Innophos Phosphoric Acid

Manufacturing History

At the turn of the century, we were one of the first companies to pioneer the manufacture of phosphoric acid. A process was developed for acidulating bones from the Chicago stockyards to make acid for use in manufacture of calcium phosphate leavening agents. A few years later, we converted the process to phosphate rock and in the 1920's were the first company to produce high purity phosphoric acid using the blast furnace process. Since that time purified phosphoric acid has been produced by burning elemental phosphorus, converting it to phosphorus pentoxide, and then hydrating it to phosphoric acid. This is known as the "thermal" method and, until recently, was considered the only means of producing high quality phosphoric acid in strengths of 75%, 80%, 85% and 105%. Additional heating in a separate unit is used to produce 115% H$_3$PO$_4$ which is polyphosphoric acid. Innophos Inc. has become widely recognized as a premier source of thermal phosphoric acid. While it produces quality acid, the thermal process has a significant drawback. It consumes large amounts of electricity. About 15 years ago, concern over higher and higher energy costs prompted European producers to begin looking for more cost-effective methods. Out of these efforts, a two-step process has evolved: Phosphate rock is reacted with sulfuric acid to form "green" phosphoric acid. A solvent is used to extract and purify the acid. The solvent is then separated from the purified phosphoric acid and the acid is treated further to eliminate all solvent residue from the finished product. The purified phosphoric acid produced by this method is commonly known as wet process acid. Once again, Innophos was a pioneer in the development of wet process technology, and has since become one of Europe's leading suppliers. This technology, with additional refinement for the U.S. market, has provided the basis for our purified phosphoric acid (PPA) facility in Geismar, Louisiana.

Safety Data

Please request Innophos Material Safety Data Sheets for complete safety information: 1-609-495-2495

Bulk Storage

Phosphoric acid is corrosive to mild steel, cast iron, copper, brass and bronze, and if the acid is to be shipped or stored in metal containers the proper material of construction must be selected. There are several materials which are considered satisfactory.

Stainless Steel: Type 316 ELC stainless steel is the most widely used because of its acceptable resistance to corrosion. This offers good resistance to acid up to 8% H$_3$PO$_4$ at 90°C and 115% H$_3$PO$_4$ at 115°C.

It is important for the tank bottoms to be rolled approximately three inches so that the welds joining the side sheets to the bottom plate are free to expand and contract. Corner welds should be avoided, as undue stresses in the weld metal can occur and will aggravate corrosion.

When using a vertical tank design with a flat bottom, it is particularly important to have the bottom as uniformly supported as possible to avoid undue stresses in the bottom plate. This is easily done by setting the tank on a flat supporting pad, preferably concrete with a minimum compressive strength of 2500 psi at 28 days, reinforced and carried to frostfree depth and good bearing soil. Since a good, economical foundation design depends on many variables, a competent foundation expert or civil engineering firm should be consulted.

If it is desired to check the bottom of a stainless steel tank periodically for leakage, the tank should be set on dunnage consisting of closely spaced wood beams of equal height, properly leveled. Steel beams should not be used because of the corrosive effect in case of leakage. The spacing should be such that the bending stress of the bottom plate does not exceed 17,500 psi. The dunnage may be supported by piers of sufficient height to permit easy access to the tank bottom for inspection. If the dunnage is supported by concrete, the surface of the concrete should receive a protective coating. Again, a civil engineer should be consulted.
When stainless steel is used, all welding should be done in such manner that:

- Carbon content of the weld metal shall not be greater than that allowed in the parent sheet.
- All inclusion of foreign matter, as chrome oxides, slag or foreign metal shall be carefully avoided.
- Edges of all sheets, strips, plates and tubular products to be welded shall be cleaned thoroughly. They shall be free from grease, oil, scale or oxide.
- All edges shall be properly fitted so that a minimum of weld metal is used. All plate material for butt welding shall be beveled by machine or milling process.
- All welding material of No. 16 gauge and heavier shall be done by metal-arc, direct current welding. In general, reverse polarity is preferable.
- All welding of stainless steel to stainless steel shall be done with a welding rod of higher alloy content than the parent metal. Flux-coated welding rods shall be used. Welding rods larger than 3/16” shall not be used. Also, submerged arc, TIG (tungsten inert gas), and SIGMA (shielded inert gas metallic arc) welding may be used. TIG welding is recommended for all piping. All welded metal and adjacent areas shall be as resistant to corrosion as the parent material.
- All scale shall be removed from the parent and weld material for all areas exposed to corrosion after fabrication, and welds shall be ground smooth on the corrosion side.
- All sheets shall be sheared or sawed to size or shape. No cutting by burning with carbon or steel electrodes shall be used for any portion of the work. Arc-Air cutting methods may be employed.
- All welds shall be passivated.

**Rubber Linings:** Linings made of rubber are used extensively in the chemical industry, and have found widespread use in the manufacture and transportation of phosphoric acid. For this purpose "soft" or "semihard" rubbers are most suitable. The hardness of rubber is measured by an instrument called a Durometer. (Type A is used to measure soft rubbers.) This device consists essentially of a small drill or blunt indenter working under pressure exerted by a coiled spring. Durometer readings in the semi-hard rubber scale (a range from 50 to 90) are the most satisfactory for use with the acid. These linings can be used with solutions and slurries up to a temperature of 75° - 80° C (167° - 176° F). It must be cautioned here, however, that one of the shortcomings of rubber linings containing carbon is the fact that they are inclined to impart color to the acid at temperatures higher than 60° C (140°F). This can be critical in any situation where color is an important factor, such as the storage of food grade acid. For this reason, it is necessary to line acid storage tanks or other production equipment with special food grade rubbers if color retention is important.

In addition to its use in tanks, rubber also finds its way into linings for piping, as a cover for pumps and agitators, and for belting, skirts, and enclosures.