



TECH 2018-4: Propylene

Propylene is one in a series of reports published as part of Nexant’s 2018 Technoeconomics – Energy & Chemicals (TECH) program.

Overview

Historically, the conventional routes to propylene production were as a byproduct of olefins production such as steam cracking, or recovery from refinery processes like fluid catalytic cracking. More recently, methanol-based propylene has become prevalent, especially in China. With the advent of the shale gas revolution in the United States, steam cracking has become more focused on lighter feedstocks, thus reducing propylene byproduct production. Furthermore, investments in ethane and NGL export capacity from the United States have contributed to the conversion to lighter steam cracker feedstocks in other parts of the world as well, creating an imbalance in the traditional supply route for propylene and leading to growth in on-purpose propylene technologies such as methanol conversion (methanol-to-olefins, methanol-to-propylene), propane dehydrogenation, and olefins conversion or metathesis. As growth in propylene demand continues to outpace growth in ethylene demand, the importance of on-purpose propylene production will continue to grow. This TECH report provides an overview of the commercial and developing technologies for producing propylene and addresses:

- What are the major production technologies for propylene and how do they differ? Is the technology available and who are the technology holders and licensors?
- How are byproduct routes to propylene and newly developing on-purpose routes evolving and will they improve the production of propylene?
- Are certain feedstocks or processes more competitive than others and how do the economics of producing propylene change across different geographic regions?
- What is the market environment for propylene like today?

Commercial Technologies

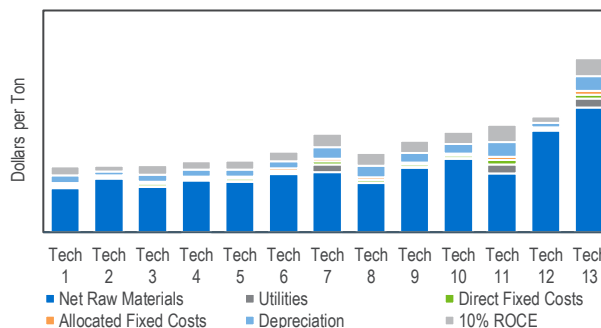
The majority of propylene produced globally can be categorized as coming from either steam cracking operations, refinery operations, or on purpose production. Steam cracking produces propylene as a byproduct of

ethylene production and accounts for the majority (47 percent in 2017) of installed propylene capacity. Refinery operations are the second largest source of propylene (32 percent) globally. Catalytic cracking is a process which breaks down the larger, heavier, and more complex hydrocarbon molecules into simpler and lighter molecules. On-purpose propylene technologies make up the remainder of global propylene capacity accounting for 21 percent. On-purpose technologies include propane dehydrogenation (PDH), methanol conversion, and metathesis. This report presents the major process technologies involved in the production and recovery of propylene.

Process Economics

Detailed cost of production estimates for various technologies are presented for USGC, Middle East, China, and Western Europe locations. Estimates are developed based on FCC technology, steam cracking, fractionation, propane dehydrogenation, MTO, MTP, and dimerization and metathesis.

Propylene Production Technology Comparisons



Commercial Overview

Global propylene consumption in 2017 reached almost 106 million tons. Polypropylene continues to lead demand for propylene with this derivative segment accounting for 65 percent of consumption. Going forward, average annual demand for ethylene is expected to grow at over four percent through 2022. An overview of the supply, demand, and trade of ethylene on a global and regional (North America, Middle East, Western Europe, and Asia Pacific) basis is provided in this TECH report.



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Technology and Costs comprises the Technoeconomics – Energy & Chemicals (TECH) program (formerly known as PERP), the Biorenewable Insights program (BI), the Sector Technology Analysis, 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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