APPLICATION STORY

Thermal imaging provides early leak detection in oil and gas pipelines

Monitoring the integrity of hundreds of kilometers of oil or gas pipeline networks may seem like a daunting task at first, but fortunately, technology can take over many of the labor-intensive tasks. Canadian video analytics specialist IntelliView knows the demands of oil and gas pipeline operators all too well. The company recently developed a smart camera solution, including a thermal camera from FLIR, to remotely monitor oil pump stations for leaks in an automated way.

Pipelines are still the safest mode of transporting oil, but the occasional occurrence of unintended leaks cannot be avoided. Human error during maintenance, sabotage, corrosion, and ageing pipes and fittings are all known to be contributing factors that cause leaks. Especially susceptible sections of the pipeline infrastructure include controlling valves, pig traps, pig receivers, meters, and pressure gauges.

Although pipeline leaks often start small, late detection and identification of leaks can be detrimental. For an oil and gas company, delayed detections can cause millions in financial losses, as well as damage to reputation and the environment.

MULTI-TECHNOLOGICAL APPROACH

In an effort to avoid these loses, many pipeline operators are taking a more proactive approach to maintaining the safety of their infrastructure and securing high-risk areas from potential leaks.

Oil and gas operators typically apply a multi-layered, multi-technological approach to leak detection. The most conventional methods for leak detection include manned or unmanned aerial and ground surveillance, Supervisory Control and Data Acquisition (SCADA) by remote control rooms, and other computational pipeline monitoring systems.

A variety of leak sensors can also be deployed within facilities to aid with detection and monitoring; however, timely visual verification of an alert can sometimes be a challenge for remote facilities such as pump stations and pig traps.

"Pump stations, pig launchers and pig receivers present a unique challenge because a release of liquid is usually very small and this type of equipment requires a unique coverage of potential leak points," says Chris Beadle, VP Sales and Marketing at IntelliView. "For a technology to be effective, it needs to provide sufficient coverage of the infrastructure and maintain an acceptable level of detection accuracy, while returning very minimal nuisance alerts."

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 small as 6 liters per minute within seconds of occurrence.

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

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

By design, external and internal leak detection methods widely used by the industry today are primarily intended for mainline transmission monitoring rather than pump station or pig trap environments. Acoustic cable-based sensors could be negatively impacted by valves and pumps, and use of fiber cable may be restricted as it cannot be run through valves and pumps off of the mainline and the leak may not generate enough acoustic noise for the system to alert. Moreover, these technologies do not have the ability to send a visual picture of a leak for verification, and so, would require a first response team to be dispatched to confirm an event.

CAMERA-BASED DETECTION

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, including the oil and gas, security and mining industries.

"We understand the challenges of pipeline operators very well," says Beadle. "We knew that a fixed, camera-based leak detection system would be an ideal approach for monitoring unmanned pump stations. With our combined expertise of visual and thermal camera technologies, we were able to offer an effective method of detecting and alerting on very small, above-ground fluid spills within a matter of seconds."

IntelliView's leak detection solution, called the DCAM (Dual Camera Analytic Module), is a compact combination of visual and FLIR thermal cameras with built-in proprietary leak analytics, wireless connectivity and automatic climate control. Within its field of view, the DCAM can see an oil leak as small as 0.36 cubic meters per hour from a distance of up to 60 meters. The software then automatically analyzes the event based on user defined leak parameters and, if a critical condition is determined, an alert notification with image and video is generated for instant verification.

FLIR A65 THERMAL CAMERA

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 all weather conditions and in temperatures up to 140°F (60°C).

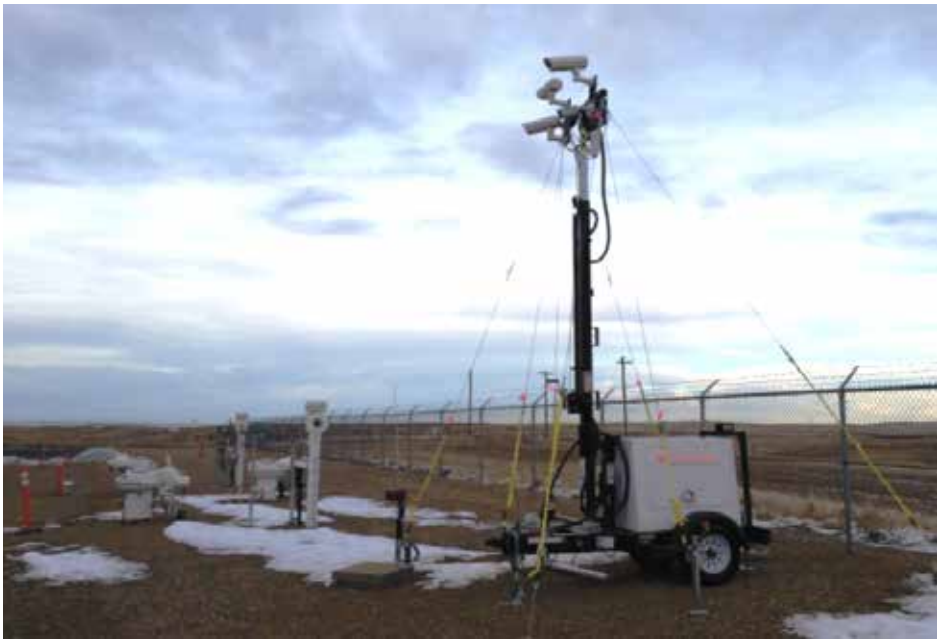
"The A65 is a compact thermal camera, which makes it easy to integrate into the DCAM system," says Beadle. "It is a very complete camera with a wide range of lenses and the ability to discern absolute temperatures provides critical information for use in our analytic algorithms."

SMART ANALYTICS

IntelliView's DCAM not only detects leaks based on temperature differences presented by the thermal camera, but also based on smart video analytics that takes into account liquid movement and leak size. This results in a very low false alert rate. The analytics work together with a series of algorithms to filter out unwanted events, such as moving vehicles, snow, heavy rain, glare and shadowing.

Another success factor of the DCAM is the combination of visual and thermal sensors, in that the alerts generated by the thermal camera can always be verified by an operator on the visual video image.

"We believe that the IntelliView DCAM system is a very efficient way to monitor the safety of above-line piping facilities on a 24/7 basis," says Beadle. "It not only helps organizations to enhance response time, but also to reduce man power and save costs."



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.

DCAM's video analytics take into account liquid movement and leak size.

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

www.flir.com/automation

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