



## *Safety Topic*

**March, 2002**

### **TOPIC: Working With Oxygen**

**INTRODUCTION:** The potential hazards of oxygen are often underestimated. It is nonflammable yet greatly enhances combustion. Although we must have it to survive, too much or too little can pose significant safety hazards.

**GOAL:** Employees should understand basic safety precautions when working with oxygen and be able to explain these to customers. After training, employees should be able to answer questions about oxygen properties, oxygen deficiency, oxygen enrichment, and personal protective equipment.

**MEETING PREPARATION:** Make copies of Material Safety Data Sheets for oxygen, nitrous oxide, and other oxidizers in your facility. Determine where oxygen is in use (demo rooms, garage, repair shop, etc.) or being transferred (fill room, customers' vans). Make a walk-around inspection and note locations of flammable or combustible material and areas where ventilation is poor. This should be discussed in your safety meeting.

#### **ITEMS TO CONSIDER:**

1. Although oxygen and nitrous oxide are the two most common oxidizers found in welding supply distributorships, they are not the only ones. Despite differences and additional hazards among the oxidizers, they all share one common characteristic -- they greatly increase combustion. Not only will combustible materials burn much more readily in the presence of oxidizers, but many materials (e.g., stainless steel) which normally are not combustible in air will burn in the presence of oxidizers under certain conditions.
2. Material Safety Data Sheets offer specific precautions to be taken when working near enriched oxygen atmospheres and other oxidizers. Explain applicable MSDSs to employees, paying particular attention to the hazards, recommended controls, and personal protective equipment recommendations.
3. The attachment to this month's Safety Topic offers important information about working with oxidizers and oxygen, in particular. Discuss this information with your employees.

Mike Lopez, NWSA Safety Consultant Phone: (205) 853-9874; Fax: (205) 853-2067

## **ATTACHMENT TO MARCH 2002, SAFETY TOPIC**

### **OXYGEN DEFICIENCY**

The minimum oxygen content of the air, at normal atmospheric pressure, should be at least 19.5% (vol). In confined spaces, monitoring of oxygen content is essential. In other than confined spaces, normal ventilation is usually adequate assuming that toxic or noxious gases are not present. Proper ventilation is necessary because other gases may asphyxiate by simple oxygen displacement.

At less than 19% oxygen, workers may experience impaired coordination and decreased ability to perform certain tasks. When the oxygen level falls to below about 16%, workers become mentally incapable of understanding the dangers involved. Symptoms include sleepiness, fatigue, loss of coordination and confusion. Exposures to 12% oxygen or less can bring about unconsciousness without warning.

Personnel must remember that despite the proper amount of oxygen present, hazards can still exist, especially where ventilation is poor. For example, exposure to excessive amounts of carbon dioxide can result in serious physical effects, including death, regardless of the amount of oxygen present.

### **OXYGEN ENRICHMENT**

Oxygen enrichment, generally considered to be in excess of 23.5% (vol) presents other dangers. Flash points and auto-ignition points of many materials are greatly lowered in oxygen (or other oxidizer) enriched atmospheres. It is for this reason that combustible or flammable material such as oil and grease must not directly contact oxidizers. Regulator fires are not uncommon when oily residues or small solid particles produce low ignition energy, resulting in heat build-up.

In addition to decreased flash and auto-ignition points, oxygen enriched atmospheres increase flammability ranges. For example, the upper flammable limit of methane in air is 15%; this limit is increased to 55% in oxygen.

Oil and grease can react violently in the presence of oxygen. Customers who ask for "air" should be questioned regarding the intended usage. There are many incidents of fatal and near-fatal accidents where oxygen has been used in place of air for such things as cleaning parts, pressurizing hydraulic systems, inflating tires, etc.

### **OTHER HAZARDS**

Refer to Material Safety Data Sheets for properties and specific hazards of oxidizing gases. However, it is important to point out to employees that oxidizing gases may also exhibit other potentially hazardous characteristics. For example, chlorine is not only a strong oxidizer, but toxic and corrosive, as well.

### **PERSONAL PROTECTIVE EQUIPMENT**

If you do not yet mandate use of personal protective equipment in your filling areas, **now** is the best time to comply with this OSHA requirement. Perform an assessment of existing and potential hazards, bearing in mind properties of gases, locations of flammable or combustible material, available ventilation, and of course, the particular job(s) performed.

If employees fill liquid oxygen, do not overlook the extremely cold temperature of cryogenics. Gauntlet-type gloves, clear face shield, and cuffless trousers extending beyond the tops of shoes are considered essential.

### **STORAGE & TRANSPORTATION**

Oxidizers should not be stored near combustible or flammable material, nor in areas of restricted ventilation. OSHA requires oxygen to be separated from combustible or flammable material by a distance of at least 20 feet or by use of a fire barrier of at least 5' in height, rated for ½ hour. Areas around bulk tanks should be maintained free from dried weeds, leaves, etc.

Pay particular attention to vehicles with home-delivery cryogenic tanks, especially vans. Oxygen must be vented **up** to the outside, *not down* where oxygen may contact asphalt or the greasy undercarriage of the vehicle. Flooring, braces, etc. within the van should not be wooden. In addition, piping may require relocation so that the vessel may be filled with doors open, without the need for any employee to enter the cargo compartment.

DOT prohibits smoking within 25' of any commercial vehicle carrying oxidizers.

Only cylinders cleaned and approved for oxygen service should be used. Never fill liquid oxygen in a container not specifically approved for oxygen service.

### **EMERGENCIES**

In the event liquid oxygen is spilled, all ignition sources should be turned off. Do not walk or roll equipment on gravel, concrete, or other porous surfaces which has been exposed to liquid oxygen. Keep personnel away from the area for at least 30 minutes after all frost has disappeared.

Liquid oxygen can cause severe frostbite. The frostbitten part should be placed in warm water or warmed gently under blankets. Get medical attention immediately.

###