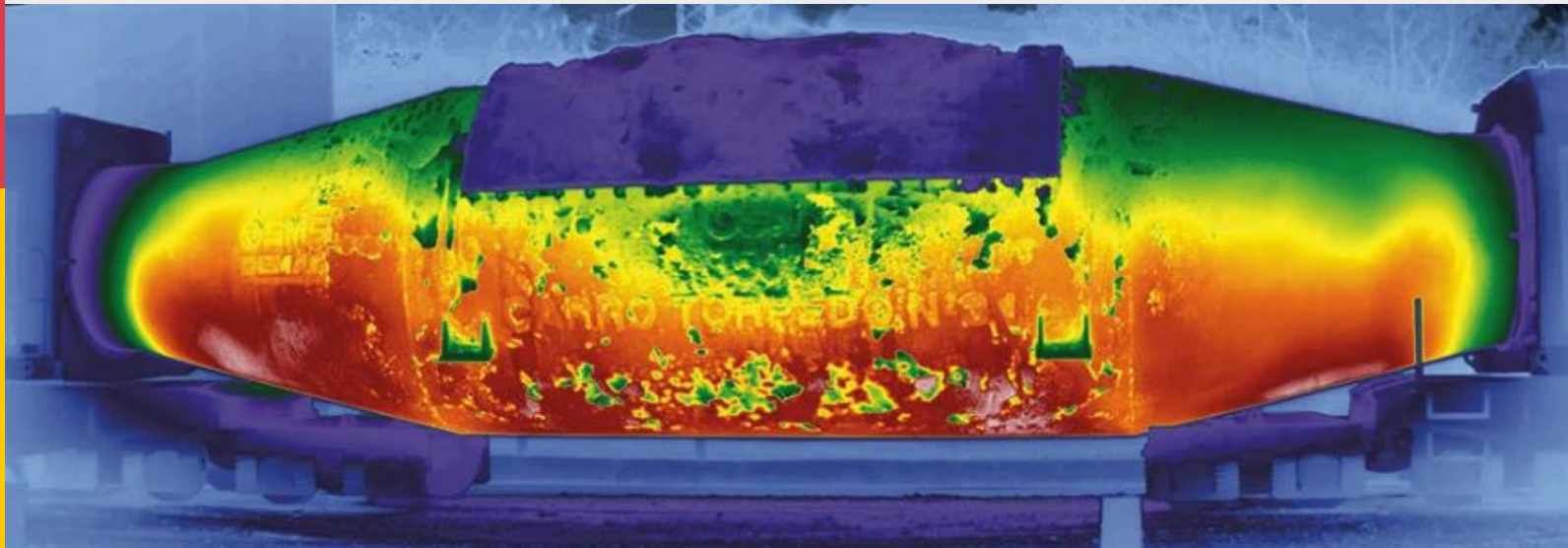




APPLICATION SPOTLIGHT - STEEL INDUSTRY



Automated Torpedo Car Temperature Monitoring System

Continuous monitoring

Steel breakouts are real-life nightmares. Showering a plant floor with hundreds of tons of 1400°C of molten iron is an extremely dangerous and costly mistake that steel mills try desperately to avoid. A breakout can result in the loss of revenue in raw materials, severe damage to nearby equipment, extended downtime, or worse— the injury or death of a worker. Monitoring ladles and torpedoedoes with thermal imaging makes preventing breakouts more realistic, but traditional handheld cameras require an operator, limiting inspection frequency and creating potentially dangerous workplace conditions.

The torpedo car monitoring system comprises infrared cameras to cover the complete outer surface of the torpedo cars, an infrared imaging software for data acquisition and system control, a database for the storage of all measured data. It is designed to effectively prevent hot breakouts, by continuously monitoring the torpedo cars during operation. This way, areas with defects or depletions in the refractory lining are automatically detected long before they become critical.

FLIR Thermal Imaging Cameras offer a solution

FLIR - The Global Leader in the Design, Manufacture and Marketing of Thermal Imaging Infrared offers the most advanced thermal imaging camera with smart sensor capabilities, offer advanced thermal imaging paired with edge computing and industrial internet of things (IIoT) for simplified inclusion in new or existing networks. With

multiple field-of-view choices, motorized focus control, and unrivaled network connectivity, these automation cameras can tackle the most complex remote monitoring, alarming, and analytics objectives

Better safety for steel plants

Proper safety measures and healthy equipment can go a long way in avoiding major accidents. Diligent preventative maintenance of the ladles and torpedoedoes are used to shuttle molten iron between steelmaking processes is critical. The Automated Torpedo Car Monitoring System is a turn-key solution for automatic early breakout warning to guarantee plant safety, while optimizing operational costs.

Cost benefits

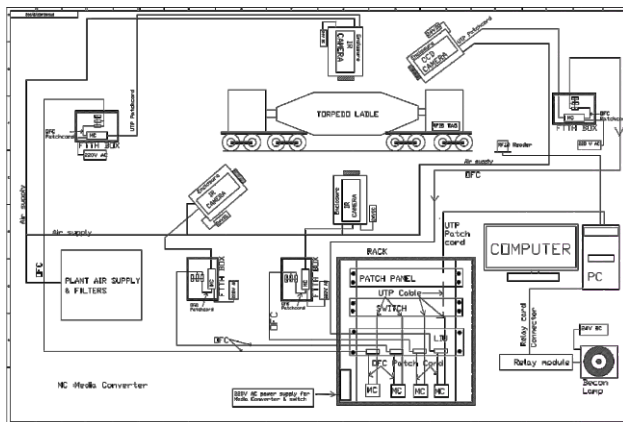
This system also helps to reduce the production costs by extending the service life of torpedo refractories. Each time the fireproof lining gets in contact with liquid metal, its condition deteriorates until finally the torpedo must be relined. Generally, the maintenance intervals for refractory material are determined based on experience. For safety reasons, these time intervals are commonly quite conservative.

The monitoring system allows a reliable assessment of the remaining lifetime of the refractory lining. The number of heats can thus be maximized without any safety issues and the re-lining can be scheduled more precisely. Considering the high costs for the refractory maintenance, the system can significantly contribute to a reduction of the production costs of steel.

How it works

Three infrared cameras in protective enclosures for monitoring the complete outer surface of the torpedo cars RFID or visual camera for automatic recognition of the torpedo car. Server computer with the monitoring software for displaying the status of the torpedo, e.g. digital output module with signal light.

Typical Single Line Diagram



Temperature trend analysis

Based on stored data of previous measurements on a torpedo car, the monitoring system analyzes the temperature as a function of the torpedo service time. An increase in the temperature trend implies a potential breakdown of the refractory and will trigger an alarm. Moreover, the temperature trend also provides a clear information for the progression of refractory wear, allowing to schedule maintenance activities more precisely

Alarm

Areas of the torpedo, where the temperatures indicate excessive wear, or a defect are highlighted with alarm colors in the user interface. This way, the operator gets a clear impression about the location and severe ness of a potential problem with the refractory. An alarm is generated at various levels as per the system configuration.



Automation Partner

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Advantages of FLIR

Flir thermal Imaging Camera gives automation system solution providers a running start with a camera that is easy to add, configure, and operate in HMI/SCADA systems. Optimize Process Control and improve quality assurance through inline thermal inspections. Identify abnormal conditions before a failure so maintenance doesn't impact uptime. FLIR A Series camera offer unmatched power and flexibility in thermal monitoring for improved product quality, productivity, maintenance.



MODBUS gives the flexibility of superior connectivity* through features such as Wi-Fi, Modbus TCP, and Ethernet/IP—all of which simplify integration into HMI/SCADA systems



ONVIF accommodates standard security VMS and NVR solutions including control of pan/tilt*



Prepares for digitalization through MQTT protocol



Integrates easily into web services with the REST API over XML or JSON

Conclusion

The whole system is designed for reliable 24x7 operation in the harsh environment of a steel plant. The system works effectively for observing surface temperature of molten steel. The system's effectiveness hinges on reliable FLIR thermal imaging, flexible customized application and excellent service support.

