APPLICATION STORY

FLIR enables real-time liquid leak detection in the mining industry

IntelliView's DCAM™ dual-camera solution uses visual and FLIR thermal cameras for early leak detection in gold mining pipelines.

The FLIR A65 produces high-quality thermal images in 640 x 512 resolution, with temperature differences as small as 50 mK.

Toxic chemicals, such as cyanide and sulfuric acid, are widely used for metal extraction in the mining industry. Whenever unintended leaks of these chemicals occur, it can immediately have serious consequences for the environment. Traditional monitoring systems struggle to detect small leaks early enough. That's why Canadian video analytics specialist IntelliView recently developed its DCAM™ analytic dual-camera solution for above-ground facilities. Making use of the compact FLIR A65 camera, IntelliView offers the gold mining industry an advanced solution to spot surface liquid leaks based on temperature and emissivity differences.

IntelliView Technologies Inc. (IVT), based in Calgary, Alberta (Canada) is a leading developer and supplier of intelligent video analytics based systems for various industrial surveillance applications. Since 2003, the company has been providing real-time detection solutions for oil and gas, security, mining, and wildlife protection applications, among others.

GOLD MINING
The gold mining industry uses a process called cyanidation to extract gold from low-grade ore by converting the gold into a water-soluble matter. The mined ore is typically collected on large heaps, which are irrigated with a leach solution to dissolve the valuable metals. The solution then percolates through the heap and leaches both the target and other minerals. The leach solution containing the dissolved minerals is then collected, treated in a process plant to recover the target mineral.

After extraction, a mix of water, chemicals and sand is pumped back to a tailings pond, where it is purified and then pumped back to a leach mill for reuse. Typically, a tailings pond is located at a distance from the mine. Above-ground pipelines carry the water-soluble mix between the mine and the pond. Unfortunately, the pipelines are susceptible to leaks, either due to temperature changes between spring and fall, or because of unanticipated events like damaged pipes, ground movement, human error or vandalism.

LIQUID LEAK DETECTION
"With standard leak detection techniques, such as pressure sensors or mass volume calculations, it is very difficult to detect small-size liquid leaks very early on, mostly due to the leak size. These standard solutions have a typical accuracy of one to five percent," says Shane Rogers, vice-president Product Development at IntelliView. "In the mining

IntelliView's DCAM™ (Dual Camera Analytic Module) combines a visual and FLIR thermal camera with built-in proprietary leak analytics. Within its field of view, the DCAM can see a leak as little as 6 liters per minute within seconds of occurrence.

The FLIR thermal camera allows the DCAM system to provide very accurate detection results with an extremely low false alarm rate.

An IntelliView trailer in the field: The weatherproof and self-contained trailer can accommodate multiple DCAM™ units and green power options (fuel cell and solar panels). The DCAM offers an effective way of detecting and alerting on small above-ground fluid spills, sprays and pooling within seconds.

industry however, pipelines are typically monitored by means of regular manned patrols on foot and/or by car. Needless to say that this can be a very costly operation, and is by no means a watertight 24/7 control process. The mining industry is extremely concerned with the environmental impact of a spill and water stewardship in general and has been actively seeking to improve their monitoring methods for years."

With these needs in mind, IntelliView developed an effective method of detecting and alerting on small above-ground fluid spills, sprays and pooling within seconds. IntelliView's Leak Detection solution features a new generation product, called the DCAM™ (Dual Camera Analytic Module), a compact combination of visual and FLIR thermal cameras with built-in proprietary leak analytics. Within its field of view, the DCAM can see a leak as little as 6 liters per minute within seconds of occurrence. The software then automatically analyzes the event based on user defined leak parameters and, if an alarm condition is determined, an alarm notification with image and video is generated for instant verification. As a system designed to accommodate multiple applications, the leak analytic software can be combined with security surveillance analytics to monitor sites and assets for intrusion, loitering, theft, and other related events.

THERMAL IMAGING PROVIDES EARLY WARNING

"We have found that thermal imaging is a very efficient way to detect liquid leaks in a very early stage," says Shane Rogers. "Our DCAM solution looks at temperature differences between the water/chemicals mix in the pipelines and the ambient temperature. Usually, the temperature difference between the two is big enough to make the detection effective. If not, a thermal camera can also detect leaks based on emissivity characteristics. Together with movement detection functionality, our video analytics can make very intelligent liquid leak detections with a high degree of accuracy."

"The use of thermal imaging technology has some distinct advantages from an operational standpoint," Shane Rogers continues. "Of course, the detection of temperature differences makes leak detection very accurate, but the technology is also relatively immune to rain, snow or fog, and can be used at night without the need for additional illumination."

MANAGING FALSE ALARMS

The IntelliView DCAM system also includes a visual camera, which is used for visual confirmation. When an alarm based on thermal information and the leak analytics' assessment has been generated, an operator can make a well-founded estimate on the nature of the incident, see whether it is a valid or an invalid alarm, and then decide which actions are needed to prevent further damage or handle a crisis.

"Just like in any video analytics system, maintaining accurate detection while minimizing false alarms is a balanced trade-off," says Shane Rogers. "Although it is almost impossible to avoid false alarms, too many unwanted alarms must be avoided, otherwise a detection system becomes useless. We have found that the combination of the visual and FLIR thermal camera in the DCAM is very effective in providing accurate detection results with an extremely low false alarm rate."

FLIR A65 COMPACT THERMAL IMAGER

IntelliView decided to integrate the FLIR A65 into its DCAM system. The FLIR A65 is a compact IR camera that produces high-quality thermal images in 640 x 512 resolution, with temperature differences as small as 50 mK. The series offers ten field of view options for greater control over the measurement area, and can operate in temperatures up to 140°F (60°C).

"The FLIR A65 was just what we needed for our DCAM solution," says Shane Rogers. "The A65 is very compact, which makes it easy to integrate, and it has a very compelling price/quality ratio. The resolution and the range of lenses available make it very versatile and the ability to discern absolute temperatures provides critical information for use in our analytic algorithms. Last but not least, the camera's environmental specifications allow it to perform extremely well, even in harsh temperatures."

IntelliView has been using FLIR technology for many years, especially camera cores like the FLIR Tau. But is wasn't until recently that the company made the switch to the FLIR A65 thermal automation camera. The main reason for this was the camera's GigE Vision interface. GigE Vision is the first standard to allow for fast image transfer using low-cost standard cables, even over long distances. With GigE Vision, hardware and software from different vendors can operate seamlessly over Gigabit Ethernet connections.

UNMATCHED IMAGE QUALITY

"FLIR is a leader in the field of thermal imaging," says Shane Rogers. "This was certainly one of the reasons why we chose the FLIR A65 for our DCAM solution. But what mattered even more to us, was that FLIR has allowed us access to such a high level of thermal image detail that is unique in the market and that cannot be offered by most camera manufacturers we know. Every pixel in the image provides exact temperature information, while most thermal imaging solutions just provide relative temperature values. As such, FLIR has certainly helped us to offer the gold mining industry an efficient detection solution that can reduce the risk of leak incidents significantly."

For more information on IntelliView's liquid leak detection solution for the mining industry, visit www.intelliviewtech.com.