Quicker and Easier Than Falling Asleep?

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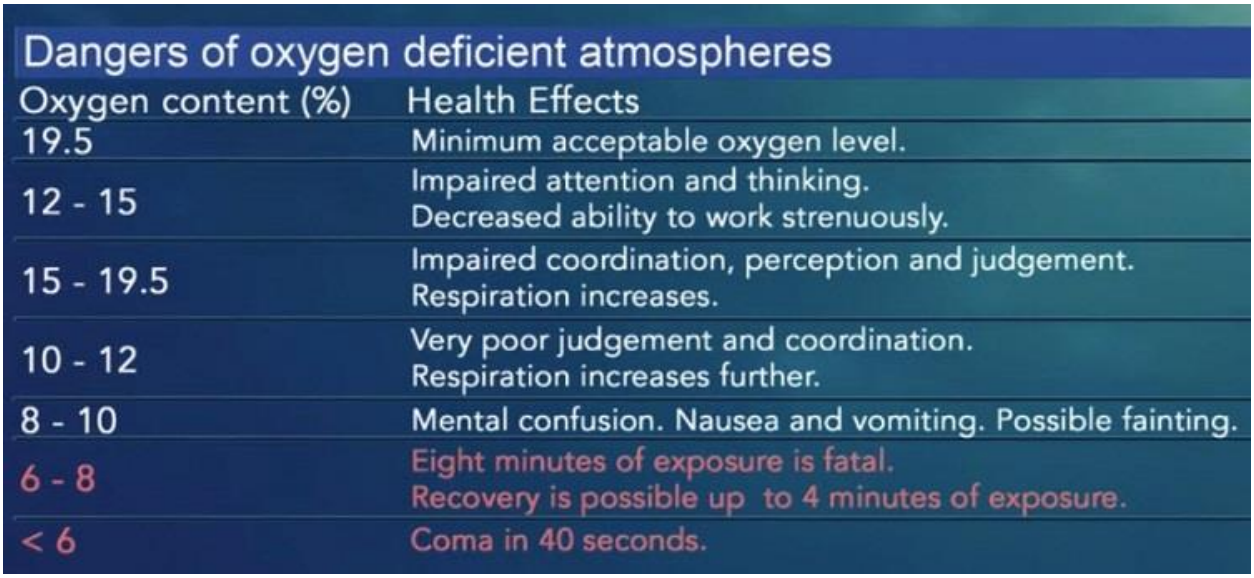
Harry Potter asks his godfather's spirit, "Does it hurt?" after he'd passed away. The answer Sirius Black gave was, "Dying? Not at all. Quicker and easier than falling asleep."

That answer may be familiar to enclosed space victims.

The air we breathe consists of several major components. Oxygen, critical for human life makes up about 20.9 percent of that air. That majority of air is made up of nitrogen – close to 78 percent. The remaining one percent largely consists of argon (about 0.93 percent) and carbon dioxide (about 0.04 percent). It doesn't seem that much could go wrong with this atmosphere, but taking away critical components or adding toxic substances can kill us in an instant.

Encountering an unsafe atmosphere is not what most of us have planned in a day's work. On vessels of any shape and size, the place we are most likely to encounter an unsafe atmosphere is an enclosed space. Recognizing the enclosed space and the hazard within is the first step in not encountering an unsafe atmosphere.

One or two deep breathes of an atmosphere containing 700 parts per million (PPM) of hydrogen sulfide can cause instantaneous death. If the oxygen level drops to four to six percent, a human will enter a coma in as little as 40 seconds and be dead in three minutes. Easier than falling asleep…



Dangers of oxygen deficient atmospheres	
Oxygen content (%)	Health Effects
19.5	Minimum acceptable oxygen level.
12 - 15	Impaired attention and thinking. Decreased ability to work strenuously.
15 - 19.5	Impaired coordination, perception and judgement. Respiration increases.
10 - 12	Very poor judgement and coordination. Respiration increases further.
8 - 10	Mental confusion. Nausea and vomiting. Possible fainting.
6 - 8	Eight minutes of exposure is fatal. Recovery is possible up to 4 minutes of exposure.
< 6	Coma in 40 seconds.

Recently, a surveyor from Gard P&I Club was portrayed in both a short movie and a written description of his enclosed space near miss. Having been called to survey a deck barge, the surveyor arrived on board to find the void spaces opened, so entered along with the superintendent. Starting to take pictures at the bottom of the space, the surveyor soon felt tired and decided to sit down briefly. Just how close he was to becoming a statistic soon became clear…

The Gard surveyor's recollection of the incident was of a relatively short time span, but the reality was that an ongoing rescue effort of close to a half hour had passed. The superintendent's quick recognition of the situation and thinking outside the box (he summoned a cylinder of oxygen which was released into the void space) prevented the surveyor from becoming that statistic.

But isn't this extreme? Wouldn't it take something extraordinary for the atmosphere on our ship to change so radically? Sadly, the answer is "No." It doesn't take much at all to change the atmosphere. For a void space that hasn't been opened in the past three years, all it takes is time and moisture for the steel to oxidize (rust), depleting oxygen levels to an unsafe level. For a cargo hold loaded with wood on the Isle of Man-flagged *Sally Ann C* in 2015, it was a mere three days without ventilation that depleted the oxygen level from 20.9 to 4.5 percent.

Unconsciousness and death was near-instantaneous for the chief mate and chief engineer on the *Sally Ann C*. The second mate was the "lucky" one having survived. He suffered lifelong injuries due to his prolonged time in an oxygen-deficient atmosphere. Easier than falling asleep…

The portable atmosphere testing instruments required under SOLAS regulation XI-1/7 are recommended to be capable of measuring and displaying four gas concentrations. They are oxygen, flammable gases or vapors (percent of LFL), carbon monoxide and hydrogen sulfide. These four gases or vapors constitute the most prevalent hazards onboard most vessels. The same portable atmosphere testing instruments are intended to be used by a competent person.

So, oxygen deficient or enriched atmospheres are dangerous, but what of the other gases or vapors that are detected by this multi-gas detector? Detecting flammable gases or vapors seems self-explanatory if one were on a tanker, but a bulker, container ship or ro-ro? A bulker under fumigation might have explosive and toxic phosphine gas present after undergoing the fumigation treatment to rid the cargo of or prevent pests. A ro-ro carries any type of cargo that can roll-on or roll-off. And

containers? Who knows what is actually in them? The only time you have a good idea is when it's a refrigerated container or hazardous material.

The required four-gas meters will detect the most likely atmospheric hazards on board. Unfortunately, the more exotic or lower concentration gases may require the use of gas detection tubes specifically designed for them. Your vessel's safety management system should designate these and will likely also designate when they are required.

And what exactly is an enclosed or confined space?

According to the IMO, an enclosed space means a space which has any of the following characteristics:

1. limited openings for entry and exit;
2 inadequate ventilation; and
3 is not designed for continuous worker occupancy,
and includes, but is not limited to, cargo spaces, double bottoms, fuel tanks, ballast tanks, cargo pump-rooms, cargo compressor rooms, cofferdams, chain lockers, void spaces, duct keels, inter-barrier spaces, boilers, engine crankcases, engine scavenge air receivers, sewage tanks, and adjacent connected spaces.

On many vessels, when one speaks of enclosed spaces, most crew members envision tanks and voids. Unfortunately, they do not consider cargo spaces, f'ocsle storerooms or bow thruster spaces to be potentially hazardous. That is most unfortunate, as it's the blind eye that's turned to this hazard that often results in fatalities and injuries. Cargo holds of container vessels are an oft-overlooked hazard. As they contain a variety of cargo ranging from hazardous materials to reefer containers to who-knows-what, the potential for containerized cargo to affect the atmosphere is always a possibility.

Who is responsible for training the vessel's crew – especially the "competent person?" Is it the captain? The company? The crewing agency? The answer, realistically, is all of them. But is anyone ensuring that that training is being undertaken? Or that the crew is retaining the training?

Recently, Marshall Island-flagged vessels had confined space entry incidents on a tanker and a bulk carrier. These incidents, which occurred within approximately 24 hours of each other, resulted in the deaths of three seafarers and two seafarers losing consciousness. A safety advisory pertaining was released and can be accessed below. In short, it advised vessel managers to review with their vessels:

• the dangers of improperly entering a confined space;
• how to recognize a confined space and examples of the different types of confined spaces a seafarer might encounter while performing their day-to-day shipboard tasks;
• that all seafarers, regardless of how junior or senior, must not enter a confined space without permission and then only in accordance with ship management's established procedure;
• who on-board is authorized to permit entry into a confined space; and
• that the best way for a seafarer to assist a fellow seafarer inside a confined space is to immediately raise the alarm so that an organized rescue can be conducted in accordance with ship management's established procedure.

The risk of enclosed or confined space entry is always present on vessels of all sizes. Recognition of the risks and hazards is critical. As mariners, where are you or your crew getting their information and training? If you are a vessel manager or shipping executive, have you ensured your crews are trained and competent?