

SPECulations

A Periodic Newsletter for Design Professionals
About Innovative Products and Ideas Worthy of Specification Consideration

May 2001
(E1)

How Are You Dealing With Your Gas Problems?



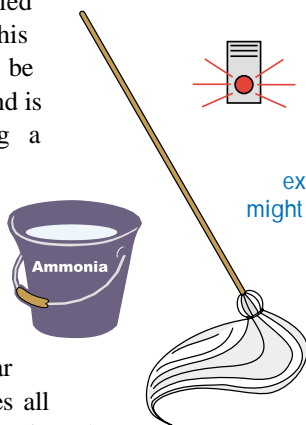
WORLD LEADER IN GAS MONITORING
FOR OVER 30 YEARS

No, not that gas! Not even the price of natural gas or gasoline! How are you dealing with detection and alarm for carbon monoxide, refrigerants, ammonia, methane, hydrogen, etc? Have you specified a refrigerant sensor only to realize it doesn't do the entire job? Have you selected the proper sensor for the gas; i.e. is it gas specific or will you get a false alarm if the janitor mops the floor with an ammonia cleaner? Do you have the right number of sensors and are they installed at the right height?

After you've sensed the gas, what do you do with the alarm? Do you start a fan? Initiate shutdown sequence? Auto dial emergency service?

The Science Of Gas Sensing

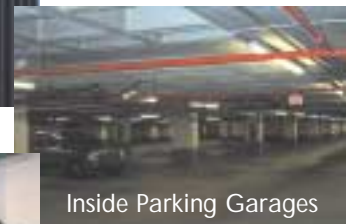
Over the past several years, gas monitoring technology has gone through some dramatic advancements in sensor accuracy, detection range and operational reliability. Until recently, most gas monitoring sensors utilized a solid state, semiconductor technology, also called "Q2" sensing. This technology proved to be accurate to +/- 10% and is capable of detecting a wide range of gases. Although the level of accuracy is acceptable, the semiconductor technology is not specific to a particular gas; therefore it senses all gases within the monitored environment. This technology may create false alarm levels depending upon the application and may be affected by temperature and humidity levels.



An ammonia based cleaner is just one example of what might trigger a false alarm reading when utilizing semiconductor technology.



Buildings



Inside Parking Garages



Chiller Rooms



Industrial Plants

In addition to the "Q2" sensing technology, there are four proven types of specifically designed gas sensors that are categorized as "Q1" sensors.

Sensor Type

- Electrochemical
- Catalytic
- Infrared
- Diffusion Cell

Gas

- Toxics
- Hydrocarbons
- Refrigerants
- Oxygen

All "Q1" sensors are: accurate to +/- 3%, specific to the exact gas sensing application and unaffected by temperature or humidity.

Differences Between Q1 and Q2 Sensing Technologies

<u>CRITERIA</u>	Q1 SENSING WIDE RANGE OF GASES DETECTED 4 Sensing Technologies	Q2 SENSING LIMITED RANGE OF GASES DETECTED 1 Sensing Technology
	Electrochemical.....Toxins and Hydrogen Catalytic Combustion.....Hydrocarbons, Solvents, VOC's and Alcohols Infrared.....Refrigerants, Carbon Dioxide Diffusion Cell.....Oxygen	Solid State.....Carbon Monoxide, Methane Hydrogen, R-11, R-12, R-22, R-22, R-134A, Ammonia
ACCURACY – Capacity of sensor to provide a reading close to the absolute value.	HIGHER READING ACCURACY +/- 3%	LOWER READING ACCURACY +/- 10%
LINEARITY – Capacity of sensor to provide predictable readings for incremental gas concentrations.	HIGHER READING STABILITY +/- 2% FSD	LOWER READING STABILITY +/- 5% FSD
REPEATABILITY – Capacity of sensor to provide the same reading for a given gas concentration detected.	HIGHER READING RELIABILITY +/- 2%	LOWER READING RELIABILITY +/- 5%
DETECTION RANGE – The minimum and maximum gas concentrations detectable by a sensor.	WIDER RANGE OF DETECTION Ex: 0–500 PPM for Carbon Monoxide	LOWER RANGE OF DETECTION Ex: 0–250 PPM for Carbon Monoxide
INTERFERENCE – Erroneous reading by the sensor caused by the presence of other substances.	GAS SPECIFIC – Not affected by airborne contaminants nor affected by temperature or humidity variations	GENERIC SENSOR – Solid state sensors can be affected by contaminants such as solvents, ammonia vapors, sulfur compounds, humidity and temperature
CALIBRATION – To check, adjust or standardize the graduations of a sensor by using a calibration gas.	HIGH STABILITY Once every 12–18 months	HIGH DRIFT Once every 6–12 months
VALUE	THE MOST COST EFFECTIVE SOLUTION – The stability, accuracy and gas specificity of the Q1 sensors afford low maintenance operation, free from nuisance alarms	LOW FIRST COST – Solid state sensors are lower-end designs commonly used on projects where low first cost is the paramount concern

Understanding Toxic Gases

Toxic gas is defined as: any gas or vapor capable of causing injury or death. All toxic gas concentrations are measured in Parts per Million (PPM) and are divided into three parameters by the Occupational Safety and Health Administration (OSHA).

Time Weighted Average (TWA) – the time-weighted average concentration for a normal 8-hour workday or 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse affect.

Short Term Exposure Limit (STEL) – the maximum concentration to which workers can be exposed for a period of up to 15 minutes continuously.

Threshold Limit Value – Ceiling (TLV-C) – the concentration that should not be exceeded even instantaneously.

When designing a gas monitoring system, the TWA level should activate the first alarm level set point, the STEL should activate the second alarm level.

GAS	SCALE	LEVEL A	LEVEL B
Carbon Monoxide	0–500 PPM	35 PPM	200 PPM
Ammonia	0–200 PPM	25 PPM	35 PPM
Nitrogen Dioxide	0–10 PPM	1 PPM	3 PPM
Chlorine	0–15 PPM	1 PPM	3 PPM
Sulfur Dioxide	0–10 PPM	2 PPM	5 PPM
Hydrogen Sulfide	0–50 PPM	10 PPM	15 PPM
Carbon Dioxide	0–2000 PPM	850 PPM	1500 PPM

Understanding Explosive Gases

Explosive gas is defined as: any gas or vapor that is volatile by nature and which, in the presence of air, can ignite, burn and/or explode. All explosive gases are measured in a percentage relative to two parameters categorized by OSHA.

Lower Explosive Limit (LEL) – the lower limit of flammability of a gas or vapor at ordinary ambient temperatures expressed in a percentage of the gas or vapor in air by volume.

Upper Explosive Limit (UEL) – the upper limit of flammability of a gas or vapor at ordinary ambient temperatures expressed in a percentage of the gas or vapor in air by volume.

When designing a gas monitoring system for explosive gases, the first alarm level should activate at 25% of the LEL and the second alarm level should activate at 50% LEL.

GAS	SCALE	LEVEL A	LEVEL B
Combustibles	0–100% LEL	25% LEL	50% LEL
Methane	0–5.1% LEL	1% LEL	2.5% LEL
Propane	0–100% LEL	25% LEL	50% LEL
Hydrogen	0–2.5% LEL	1% LEL	2% LEL

Alarm Level Setpoints

Most quality gas monitor manufacturers will allow two alarm level set points. The first alarm level set point should activate some type of air moving device such as exhaust fans, makeup air units, outside air dampers, etc. The second alarm level set point would then activate the high speed setting of a fan, close a gas valve, set off audible and/or visual alarms, and even dial a telephone to notify a service technician.

Another perSPECTive...



By Dave McIntyre

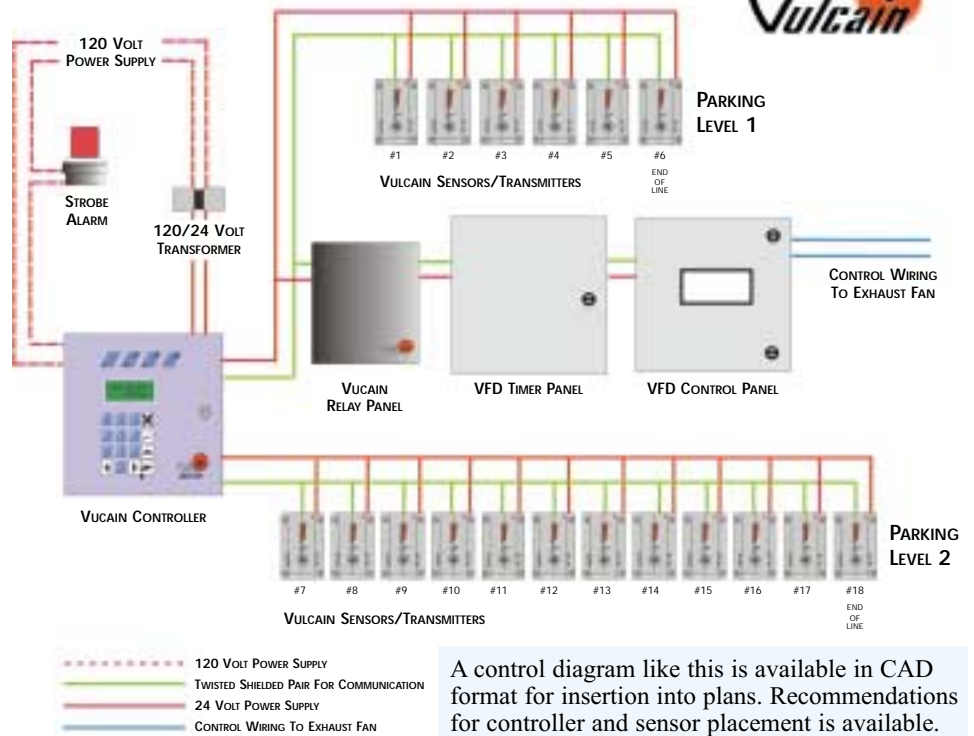
It's not enough to specify just any gas sensor and expect the contractor to find the proper components to build a complete system. Likewise, it's not enough to simply state, "install detection system per code" because the codes are often vague, behind the times, or worse yet, silent. The engineer must rely on his knowledge, experience and imagination to properly specify the gas detection system. These are critical life safety systems, and leaving this responsibility to the contractor is not in your client's best interest.

The Uniform Mechanical Code does dictate that chiller rooms be provided with purge fans, audible/visible alarms and emergency switching - a fair start. However, completing the system, locating the sensors and developing a sequence of operation are left entirely to the specifier.

Today, complete refrigeration sensor systems are available without having to specify lots of pieces for the contractor to buy and fit together. Sensors, logic controller, telephone dialer, VFD, bypass panel, chiller shutdown, battery backup, horn, lights, "break-glass" switch, emergency stop switch, and more can all be provided in a single, pre-engineered UL508 listed panel.

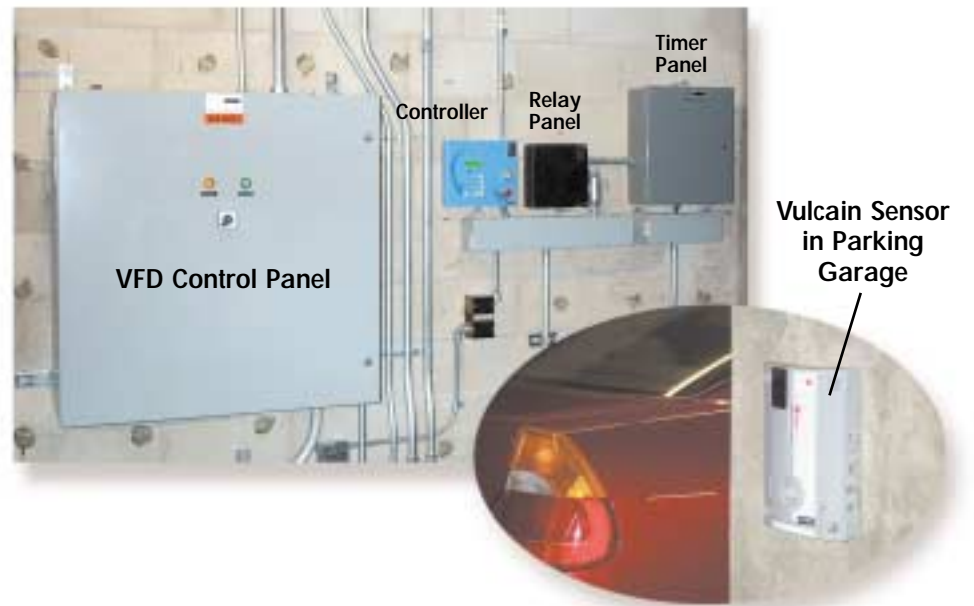
In summary, properly specified gas detection systems should call for gas specific sensors and a controls package capable of responding to sequence of operation that suits the application. The "Design Questionnaire" enclosed with this issue will help you identify your project requirements. Send us the form and our system application specialists will design a panel to meet your needs.

Carbon Monoxide Detection System Control Diagram



A control diagram like this is available in CAD format for insertion into plans. Recommendations for controller and sensor placement is available.

Installed Vulcain System



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Email: publisher@toroaire.com

Web Page: www.toroaire.com

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