



## **Detecting Carbon Monoxide**

By Janet L. Keyes, CIH

Carbon monoxide is a sneaky killer. You can't smell it. It doesn't produce a blue haze. The only way you know if it's present is by monitoring for it – or by people getting sick.

Carbon monoxide is a byproduct of combustion. Any time you burn something containing carbon, you can produce carbon monoxide. With exactly the right oxygen/carbon mix, you might get complete combustion, forming water and the relatively harmless carbon dioxide. But if conditions aren't just right, carbon monoxide forms. Smokers have higher levels of carboxyhemoglobin (hemoglobin carrying carbon monoxide instead of oxygen) than nonsmokers, because they're breathing the combustion products of tobacco. Cars have exhaust systems designed to remove carbon monoxide, because running a car requires burning gasoline. Residences are required to have carbon monoxide alarms, because natural gas appliances can produce carbon monoxide.

At high levels, those above 1200 ppm, carbon monoxide (CO) can kill within an hour. Levels around 400 ppm will make you feel sick and give you a bad headache after an hour or two. You could get those levels if a fuel-burning appliance, such as a furnace, malfunctions or if you operate small engines in enclosed places (an example: a gas-powered pressure washer in a basement). Lower levels can cause heart damage, of particular concern to anyone with existing heart disease.

Vehicle repair shops are running cars in and out all day. You're heating your shops in winter. If you paint, your painters might be using air from a compressor, which could overheat, producing carbon monoxide. How do you know that you're not poisoning workers with CO? Easy answer: ventilate and monitor.

Both building codes and Minnesota OSHA require building ventilation to control carbon monoxide. If you repair vehicles (whether mechanical or collision), you should have general exhaust ventilation, able to remove air near the floor (because that's where tailpipes are usually found). If you need to run engines, you also need tailpipe exhaust. You can run a hose from the tailpipe right outside, as long as the hose is less than ten feet long.

There's no requirement to monitor for carbon monoxide in repair shops, although you are required to keep levels averaging less than 35 ppm. If you have a good exhaust ventilation system, keep your heating appliances in good shape, and minimize how much engines are operated indoors, you probably don't have to worry about monitoring.

There is one case when monitoring for carbon monoxide is required. If your painters wear airline respirators, using air from your compressors, you need to monitor the air they're breathing. You must provide Grade "D" breathable air, which means there are stricter limits than general shop air: a ceiling limit of 10 ppm instead of an eight-hour average of 35 ppm. If compressors overheat, they can produce their own CO. If their air intake is poorly located, such as right by your tailpipe exhaust vent, they can draw in CO.

The easiest way to monitor the airline air is with an inline CO monitor – providing it works correctly. If your compressor has a high temperature alarm, you can periodically check the air

from your filtration unit and going into the respirator hood instead. But that typically requires more recordkeeping than using an inline monitor.

Carbon monoxide alarms need to be sensitive enough to respond to the levels of concern. Household CO alarms have solid state sensors, set to go off if levels are above 100 ppm for 90 minutes or 400 ppm for fifteen minutes. They're just sensitive enough to give you a heads-up that you need to get out. They won't warn you about the lower levels that can cause longterm damage.

Parking garages also often use solid state sensors. These are often connected to ventilation systems, so if levels go above 35 or 50 ppm, the ventilation will kick on. These sensors can last a long time, but they do drift, so need regular calibration.

Solid state sensors don't work well for airline systems (although we've seen them used there). They're not sensitive enough to reliably respond to 10 ppm. Their accuracy is affected by changes in temperature and humidity. And they have a lot of cross-sensitivity, so they could respond even when CO isn't present.

For airline systems or to be sure that employees are not exposed to more than the OSHA workplace limit, we typically use electrochemical sensors attached to the airlines. They're very accurate and don't have the cross-sensitivity issues of solid state sensors. The disadvantages: they need regular calibration, because they'll drift. And they typically don't last as long as solid state sensors. But they're much better suited for detecting low levels of carbon monoxide.

When you install or replace a carbon monoxide monitor for an airline system, ask your supplier if the CO monitor sensor will reliably and accurately respond to 10 ppm. Opt for one with a digital read-out. And be aware that the best sensors for airline respirators will need to be replaced every couple of years and will need calibration. Ask for a demonstration of how to calibrate (it should be quite easy).

There are other ways to monitor for carbon monoxide. Facilities that that use LP-powered forklifts are required to monitor workplace CO levels at least quarterly. For them, colorimetric diffusion tubes, small glass tubes holding a substance that changes color in proportion to the time of exposure and the concentration, work well. Colorimetric tubes can be used to get immediate results, too.

Even though vehicles produce much less carbon monoxide than they used to, it still can be a concern. Minimize how much is produced: keep combustion appliances tuned up. Control it when it must be produced: install and use exhaust ventilation systems. And accurately check how much is produced: use the appropriate carbon monoxide sensors, calibrated often enough to be confident of results.

If you have questions about carbon monoxide alarms, airline respirator systems or safety in general, contact CHESS at 651-481-9787; toll free at 877-482-4377, or [carkey@chess-safety.com](mailto:carkey@chess-safety.com)

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