

Storage and handling standards for hydrogen peroxide

- Properly sized pressure relief devices **MUST** be present to allow delivery. Normally pressure relief is provided by a large (50–60 cm) manway opening with a **LOOSE** cover. Alternative pressure relief devices are pressure relief valves and/or rupture disks.
- Install relief valves in areas where it is possible to trap H₂O₂ such as between block valves. An alternative is to confirm that procedures are in place that require specific valves to be left open to prevent trapping H₂O₂. H₂O₂ trapped in a piping system will (not might) result in a pressure increase due to the oxygen released during decomposition. It is possible for the accumulated pressure to exceed the structural limit of the pipe or fittings causing fracture or disintegration of the piping resulting in property damage and/or serious personal injury.
- Insure that all valves have relief holes drilled through one side of the ball (or plug) to prevent dangerous pressures from developing inside a closed valve. This is a requirement, however, it is difficult or impossible to verify this on an operating system. The pressure burst of ball or plug valves can produce high velocity projectiles capable of causing serious injury or death.
- Stainless steel (304L & 316L) or aluminium (grades 5254, 1060) is recommended for permanent systems. PVC should only be used for short durations, such as trials (no more than 2 months). PVC is not recommended for outdoor systems.
- Be sure that secondary materials of construction are compatible with H₂O₂. Examples of this are: replace carbon steel diaphragm pump heads with SS heads; replace carbon steel upper half of pulsation dampener with stainless steel. A hole in the diaphragm would result in H₂O₂ coming in contact with the carbon steel in the upper half. Severe decomposition will occur resulting in destruction of the dampener.
- In cases where a diaphragm separates H₂O₂ from oils, be sure that a non-reactive oil is used. This occurs primarily in diaphragm-type metering pumps. Should a diaphragm fail, H₂O₂ could come in contact with a hydrocarbon oil resulting in an explosion hazard.
- Gaskets must be Teflon, Teflon envelope, Viton, EPDM or Gylon 3500. Teflon envelope gaskets may experience filler degradation over time due to weathering, resulting in failure of the gasket – this should be monitored.
- Teflon tape is only a thread lubricant not a sealant, in time these joints will leak. Use Loctite PST for stainless steel pipe (Sealant 567) on all threaded fittings.
- HDPE tanks **MUST** have secondary containment by either a concrete area or a “tank within a tank” design. A dike will provide containment in the event of a spill and also prevent equipment such as fork trucks from hitting the tank.

Storage and handling standards for hydrogen peroxide—continued

- Install a containment area around stainless steel and aluminium storage tanks. This will provide containment in the event of a spill and also prevent equipment such as fork trucks from hitting the tank. Depending on local regulations, secondary containment may be required. Factors such as proximity to the public or water ways are to be considered if local regulations do require containment.
- All debris such as wood must be removed from the containment area. All grass should be removed from the immediate area around the tank. These materials can be ignited by H₂O₂ concentrations as low as 16 percent. Tank areas must be free of any other flammable or combustible materials, reducing agents, alkaline materials, or other materials that are incompatible with hydrogen peroxide.
- Running water must be provided at the unloading site, as this is required for use in rinsing delivery hoses as well as diluting any spills.
- The customer must have eye wash and safety shower units readily accessible—within 15m of the unloading area and on the same level. These must be clearly marked and easily accessible in case someone should come in contact with H₂O₂.
- Be sure that operating personnel wear the proper protective gear when handling H₂O₂. This includes face shield, chemical goggles, hard hat, rubber boots and gloves and a chemical resistant suit.
- Do not use air, nitrogen, or other gases to pressurize tanks or distribution equipment as a means of transferring product. Most air and nitrogen systems are fabricated from carbon steel and could introduce rust to the tank, which could lead to decomposition of the H₂O₂. Also, in the event of a leak, additional time is required to bleed the pressure from the tank in order to stop the leak. Gas pressure transfer systems can cause unexpected discharge of hydrogen peroxide from fittings or connections and gas release may cause overflow of tanks.
- Install a dosing tank upstream of metering pumps. The purpose of this tank is to prevent the accidental backflow of contaminants to the storage tank. Although there are normally check valves installed, these are only considered to reduce the magnitude of process backflow, not prevent it. In some cases, a dosing tank is required. An example of a situation where it is required is the addition of H₂O₂ into a process line containing sulphuric acid (decolourisation) or organic materials.
- Never return H₂O₂ to a bulk container or tank. Once H₂O₂ has been removed from the storage tank it should never be returned to it. This reduces the chance of contamination being introduced into the storage tank. Contamination in the storage tank could cause decomposition. This includes the discharge from the relief valves.

Storage and handling standards for hydrogen peroxide—continued

- Install a temperature indicator and alarm to monitor product temperature in the tank. One of the first signs of decomposition is an increase in temperature of the tank contents. An early indication of this will allow personnel time to take the necessary steps to limit the consequences of the decomposition. This is a requirement on any tank containing >50 percent hydrogen peroxide.
- Some type of level indication is required. This may be a sightglass or electronic style.
- Replace the typical 2" male hose adapter on the storage tank loading line with 1-1/2" male hose adaptor. Since most other chemical connections are 2", this will reduce the possibility of another product being accidentally unloaded into the H₂O₂ tank. The dust cap for the hose adaptor must have a small (2 mm or 3 mm) vent hole drilled through it to prevent a dangerous pressure build-up between the shutoff valve and the cap.
- The dust cap for the hose adaptor **MUST** have a small (2 mm or 3 mm) vent hole drilled through it to prevent a dangerous pressure build-up between the shutoff valve and the cap.
- Locate unload line away from other chemical unload lines to prevent accidental cross-contamination of potentially incompatible chemicals.
- Label the tank to insure that the contents are properly identified to employees as well as delivery and emergency services personnel. Label the piping to ensure that the contents are properly identified to employees as well as contract maintenance and emergency services personnel. Install a 2014 or 2015 DOT placard on the H₂O₂ connection (identical to the marking on the truck).
- Do not use buckets for transferring H₂O₂. Convey H₂O₂ directly to the chemical mix tank using piping or tubing to eliminate manual handling.
- All H₂O₂ equipment must be dedicated to this service. Equipment must not be used for other products since this could cause severe decomposition and damage to equipment and/or personal injury.

For more information:

Bernhard König
Senior Manager Engineering Services
Active Oxygens
Phone +49 6181 59-2422
Fax +49 6181 59-4072
bernhard.koenig@evonik.com