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BP New Generation Process for Polymer-Grade Terephthalic Acid Production

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Abstract

Terephthalic acid (TPA) and dimethyl-terephthalate are used as raw materials in the production of polyesters. Terephthalic acid is produced in two forms:

- The technical grade—99.9 wt% TPA with up to 400ppm 4-CBA
- The polymer grade—99.99 wt% TPA with less than 25ppm 4-CBA

World consumption of terephthalic acid has grown at an average annual rate of more than 6%, driven by great demand for textile fibers and polyethylene terephthalate (PET) bottles. Fast population growth, combined with the replacement of cotton as textile raw material, has spurred high demand for polyester fibers in China and Southeast Asia. In North America and Europe, TPA demand has been driven mainly by applications in the bottle and container markets, where glass has been largely replaced by lightweight PET bottles.

The core technology for producing terephthalic acid has remained the same since the 1960s. Crude TPA is produced by bromine-promoted catalytic oxidation of p-Xylene, and purified by a hydrogenation step. However, several incremental improvements have been implemented in the TPA process over the years, covering both the main oxidation and the purification sections. In late 2000, BP announced the development of a new generation TPA process, called “X Technology.” The new technology achieves great process simplification by using innovative methods for water recycling and improved solid-liquid separation techniques. As a result, purified terephthalic acid (PTA) can be produced at significantly lower capital and operating costs.

The focus of this report is a techno-economic evaluation of the BP process for purified terephthalic acid production. A conceptual design and preliminary economics for the BP PTA process has been developed. A discussion of the current status of the PTA industry is also presented, including product derivatives and end-use applications, global and regional supply and demand, producers, and technology licensors. In addition, we examine recent patent applications dealing with several aspects of PTA technology.

The process economics include estimated capital costs and production costs—variable cost, plant cash cost, plant gate cost, and net production cost. A brief market overview summarizes the global supply and demand end-use market and demand drivers.

The process economics developed in this review is based on the US Gulf Coast and is presented in English units. However, we include with this review an iPEP Navigator interactive Excel attachment, which allows our clients to convert the economics to other major global regions in English or metric units. To use the iPEP Navigator file, open it in Excel AND click on the Display iPEP Interface button. The economics will be automatically updated with the selection of a unit and a region in the list boxes.

Contents

1 Introduction	4
Toxicity	4
Industrial uses	4
2 Summary	6
General aspects	6
Summary of processes evaluated for terephthalic acid production	7
Direct oxidation of p-Xylene (most common process)	7
Hydrolysis of DMT	7
Nitric oxidation of p-Xylene	8
Amoxidation of p-Xylene	8
Production from o-Xylene or naphthalene	8
Waste generation (gas, liquid, and solid)	8
Market and capacity data	9
Review scope summary	10
3 Chemical reactions and product impurities	12
Chemical reactions involved	12
Oxidation section	12
Acetic acid recovery	13
Side reactions	13
Hydrogenation or purification reaction	13
Product impurities	14
4 BP new-generation PTA process	15
Process description	15
Feed preparation and oxidation	15
Crystallization and filtration	15
Reactor vapor absorption and off-gas	16
CTA purification and product storage	16
Catalyst recovery	17
Process discussion	19
Reduction in PX-consumption	19
Power generation	19
Water separation and recycle	20
Solid-liquid separation of terephthalic acid product	20
CAPEX and OPEX estimation	27
5 References	37
6 Patents summary	38
Process schematic flow diagrams	40

Tables

Table 1 Physical and chemical properties	4
Table 2 World terephthalic acid supply and demand	9
Table 3 Terephthalic acid historical and projected annual capacities	9
Table 4 Terephthalic acid capacity worldwide for different processes used	10
Table 5 Typical polymer-grade TPA specification	14
Table 6 Design bases	18
Table 7 HC feed and utilities specific consumption per ton of PTA production	19
Table 8 Component balance	21
Table 9 BP PTA process—Major equipment	28
Table 10 BP PTA Process—Total capital investment	29
Table 11 BP PTA process—Production costs	30
Table 12 BP PTA Process—Direct costs by section	32
Table 13 Economics summary	33

Figures

Figure 1 Effect of plant capacity on investment and product value	34
Figure 2 Effect of operating level and plant capacity on product value	35
Figure 3 Effect of p-Xylene price on product value	36
Figure 4 Process schematic flow diagram for BP new generation PTA production process	41

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