

phosphoric acid is used to suppress microbial growth. Care should be used with the injection of phosphoric acid into hard water since it may cause the precipitation of calcium carbonate at the interface between the injected chemical and the water source.

For safety, dilute the concentrated acid in a non-metal, acid-resistant mixing tank prior to injection into the irrigation system. When diluting acid, always add acid to water, never water to acid. The acid injection point should be beyond any metal connections or filters to avoid corrosion. Flushing the injection system with water after the acid application is a good practice to avoid deterioration of components in direct contact with the acid.

Acids and chlorine compounds should be stored separately, preferably in epoxy-coated plastic or fiberglass storage tanks. Acid can react with hypochlorite to produce chlorine gas and heat; therefore, the injection of acid should be done at some distance (2 feet), prior to the injection of chlorine. This allows proper mixing of the acid with the irrigation water before the acid encounters the chlorine.

Hydrochloric, sulfuric, and phosphoric acids are all highly toxic. Always wear goggles and chemical-resistant clothing whenever handling these acids. **Acid must be poured into water; never pour water into acid.**

## Scale Inhibitors

Scale inhibitors, such as chelating and sequestering agents, have long been used by other industries. A number of different chemicals are being marketed for use in micro irrigation systems to prevent plugging. Many of these products contain some form of inorganic polyphosphate that can reduce or prevent precipitation of certain scale-forming minerals. These inorganic phosphates do not stop mineral precipitation, but keep it in the sub-microscopic range by inhibiting its growth. Probably the most commonly used of these materials is sodium hexametaphosphate -- as little as 2 ppm can hold as much as 200 ppm calcium bicarbonate in solution (Cowan and Weintritt, 1976).

Sodium hexametaphosphate is not only effective against alkaline scale, but also forms complexes with iron and manganese and can prevent depositions of these materials. Although the amount of phosphate required to prevent iron deposits depends on several factors, a general recommendation is 2 to 4 ppm phosphate for each ppm of iron or manganese (Cowan and Weintritt, 1976).