

STIRRED TANK REACTOR

The Stirred tank Reactor facilitates multiple reactions between ammonia and acids or oxides to produce various compounds, primarily **ammonium salts**. Key reactions include:

1. **Diammonium Sulphate** formation from ammonia and sulfuric acid.
2. **Monoammonium Phosphate (MAP)** from ammonia and phosphoric acid.
3. **Diammonium Phosphate (DAP)** by further reacting MAP with ammonia.

Other compounds like **calcium phosphate**, **magnesium ammonium phosphate**, and **iron and aluminium ammonium phosphates** are produced by reactions involving metal oxides, ammonia, and phosphoric acid.

MAP and DAP Production Process

- **MAP Production:** Ammonia gas is passed into a 75% phosphoric acid solution, releasing significant heat and causing the mixture to crystallize upon cooling. The resulting solid is centrifuged, dried, and sold as **white MAP crystals**.
- **DAP Production:** A 35% phosphoric acid solution is used, with ammonia passed through a series of agitating tanks. Lower acid concentration (35%) prevents overheating, allowing complete conversion to **DAP**.

Process Conditions and Control

- **Temperature Control:** The exothermic reactions raise temperature, controlled by adjusting ammonia and acid inflows.
- **Pressure:** Operated at **2 kg/cm²** to increase the boiling point, enhancing product solubility and reducing slurry moisture.
- **N/P Molar Ratio:** A molar ratio of **1.4:1.5** (N to P) optimizes product solubility, enabling operation with minimal moisture content in the slurry.

These conditions ensure effective production, reduced moisture, and manageable solidification during MAP and DAP production.

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