Reducing Costs and Enhancing Safety with Open Path Infrared (IR) Gas Detection

It is fair to say that Infrared (IR) technology has revolutionised the gas detection market, providing a principle of detection that offers many tangible benefits in terms of performance, functionality and reduced ongoing costs.

Since IR’s introduction into gas detection during the late 1970s, a variety of principles have subsequently emerged, the most impacting of which has been Open Path. This is a detection technique that allows gas to be monitored across a large range. Unlike a single Point IR device, an Open Path detector usually has two components with a beam of IR light between them, allowing this type of device to detect a gas cloud that drifts into the beam. This configuration provides the instant benefit of an increased chance of detecting a gas leak.

Designed to monitor a diverse variety of Hydrocarbon gases, Open Path IR has a number of key benefits that add real value, when compared to solutions like catalytic bead detection. It is essential to consider the build, configuration and value of the Open Path devices currently available, when selecting a system, as they can vary considerably in terms of performance capability and ability to reduce ongoing costs.

• An Open Path device provides a greater chance of seeing gas over any Point detection solution (including IR Point)
• An Open Path device offers fail-to-safety operation (no unseen modes of failure), with self-checking diagnostics
• An Open Path device has a fast speed of response: typically T90 in less than 5 seconds
• An Open Path device delivers increased sensitivity that allows for the measurement of LEL metres
• An Open Path device offers low on-going costs, by requiring minimal maintenance over other Hydrocarbon detection solutions
• Some Open Path devices, like Honeywell Analytics’ Searchline Excel, offer unrivalled reliability by maximising the chance of seeing gas in all weather conditions such as snow, fog, rain and high sunlight
• Some Open Path devices like Honeywell Analytics’ Searchline Excel, can monitor long paths of up to 200 m
• Some Open Path devices like Honeywell Analytics’ Searchline Excel, feature intelligent diagnostic capabilities facilitating “early warning” of a need for maintenance. This helps sites to carry out preventative maintenance rather than reactive
• Some devices like Honeywell Analytics’ Searchline Excel provide a reduced wiring cost and simplified installation
The Principle of Open Path IR

Open Path uses NDIR (Non-dispersive Infrared); a principle that is flexible and can be used for both Point and Open Path IR gas detection.

The system works in the following way within the context of Open Path detection: The transmitter sends a beam of IR light from a lamp across a range towards a receiver. All Hydrocarbon gases absorb IR light at specific wavelengths, so the difference in light intensity when it reaches the receiver indicates the presence of a gas. The gas concentration is measured electro-optically by its absorption of a specific wavelength in the IR spectrum. The detector itself has an optical filter that eliminates all light except the wavelength that the selected gas molecules can absorb. This is an essential aspect in minimising and potentially negating the occurrence of cross-sensitivity between gases that have similar absorption levels of IR light and also other phenomena such as water vapour, which also absorbs light within the Infrared spectrum.

Designing Optimal Performance and Stability

As the industry’s leading optical gas detection provider, Honeywell Analytics manufactures the current market-leading Open Path IR solution, Searchline Excel. One of the devices key values is its exceptional performance and stability, delivered through its intelligent optical configuration.

Weather phenomena can reduce the performance of some Open Path devices, but Searchline Excel’s sophisticated technology - including a patented double band pass filter that fully compensates for water-based phenomena such as snow, ice, rain, fog and sea spray - make Searchline Excel reliable in all climatic conditions. The device is also immune to sunlight through the use of a Xenon flash lamp that is brighter than the Sun in the IR spectrum and has a unique pulse duration and shape that allows the device’s signal processing to validate that signals received are from the transmitter and no other sources. This makes Searchline Excel immune to all sources of radiation such as flare stacks, arc welding and lightening.

Searchline Excel is optimised to work in the harshest weather conditions, including permafrost. The transmitter and receiver feature heated optics designed to reduce any moisture, condensation, snow or ice on the glass that could otherwise obscure the optics in extreme environments.

Maximising Uptime, Enhancing Safety and Reducing Ongoing Costs

One of the key values of Open Path devices is the ability to simplify maintenance and reduce ongoing costs. Searchline Excel is controlled by microprocessors with integrated self-diagnostics and fault monitoring functions that assist with planned maintenance. Aspects include in-built communication between the receiver and the operator, facilitated by a portable interrogator that is suitable for use in hazardous areas and can be connected via the device’s built-in RS485 serial communication. The interrogator offers the operator a menu-driven interface, which permits commands for commissioning and aligning, calibration and configuration of the system itself, including the visualisation system. Thanks to the device’s self-checking diagnostics, it is always able
to “see gas” and provide an early warning of a need for maintenance. This makes Searchline Excel fail-to-safety, meaning that there are no unseen modes of failure and it can advise of a beam block because the receiver is always able to analyse the IR light received from the transmitter. With other detection principles, there is the chance of compromising a device’s ability to detect gas; examples include accidental painting of devices or a hood covering a unit. Even a Point IR detector will not be able to alert to a work glove being placed over its sensor; it will act as if it is online and ready to see gas, even though a potential gas release will not be able to permeate through the glove and into the device, so it can be detected.

Many refineries and oil and gas applications use a mix of both Point IR devices and Open Path. Typically Point detectors monitor joints, seals and flanges where leaks are most likely to occur, and Open Path is used to enhance safety and ensure that a gas cloud is picked up, even if an air current changes, causing the gas to migrate away from a Point detector.

Another cost-saving from some Open Path devices like Searchline Excel, is reduced wiring costs because of its ability to monitor a wide area with a single transmitter and receiver set-up - where many points would be needed to provide the same coverage and level of protection. Many comparable solutions available in the market place do not offer this reduced wiring capability and this is a key aspect that makes Honeywell Analytics’ Searchline Excel capable of delivering notable cost savings and adding real value.

Three range formats of Searchline Excel are available: short range (5-40 m), medium range (40-120 m) and long range (120-200 m), depending on application needs. In fact, Searchline Excel offers one of the longest potential ranges in the market place, with its 200 m detection path capability.

Searchline Excel’s multi-drop Modbus capability can enable significant savings in installation and cabling costs. A single communications cable can be run between up to 32 detectors instead of the usual ‘home run’ required for each detector. Additionally, the 2-way digital communication protocol allows configuration, warning and fault diagnostics to be communicated back to the control room. This reduces servicing and maintenance costs as the operator can diagnose the state of any individual unit before deciding to send anyone into the field.