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PERP Report 2017-1: Propylene Oxide

“Propylene Oxide” is one in a series of reports published as part of the 2017 Process Evaluation/Research Planning (PERP) Program.

Overview

Propylene oxide (PO) is a chemical intermediate predominantly used in the production of polyether polyols, propylene glycol, and other specialty chemicals. Polyether polyols are used in the preparation of polyurethanes for the manufacturing of furniture, mattresses, automobile seating, sport shoes, rigid foam, and insulation. Propylene glycol is used for the production of unsaturated polyester resins for use in pipes, tanks, and boats, and as an aircraft de-icing fluid.

There are currently five commercially available process routes for producing propylene oxide. The chlorohydrin process is typically integrated with chlor-alkali plants which provide chlorine and caustic soda for the process. Co-product processes include POSM and POMTBE that produce more than twice as much styrene monomer or MTBE coproducts than propylene oxide, and processes that do not produce substantial amounts of co-product include those based on cumene and hydrogen peroxide epoxidation.

This PERP report provides an overview of the five commercially available propylene oxide technologies and insight into the cost drivers for each process. The following questions are addressed in the report:

- What are the major technologies for propylene oxide production and how do they differ?
- Who are the major licensors and what technologies do they offer?
- What is the impact of coproduct production on capital cost and production cost for POSM and POMTBE technologies?
- How do the process economics compare across different geographic regions and what are the key production cost drivers for each technology?
- Which technology offerings provide the lowest cost of production, and which regions in the world provide attractive investment opportunities?

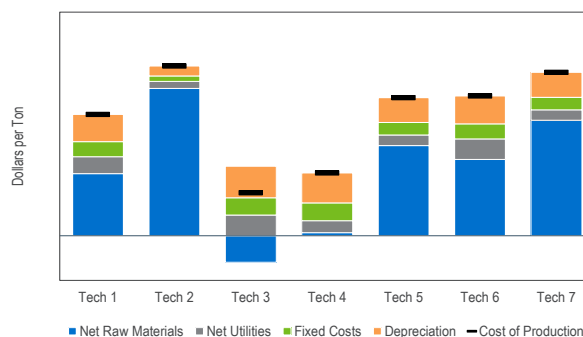
Commercial Technologies

The chlorohydrin process is the oldest technology for propylene oxide production and has the largest share of installed global capacity. Major licensors include Asahi Glass, Conser, Dow, and Tokuyama. POSM technology is the next largest propylene oxide technology based on installed capacity with LyondellBasell, Nihon Oxirane, Repsol, Shell, and SKC Chemical as major technology holders. POMTBE technology is held by LyondellBasell and Huntsman, while Sumitomo offers cumene technology and HPPO technology is held by Dow/BASF, Evonik/Uhde, and Sinopec.

Process Economics

Detailed cost of production estimates are presented for the production of propylene oxide by the five process routes for the major global producing regions that include the United States, Western Europe, and China. Production cost variations such as bio-based propylene and non-integrated chlorohydrin-based production are also examined.

TECHNOLOGY COST OF PRODUCTION COMPARISON



Commercial Market Review

Global propylene oxide demand reached 9.2 million tons in 2016 led by demand in the Asia Pacific region which accounted for about 46 percent of global demand. North America and Western Europe together make up almost 50 percent of propylene oxide consumption globally. With little regional trade in propylene oxide, regional capacity closely follows regional consumption. Global production capacity in 2016 reached 9.8 million tons with about 43 percent of this in the Asia Pacific region. The PERP report provides an overview of the supply, demand, and trade of propylene oxide on both a global and regional basis.

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