How thermal imaging boosts safety, cuts downtime says FLIR

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In the mining industry, where adverse weather and environmental conditions are workplace norm, thermal imaging has been proven a dependable tool to help limit unscheduled downtime and improve workplace safety. In the process, it has proven to save millions of dollars.

This application note explores the value of integrating thermal imagers into process condition monitoring and predictive maintenance programs on electrical and mechanical systems in mining operations. It also touches on newer applications that are becoming more popular in the mining industry.

To help avoid catastrophic downtime or equipment loss — and to reduce insurance premiums and improve worker safety — mining companies rely on comprehensive predictive maintenance programs. While it’s common for mining companies to outsource some tasks, it’s more cost effective to keep as much of the monitoring and repair in house as possible.

More than 20 years ago, Per Fostvedt, founder of Infrared Systems in Ogden, Utah, started promoting thermal imaging to mining operations as a means to improve processing and predictive maintenance programs.

“When I first started calling on mines, the reception was mostly negative. Because at that time, their philosophy was to run equipment to failure, then repair or replace it,” Fostvedt said.

But the philosophy has changed over the years. Regularly scheduled predictive maintenance programs improve worker safety and save time and money. Typically, if there’s a solution available that improves safety, then mining companies are willing to invest. Many mines own thermal imaging cameras and software and send employees to infrared training courses to better understand applications and learn how the IR cameras work.

Mining companies also employ specialized outside professionals who must be able collect quality thermal imaging data, gather accurate temperature measurements, and provide timely equipment condition information using heat transfer concepts with both qualitative and quantitative thermography.

Mining operations rely heavily on electric power for ore extraction, transportation, and processing, as it is most efficient and economical and more environmentally friendly than diesel power.

A thermal image can show a substation voltage regulator termination that is very near failure. If this substation fed vital operations, and should it have failed and forced an unplanned shutdown, lost revenue could have reached millions of dollars.

A rope shovel is the lifeline of many mining operations. If it unexpectedly malfunctions, then consequences ripple through the entire mining process. Most sites don’t have shovel replacement parts readily available. Depending on the issue and age of the shovel, the part may not even be available.

Downtime can stretch on for days, which is why regularly scheduled maintenance, including IR, is so important. Issues such as overheating boom cylinders can be caught during regularly scheduled maintenance prior to malfunction can mean the difference between a fix during a 12-hour shift or losing $180,000 per hour in production and purchasing a new electric 7200 V rope shovel, which will cost several million dollars.

Other mining industry applications

Thermal imaging applications in the mining industry go beyond electrical and mechanical predictive maintenance. Depending on the type of mine, the following application cases may also be in effect:

- **Condition Monitoring**: Fix-mounted and vehicle-mounted thermal imaging cameras provide real-time imagery and data to a central monitoring station which tracks everything from temperature gradients to electrical cabinets to switch gear. In mines that are digitizing operations, data from these images can be analyzed over time to more accurately predict failure, schedule shorter maintenance windows, and minimize production downtime.

- **Security**: Size, accessibility, and safety are factors that can make manual patrols of mining site perimeters challenging. With pan/tilt/zoom configurations of high definition thermal and colour cameras – combined with modern cloud-based networking, software, and analytics – a mine’s command centre can monitor the entire site from a single location.

- **Safety**: By monitoring the integrity of a mine’s walls with thermal imaging, mining companies have more stability data to reference when deciding whether it’s safe to send workers into a mine.

- **IR Windows**: Many mining operations are requesting that new equipment include IR windows to make thermal imaging inspections safer and easier, especially of electrical equipment. Many mines are undergoing retrofitting of older equipment with IR windows as well.

- **Drones**: Unmanned aerial monitoring provides a comprehensive perspective of invisible heat differences in electrical transmission systems from the air and for mine site voids.

Whatever it takes to get the job done, the mining industry has embraced thermal imaging as a reliable predictive maintenance asset. Fostvedt said, “IR is a vital tool to monitor the transformers that feed watering systems, the refrigeration systems, the processing, motor control centres and the substations, surface and underground.”

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