



TECH 2023-6: Styrene/Ethylbenzene

Styrene/Ethylbenzene is one in a series of reports published as part of NexantECA's 2023Technoeconomics – Energy & Chemicals (TECH) program.

Overview

Ethylbenzene and styrene production technologies are relatively mature with several licensors offering technology in these areas.

Sustainability concerns of single-use plastics and pledges from governments and end-users to decarbonize are driving developments related to recycled polystyrene, improved circularity of products and reduced carbon emissions.

This TECH report provides an updated overview of the conventional technologies and economic aspects of producing ethylbenzene and styrene. The following topics are addressed in this report:

- What are the main technologies employed to manufacture ethylbenzene and styrene, and how are they different from one another?
- What are some of the recent technological developments, especially focusing on recycled and renewable routes?
- What is the carbon intensity of each production route and how does it vary across different regions?
- How do the process economics for different ethylbenzene and styrene technologies compare across different global locations? Which region in the world provides attractive investment opportunities?

Commercial Technologies

This report contains the process descriptions of the various production routes for ethylbenzene and styrene monomer and an overview of the licensors who provide the technologies.

For ethylbenzene:

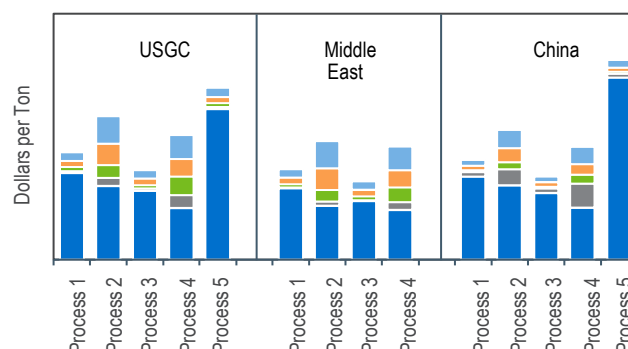
- Liquid Phase Alkylation
- Reactive Distillation with Dilute Ethylene

For styrene:

- Catalytic Dehydrogenation of Ethylbenzene
- Propylene Oxide/Styrene Monomer (POSM)
- Styrene Extraction from Pygas

Process Economics

Detailed cost of production estimates for the major ethylbenzene and styrene monomer processes are presented in this report under a typical world scale design basis and based on Q1 2023 pricing basis. Regional production economics analysis is provided for the United States Gulf Coast, Middle East, and China.



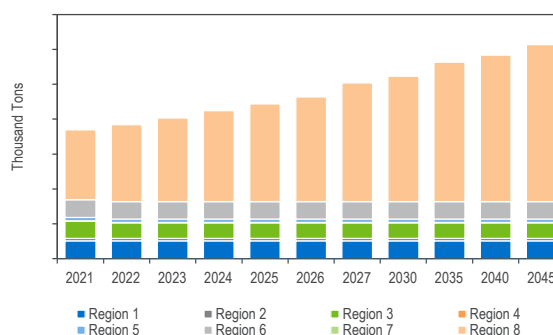
Carbon Intensity

Carbon intensity analysis and commentary covering scope 1 and scope 2 emissions are covered for the major ethylbenzene and styrene technologies.

Commercial Overview

Styrene monomer is used in a broad range of polymer derivatives, ranging from commodity polymers to engineering plastics and synthetic rubber, namely polystyrene and expandable polystyrene (EPS). A styrene capacity list is provided for North America, Western Europe, Middle East, and Asia Pacific.

Global Styrene Capacity





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- 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.

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