FILE: G-98
ISIC: 3512

Phosphate Fertilizer Plant

View of Superphosphate Plant

Furnace of Fused Phosphate Plant

The need for phosphorus in plant growth has been known for a long time. But its highly important function was identified only recently, by the discovery that certain high-energy phosphate bonds are involved in the respiratory and photosynthetic processes. These bonds apparently are necessary for the transfer of energy in some of the plant metabolic processes without which the plant would not live. Phosphorus is also necessary for the health of the plant; it is a constituent of nucleic acid, phytins, and phospholipids, and in the early life of the plant contributes to the formation of the reproductive parts. It is also essential to seed formation and is found in large quantities in seed and fruit.

Although most soils contain large reserves of phosphate in the form of apatites (complex calcium phosphate), iron and aluminium complexes, and organic compounds, such sources are so insoluble that plants can make little use of them. Therefore, there is a need for phosphate to be supplied to the plants to increase the growth and to maintain the health of them.

Generally, phosphates are supplied to the plant in two major form, such as calcium phosphate or ammonium phosphate. Among these two types, the calcium phosphate is the older type, and, in the form of superphosphate, was the first commercial fertilizer of importance.

The plant which is to be introduced here is one which produces calcuim phosphates, such as superphosphate, fused phosphate and the complex fertilizer which was made by mixing superphosphate and fused phosphate. And this plant has some specific characteristics as follows:

- Require low plant cost.
- Can make fertilizers with various composition.
- In case of fused phosphate plant, furnace life is four times longer than that of furnaces used in other similar process.

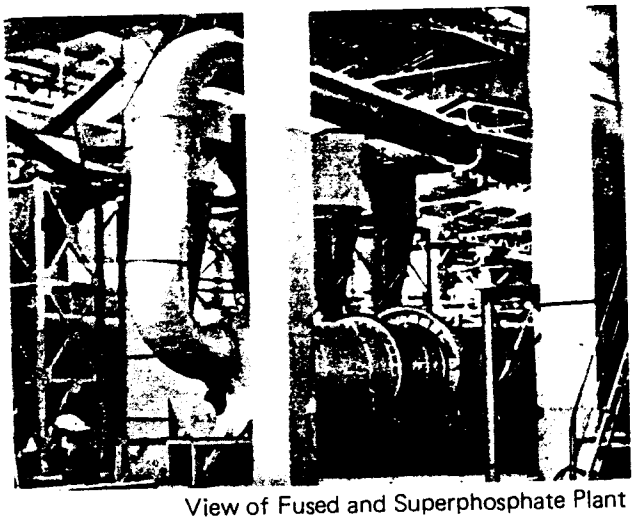
Products and Specifications

Phosphate fertilizers produced in this plant include superphosphate, fused phosphate and complex fertilizer of fused phosphate and superphosphate. Respective characteristics and components are as follows (Generally, fused phosphate is blended and used in the form of fused and superphosphate fertilizer. It will be included in the fused and superphosphate complex fertilizer):

o Superphosphate

Characteristics

- Since it is granular, the fixation of phosphorus



View of Fused and Superphosphate Plant

is relatively low with high fertilizer effect.

- Being quick-releasing, it is essential for short-term crops.
- The use of quick-releasing superphosphate will bring the satisfactory phosphorus effect since the growth period of rice seedling, particularly in the bed for mechanical transplantation, is short.
- When used in a vinyl house, there will be no damage by ammonia gas.
- It prevents sulfur deficiency and increases the sweet taste.
- It increases volatile matters of such spice vegetables as garlic, onion, ginger and mustard.
- When mixed with compost, its maturation is quickened.
- It improves leaves, stems and branches of all crops. And it makes them resistant to damages by blight and harmful insects and increases the yield.
- Chemically acidic fertilizer, but it becomes physiologically neutral when used.

Component

It contains 20% of soluble phosphorus as well as gypsum (sulfur and limestone) as auxiliary component.

o Fused and superphosphate complex fertilizer

Characteristics

- Fused and superphosphate fertilizer is gray-white colored granule phosphatic fertilizer which is the admixture of slowly responding fused phosphate and quick responding calcium superphosphate.
- Contains not only ortho-phosphate but also metapyrophosphate being necessary for the growth of crops.
- Contains not only phosphorus but also magnesium, calcium, silicate, sulfur and trace elements. Moreover, the granulated product provides much convenience for the farmers to apply this fertilizer.
- Reacts close to the neutral and has a low hygroscopies.
- Granules prevent the soil adsorption and eventually improve phosphate effect.

Effects

- Since this fertilizer contains both of quick releasing water soluble phosphate and slow releasing citric acid soluble phosphate, the nutrients can be utilized more or less evenly from the early growing stage to the later period to paddy rice, barley, vegetables and all other crops.
- Fused and superphosphate fertilizer helps to form the strong tissue of root, stem and leaf of the plant and reduces damages from lodging and insect-disease infection and it also protects from the nitrogen excess symptoms.
- Calcium and magnesium help to reduce harmful substances in the soil or plant and the magnesium, which is part of chlorophyll, activate carbon assimilation process.
- The nutrients contained in this fertilizer such as phosphate, calcium, magnesium, silicate, sulfur and trace elements help to improve soil fertility when it applies consecutively to the acid soil, degraded paddy soil, newly reclaimed soil, tidal land and ill-drained paddy soil.

Component

Citric acid soluble phosphate	:	20.2%
Water soluble phosphate	:	8.0%
Magnesium	:	4.50%
Calcium	:	33.5%
Silicate	:	9.3%
Sulfur	:	6.5%
Other component	:	Trace

Contents of Technology

1) Process Description

This calcium phosphate plant consists of superphosphate plant, fused phosphate plant and fused and superphosphate complex fertilizer plant where two fertilizers are blended.

(a) Superphosphate plant

The raw material phosphate rock is finely crushed in the Reynold's mill so that about 90% can pass 200-mesh screen. It is collected in a cyclone. The collected phosphate rock powder is transported by screw and bucket conveyors to an automatic weighing machine.

In the meantime, sulfuric acid from a tank is diluted

to 60-70%, an optimum concentration for reaction, and weighed in suitable quantity and put into the screw conveyor type mixer together with phosphate rock powder.

The feedstock mixed for 2-4 minutes in the screw conveyor is then transferred again to the Den conveyor, which is a continuous curing equipment, where it is cured for about 70 minutes. When cured and hardened, it is cut by a slicer at the outlet of the conveyor.

Since much toxic gas is generated in the reaction, the equipment should be tightly sealed and also so designed to enable eliminate the toxic gas effectively.

The reaction product cut by the slicer is transported back by means of conveyor to the curing tank, where it is subjected to a long curing to allow complete reaction. It is crushed to give required particle size prior to packing as product.

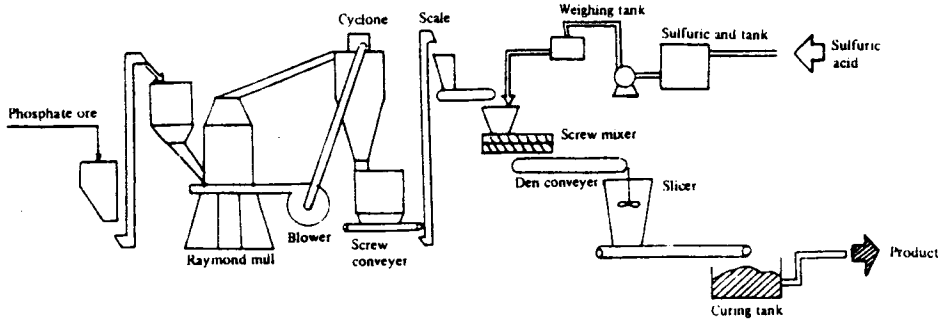
(b) Fused phosphate plant

The fused phosphate is produced by mixing phosphate rock with a variety of materials followd by fusing. It is characterized by not using sulfuric acid in the manufacture.

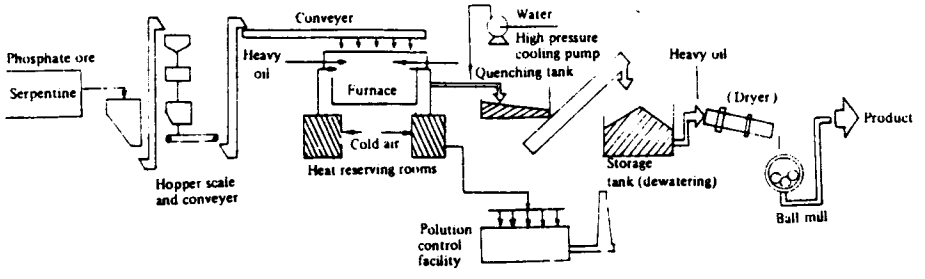
The raw material phosphate rock and serpentine are supplied by bucket conveyor to a hopper scale for weighing in a constant blending ratio and then put into the furnace by neans of conveyor. The raw material is fused by burning Bunker-C oil as heating source. The fused substance is sent to the quenching tank through the outlet of the furnace.

The fused phosphate is usually so corrosive that most of the refractories cannot be used, requiring

Superphosphate Manufacturing Process Flow Sheet



Fused Phosphate Manufacturing Process Flow Sheet



Fused and Superphosphate Fertilizer Manufacturing Process Flow Sheet