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**REPORT**

**(16-05 TO 01-06)**

Purified Terepthalic Acid (PTA) plant 5 & 6 has a design capacity of 1120 kTA production of purified Terepthalic Acid.

The PTA PLANT is designed to produce this output in 8000 operating hour per year, based on a flow sheet rate of 140 te/h of PTA, on a single stream basis. This rate is referred to as the normal capacity.

Design flexibility of the PTA PLANT is expected to allow operation in the range 70 – 110% of normal capacity.

**Raw material, catalyst and chemicals:**

* Paraxylene (raw material)
* Compressed air (raw material)
* Hydrobromic acid (promoter)
* Cobalt acetate (catalyst)
* Manganese acetate (catalyst)
* CMA catalyst solution
* Acetic acid (solvent)
* Normal propyl acetate (entrainer)
* Oxalic acid (catalyst recovery reagent)
* Sodium formate
* Platinum
* Hydrogen (for purification)
* Caustic soda 5% w/w (off gas scrubbing)

Terephthalic acid (TA) is produced by the liquid-phase air oxidation of paraxylene in acetic acid solvent, and is catalyzed by soluble cobalt, manganese and bromine compounds.



The process achieves a high yield of terephthalic acid from paraxylene - typically 96-97% of stoichiometry.

*The reaction is highly exothermic, liberating close to 3,000 kcals or 12,500 kJ per kg of paraxylene consumed.* The reaction proceeds via a series of steps in which each methyl group is sequentially oxidized via the aldehyde to the acid.

The slowest step in the above series of reactions is the oxidation of paratoluic acid; hence this acid is the intermediate present in the largest quantity. Since paratoluic acid is soluble in acetic acid solvent it does not appear as the major impurity in the CTA product. 4CBA, although present in smaller amounts in the reactor is much less soluble in acetic acid: It co-precipitates with terephthalic acid and hence appears as the major impurity in CTA.

Although Acetic acid does not appear in the main reaction sequence, acetic acid has an important role in the oxidation process. It serves as a solvent for both paraxylene and the cobalt/manganese/bromine catalyst in the reactor feed and it forms slurry with the precipitated CTA crystals, enabling the product to be easily removed from the reaction system.

**Oxidation Plant:**

The Oxidation Plant is designed for continuous operation and consists of six main sections:

* Process Air Compression
* Offgas Treatment
* Reaction
* CTA Crystallisation
* Separation & Drying
* Catalyst Recovery
* Solvent Recovery

**General Process Description:**

Feed in the Oxidation Reactor contains Paraxylene, Compressed Air (from Process Air Compressor) and Acetic Acid (Solvent) Solution. The inner wall of the Reactor is lined with 2mm thick Titanium coating. Temperature in the Reactor is 197 0C and Pressure is about 15.3 barg. The offgas produced is sent to offgas treatment section.

The slurry containing Crude Terepthalic Acid and byproducts (Water) from the oxidation reactor are sent to series of three Crystallizers. In these Crystallizers, concentration of solids in the slurry increases. This slurry is sent to vacuum rotary filter where a cake of wet CTA is retained on the filter cloth, whilst the Mother Liquor passes to the inside of the filter drum. The wet CTA is sent to the drying section which uses rotary steam tube drier. The Mother Liquor obtained is sent to Catalyst recovery section.

**Major Equipment Used:**

* Offgas Expander
* Steam Turbine
* Process Air Compressor
* Oxidation Reactor (CSTR)
* Kettle type Heat Exchangers
* Shell and Tube Heat Exchangers
* Knockout Drum
* Scrubbers
* Azeotropic Distillation Column
* Centrifugal Pump
* HP Absorber