

## The SAEC Process

### Purification of Green Phosphoric Acid to Food Grade

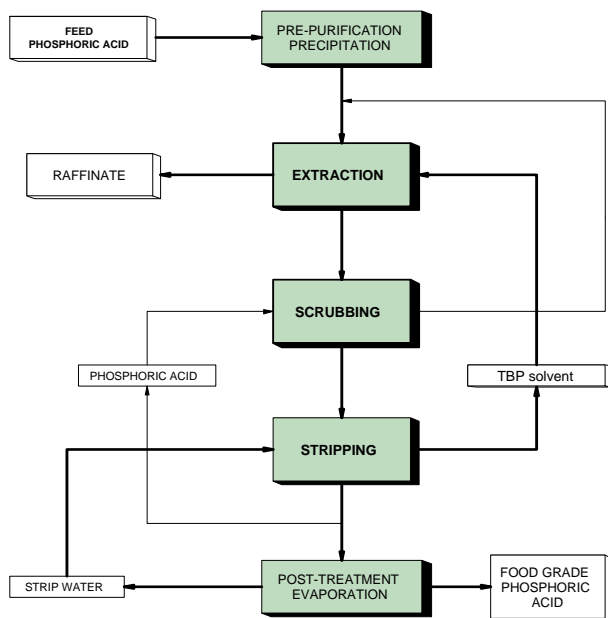
By reacting apatite with sulfuric acid, phosphoric acid and gypsum will result. Most phosphoric acid is produced in this way and is normally used as raw material (green acid) to produce fertilizers. A small amount, however is further refined to phosphoric acid of food grade quality.

The green phosphoric contains 28 - 54 %  $P_2O_5$ . The acid is heavily entrained with impurity cations, among which arsenic, cadmium and uranium are the most poisonous. In addition, anions like chloride, fluoride and sulphate must be considered.

quality of such phosphoric acid equals that of thermally produced acid.

Purification and concentration of green phosphoric acid to food grade acid is performed in the three main steps:

- Pre-purification by precipitation of arsenic and sulphate, incl. filtration.
- Purification of the phosphoric acid by solvent extraction
- Post-treatment to remove fluoride and concentration to 80 - 85 %  $H_3PO_4$  (about 60 %  $P_2O_5$ ).



Solvent Extraction is the predominant methods for the purification of green phosphoric acid to food grade quality. The



In the pre-purification step chemicals are added to precipitate arsenic and sulfate. The acid is then cooled and left for an appropriate ageing time. A flocculent is added and the solid content is allowed to flock (precipitate) in a clarifier.

The clear phosphoric acid is fed to the solvent extraction operation, where about 60 % of the acid is extracted counter-currently in several stages to an organic solvent containing TBP in kerosene. The resulting raffinate containing most of the contaminating substances, together with the slurry from the clarifier, is returned to the phosphoric acid plant. In this way, the impurities in the green acid will be returned to fertilizer production without creating additional environmental problems.

The organic solvent containing the phosphoric acid is scrubbed counter-currently with small amounts of phosphoric acid whereby the metal cations and part of the anionic components, such as chloride, fluoride and sulphate, are re-extracted from the organic solution. The scrub extract,

enriched in impurities, is recycled to the extraction stage.

After adjusting the temperature to about 40 °C, the organic solvent is treated with clean water to strip out the phosphoric acid. This acid, containing about 22 %  $P_2O_5$ , is heated and water evaporated to produce concentrated phosphoric acid (60 %  $P_2O_5$ ) of food grade quality.

The up grading of the concentration is among the post-treatment steps. In this operation, the fluoride content of the acid is further decreased by pressure stripping of acid with steam. The content of fluoride will be <10 ppm. Finally, oxidative degradation of organic trace impurities secures the food grade phosphoric acid quality.