

product. The manufacturing process is very simple. It consists of mixing finely-ground phosphate rock, preferably containing 32 percent of more P_2O_5 , with slightly diluted sulfuric acid (55°B) in the ratio of 100 parts of rock to 85 parts of acid. The principal chemical reaction consists of the conversion of the insoluble tricalcium phosphate in the rock to hydrated monocalcium phosphate and the precipitation of the excess calcium as calcium sulfate.

Concentrated superphosphates contain from 25 to 48 percent available P_2O_5 . The highest concentrations, called triple superphosphate, are manufactured by soaking phosphate rock in phosphoric acid and water, thereby converting the insoluble tricalcium phosphate into water-soluble hydrated monocalcium phosphate. The phosphoric acid can be made from phosphate rock by production and oxidation of elemental phosphorus in an electric furnace, and hydration of the resultant P_2O_5 ; or by decomposition of phosphate rock with sulfuric acid, and filtration of the resulting phosphoric acid from the insoluble residue. The capital cost of the existing superphosphate plant at Lyallpur, which has a capacity of 3,500 tons of P_2O_5 per year (18,000 tons of superphosphate) was Rs 2.5 million, or Rs 0.7 per annual pound of P_2O_5 .

At present, all the phosphate rock and sulfur used in the production of phosphate fertilizer in West Pakistan must be imported. On the world market, the price of elemental sulfur is about \$25 per ton. Because this material is inflammable, its shipping costs are rather high—from \$10 to \$15 per long ton.

High quality phosphate rock costs about \$7.50 per short ton. Although the United States is the largest producer, this material is also produced in Morocco, Tunisia, and Jordan. Shipping costs from these countries to Karachi could be as low as \$8.50 per ton.

Assuming a cost of \$40 per ton for sulfur, and \$16 per ton for phosphate rock on the docks at Karachi, the total cost of raw materials for a ton of P_2O_5 would be \$75. This is much lower than the cost of imported P_2O_5 as triple superphosphate. This material sells at the shipping point for about \$62 per ton containing 48 percent P_2O_5 . Shipping costs for bagged fertilizer are close to \$10 per ton, making a total at Karachi of \$150 per ton of P_2O_5 .

Imported raw materials for a plant capable of producing 100 tons of P_2O_5 per day, operated at 90 percent of capacity, would cost \$2.5 million per year