

MISC.

Carbon Monoxide Alert

ARTICLES

by David Pascoe

After many years of declining, the number of cases of carbon monoxide poisoning cases is on the rise. This statement is based not on any official statistic -- I don't know that there are any -- but merely the number of cases that have come to my attention, which are numerous.

In the last 30 years, huge strides have been made toward making marine engine exhaust systems safe, particularly the gasoline engine which puts out more than double the amount of CO that diesel does. I would attribute the increase in the number of cases to the large increase in newcomers to boating that are (1) less aware of the CO danger, and (2) are more prone to not maintain their boats as well.

Carbon monoxide is an odorless gas that is a combustion by-product of both gas and diesel engines. When inhaled by the human body it is most dangerous because it interferes with the blood system and most especially the brain. In smaller doses it results in temporary illness if you are lucky, and brain damage if you are not. In larger doses it causes internal hemorrhaging and death. The first symptom of CO poisoning is drowsiness and sometimes nausea, the latter of which is most often associated with diesel produced CO. Sleepiness and headaches are the primary symptoms.

While CO itself is odorless, one can always be sure that it is present by the distinct smell of the engine exhaust. Thus CO is not the totally invisible enemy that it is often made out to be. You are unlikely to have CO present without the odor of engine exhaust present. The lone exception to this is in the case of leaking engine exhaust systems. **THE BEST WAY TO DETECT CO IS TO BE AWARE OF THE PRESENCE OF ENGINE EXHAUST FUMES.** Just be aware that over a period of time people become inured to the smell and cease noticing it. Remember that you are unlikely to hear a CO alarm over the engine noise.

CO gets into the boat by two means. First is the "station wagon" effect in which a boat moving forward creates a vacuum behind it that tends to pull exhaust fumes back into the boat. This most often occurs in a **FOLLOWING SEA** when the wind is from behind, and the boat is traveling just slightly faster than the wind is blowing, though a few boats have acute station wagon effects when heading upwind. CO is a bit more difficult to detect in well-tuned gas engine boats than it is in diesel because diesel fumes have a much stronger odor (usually). Never-the-less, with a gas boat, you should be able to smell gas fumes coming aboard. Some boats are more prone to the station wagon effect. Typically these are flying bridge sedans with a high aspect ratio that will tend to pull in fumes behind it. Boats that are least prone to it are express cruisers and other similar low profile boats.

Very calm days are more dangerous than windy days. Heading into the wind, when there is a great deal of air, spray and exhaust fumes being pulled aboard, you may get frequent whiffs of exhaust fumes, but chances are there is so much fresh air moving around in the cockpit that it's not going to be harmful. The larger danger is when the air is calm, and when the fumes being pulled back stay there and are not blowing away. Under any conditions, of course, you should be alert to fumes entering through an open cabin door.

CO is heavier than air and will tend to collect in cabin spaces. That's why a boat prone to the station wagon effect, running along with the rear cabin door open may end up filling the cabin with exhaust fumes. You should be alert to when this occurs. There are two ways to avoid it. The best way is to open a window or hatch that will facilitate an airflow through the cabin while leaving the rear cabin door slightly open. The point here is to create ventilation that will clear the cabin of any exhaust fumes. Secondly, if the station wagon effect is acute, alter your course so that the wind is not directly behind the boat, but is working to break the vacuum behind the boat and prevent it from being carried aboard.

The Most Deadly Means By far the most deadly means that CO accumulates in cabin spaces is via leaking exhaust systems. It is just plain foolhardy not to inspect an inboard engine exhaust system frequently. Like the muffler on your car, exhaust systems do not last forever and require frequent maintenance. **ANY TIME THE EXHAUST SYSTEM SHOWS EVIDENCE OF A WATER LEAK, THERE IS A SERIOUS POTENTIAL FOR A CO LEAK.** Do not forget that. All exhaust systems are cooled by water. **IF IT'S LEAKING WATER, IT'S**

PROBABLY LEAKING CO.

Exposure The effects of CO are cumulative in relation to the period of exposure. That means that long term exposure (say six hours) to low levels of CO can be similar to a short, massive dose. Situations like this usually occur to occupants, say in the cockpit of an express cruiser, heading down wind for a period of hours. You will know when it is happening as a result of smelling exhaust fumes, so be alert to this. The way to avoid it is to alter your course to a point where the fumes are no longer being brought into the cockpit. Running a long, straight course may mean you have to resort to tacking, sort of like a sailboat, to get to your destination. If you are being subjected to a strong odor of exhaust fumes, you must do something to alleviate the fumes coming into the cockpit.

The Rules Are:

Inspect Exhaust System at Minimum Biannually

Repair Any Sign of Exhaust System Leakage Immediately

**Do Not Continue to Operate the Boat in the Same Direction
When Exhaust Fumes are Obviously Coming Aboard**

Install a CO Detector in Gas Boats

Inspection Interval: Inspect exhaust systems after every 50 hours operation or every 90 days, whichever comes first. On my own boats, I inspect the system every time I go out. I've suffered CO poisoning and I'm not going to let it happen again.

Sleeping On Board Most CO fatalities occur to occupants sleeping on board with gas generators running. My advice is to regard sleeping with a generator running as very dangerous unless you have a high degree of certitude that the exhaust system is absolutely secure, and that you have a CO monitor that is certified operational.

This includes taking short naps while underway. I recommend taking naps while underway only be done when there is an open window or hatch that provides a good airflow through the interior, particularly the space in which the person is sleeping. The safest place to sleep will be in the forward most stateroom; the most vulnerable place the AFT quarters. If anyone needs to sleep, put them in the forward cabin or vee berth with the hatch at least open a few inches. IF THE VESSEL IS TRAVELING DOWNWIND, THEN IT IS NOT GOING TO BE SAFE. There must be an airflow through the cabin. It is best to avoid sleeping anytime the vessel is running downwind.

CO Monitors and Alarms CO alarms work, but only when they are maintained. The difficulty with alarms is that the sensors degrade after fairly short periods of time like, say, six months. They are very sensitive to contaminants. When contaminated, the alarms will usually sound and not shut off. When this happens, the tendency is to disconnect them and forget about them. Quite a few poisoning cases have occurred when annoyed boat owners solved the problem by disconnecting the alarm. In the north, where the vessel is laid up for the winter, make it a matter of routine to have the unit serviced at the beginning of the season. In year 'round climates, do it biannually. Oh, yes, and be sure that the servicing firm is qualified to do this.

Diesel Boats The amount of CO produced by diesel is usually less than half that of gas. Even so, that does not mean that it is not dangerous, plus you are also being subjected to poisonous sulfur dioxide. Sulfur dioxide is considerably less deadly, but it has a tendency to make you feel sicker. In rough water, it can severely increase the effects of sea sickness, and is often the cause of sea sickness. Long term exposure to diesel exhaust can do the same thing as short term exposure to gas exhaust. In either case, the condition has to be eliminated. Again, achieving the proper air flow over and around the boat is the way to do this.

One Final Prod Non lethal cases of poisoning are debilitating, painful and usually result in some degree of brain damage from minor to severe. Fatal cases are one of the ugliest forms of death imaginable. I've personally observed a CO fatality, and the amount of hemorrhaging and loss of blood it causes is hard to imagine. The good news is that you can reduce the odds of this happening to you to near zero by being alert to the risk. In fact, being alert, or just plain lucky, is the only way to prevent it.

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