

Prevention of the Contamination of Cryogenic Liquid Oxygen Cylinders

A few years ago the following accident was reported in the gas industry:

A driver was picking up a liquid oxygen cylinder at a scrap yard, where it was being used with propane to cut up metal. When the driver picked up the cylinder it exploded, killing him. An investigation showed that there had been a back-flow of propane into the liquid oxygen cylinder, and just moving the cylinder was enough to set off an explosion.

This story is an important reminder that all cylinders can potentially become contaminated while in storage, in use or in transport. However, in the case of liquid oxygen cylinders, the risk and the potential for serious damage and/or injury is much greater. It is therefore of vital importance to understand the main sources of contamination and means of prevention.

There are two principal ways that a cylinder carrying liquid oxygen can become contaminated, and thereby dangerous. Either of these can result in a serious fire or explosion. Always follow the guidelines below to ensure that no contamination occurs. These methods of contamination are:

A. Contamination by contact with any oil, grease or other hydrocarbon

Prevention

The primary way to prevent this kind of contamination is by ensuring that the equipment used is thoroughly inspected and properly cleaned for oxygen service.

1. All equipment that might come into contact with the oxygen, must be kept clean and free of oil, grease or other hydrocarbon materials. If evidence of these contaminants is found on any equipment, have it inspected and cleaned by a qualified repair facility before using it.
 - Inspect oxygen regulators *before* installing them on cylinders.
 - Ensure that there is no contamination on the inlet connections, nut, nipple or filter.
 - Ensure that the cylinder valve outlet connection is free of contaminants, *before* attaching it to the regulator.
2. Ensure that work area and clothing are free of oil, grease or other hydrocarbon materials. Do not smoke when handling the cylinders.
3. Inspect and leak test the cylinder and equipment before each use.



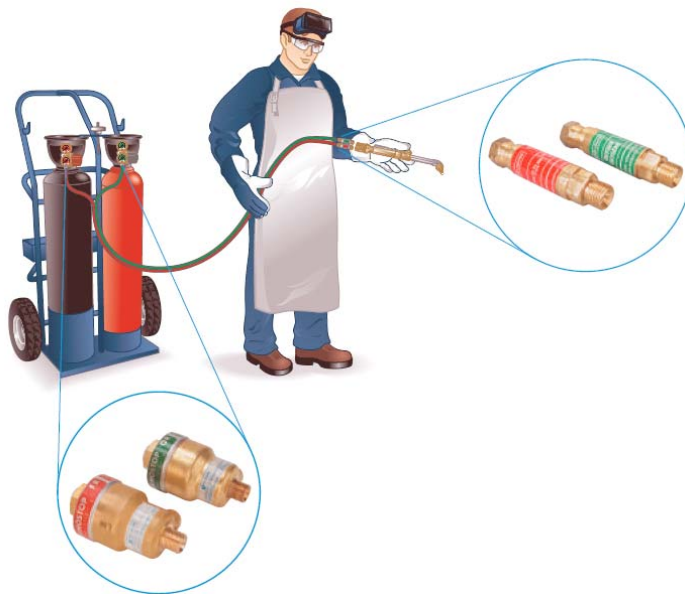
B. Contamination by the reverse flow into the cylinder, of a flammable gas used in heating/cutting/welding applications.

Prevention

This kind of contamination is a hazard in welding and cutting applications, where oxygen is mixed inside the torch set with a flammable gas (ie. acetylene, propane or MAPP). A drop in pressure on one line can result in the flammable gas returning up the oxygen line and into the cylinder.

Below are some recommendations to prevent this kind of contamination:

1. Purge each line before lighting the tip of the torch, to ensure that no oxy-fuel gas mixture is present.
2. Install flashback arrestors with built-in reverse-flow check valves and flame arrestors, on both the oxygen and the flammable lines.
3. Install a flashback protection device on each line at either the inlet of the torch set or the regulator outlet connections, depending on the model. This can stop a potential fire from progressing back into the cylinder.
4. Do not allow the flammable gas supply or the oxygen cylinder to become empty. An inadequate supply of gas may cause a backfire or flashback.
5. Always ensure that you are using appropriate equipment and following the manufacturer's operating instructions.



Further information can be found in the following publications of the Compressed Gas Association and the Canadian Standards Association:

Compressed Gas Association

CGA G-4.1	Cleaning Equipment for Oxygen Service
SA-11	Potential for Hidden Cryogenic Liquid Cylinder Contamination
SB-8	Use of Oxy-Fuel Gas Welding and Cutting Apparatus
SB-16	Use of High Flow Oxy-Fuel Gas Heating Torch Apparatus
TB-3	Oxy-Fuel Hose Line Flashback Arrestors

Canadian Standards Association

W117.2-06	Safety in Welding, Cutting, and Allied Processes
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