



TECH 2020S8: Polyisobutylene (PIB)

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

Overview

Polyisobutylene (PIB) is a class of oligomers and polymers of isobutylene of different molecular weights used as a lubricants (i.e., lube) oil additives, fuel additives, and for industrial applications (e.g., adhesives, sealants, and caulks).

In addition to molecular weight, PIB is distinguished by its reactivity. Conventional PIBs (C-PIB) have 10 percent terminal reactive sites, while highly reactive PIBs (HR-PIB) have over 80 percent reactive sites. Due to its higher reactivity, HR-PIB has been substituting C-PIB in applications where it is further chemically converted, particularly in the lubricant and fuel additives sector.

This TECH report provides an updated overview of the technological, economic, and market aspects of PIB. The following issues are addressed in this report:

- What are the technologies used by the world's top main PIB producers? What are some of the recent technology improvements implemented by these producers?
- How do the process economics compare depending on the molecular weight and different geographic regions?
- What is the global demand of PIB according to its reactivity? How does growth compare among the key regions?

Commercial Technologies

The typical processes employed in producing both C-PIB and HR-PIB are markedly similar overall. The largest difference between the processes lies in the reaction conditions.

All major producers of PIB developed and/or patented their own technologies and only one merchant producer is actively licensing its technology.

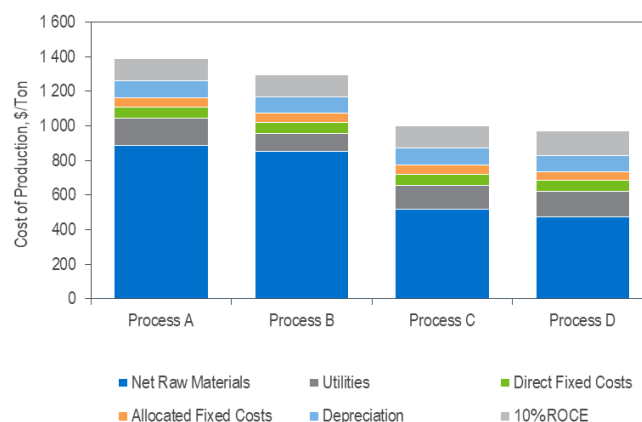
Although aluminum chloride (AlCl_3) has historically been used as a catalyst for PIB production, more advanced technologies employ a BF_3 complexed catalyst to provide improved purity and simplified processing.

Isobutylene feedstock can be obtained in contained form from the steam cracking of liquids, a refinery's FCC unit, and an isobutene dehydrogenation facility.

Process Economics

Detailed cost of production estimates for various technologies are presented for USGC, Western Europe, China, and South Korea locations. Estimates are developed for low, medium, and high molecular conventional as well as low molecular highly reactive commercial routes to PIB. Sensitivity analyses on feed pricing, economy of scale, and capital investment were also developed. Additionally, a return on investment and investment attractiveness analysis for PIB production facility is provided for the routes and regions studied in this report.

PIB Production Costs



Commercial Overview

Global PIB is estimated to be approximately 843 000 tons in 2020, where lubricant additive is the key end-use application for conventional PIBs, though its share in overall conventional PIB demand is much lower than that for HR-PIB. Demand is expected to grow at around 1 percent annually until 2025.

An overview of the supply, demand, and trade of PIB on a global and regional (North America, Western Europe, and Asia Pacific) basis is provided in this TECH report.



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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
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- 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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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.

NexantECA serves its clients from over 10 offices located throughout the Americas, Europe, the Middle East, Africa, and Asia.

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