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CNPC (China National Petroleum Corporation) Millionton PTA Process

Process Economics Program Review 2017-01

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Abstract

Purified terephthalic acid (COOH-C_6H_4-COOH), commonly known as PTA, is an aromatic dicarboxylic acid having major application in the production of polyethylene terephthalate (commonly referred to as polyester or PET). PET is used in clothing, fibers, and for manufacturing plastic bottles. In the past five years, world consumption of terephthalic acid has increased by around 4–6% per year, driven by population growth and increasing per capita consumption by the growing middle class in developing countries. Fast population growth, combined with the replacement of cotton as a textile raw material, has spurred the demand for polyester fibers in China and Southeast Asia. The demand for terephthalic acid has increased in North America and Europe mainly due to its application in the bottle and container markets, where glass has been largely replaced by lightweight PET bottles.

In 2016, global PTA consumption was approximately 60 million metric tons, while global capacity during the same period was approximately 70 million metric tons.

From the 1960s, catalytic partial oxidation of *para*-xylene followed by the purification step is the most widely used process for terephthalic acid production; other processes and feedstocks are less common and mostly obsolete now. Terephthalic acid production is an energy-intensive process, which generates a lot of gaseous and solid effluent that needs to be treated before disposal to the atmosphere. Several incremental improvements have been made over the years, covering the oxidation section, purification sections, effluent treatment, and mother liquor processing sections.

Prior to large-scale PTA production, dimethyl terephthalate (DMT) was the predominant cofeedstock along with monoethylene glycol (MEG) to produce PET. Over the time, advances in PTA purification technology have obviated the need for manufacturing DMT. DMT production in 2016 was approximately 2 million metric tons.

In the late 2000s, China National Petroleum Corporation (CNPC) has developed a new generation process for PTA production, and has been awarded some big PTA projects in China and overseas. This review focuses on the technoeconomic evaluation for the CNPC process for PTA production, with the available patents and other nonproprietary information documented in our evaluation.

The process economics developed in this review is based on a US Gulf Coast plant location and is presented in English units. However, we have included an iPEP Navigator interactive Excel attachment with the electronic version of this review, which allows our clients to convert the economics to other major global regions and between English and metric units. To use the iPEP Navigator file, open it in Excel and click on the “Display iPEP” Interface button. The economics automatically updates with the selection of a unit and a region in the list boxes.

Keywords: CNPC, crude terephthalic acid (CTA) purified terephthalic acid (PTA), *para*-xylene, partial oxidation

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