

Hazard Alert



Oxygen Tank Valves

Hazard Summary

In August 2023, a worker was injured when the valve attached to an oxygen cylinder exploded. The worker was preparing to use a plasma table at a manufacturing plant and went outside to turn on the oxygen supply from a 16-cylinder gas pack. While the worker was in the process of opening the valve, the valve exploded. Fortunately, the 16-cylinder gas pack was properly stored on a skid that was secured to a metal frame. Proper tank storage was effective in limiting more serious injuries to the worker and preventing structural damage to the facility.

Hazard Location

This alert applies to all workplaces where compressed oxygen cylinders are used.

Contributing Factors

It was determined that the explosion was caused by using an inappropriate valve, in this case a hydraulic valve instead of a valve specifically designed for regulating the flow of oxygen. Hydraulic valves are typically coated with a lubricant and should never be used in oxygen systems. The contaminated valve created a source of friction which ignited when it came in contact with the oxygen from the tank.

Pure oxygen at high pressure, like the type found in compressed gas cylinders, can react violently with common materials such as oil and grease. Oxygen is very reactive and behaves differently than air, compressed air, nitrogen, and other inert gases. Any type of contamination in an oxygen valve or line, such as oil, dirt or Teflon tape, creates friction when the gas is introduced.

Rapid opening of oxygen valves can result in high oxygen velocities which will also generate friction heat and create a potential ignition source. Heat can also be generated through compression of oxygen which can occur where a pressure regulator is connected to an oxygen cylinder.



Legislated Requirements

- Section 37.19(1)(a) of the General Regulations in the Occupational Health and Safety Act states that the employer shall ensure that compressed gas cylinders are kept in an upright position and secured against falling during storage, transportation, and use.
- Section 5(2)(b)(i) of the WHMIS Regulations in the Occupational Health and Safety Act states that an employer shall ensure that a worker who works with a hazardous product or may be exposed to a hazardous product in the course of the worker's work activities is trained in the following procedures: (b) procedures for the safe use, handling, storage and disposal of a hazardous product contained or transferred in a pipe or a piping system including valves.
- Section 37 of the Occupational Health and Safety Act states that an employer shall, whether or not a person has been injured, provide the Director with a written report of all accidental explosions.

Recommendations

Oxygen tanks are common in many workplaces. Although the type of work may vary in each workplace the recommendations below apply to all.

- Make sure that all connection points are free from contamination, including grease, oil, dirt, and Teflon tape prior to connecting any regulators, hoses, or valves.
- Do not handle an oxygen cylinder or apparatus with oily or greasy hands or gloves.
- Follow manufacturer recommendations and make sure only suitable materials and safe components are used as part of a compressed oxygen system.
- All material used/introduced into the compressed oxygen system must be cleaned - and kept clean - to prevent contamination with flammable or non-oxygen compatible substances.
- Protect workers by installing shields, like panels in front of valves and other components or by installing remote-controlled valves that can be operated from a safe distance.
- Design oxygen systems to effectively reduce the risk of fire or damage from explosions.
- Make sure cylinders are secured in an upright position.
- Open valves slowly to reduce and control the oxygen velocity.
- Make sure the appropriate fire extinguisher and a burn kit are readily available in case of emergency.

