



TECH 2020-2: Purified Terephthalic Acid

Purified Terephthalic Acid is one in a series of reports published as part of NexantECA's 2020 Technoeconomics – Energy & Chemicals (TECH) program.

Overview

Purified Terephthalic Acid, or PTA, is also known as 1,4-benzenedicarboxylic acid and is commercially produced by the oxidation of *para*-xylene, catalyzed by metals (e.g., Co^{+2} , Mn^{+2}) and bromide in acetic acid. Over the years, technology developers have optimized the conversion of *para*-xylene to terephthalic acid with yields reaching 99 percent or more for many offerings. Today, technology holders are focused on incremental improvements to their processes to reduce operating costs through energy savings, operating efficiency, and process integration. In addition, great strides have been made to reduce capital cost through standard capacity offerings, compact plant designs, and supply chain optimization, leading to a very competitive landscape of technology offerings. Major Licensors now offer plants capable of producing 1.2 to 1.6 million tons per year of PTA in a single reactor design and from 2.4 to 3.2 million tons per year in a dual reactor design.

This TECH report provides an overview of the process technologies available for producing terephthalic acid and addresses the questions:

- What are the major process offerings for terephthalic acid production and how do they differ? Who are the major technology licensors?
- How competitive are the different technologies and what are the key operating cost drivers?
- How do the economics of producing terephthalic acid change across different geographic regions?
- What regions offer an attractive investment opportunity for producing terephthalic acid?

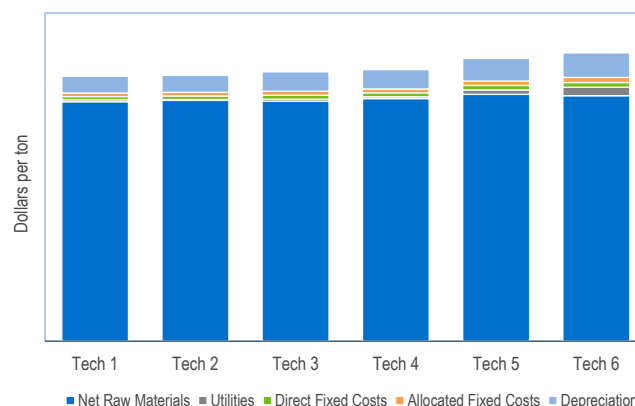
Commercial Technologies

Purified terephthalic acid production processes developed and licensed by BP, CNPC/CKCEC, Grupo Petromex, INVISTA, Johnson Matthey/Dow, and Sulzer GTC are presented in this report. All licensors offer processes based on *para*-xylene oxidation, but they have also developed unique process variations to improve *para*-xylene conversion, heat recovery, and solvent/catalyst recovery striving towards reduced operating costs and capital investment.

Process Economics

Detailed PTA cost of production estimates for the major technologies are presented for USGC, Middle East, and China locations to illustrate the cost competitiveness between different licensors and between different producing regions. Process economics are included for a single reactor design with a capacity of 1.2 million tons per year and for a dual reactor design with a capacity of 2.4 million tons per year. An historical margin and return on investment analysis for the three regions is included to assess investment attractiveness.

Purified Terephthalic Acid Production Costs



Commercial Overview

Global consumption of PTA in 2019 was nearly 74 million tons with the Asia Pacific region accounting for 85 percent and China alone accounting for over 60 percent of global demand. PTA is primarily used to produce melt-phase polyethylene terephthalate (PET) which can either be directed to spinning production lines for polyester fiber or to PET chip production and solid state polymerization to produce a bottle grade PET resin. In 2019, about two-thirds of melt-phase PET was consumed in fiber applications and 25 percent converted to bottle grade resin, with the balance used in film applications. This TECH report provides a global and regional overview of the supply, demand, and trade of purified terephthalic acid.



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The TECH program (formerly known as PERP) is globally recognized as the industry standard source of process evaluations of existing, new and emerging of interest to the energy and chemical industries.

TECH's comprehensive studies include detailed technology analyses, process economics, as well as commercial overviews and industry trends. Reports typically cover:

- Trends in chemical technology
- Strategic/business overviews
- Process Technology:
- Chemistry
- Process flow diagrams and descriptions of established/conventional, new and emerging processes
- Process economics – comparative costs of production estimates for different technologies across various geographic regions
- Overview of product applications and markets for new as well as established products
- Regional supply and demand balances for product, including capacity tables of plants in each region
- Regulatory and environmental issues where relevant

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- Consultation time with the project team

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Technology and Costs comprises the Technoeconomics – Energy & Chemicals (TECH) program, the Biorenewable Insights program (BI), and the new Cost Curve Analysis. These programs provide comparative economics of different process routes and technologies in various geographic regions.

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