



FLIR A310 thermal imaging cameras are mounted in protective housings above the coal transport belts.

Thermal imaging cameras prevent fires at Korean coal power plant

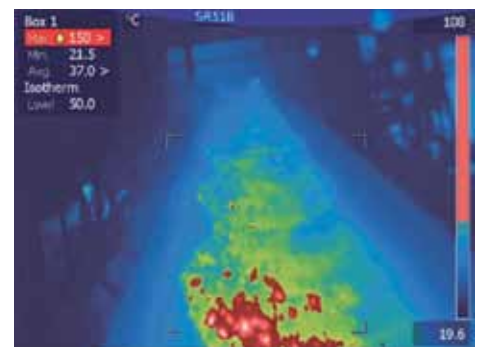
To avoid the risk of spontaneous combustion in the coal conveyor system at the Dangjin Coal Fired Power Complex (DCFPC) in South Korea the owner of the plant, the Korea East-West Power Company (EWP), has installed a fire warning system based on thermal imaging cameras. By detecting a rise in temperature long before it rises to the point where the coal reaches combustion the thermal imaging cameras help ensure the plant safety and continuity of power production.

Huge quantities of coal are stored in bunkers, silos, hoppers and open air stockpiles, but coal is a combustible material, making it susceptible to a variety of ignition scenarios. One of the most frequent and most dangerous causes of coal fires is spontaneous combustion. This can occur in any location where coal is stored or transported. Coal can start oxidizing with the oxygen in the air. This causes a rise in temperature. At first the coal's temperature climbs just above the ambient temperature, but if left unchecked it can rise to above 400 degrees Celsius, causing the coal to burst into flame.

During the pre-combustion oxidization process the coal can also produce large amounts of methane and carbon monoxide gases. The toxic and explosive gases can

further complicate the efforts of firefighters to extinguish these coal fires. It is therefore of utmost importance that these fires are detected in an early stage, so an actual fire can be prevented. That is why many coal storage plants are enhanced with thermal imaging cameras. Unlike smoke detectors, which require the production of smoke to function, an early warning system based on thermal imaging technology can detect the rise in temperature long before the coal ignites. Based on this early warning measures can be taken to halt the rise in temperature, preventing the actual combustion and the devastating coal fire that would follow.

One of the companies that have realized the potential of thermal imaging technology for fire prevention in coal storage plants is



This thermal image shows the temperature alarm going off during one of the tests performed by the EWP personnel.

the Korea East-West Power Company (EWP). It operates five power plants, including the Dangjin Coal Fired Power Complex (DCFPC). The DCFPC has total power generation capacity of 4,000 Mega Watts from eight coal-fired units.

Risky coal transport

To transport the coal to the boilers a conveyor belt system of several kilometers in length is used. During the transport the chance of spontaneous combustion is even higher than in storage facilities where



the coal lies still. When the bituminous coal ignites the fire would not only be dangerous for the plant's personnel and likely destroy part of the conveyor system, it would also cause power generation to come to a complete stop. "This scenario is not acceptable", says Kim Young Min manager at DCFPC. "That is why we installed a number of FLIR thermal imaging cameras."

The Environment Facility Team of the DCFPC chose to build their early fire warning system around the FLIR A310 thermal imaging camera. "Before we installed the FLIR A310 thermal imaging cameras we tested them extensively to make sure this system would work and we were very happy with the results", explains Kim Young Min. "The FLIR A310 thermal imaging camera can detect the slightest rise in temperature and it will not only automatically alert personnel, it will also trigger the automatic sprinkler system. This way the fire prevention system can automatically prevent or extinguish coal fires, enhancing plant safety and ensuring the continuity of the power production."

Automatic temperature alarm

One FLIR A310 thermal imaging camera is installed at the storage end, checking the coal as it enters the conveyor system. As the



The FLIR A310 thermal imaging cameras are mounted over the conveyor belt in waterproof protective housings.



Tests by EWP employees have clearly shown that the thermal imaging early fire warning system is very effective in preventing coal fires.



The footage and thermal data from the seven FLIR A310 thermal imaging cameras is sent to the PLC and to the control room.

coal is transported to the boilers at a speed of four meters per second several additional FLIR A310 thermal imaging cameras check the temperature along the way. If at any point the temperature of the coal rises above a previously determined parameter an alarm goes off.

All in all seven FLIR A310 thermal imaging cameras are included in the early warning system. All of these cameras are connected to a TCP/IP network using a standard Ethernet cable. Through the network the thermal data from the FLIR A310 thermal imaging cameras are shared with a programmable logic controller (PLC), which will immediately stop the conveyor belt and activate the sprinkler system if a FLIR A310 thermal imaging camera's temperature alarm is triggered.

FLIR A310 thermal imaging camera

The FLIR A310 thermal imaging camera contains an uncooled microbolometer detector that produces thermal images with a resolution of 320x240 pixels at a thermal sensitivity of 50 mK (0.05 °C). It contains built-in analysis functions that provide spot temperature measurement and area temperatures and an automatic alarm function.

"We chose the FLIR A310 thermal imaging camera not just for the camera quality, but also because of the easy integration with our existing PLC", explains Kim Young Min. "We wanted functionalities like remote control through the TCP/IP network, seamless integration with the PLC and we also wanted to monitor the live thermal footage in the Control Room using analog composite video. The FLIR A310 thermal imaging camera satisfies all these requirements at a highly competitive price."



The PLC immediately stops the conveyor belt and activates the sprinkler system when the temperature alarm is triggered.

Seamless integration

Due to the TCP/IP connectivity of the FLIR A310 thermal imaging cameras they are seamlessly integrated in the system. If a temperature alarm is triggered the PLC relays the information to the rest of the network, employees are alerted through sound and flash alarms and certain responsible individuals receive an individual user notice through email or FTP. The thermal footage is recorded to be used for later analysis or as evidence.

The software solution, which is based on the FLIR IR Monitor software and the FLIR Software Development Kit (SDK), also allows temperature graph analysis and temperature trend analysis. The automatic temperature alarm can be based on several parameters, including spot temperatures and the minimum, maximum, average and relative temperatures in defined areas.

Protect your assets

The Environment Facility Team of the DCFPC has verified the high performance, reliability and applicability of the FLIR A310 thermal imaging camera based fire warning system by testing the temperature alarm extensively "We are certain that the thermal imaging camera based fire prevention and extinguishment system will protect our assets and further improve our operating efficiency", concludes Kim Young Min.

For more information about thermal imaging cameras or about this application, please contact:

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