PARKING

A Publication of the National Parking Association

March 2011

Trends in Green Parking

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Demand Controlled Ventilation **Cuts Energy Bills, Increases Patron Comfort**

Gas and environmental detectors in garages save money and reduce greenhouse gas emissions

By Mike Adelman

Carbon monoxide (CO) in automobile exhaust is a potentially deadly gas that must be removed from enclosed parking garages. The traditional solution has been to run all of the exhaust fans whenever vehicles have access to the facility. But the traditional solution is also the most costly and environmentally unfriendly one. Technology advances supported by building code changes and third-party performance certification have made "demand controlled ventilation" in both new construction and retrofit projects both viable and prudent.

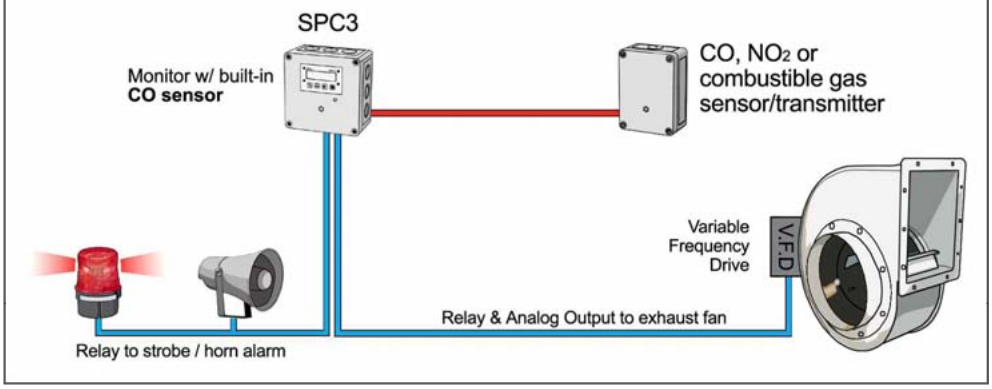
Field proven and easy to install, carbon monoxide detection systems continuously monitor the actual amount of CO present in the air and operate the fans in the affected zones only when code-defined safety levels are breached. The energy savings are dramatic and patron comfort and safety are enhanced. Products tested to meet recent ANSI/UL standards provide years of reliable, maintenance-free operation. Such systems are already in operation across the country and around the world.

The harmful effects of carbon monoxide on humans are well known. The International Mechanical Code standard for maximum permissible exposure to CO is 25 parts per million (ppm). With parking patrons moving about and attendants stationed

Figure 1

Underground Garage/Parking Structure of an Office Building –**100,000 sq ft** for about **350 parking spaces** for automobiles –Approximately total **75 HP** (Horsepower), combined of all fans –12 hours/day and 7 days/week garage operation		
HP (Horsepower) **to Watts** (Electrical Power) **Conversion** *(In this example the fan motor efficiency and load factor canceling out each other)* **75 HP x 746 Watts**/HP = 55,950 Watts divided by 1,000 = **55.95 kWatts**		
Annual Fan Power Consumption (kWh)	**Without** Gas Detection Demand Control **12** hours/day x **365** days x **55.95** kWatts = **245,061 kWh**	
	With Gas Detection Demand Control **2** hours/day x **365** days x **55.95** kWatts = **40,844 kWh**	
Annual Savings	**kWh Savings per Year:** No Demand Control 245,061 kWh Demand Control -40,844 kWh Savings = **204,217 kWh**	**Electricity Cost Savings per Year:** 204,217 kWh x **$0.175** per 1kWh Savings = **$35,738**
–Installation Cost– **Return Investment**	With Utility Rebate	**Immediate** to **0.5 Year**
	(No Rebate)	**0.8** to **1.5 Year**
Greenhouse Savings	273,651 lbs CO_2	

Figure 2 – Typical analog, single- or dual-point carbon monoxide detection and control system for a parking structure



in the garage, proper ventilation is imperative. Consequently, mechanical, building, fire protection and other codes and standards have been developed to ensure the safety of the general public as well as the parking structure employees. Although older codes called for continuous fan operation, most codes now allow the use of performance-certified, demand-based ventilation control using reliable CO sensors to decide when each fan should run.

Energy reduction and the associated cost savings are immediate when the gas detection and control system is installed. Figure 1 demonstrates the annual energy consumption savings, energy cost savings and reduction in greenhouse gas emissions that can be realized by using CO detectors for demand controlled ventilation in a 100,000 square foot garage with 350 parking spaces. In a region where utility company rebates are available for energy reduction projects, the return on investment is typically six months or less. Without rebates, the ROI is still an attractive 18 months or less.

In the example in Figure 1, greenhouse gas emissions are reduced by over 135 tons per year. Actual energy savings can easily be demonstrated by recording the fan operating hours after system installation. Although not as easy to calculate, consideration should also be given to the fact exhaust fans discard "conditioned" air, which must be replaced with "outside air." In cold climates, the cost of heating the outside air to a comfortable level for garage patrons is significant so less fan operating time also reduces the facility's heating cost.

Other Benefits: Patron Comfort and Cost Savings

In addition to the direct and immediate financial and environmental benefits of reducing fan operating hours, benefits are also realized in terms of patron comfort and long term facility operating savings.

Fans require periodic maintenance—lubrication, balancing and belt replacement—if not outright repair/replacement. Perfectly operating fans produce noise and vibration; imperfectly operating ones roar loudly and shake the floor noticeably. By reducing the monthly hours that each fan runs, their service lives and maintenance intervals are lengthened and patrons are not subjected to the often quite noticeable roar and rumble.

Demand controlled ventilation systems can also be equipped with temperature and humidity sensors to increase ventilation under hot/humid conditions, further enhancing the patron's parking experience.

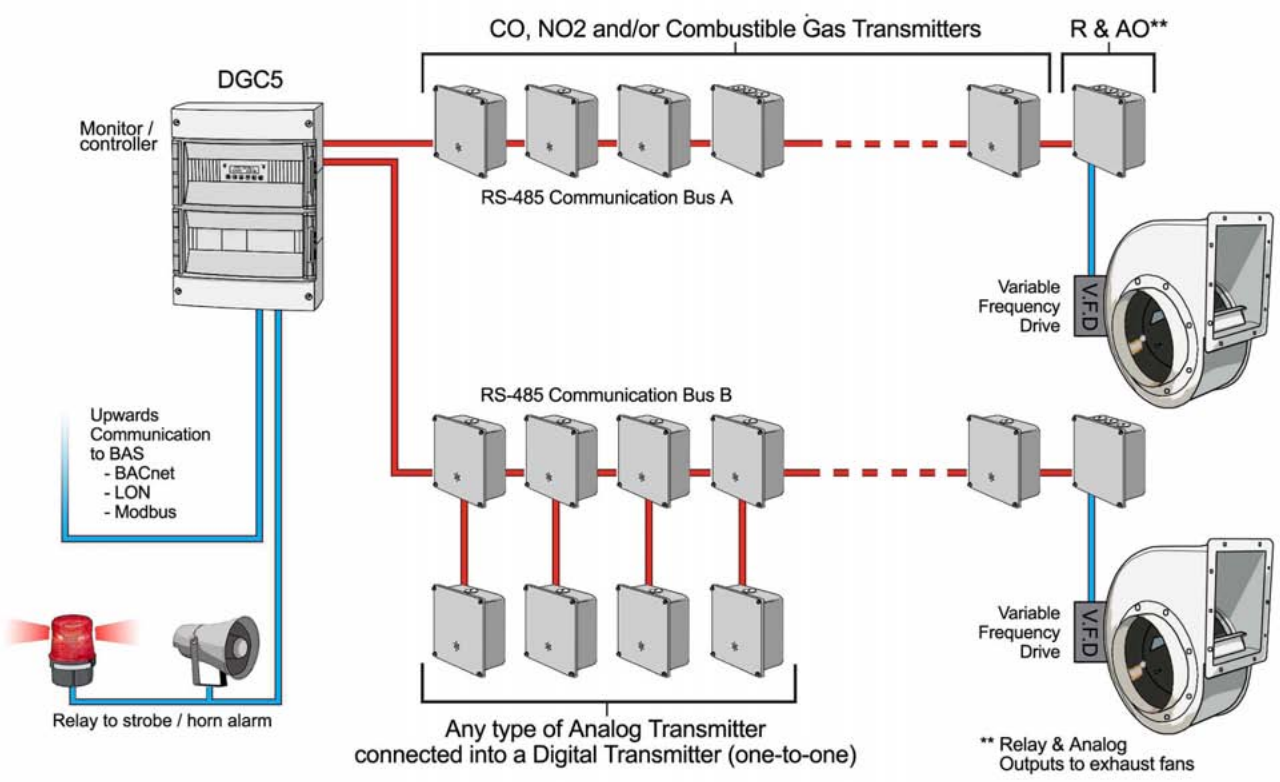
Solutions for Facilities Large and Small

All of these benefits are available for enclosed parking facilities of all sizes. Figures 2–3 illustrate the most economical solutions for small (under 15,000 sq. ft.), medium (up to 90,000 sq. ft.) and large (90,000+ sq. ft.) facilities, respectively. For parking garages in facilities with building management systems, interfaces are available which provide building operators and owners with real-time and historical looks at CO levels and fan operating patterns.

Choose an ANSI/UL-Certified Solution with Confidence

There are many gas detection products available on the market today based on technologies new and old. So what's the best way to choose one

Figure 3 – Typical digital, RS-485, multi-point carbon monoxide detection and control system for a parking structure



that delivers all of the benefits without compromising safety?

In 2004, Underwriters' Laboratories (UL) released standard 2075 for Safety Gas and Vapor Detectors and Sensors, followed in 2008 by standard 2017 for Safety General-Purpose Signaling Devices and Systems. Nationally recognized testing labs (NRTL) perform 40 functional and performance tests before granting certification to these important standards. Once certified, the manufacturer is required to test 100 percent of the units that they produce, with the NRTL auditing those tests quarterly and independently performing lot-sample testing.

Many products on the market carry a UL certification, but most often the certification is to an easy-to-meet standard that only ensures that the device is electrically safe, not that it reliably performs its intended function. Installing ANSI/UL 2017/2075 performance certified products is the best way to ensure that your investment in an energy saving gas detection system will perform as expected.

In addition to being performance certified, to ensure that the code-specified CO concentrations are properly controlled, the sensors themselves must be capable of making accurate measurements and should not be a maintenance burden. Older solid-state technology can only measure to within +/- 7 to 15 percent and are "cross sensitive" to other, benign gases in the air, newer high-accuracy electrochemical sensors measure the CO level within two percent, have a typical life span of five years and have low-cost, field replaceable sensing elements.

Summary

Coal miners once carried canaries to alert themselves when dangerous gases were present. Today there is field-proven technology to keep enclosed parking garages safe from carbon monoxide buildup.

If compliant with local building codes, implementation of demand-controlled ventilation is some of the lowest greening-up fruit that can be picked in the design or retrofit of an enclosed parking garage.

Mike Adelman is marketing and product manager for INTEC Controls in San Diego, Calif., and a senior member of the International Society of Automation. He can be reached at **mike.adelman@inteccontrols.com**.