Materials of Construction for the Storage of Hydrogen Peroxide

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Technical Data Sheet

Introduction

There are three primary materials of construction that are recommended for the storage of hydrogen peroxide; low carbon stainless steel, high purity aluminum, and high density polyethylene. There are advantages and disadvantages to each material.

Stainless Steel

Low carbon grades of stainless steel are excellent for the storage of hydrogen peroxide. Alloys which are suitable include 304L and 316L. Properly passivated stainless steel provides a very stable surface for the storage of hydrogen peroxide.

The corrosivity of hydrogen peroxide on stainless steel is minimal, so a typical tank should last thirty years or more.

Equipment fabricated of stainless steel must have proper surface preparation. It must also be chemically passivated prior to use with hydrogen peroxide. This removes surface impurities and creates an inert layer on the surface of the metal. Stainless steel can easily be repaired.

Aluminum

High purity aluminum (>95% aluminum) is the most compatible material for storage of hydrogen peroxide. Alloys which have a high aluminum content include 1060 and 5254. Aluminum provides the most stable surface for the storage of hydrogen peroxide.

The corrosivity of stabilized hydrogen peroxide on aluminum is minimal, so a typical tank should last thirty years or more. There are some special grades of hydrogen peroxide that are corrosive to aluminum. Aluminum is subject to attack from chlorides, which may be introduced with water used for dilution.

Equipment fabricated of aluminum must have proper surface preparation. It must also be chemically passivated prior to use with hydrogen peroxide. This removes any surface impurities and creates an inert layer on the surface of the metal. Aluminum can be repaired, but requires special welding skills.

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High Density Polyethylene

High density polyethylene is a suitable material of construction for the storage of hydrogen peroxide. Different resins react differently with hydrogen peroxide. High density polyethylene provides a very stable surface for the storage of hydrogen peroxide.

Hydrogen peroxide causes environmental stress cracking and embrittlement. This increases with the concentration of hydrogen peroxide, so the concentration is limited to 50%. This can also be caused by UV attack from sunlight, use in a high ambient temperature environment (>90°F), or the presence of a stress cracking agent such as oxygen. Cross linked HDPE and UV stabilizers are typically used to provide some increased resistance. The actual lifespan is difficult to predict because of the various factors involved. Tanks typically last between three and ten years in hydrogen peroxide service.

High density polyethylene can be put into service after a simple cleaning. Since XLHDPE becomes a thermoset material after molding, it is not weldable and repairs cannot be made. A visual inspection is helpful, but only destructive test methods can fully determine the structural integrity of the tank.

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