TECHNICAL ARTICLE

IS THERE SOMETHING IN THE AIR?

	CGA Grade E	US-Navy NAVSEA	OSHA CFR 29
Oxygen (O_2)	20-22 (%)	20-22 (%)	19.5-23.5 (%)
Carbon Dioxide (CO_2)	1000 (PPM)	1000 (PPM)	1000 (PPM)
Carbon Monoxide (CO)	10 (PPM)	20 (PPM)	10 (PPM)
Hydrocarbons (CH_4)	25 (PPM)	25 (PPM)	_____
Water Vapor (H_2O)	♦ 67 (PPM)	♦ 67 (PPM)	♦ 67 (PPM)
Dew Point	-50°F	-50°F	-50°F
Oil & Particles	5 (mg/m_3)	5 (mg/m_3)	5 (mg/m_3)
Odor	NONE	_____	NONE

♦ May vary with intended use.

Air . . . compressed breathing air, simple isn't it? I say it's not simple. Let me explain. The air we breathe from our atmosphere is by nature composed of approximately 21% Oxygen and 78% Nitrogen. The balance is made up of trace gases such as Argon, Helium and others. When we compress air for breathing, it has to go through a process which can add many other substances, some of which are dangerous. But this is only a glimpse of the factors in producing acceptable compressed breathing air that meets safe requirements.

There are, in fact, standards that your compressed breathing air should meet, depending on its final use. There are a number of organizations that dictate these standards; for instance the Compressed Gas Association (CGA), national Occupational Safety and Health Administration (OSHA) and the U.S. Navy. There are others but these 3 deal primarily with air for breathing while diving. CGA Grade "E" standard is the one which most diving air dispensers should be familiar with. Its maximum limits are shown on the chart pictured above. While sport divers are concerned with CGA Grade "E", commercial divers usually fall under OSHA standards because they are paid workers. OSHA limits are slightly more lenient than Grade "E". These standards are extremely important in insuring the safety of your breathing gas, both for short and long term health hazards or even lessening any threat to your life.

If you were to look at the description of the air in our atmosphere you would say that it looks like it falls within the standards. So, why wouldn't the compressed air I draw into my compressor from the atmosphere, meet the standards set for CGA Grade "E". Doesn't it just compress it and put it into my tank? Well . . . lets discuss your atmospheric air. We call this "the source air". Depending upon your location, the source air may contain many industrial pollutants. One of the most dangerous is Carbon Monoxide (CO). This CO could originate at many sources, such as, vehicle exhaust from nearby parking lots, indoor gas heaters, as well as gas stoves and appliances. Lets also consider the likelihood of fumes from solvents and cleaning solutions. Then comes the compression process . . . yes, process. We all know that processing things usually changes them. In the case of breathing air, we are adding more contaminants during the compression process - Contaminants such as Carbon Monoxide and Carbon Dioxide from oxidized lubricant oils, vaporized moisture and oil and dirt particles. Right about now, things may sound pretty awful concerning the quality of compressed air. The conditions I just mentioned are normal with a well maintained and operating compressor. So the potential to worsen is there.

So now is the stage at which the situation can be improved by thoroughly filtering the compressed air. An adequately sized and designed purification system will deliver a grade of air to meet its intended use - in this case "breathing air". Any good system should be constructed so as to address each of the 3 stages of purification as well as to include any needed peripheries.

1. Coalescing or Condensing
2. Chemical Filtration
3. Particle Removal

Lawrence Factor™ offers a free product bulletin which illustrates this kind of equipment.

Timely maintenance and cartridge change is one of the most important considerations when operating a purification plant. By all means, sound practice and care go a long way towards ensuring a good outcome; i.e. safe breathing air. A common mistake is seen in swapping (or rotation) of adsorbent cartridges in a multi - tower system. This appears to be a cost saving tactic while in fact it could easily jeopardize the air quality by reintroducing contaminants back into the air stream.

Operating personnel should be a point of attention as well. A well trained air dispenser is key to safe operation and sadly it is the least regarded. Does this person understand how the air could become tainted? Do they even know the possible contaminants or the air standard by which they should abide? Are they familiar with safe cylinder charging practices? How seriously do they safeguard themselves and other staff? Clearly there are a lot of issues in question.

How do you ensure that the product you are producing is up to standards and that your organization/staff is acting responsibly? Well . . . you've already taken the first step: concern, information and education. We call it "Air Awareness". Here are some of the major points to address.

- Install a quality control program for your air compressor and its filter system.
- Train all the staff members who maintain or operate the air system.
- Have the processed air analyzed by a qualified (accredited) lab periodically.
- Spot check tanks out of each batch filled with a personal testing device (such as CO-Cop™).
- Know the limitations of your air and filtration systems and understand how these limits can diminish.

Commercial dive operators have to be especially conscientious since their divers are probably breathing a proportionally higher amount of compressed air and thus raising their exposure to dangerous substances. Breathing tainted air poses health effects on both short and long term basis. Be careful, educate yourself, be *AIR AWARE*.

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