

By Jeff Kresch, Raytek

Fixed-mounted infrared systems are designed for automated monitoring and control of continuous or stationary targets. Could your process benefit?

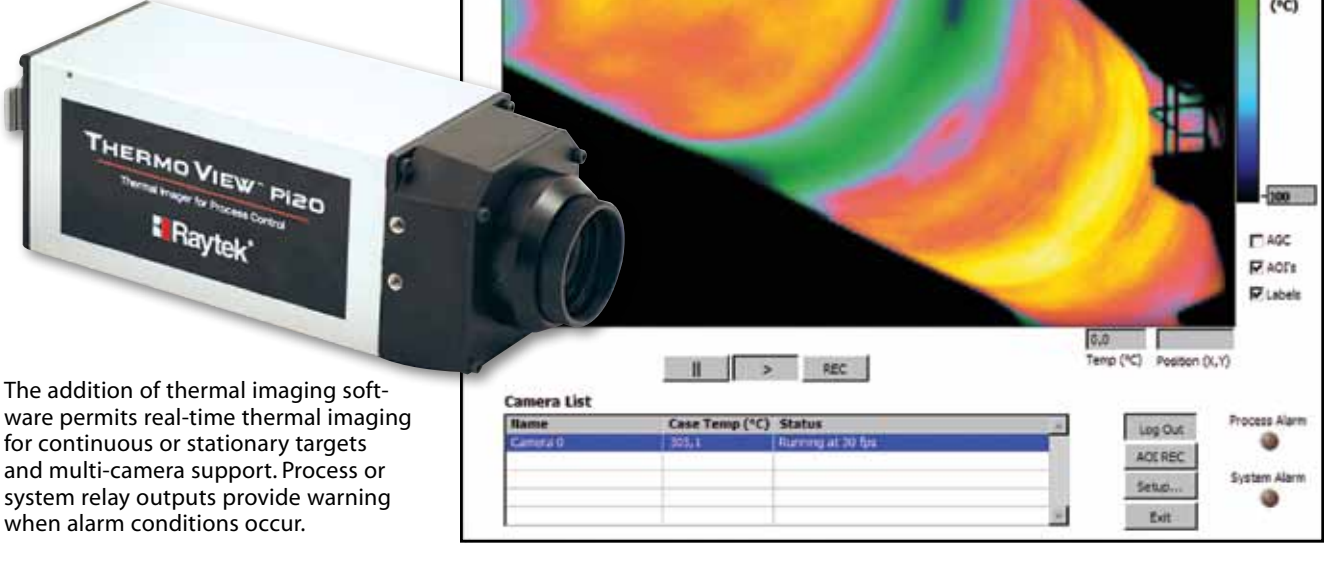
Noncontact temperature measurement is widely used for industrial process monitoring and control. Infrared (IR) thermal imaging can provide detailed information to help improve product quality and increase productivity. Technology innovations combined with lower costs help make fixed-mounted, high-resolution infrared thermal imaging systems an effective solution for many process industry applications.

This article discusses the benefits of fixed-mounted thermal imaging devices vs. portable, handheld thermal imagers. It describes developments that improve the performance of fixed thermal imaging for use in industrial process heating.

The basis for infrared thermal imaging technology is that any object whose temperature is above 0°K radiates infrared energy. The amount of radiated energy is a function of the object's temperature and its relative efficiency of thermal radiation, known as emissivity. Radiated energy can be detected with a thermal camera and, with the use of sophisticated computer software, converted into an image that is visible on a screen. A thermal imaging camera can easily identify hot or cold spots in production line operations by measuring surface temperature variations.

Infrared thermal imaging equipment is used in the process industries for a range of manufacturing, quality control and asset management tasks. It enables plant operators to adjust process parameters for greater productivity and throughput, find defects on materials non-destructively and improve quality control procedures.

Infrared thermal imaging systems provide an area temperature measurement. By contrast, spot sensors are capable of only of a single-point temperature reading. In many applications, the desired location to measure the target temperature will vary. In such cases, the broader view of a thermal imaging is effective. In the tobacco industry, for example, infrared thermal imaging helps to reduce waste from improperly dried tobacco and prevent fires caused by smoldering tobacco stored in bunkers. A fixed thermal imaging camera and software



The addition of thermal imaging software permits real-time thermal imaging for continuous or stationary targets and multi-camera support. Process or system relay outputs provide warning when alarm conditions occur.

also can be used in widely varying applications such as to detect unquenched clinkers on coke conveyers, or identify hot spots during pressboard manufacturing and garbage incineration.

Portable and Fixed Systems

The thermal imaging equipment available today varies in size, shape and design. The cost of these systems depends, in part, on the purpose of the temperature measurement as well as the complexity of system software used for viewing, archiving and playback of thermal images.

No single infrared temperature measurement device can meet all process industry requirements — the range of applications is too vast. Most users can choose between portable, handheld instruments or fixed units that measure the temperature on a continuous or periodic basis.

Handheld infrared thermal imagers have gained popularity due to their portability and ease of use. When purchasing a handheld imager, however, the buyer should be aware of the design and weight of the thermal camera. Equipment ruggedness and environmental protection are considerations as well. Battery-powered, portable units provide an analog video output. Typically, they are used in maintenance, quality control, diagnostics and spot measurements.

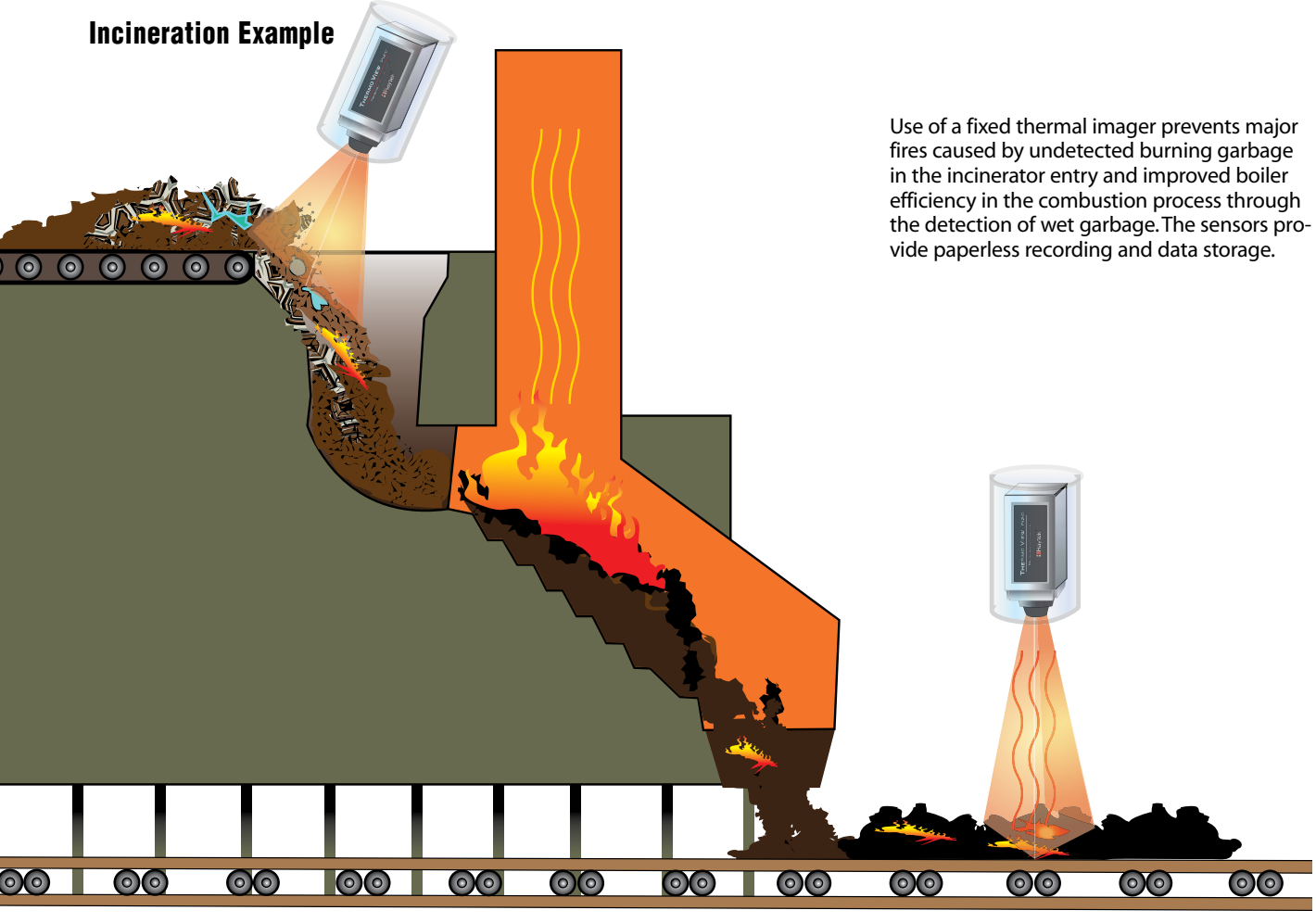
Fixed-mounted units are installed in one location and operate on line power. They are designed for automated monitoring and control of continuous or stationary targets. They typically transmit the video long distances via Ethernet.

Fixed thermal imaging offers continuous monitoring of a process condition. Portable thermal imaging will only provide information when the operator moves the camera to the location to be monitored. A typical example is monitoring the shell temperature of torpedo cars used to transport molten metal in a steel mill. In this application, use of a fixed thermal imager ensures that every time a torpedo car passes the viewing location, an inspection of the shell temperatures of the car will be cataloged and monitored.

Technology Developments

As infrared thermal imaging solutions become easier to integrate into process control applications, more plants are choosing to implement the technology. Improvements in imaging system designs have resulted in shorter response times that allow the users to take advantage of faster communications between the camera and the process monitoring/control system.

Incineration Example



Use of a fixed thermal imager prevents major fires caused by undetected burning garbage in the incinerator entry and improved boiler efficiency in the combustion process through the detection of wet garbage. The sensors provide paperless recording and data storage.

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Imaging system manufacturers also continually work to simplify the user interface so that infrared imaging becomes as easy to use as machine vision systems.

Technology advances in infrared thermal imaging also allow for an expanded view of process performance. Fixed-mounted process imagers provide a real-time view of thermal images, allowing plant operators to shorten process startup times and lower production line changeover costs. These cameras are paired with intuitive system software, which minimizes or eliminates the long learning curve associated with many earlier process-imaging systems.

When integrated with process control and process monitoring software, the most sophisticated fixed infrared thermal imagers offer multi-point control flexibility corresponding to areas of interest on the product with independent alarm settings. This provides the ability to reduce heating costs by applying heat to only the areas that need it. Users can also tell immediately when a product changeover is made if the process is under control. Process problems that show up as temperature anomalies are detected instantly. Image files and areas-of-interest archiving based on alarm conditions captures data showing when the alarm condition occurred.

Modern fixed thermal imaging systems also simplify networking over long distances using a standard Ethernet interface, which transmits multiple frames per second of imaging data from the camera. Additional fiber optic Ethernet accessories eliminate the need to place PC operating system software in a hazardous area. These features reduce capital investment costs by eliminating the need for specialized enclosures and rugged (and expensive) industrial computers designed to survive in a harsh field environment.

In addition, thermal imaging software can be employed for real-time viewing, archiving and playback of both online and offline thermal images. Multiple cameras can be supported simultaneously in a single software package, where nearly 200 process alarms can be assigned as relay outputs. As a result, users are able to minimize the total system footprint on the factory floor and control room with a single PC installation.

Few people would argue with the fact that infrared thermal imaging helps industrial plants save money and improve efficiency by optimizing process operations based on precise temperature measurements. Fixed infrared thermal imaging systems allow for automated temperature monitoring and control. Recent design advances allow fixed thermal imaging to be used as a cost-effective process control and predictive maintenance solution for many process industry facilities. **PH**

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