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Technology and Costs

# TECH 2020S7: Polyether Polyols

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

## Overview

There are two main classes of polyols used in polyurethane manufacture: polyether polyols and polyester polyols. Polyether polyols provide unusually high hydrolytic stability and good low-temperature flexibility. Polyester polyols provide superior mechanical properties, such as tensile strength, abrasion, and wear resistance, as well as solvent and oil resistance, to the polyurethanes in which they are used. Polyether polyols represent approximately 80 percent of the global polyol demand, with polyester polyols making up the other 20 percent.

This TECH report provides an overview of the technology, chemistry, cost of production, and market analysis for polyether polyols. The following issues are addressed in this report:

- What technologies are used for the production of polyether polyols? Who are the major technology licensors?
- How do the economics of production change across different regions?
- What is driving the market in different regions? Where will new capacity additions take place?

## Commercial Technologies

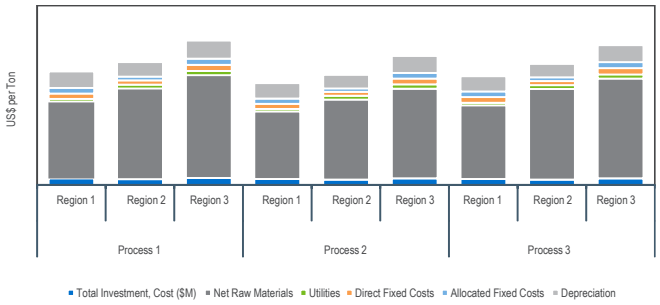
Conventional polyol technology refers to the addition of one or more types of alkene oxides onto a starting compound with more than one hydroxyl group. The process is known as oxyalkylation (or alkoxylation). The process is usually set up as batch/semi-batch process, which can be easily customized to the type of starter feedstock used and the product quality desired. The conventional route is compatible with many different types of feedstock, both petrochemical-based (e.g., propylene glycol) and from renewable sources (e.g., sucrose). Despite the disadvantages associated with a batch/semi-batch process, the oxyalkylation route remains very popular among the industry and is still widely employed today.

Polyols produced from renewable sources are most commonly produced from vegetable oils such as soybean oil, rapeseed oil, and castor oil. Under current technology, most of the vegetable oil-derived polyols follow two steps to achieve this. Triglycerides in unsaturated fatty acids are first epoxidized to form highly reactive epoxy groups. These epoxy groups are then subjected to a ring-opening reaction, which adds hydroxyl groups onto the molecule. Epoxidation of vegetable oils such as soybean oil is commercially produced by the reaction of the raw oils with hydrogen peroxide in the presence of organic acid. The subsequent ring-opening reaction can be achieved through reaction with an organic acid or with alcohol, hydrolysis in the presence of an acid catalyst, or direct hydrogenation at elevated pressure.

## Process Economics

Detailed cost of production analysis for polyether polyol technologies is provided for USGC, Western Europe, and China. Estimates are developed for glycerin-based and higher functional polyether polyols for the first quarter of 2020. Sensitivity analysis for raw material pricing and initiator pricing is also presented.

**Summary of Economics for Production of Higher Functional Polyols in Different Regions**




## Commercial Overview

The global polyether polyols market is estimated to be 7.2 million tons in 2020 and it is forecast to grow at an annual average rate of 2.1 percent in the 2019 to 2024 forecast period. Key industries driving the global demand of polyether polyols are the automotive, furniture, bedding, packaging and appliances manufacturing.

Detailed market analysis, including supply, demand, and trade analysis is provided for the major global regions in the report.

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- Chemistry
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