Chapter 6

Phosphoric Acid Technology

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I. INTRODUCTION

This review considers the basics of "wet" process phosphoric acid technology; of necessity certain important areas of development have been omitted. No mention has been made, for example, of developments in materials of construction or in equipment design. In addition, processes not yet in commercial operation or those involving acids other than sulfuric acid have also been excluded on the grounds of limited application.

The main chemical reactions involved in the "wet" process are well understood, as are the important rock impurities which cause processing problems such as corrosion, scaling, sludge deposition, and foaming. Less clear are the factors which control crystal habit and crystal growth and thereby influence filtration rates. Also, although the zones of stability of the crystal hydrates of calcium sulfate have been well investigated, the effects of rock impurities on the kinetics of transformation need to be clarified. The criteria which influence the precipitation of complex compounds also need to be identified as these compounds can adversely affect phosphorus (P) recovery efficiencies, sludge deposition, and filtration rates.

The need to obtain this knowledge becomes more urgent when one considers the gradual depletion of world stocks of high-grade phosphates. This trend will increase the pressure on phosphoric acid plant suppliers to design plants which match the processing requirements of individual rocks or a range of rocks, depending on whether the plant is sited at or away from the rock mine. There will also be an increasing need to provide beneficiation processes, which not only consider P enrichment, but also the processing implications when the rock is used for phosphoric acid manufacture.

The dihydrate process is well established as the main "wet" process route. There will still be a place for hemihydrate processes where local circumstances provide economic advantages. The comparatively low P recovery efficiency given by this type of process, however, is a disadvantage which is likely to prevent wide-scale application.