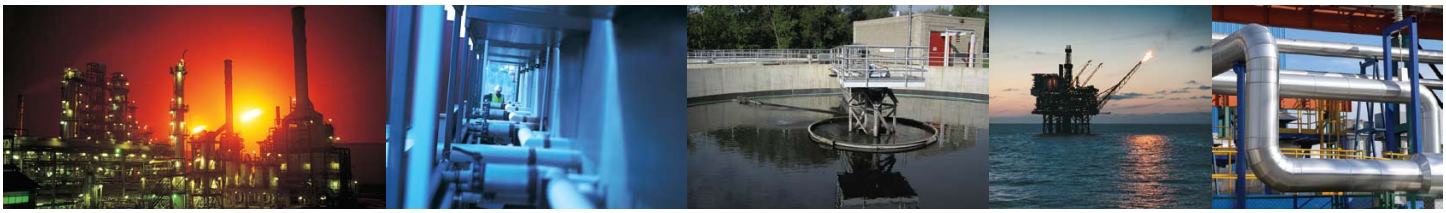
Honeywell



How to Design a Gas Monitoring System

"How many detectors do I need?" and "Where should I locate them?" are two frequently asked questions about designing a gas monitoring system — and probably two of the most difficult to answer. Unlike other safety devices such as smoke detectors, the location and quantity of gas detectors required in different applications is not clearly defined. However, experience and industry best practices offer strategic guidance.

At an industrial site, gas monitors should be installed in all areas where hazardous gases are generated as part of an industrial process or a byproduct of it. Gas leaks appear around:

- Compressors
- Pressurized gas tanks
- Cylinders or pipelines
- Solenoid and relief valves
- Gauges, seals, flanges, T-joints, filling or draining connections
- Welded and quick-connect fittings and devices
- Runoff areas, confined spaces and loading/unloading areas

In addition, gas detectors also should be present wherever gas is stored or utilized for non-process functions. At an industrial site these locations can include boiler, furnace and mechanical rooms, chemical storage areas, maintenance rooms and more.

Installation Do's and Don'ts

When designing a gas monitoring system, the following considerations should be kept in mind:

- **Light Gases:** To detect gases that are lighter than air (e.g., ammonia and methane), detectors should be mounted at a high level and preferably use a collecting cone.
- **Heavy Gases:** To detect heavier-than-air gases (e.g., butane and sulfur dioxide), detectors should be mounted at a low level.
- **Air Movement:** Natural or forced air currents can affect how an escaping gas behaves. Consider wind direction, runoff areas and confined spaces. Mount the detectors in ventilation ducts if appropriate.
- **Process Conditions:** Gas movement can be affected by unique process dynamics. Butane and ammonia, for instance, normally are heavier than air, but the gas may rise rather than fall if it is released from a process line that is at an elevated temperature or under pressure.
- **High-Pressure Systems:** Detectors should generally be placed as close as possible to potential leak sources. However, with high-pressure systems it may be best to position the detector further from high-pressure parts to allow gas clouds to form. Otherwise, any leak of gas is likely to pass by in a high-speed jet and not be detected.
- **Accessibility:** Detectors should be accessible for functional testing and servicing.
- **Sensor Protection:** When installed, detectors should point downward to ensure that dust or water will not collect on the front of the sensor. A cover or shield should protect the sensor for wet or humid applications.
- **Unit Spacing:** Not using enough detectors in a system is a frequent mistake.
- **Analog Systems:** Using a twisted-wire pair and running equipment on a bus system versus a three-wire configuration can save thousands of dollars over the life of the system. Call the Honeywell Systems Integration team for installation cost-savings ideas.

Special Considerations

Gas Characteristics, Cloud Migration, Gaseous Mixes
Each gas has its own unique characteristics and exhibits its own behavioral tendency. Hydrogen sulfide, for example, is heavier than air and will sink; methane, on the other hand, is lighter than air and will rise. Carbon monoxide, carbon dioxide, ammonia and other industrial gases have a vapor density similar to oxygen, but can quickly displace oxygen when introduced in an enclosed room; asphyxiation or rapid gas poisoning is the threat here. The point is, each gas is different and must be evaluated accordingly.

Gas clouds can migrate into neighboring residential areas and it is for this reason that perimeter monitoring strategies are used at landfills, wastewater treatment plants, gas refineries, chemical plants and other manufacturing plants; specific technologies such as open-path Infrared detection are used here.

Attention should be paid to interior rooms adjacent to a room being monitored. What industrial processes are performed or what equipment is used in these adjacent areas? Gases generated in those spaces can drift into other areas and cause a toxic/combustible mix. For example, a mechanical

room that operates on flammable gases or a stockroom that generates carbon monoxide from forklifts can mix with off-gassing elements from hydrogen-charging stations, propellants used in heating elements and the like, elevating the risk of danger.

A common example is ammonia, which seldom leaks into an industrial environment as pure ammonia. Often, this type of leak contains vapors from other liquids such as lubricants and cleaning solvents. In one documented case, this changed the lower explosive threshold from 40,000 ppm (parts per million) to 37,000 ppm.

Conducting the Site Audit

A gas leak audit of the industrial environment should be conducted with gas detection experts on hand to determine the right gas sensing technology, strategic and economical siting of the instruments and proper mix of fixed and portable monitors. The placement of the gas detectors should be determined through collaboration among experts with specialized knowledge of gas dispersion, ventilation systems, process plant system and equipment, safety codes, and electrical requirements. The agreement reached on the location of detectors should be recorded in writing.

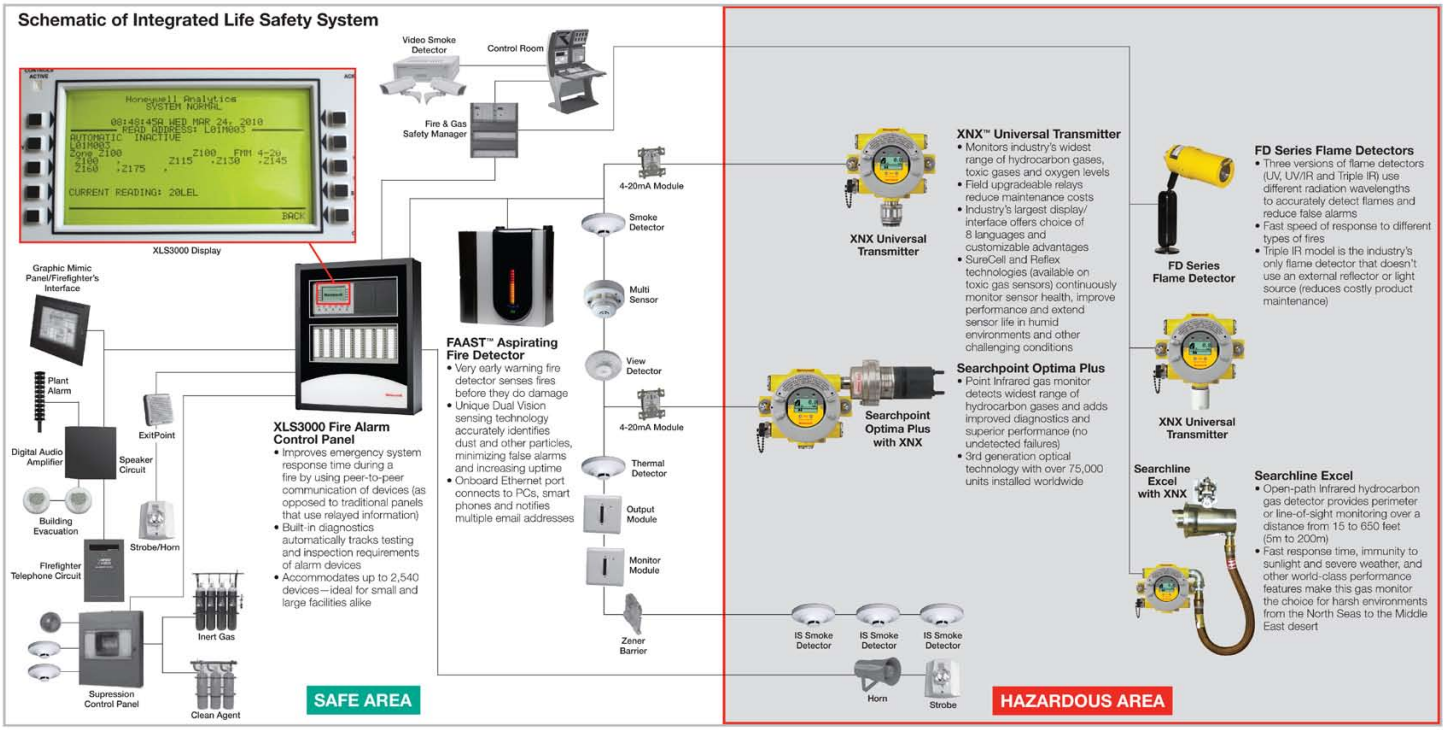
After the installation is complete, properly commissioning a system should bring the same parties together again. This process ensures that the gas monitoring system is fully functioning as designed and accurately detecting gas hazards.

Additional Help

Considerable guidance is available from standards such as EN50073, a guide for the selection, installation, use and maintenance of apparatus for the detection and measurement of combustible gases or oxygen. Similar international codes of practice such as the National Electrical Code (NEC) or Canadian Electrical Code (CEC) also may be used where applicable.

In addition, training facilities are provided by some gas instrumentation manufacturers including Honeywell Analytics. At Honeywell Analytics University, expert instructors offer certificate-based instructional programs on the use and routine maintenance of gas monitoring equipment.

For more information on designing a gas monitoring system, call Honeywell Analytics at 874-955-8200.



Designing for Success: *An integrated Fire/Gas System. This diagram illustrates the complexity that goes into a gas detection system design, as well as the cost-savings obtainable when planned properly. In this case, the detailed plan integrated safety equipment on the hazardous and non-hazardous areas of the plant, with each system using a common control panel along with one set of horns, strobes and annunciation equipment. This scheme will save the customer thousands of dollars in capital and operating expenses over the life of the system.*