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Technology and Costs

TECH 2021S4: Styrene Butadiene Rubber

Styrene Butadiene Rubber is one in a series of reports published as part of NexantECA's 2021 Technoeconomics – Energy & Chemicals (TECH) program.

Overview

The rapid development of the automobile industry in the 20th century was the main driving force behind the growth in natural rubber production (i.e., for the tire industry). Yet, to stop dependence on natural rubber and its associated supply issues that have resulted in high natural rubber pricing, a man-made replacement for natural rubber had been the goal of many chemists for years.

While properties of natural rubber cannot be duplicated, synthetic rubbers offer higher durability and better thermal stability and oil resistance, as well as better aging.

Styrene butadiene rubber (SBR) and polybutadiene rubber (BR), the two highest volume synthetic rubbers, are mainly consumed in tire production. Nevertheless, there are two main threats to the use of SBR and/or BR in tires as currently constituted. The first threat consists of the development of tires that do not need to be replaced. Another threat is the increased use of renewable materials in tire construction.

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

- What are the main routes for SBR and BR production? What are some of the advantages and disadvantages of the different routes? Who are the major technology holders?
- How do process economics compare across processes and different geographic regions? Which region provides the best attractive investment opportunity, and for what polymer production?
- Which region was the most affected by the COVID-19 pandemic and how long will it be before recovery is seen?

Commercial Technologies

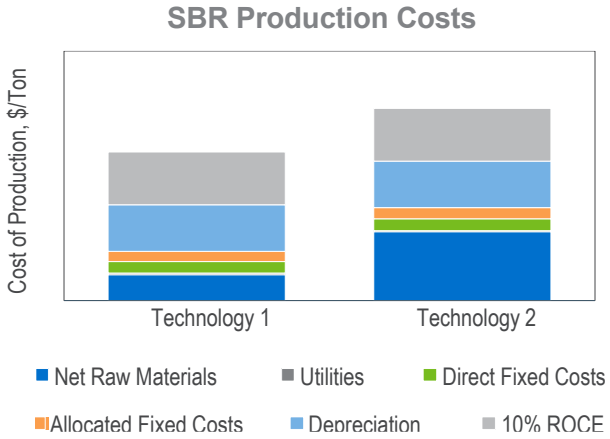
Currently, two conventional routes are polymerizing butadiene and styrene monomers into SBR: emulsion (i.e., hot or cold) and solution. Emulsion BR polymerization is produced by free radicals attacking the unsaturation of the monomers, while sSBR is based on the use of ionic initiators.

The polymerization of butadiene into BR results in the formation of several stereoisomers. The most important commercial isomer is 1,4-cis, whose configuration is similar to that of natural rubber.

Process technologies for SBR and BR worldwide are offered by a few licensors with the remaining technology holders believed to be willing to license their technologies only to their joint ventures.

Process Economics

Detailed cost of production estimates for two different production routes to SBR and BR are mainly presented for USGC, Western Europe, and China. Estimates are developed for emulsion and solution routes to SBR. Economics for BR are developed for continuous solution processes using nickel or neodymium catalysts in the aforementioned locations. Sensitivity analyses on feed pricing and capital investment were also developed. Additionally, a return on investment and investment attractiveness and historical cash cost analyses for SBR and BR production facilities are provided for the technologies and regions studied in this report.



Commercial Overview

The spread of COVID-19 in 2020 caused a dramatic reduction in the demand and production of new vehicles across the world, in addition to lower vehicle sales. As a result, SBR demand declined by 7 percent in 2020 to 4.8 million tons. At the same time, BR demand dropped by 5 percent to 3.3. million tons.

Supply, demand, and trade of SBR and BR on both a global and regional basis are provided in this TECH report.

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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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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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