Compressed air, commonly called Industry’s fourth utility, is the most common utility used in a typical industrial facility. Compressed air is used in more than 70 percent of all manufacturing activities including supplying breathing air to personnel using supplied air respirators. Hazardous breathing conditions exist in many routine industrial operations, such as chemical manufacturing, hospitals, abrasive blasting, paint spraying, industrial cleaning, and arc welding. In these and other operations that introduce contaminants into the workplace, supplied-air respirators, air filtration systems and carbon monoxide monitors are frequently used for worker protection.


These “breathing air” systems are designed to meet Occupational Safety and Health Administration (OSHA) Standard 29 CFR 1910.134(i)(1) which states: “Compressed breathing air shall meet at least the requirements for Grade D breathing air described in ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989, to include:

- Oxygen content (v/v) of 19.5% - 23.5%;
- Hydrocarbon (condensed) content of 5 milligrams per cubic meter of air or less;
- Carbon monoxide (CO) content of 10 parts per million (ppm) or less;
- Carbon dioxide (CO₂) content of 1,000 ppm or less; and
- Lack of noticeable odor”
Air Compressor Location Selection

Oil-lubricated air compressors are a common source of supplied breathing air. These compressors are placed in a wide range of ambient air conditions. Common contaminants in the ambient air of typical work areas may contain carbon monoxide, water vapor, oil and dirt. An important consideration when providing safe compressed breathing air is the location of the air compressor. OSHA 1910.134(i)(5) states, “the employer shall ensure that compressors used to supply breathing air to respirators are constructed and situated so as to prevent entry of contaminated air into the air-supply system.”

The air compressors in a large industrial facility are often located in a dedicated room or separate building from where the actual supplied-air respirators are being used. It is important to position the compressor away from hazardous areas where the air intake could be easily contaminated. Examples of potential hazardous areas include: vehicle loading areas where carbon monoxide is likely to accumulate, where heaters or combustion equipment are installed, or where chemicals and solvents are used or stored.

Four Common Compressed Air Contaminants

There are four main types of compressed air contaminants of concern in a compressed breathing air system.

1. Carbon Monoxide - Carbon monoxide (CO) is a common toxic contaminant in compressed air. It enters the breathing air system through the air intake, or is produced by overheating of piston type air compressors. The air intake must be placed away from engine exhaust or other sources of carbon monoxide. CO poisoning can cause headache, shortness of breath, dizziness, nausea or vomiting, confusion and loss of consciousness.

2. Water/Water Vapor - Air contains moisture, which is drawn into the air compressor and enters the air stream as a vapor. As compressed air flows through the system, it cools, causing the vapor to condense in the facepiece or helmet. Moisture combines with oil and solid contaminants to form sludge, which can clog or damage system components. Water also causes rust in pipelines, and can freeze in cold weather to block air flow.

An ENMET AFS-50 Air Filtration System with an ENMET CO-GUARD Carbon Monoxide monitor and alarm system in a steel enclosure

ENMET AFS-50 Air Filtration System

ENMET AFS-50 Air Filtration System with an ENMET CO-GUARD Carbon Monoxide monitor and alarm system in a steel enclosure

Air best practices

Compressed air is used in more than 70 percent of all manufacturing activities including supplying breathing air to personnel using supplied air respirators.

— Nancy Aulisa, Marketing Communications Manager, ENMET
3. **Oil/Oil Mist** - Oil is a major contaminant in systems using lubricated air compressors. In reciprocating compressors, lubricating oil applied to cylinders causes small droplets by the shearing action of the piston to enter the air system as a mist. Oil mist can cause breathing discomfort, nausea, pneumonia, and create unpleasant taste and odors.

4. **Solids** - Solids generally enter the system through the air intake. However, some materials may be introduced by the air compressor itself. In non-lubricated compressors, teflon, carbon and other materials are used as lubricants. Frictional wear can cause particles from these materials to enter the air stream.

**Grade D Compressed Air Filtration System**

A compressed air filtration system that removes oil, water, solid particles and odors from supplied breathing air is an important component in supplying Grade D breathing air and ensuring the safety of personnel using compressed air. ENMET’s AFS-50 air filtration system incorporates a unique three-stage filtration concept which utilizes a prefilter, high-efficiency coalescer filter and charcoal adsorber element. The compressed air passes through the prefilter/coalescer, a two-stage filtering device, which removes oil, water, and solid particles from the compressed air. The prefilter extends the life of the coalescer and adsorber filter elements. The coalescer is a high-efficiency filter that removes oil mist and fine (sub-micron) particles. Once the compressed air is filtered through the prefilter/coalescer it then passes through the adsorber filter which removes unpleasant odor and taste. The AFS-50 manifold has a maximum capacity of 50 CFM and is equipped with four outlet ports each supplied with a quick-disconnect. The system provides uniform air distribution to four supplied-air respirators and a fifth quick disconnect can be used for connecting a carbon monoxide monitor or an additional respirator.

**Carbon Monoxide Monitoring**

Carbon monoxide monitors specifically designed to monitor CO levels in compressed air are available for meeting OSHA requirements for Grade D breathing air. ENMET’s CO-GUARD is a compact, easy to install and operate compressed airline carbon monoxide monitor that meets OSHA
monitoring requirements. The instrument is designed for trouble-free operation, utilizing a carbon monoxide sensor with a life expectancy of up to three years. The system is supplied factory pre-calibrated and users have the capability to change alarm points, program relays for auxiliary warning equipment and perform calibrations in the field. It is simple to replace the sensor and recalibrate the instrument in the field.

Complying with OSHA 29 CFR 1910.134 Requirements for Grade D Breathing Air

A system that includes both air filtration and CO monitoring is the best solution to safeguard against exposing workers to contaminants in supplied breathing air. An air filtration panel and carbon monoxide compressed airline monitor combination system is designed to comply with OSHA 29 CFR 1910.134 requirements for Grade D breathing air. Typically, these types of systems are mounted directly on the wall or a mounting plate. In certain applications, customers require more protection for instruments that will be installed in poor ambient air conditions such as environments that may contain large amounts of dust, sand blasting material, particulates, hazardous liquids, gas vapors, overspray and corrosive materials.

Systems can be custom designed to protect the filtration and monitoring equipment by mounting them in stainless steel, aluminum or fiberglass enclosures. These enclosures deflect and protect the breathing air filtering and monitoring equipment from hazardous environments, providing continuous long life operation. The enclosure can include a lock, keeping unauthorized personnel from tampering with the devices. Connection ports are plumbed on the outside of the enclosure for easy access. Some CO monitors include service relays that can be programmed to activate auxiliary equipment, such as a strobe light and horn attached to the outside of the enclosure. These provide audible and visual alarms to alert users in the work area when a hazardous breathing air condition exists.

Employers are responsible for providing and maintaining safe breathing air equipment for their workers required to use supplied air respiratory equipment. An air filtration system and carbon monoxide monitor, designed for compressed air, helps employers maintain OSHA required Grade D breathing air.

About ENMET

ENMET offers a complete line of compressed airline monitors for monitoring carbon monoxide, oxygen, carbon dioxide, dew point and total hydrocarbon for complying with OSHA 29 CFR 1910.134 for Grade D breathing air requirements. Learn more at www.enmet.com

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A custom designed ENMET AFS-100 air filtration system with an ENMET ProAir 2200 carbon monoxide monitor.