

Crowcon Whitepaper

Sample Systems: Could sample systems be the gas detection industry's best kept secret?



Helping industry improve output and reduce costs with technology that draws samples away from potentially hazardous environments.

Introduction

It is probably safe to say that sample systems are a 'best kept secret' in the gas detection world.

Frequent down-time due to gas detection faults, the need to prematurely replace sensors due to damage and the impact of other gases or processes on the accuracy of gas detector outputs, are all daily concerns for production and instrumentation teams who maybe do not know that a well-designed sample system could improve efficiency and help manage costs.

Sample systems provide reliable detection in hot, humid, cold or dusty environments. They draw a sample from the environment to be monitored and most importantly condition that sample to ensure it is suitable for the sensing element to monitor. This means the system can be located away from the area being monitored, to a more suitable or convenient location to view, service and maintain the detector head, helping to keep operators safe. This can avoid false alarms from failing sensors and reduce system downtime as well as saving an operator's time having to rectify issues. A sample system can be configured to detect gases on site. For example, in a paint drying booth detection of gas by the sample system could action an automatic shutdown of gas into the burners to avoid further exposure. On some sites, a ventilation system could be set into motion when triggered by sample system detecting gas.

There is a variety of sample systems on the market; some which use pumps or compressed air-driven vacuum pumps to extract air/gas samples from the area to be monitored and present the samples to one or more gas sensors.

» To find out more about sampling systems on our website just visit www.crowcon.com/products/sampling-systems-for-gas-detection/

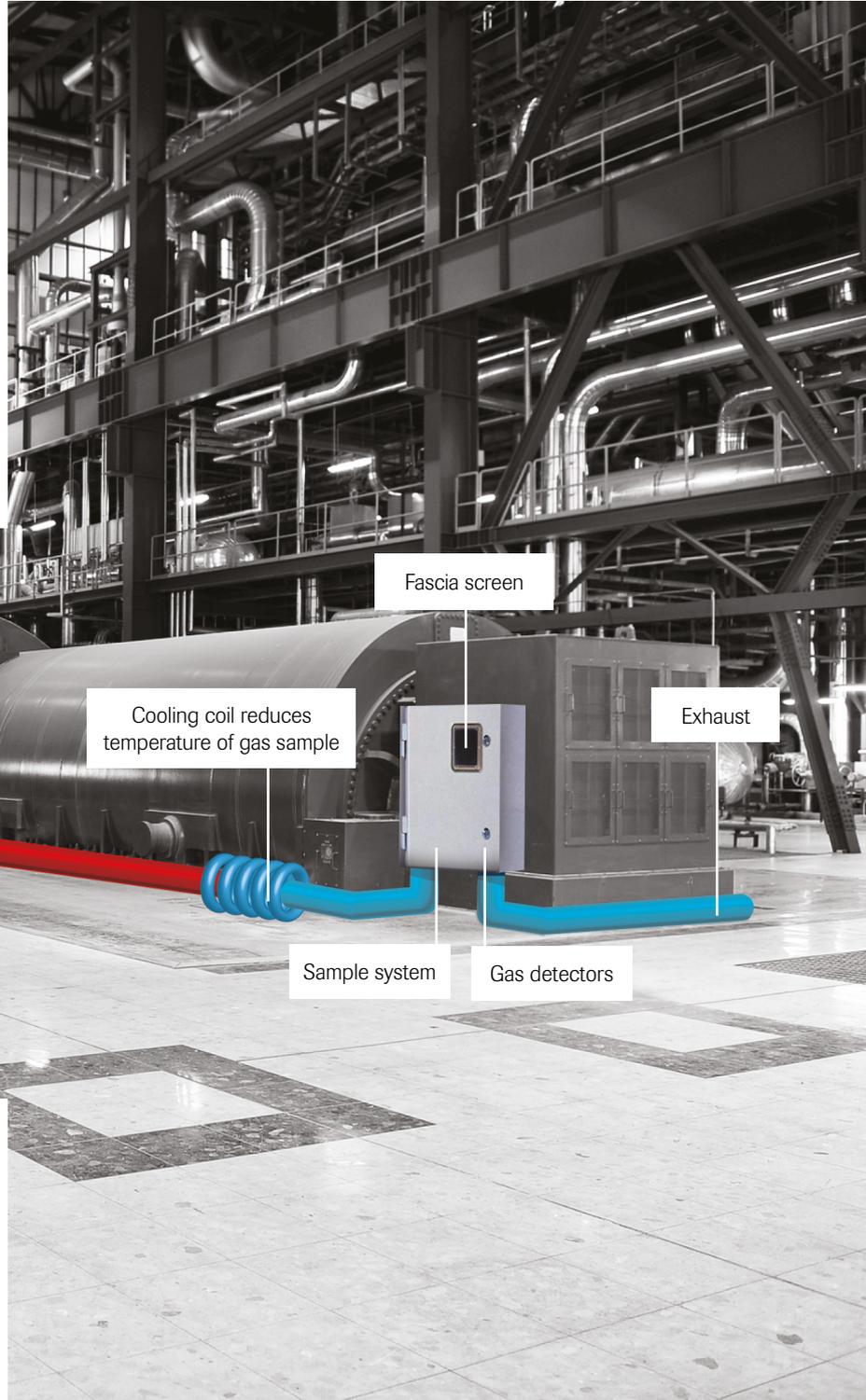
In this whitepaper, Will Allum; Fixed Product Manager from Crowcon Detection Instruments Ltd, talks about some of the key reasons why sample systems should be more widely used and highlights customers who use sample systems rather than traditional point systems.

Sample systems explained

- » Single point
- » Multi point
- » Sequential sample system
- » Aspirated sample system

How it works

- » A sample system is implemented due to the extreme heat created in the turbine. The heat would be so great a conventional detector would not be able to function correctly or completely fail.
- » A sample line is fitted to the turbine which is connected to the sample system enclosure, which draws the sample down the line.
- » Before reaching the sample system enclosure a cooling coil will reduce the heat of the gas sample to a manageable level.
- » Once the gas sample has been conditioned it will enter the enclosure and be monitored by the detector(s) to confirm gas readings.
- » If the gas reading exceeds the set level the sample system will go into alarm or if the level is acceptable, no action will be taken.
- » Once the gas sample has passed through the detector it is released into the atmosphere.



A sample system uses a draw technique to bring an air sample from a remote point to a gas detector. There are various configurations that can be tailored, built and installed to do this:

- » Single point
- » Multi point
- » Sequential sample system
- » Aspirated sample system

These different sample system options are versatile and can be tailored to site requirements, making them suitable for multiple applications across a wide range of industries.

Single point

A single point sample system generally uses a main operated pump to draw a sample, up to 1km away.

The sample enters the system via a sample valve and is filtered to remove contaminated particles/contaminants and water before being passed as a controlled flow to the detector heads (between one and four detectors).

The gas samples are analysed, and low and high alarm conditions are reported. A programmable relay, housed in the sample system cabinet, will control the sampling and purging sequence. The programmable relay offers the facility for visual integration of the sample system condition via an LCD display mounted on the front of the enclosure. The display shows operational parameters such as sampling, purging and system fault fail.

A single point system is effective when there is a requirement for CH₄ fuel leak monitoring on heaters in paint drying systems. A simple, open-plate system using a pellistor or IR sensor is ideal for this application as it is a high temperature application which needs stainless steel sample pipes and potentially, cooling coils. Water vapour is also present; evaporated from water-based paints, so water filtration is essential.

Systems have also been supplied for monitoring flammable risk from paint solvent vapours.

Multi point

A multi point sample system is made up of several single point systems mounted into one enclosure. The control panel depends on the number of detectors per system and the number of systems. Multi-point sample systems are used to support environmental chamber monitoring.

Sample lines are placed in chambers to monitor CO accumulation from vehicle exhausts fuel leaks present a flammable risk and so petrol vapour sensors can be incorporated into the system. Environmental chambers can get very hot or cold, and so stainless steel sample tubes with trace heating to prevent freezing may be necessary.

Sequential sample system

A sequential sample system operates the same as the single point. However, it can also monitor up to 32 different sample points. Each sample point is connected to a sample valve. The programmable relay opens each valve in turn and a gas sample from that sample point is passed over the detectors.

Sequential sample systems utilise a double headed pump. One pump is used as the sample pump and the other to draw on lines not being monitored. This means a fresh sample can be presented to the detectors when the line is monitored.

This system is ideal for monitoring pumping shafts and wet-wells on clean and wastewater ring-mains and road storm drains. Sample tubes are placed at various heights within shafts that can be 20-125 metres deep. On wet wells, sample systems have holes decreasing in diameter from the bottom to prevent blockage/flow-fail if the water level rises. Sample lines remove the need for a person to access the shaft for general detector calibration/maintenance which makes this method suitable for water companies.

Systems may incorporate EN-54 certified fire panels to monitor smoke and heat detectors and are typically unmanned sites.

Aspirated sample system

The aspirator system continuously 'samples' and is the only system that can be used directly within a hazardous environment. Instead of a pump to draw the sample an eductor is used. The eductor is driven by compressed air to create a negative pressure to draw the sample.

The only electrical devices fitted are a sensor and an I.S flow fail device. The detector or flow switch can be wired into a flame proof enclosure. This can be either mounted above the sample cabinet containing terminals and barriers, or directly onto a control panel in a safe area, via any necessary barriers.

In the case of a turbine, high temperature gas detectors are often fitted directly within a turbine enclosure. This presents a problem with calibration as the turbine needs to be shut down to allow the engineer access.

The aspirated sample system solution can be maintained without entering an enclosure. This makes the aspirated

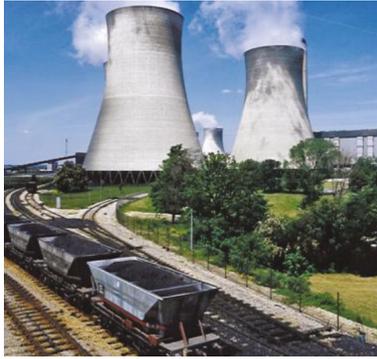
sample system ideal for gas turbine manufacturers.

This is also an ex certified option which can be mounted outside the turbine enclosure (usually an Ex Zone) to keep sample tube runs as short as possible.

This overcomes the main disadvantage of air aspirated systems, which is response time, as the sample flow rate is limited to the maximum the sensor can tolerate: one metre per second.

Ex certification is achieved using certified electrical components: Ex flow meters (with flow-fail monitors) and local terminals and galvanic Isolator (for the flow-fail coils) within an Ex certified enclosure. Detectors such as Crowcon's Xgard range and Xgard Bright Flamgard are ideal solutions for this.

» [Learn more about Crowcon's sample systems with our summary videos, and more on our site at \[www.crowcon.com\]\(http://www.crowcon.com\).](#)



Power



Automotive



Waste Water

Examples of sample systems working in harsh industrial environments

Coal used in the combustion process is delivered to a power station and unloaded into hoppers before being transported, by conveyor, to the coal silos for storage. Coal is passed by the feeder to the mill which pulverises the coal and is carried by forced ventilation fans through the classifier. The classifier grades the coal allowing only finely pulverised coal to pass through to the burners for combustion. It returns larger particles to the mill to be pulverised further.

In all these areas there is a real risk of spontaneous combustion of coal dust deposits.

Prior to combustion smouldering occurs which results in detectable levels of carbon monoxide.

At this stage there is no fire and so preventative action can be taken (such as steam/nitrogen inerting) at the operator's discretion.

Fire detection is further implemented by positioning thermocouples at strategic locations throughout the plant. The thermocouples provide direct information including increases in temperature due to the presence of a fire.

Single or multi-point systems for monitoring probes are placed in these areas and CO alarms are typically set to 50/100ppm.

This application is extremely harsh, particularly in the coal mills and so a hardened probe with a removable filter to provide long-term reliable performance is recommended.

Ask a Crowcon expert

Contact the Crowcon team on hello@crowcon.com or +44 (0)1235 557700 to learn more about how sample systems could keep your people, your premises and your reputation safe.



Conclusion

As industries recognise the need to improve and ensure safe environments for workers, and HSE further tightens its safety regulations, methods such as Crowcon's sample systems are likely to become the first-choice solution across industries using potentially hazardous gases.

» Get in touch with Crowcon's dedicated sample system team to discuss your requirements and find a solution to your gas detection challenge.

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