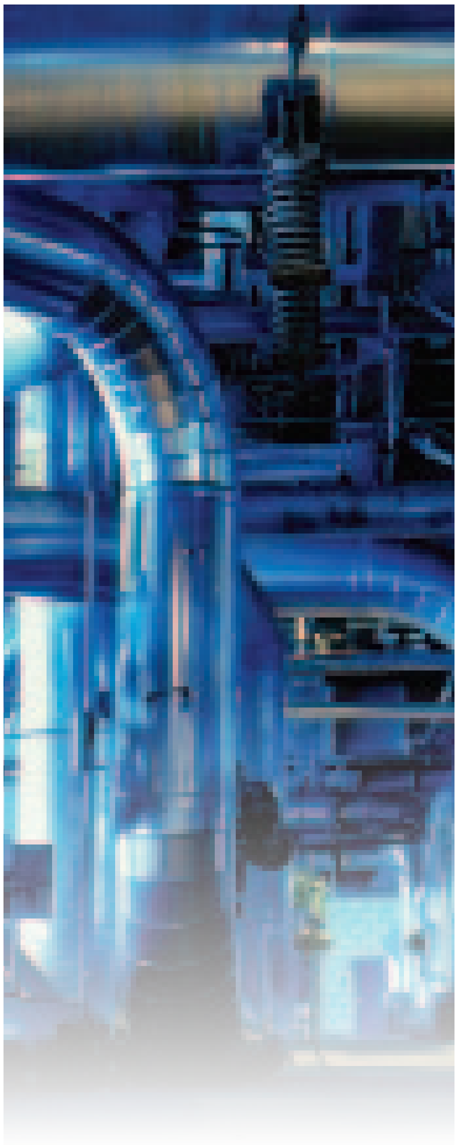


Compressor Stations



Situation Overview:

Compressor stations are the workhorses of the gas pipeline transport system. They cool, compress and purify the natural gas stream at regular intervals, typically every 40 to 80 miles, boosting or decreasing pressure as needed, ensuring that a desired flow rate is maintained along the entire transmission route.

Compressor stations can generate up to 10,000 pounds per square inch (psi) pressure. In most stations this is accomplished with the aid of gas- or diesel-driven engines or turbo-generators in enclosed or partially enclosed facilities. The enormous pressure created along the process elevates the risk of fugitive gas escape, and for this reason, gas monitoring along the entire system route is essential.

Why Gas And Flame Detection?

Gas-Driven Turbines

Installing gas and flame detectors in and around turbines should be done to enhance safety as well as productivity and efficiency. One collateral benefit from gas detection, for example, is that it can prevent engine runaway. Combustion in the engine is supported by allowing air to mix with the fuel. If this air already contains flammable gas or vapor it will have the effect of injecting more fuel into the engine in an uncontrolled manner. This can cause extra energy to be released and the turbine to run faster. Fast-response gas detection can be connected to mechanical trips fitted on the unit; these trips are usually capable of preventing build-up to critical overspeed.

Another use for gas detection is to prevent build-up of an explosive mixture in the area which surrounds the gas turbine, especially if that area is enclosed (e.g. acoustic chamber). The acoustic chamber is ventilated and if flammable gas or vapor is drawn in, gas concentration levels could rapidly build to an explosive threat. Fuel lines also pass through the chamber to feed the engine and a leak here also could contribute to a build-up of flammable gas.

If a leak occurs on the fuel side of a gas-driven turbine, it will probably be a low-pressure leak. If the compressor is driven by a “recip,” or reciprocating engine, the gas turbine will have both a high and low pressure side. Gas turbines should be protected by point Infrared, open path Infrared and flame detection. Point infrared detection will produce faster speed of response along with a greater immunity to elements such as alcohol and silicone-based products that could poison or degrade sensor life. On the other hand, with higher temperature ranges, it may be advisable to use a catalytic bead sensor; consult a gas monitoring expert for guidance.

In some cases, the air intake may be located close to the turbine itself. In this case, a quick-response detector is essential; the Searchline Excel Cross-Duct model, which has a response rate of less than one second, is often specified for this case. A very fast response is necessary to prevent over-speed problems from developing in the turbine engine, a problem that can occur if the inlet is too short or the velocity of gas is too high. In any event, it is essential to monitor the air intake so that the compressor can be shut down quickly, if necessary, i.e. before gas is sucked into the compressor. In this case, a short-range open path Infrared detector (such as the Searchline Excel) is the preferred solution; it can monitor for hydrocarbon gases across an inlet of the air intake. The Searchline Excel has a response time typically less than three seconds.

In the oil patch region in the Southwest United States, it is common to use engine-driven compressors. Flame detection should be an integral part of the monitoring scheme here. Some pipelines require fire suppression systems for large turbine-fired compressors. However, there is less concern for gas detectors in these open-air installations, where hydrocarbon leaks can readily dissipate.

Compressor Facility Characteristics

A compressor facility usually is designed with a peaked roof and a ridge vent that runs the length of the building. Sometimes forced air, but mostly convective airflow reaches this roof space. The air that reaches this area moves over partially covered walls in an upward path, catching gas that leaks away from the compressor. For many years, Point IR detectors have been placed in ridge vents near the roof space to monitor this airflow. Recently there has been a move to protect the roof with open path IR detection.

Logically, if a compressor facility collects gas in the roof space, the prudent safety measure is to shut down the facility. However, if gas is detected around the compressor, the site may shut down only the compressor. In a compressor building, the monitoring scheme can be addressed typically in two ways:

1 **1.** install infrared monitoring and flame detectors on compressor and roof line; or

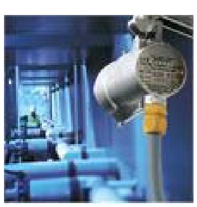
2 **2.** Install point IR detection on the compressor and open path detection on the roof area.

For heavier gases, propane typically, open path Infrared detectors are placed around the seal of compressors. It may also be advisable to shoot open-path IR detection along the perimeter of the compression building or aisles with open path. Butane or propane, heavier gases, will sink to and run along the floor level, requiring gas detection. UV/IR flame detection placed directly over equipment will search for loss of containment fires.

Other Areas to Consider

Depending on the size and nature of the operation, gas and flame detectors may be specified for other areas of the compressor station including:

3 - **Flare Stacks** – Point Infrared detection (Optima) can be used around natural gas control systems
4 - **Liquid Separators**
5 - **Refrigeration**
6 - **Power Control Room (PCRs)**
7 - **RIE Buildings**
8 - **Gas Compression Building**
9 - **Electrical Building**



Leaks may occur at various points in a compressor station operation. Pay detailed attention to:

- **Flanges**
- **Pumps**
- **Valves**
- **Seals**
- **Body castings**

A Complete Gas Monitoring Solution

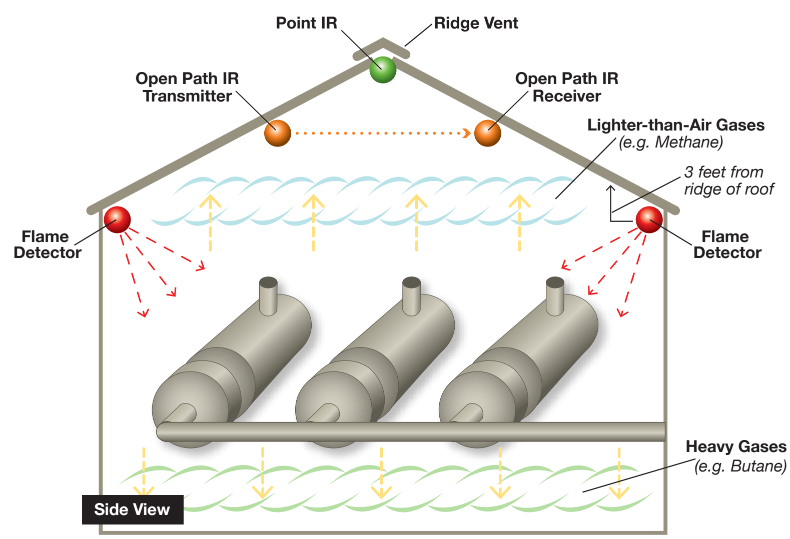
Methods of Detection

The conventional catalytic oxidation detector (which depends on controlled burning of the flammable component) is a widely applied, general purpose flammable gas detection technology. Sometimes lower detection levels may be required and in this case more reliable and responsive technologies are available.

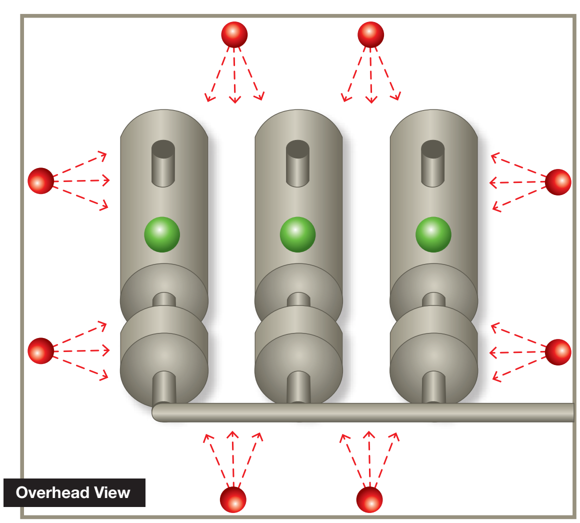
Infrared absorption is another method of detection which responds more quickly and can be more sensitive than catalytic oxidation. Widely used in hydrocarbon-specific lower explosive limit (LEL) detection scenarios, IR gas leak detection can be either open path or point detection in design. In the open path detection system a beam of infrared radiation passes from a source to a detector. The detector will show if there is any loss of energy between source and detector. The size of this loss is a measure of the amount of gas along the path of the beam. It is necessary to have a clear line of sight between source and detector, for successful operation. An infrared point detector is similar in principle to the open path but has a path

Basic Compressor Station Monitoring Scheme

(Enclosed / Partially Enclosed Area)



Effective monitoring of compressor facility could include flame detection, point infrared hydrocarbon gas monitoring, or a mix, depending on variables unique to each site.



Blanket protection of engine area, shown here, includes perimeter monitoring with flame detection, and flammable gas detectors placed over the equipment to monitor flammable gas that has a tendency to rise because of its lighter-than-air density and weight (e.g. methane).

length short enough to be accommodated within the sensor housing. It can be installed in a similar way to the catalytic oxidation detector.

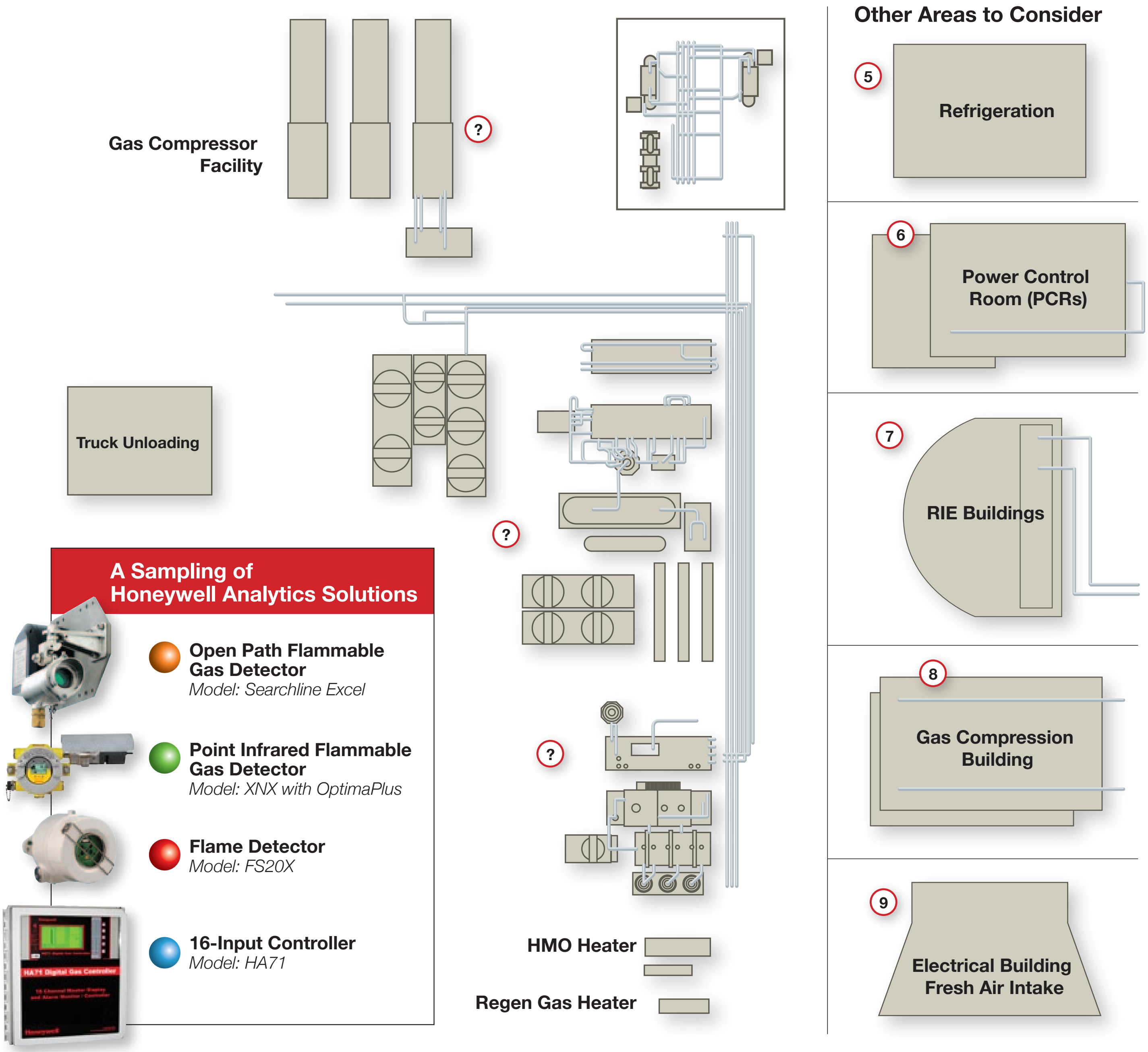
Location of Detectors

To monitor intake air to the combustion chamber one or more sensors are placed within or just outside the combustion air intake hood. This is to provide the earliest possible warning of combustible gas or vapor ingress. The exact position of the sensors must be carefully selected to maximize their ability to detect gas and avoid failure to detect gas due to excessive air speed across the sensors.

Makeup air to the acoustic chamber may be measured by a detector mounted in the supply duct or inside the chamber near to the supply vent; a high-temperature sensor is advisable in this application. Infrared open path detection has been applied by passing the beam across the mouth of the air intake hood to the combustion chamber of a gas turbine. To increase the probability of detection, two systems at right angles to each other have been applied. Sometimes a number of gas turbines operate in the same vicinity and it has been possible to set up an open path device so that it “looks” across the inlets of several power units installed side-by-side.

System Outputs

The sensors are connected to control equipment which will give an indication that preset alarm levels have been reached. If the preset alarm levels are exceeded alarm relays are actuated to initiate any required action by means of olt free contacts. Analogue signals can be connected to a remote recorder or may be fed into a host computer which can initiate any or all of these actions.



Honeywell Analytics Lines of Business



Commercial
Gas detection from standalone units to fully engineered, multi-point systems, all offering cost-effective regulatory compliance
» Applications: parking structures, chillers, mechanical rooms, office towers, commercial buildings, shopping centers, swimming pools, golf courses, schools and universities, laboratories

Industrial
Renowned Sieger and Manning gas detection systems with advanced electrochemical, infrared and open path sensing technologies
» Applications: oil and gas, cold storage, water/wastewater treatment, chemicals, engine rooms, plastics and fibers, agriculture, printing and light industrial

Portables
Single or multi-gas Lumidor and other premium detectors with compact, lightweight designs ranging from simple alarm only units to advanced, fully configurable and serviceable instruments
» Applications: underground utility and electricity ducts, boiler rooms, post-fire sites, sewers, industrial plants, industrial hygiene, first responder teams, remote fleets


High Tech/Government
A complete portfolio of gas and chemical detection instrumentation including infrared spectroscopy (MST) with no cross interference, to Chemcassette paper-based solutions (MDA Scientific) offering detection down to parts per billion
» Applications: semiconductor manufacturing and nanotechnology, aerospace propulsion and safety, specialty chemicals industry, research laboratories, emergency response

Technical Services
24/7 global network includes post-sales service and Systems Integration teams
» Emergency call out, service contracts, on/off-site repair, training and commissioning
» Complete range of spares, consumables and accessories

Find out more
www.honeywellanalytics.com

Contact Honeywell Analytics:

Americas
Honeywell Analytics, Inc.
405 Barclay Blvd.
Lincolnshire, IL 60069
USA
Tel: 847.955.8200
Toll-free: 800.538.0363
Fax: 847.955.8210
detectgas@honeywell.com

Technical Services
ha.service@honeywell.com

www.honeywell.com

Europe, Middle East, Africa
Life Safety Distribution AG
Javastrasse 2
8604 Hegnau
Switzerland
Tel: +41 (0)44.943.4300
Fax: +41 (0)44.943.4398
gasdetection@honeywell.com

Asia Pacific
Honeywell Analytics, Asia Pacific
#508, Kolon Science Valley (1)
187-10 Guro-Dong, Guro-Gu
Seoul, 152-050
Korea
Tel: +82 (0)2.2025.0307
Fax: +82 (0)2.2025.0329
analytics.ap@honeywell.com

Honeywell

DS0xxxx_vX 2/14