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Technology and Costs

TECH 2019-1: Linear Alpha Olefins

Linear Alpha Olefins is one in a series of reports published as part of Nexant's 2019 Technoeconomics – Energy & Chemicals (TECH) program.

Overview

Linear alpha olefins (LAOs) are linear hydrocarbons with a single double-bond between the first and second carbon. They are used in a wide range of applications including polyolefin comonomers, synthetic lubricants, and detergent intermediates. The main driver for global demand is the polyolefins industry. Full-range processes make LAOs ranging from C_4 to C_{30+}, while on-purpose technologies focus on a single alpha olefin, mainly C_4 through C_8, which are used as comonomers for the production of polyethylene.

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

- What are the major technologies for LAOs and how do they differ? Who are the major technology holders and licensors?
- How do the process economics compare across processes and geographic regions?
- What is the current market environment for LAOs? How does growth compare across regions? Where will new capacity be built?

Commercial Technologies

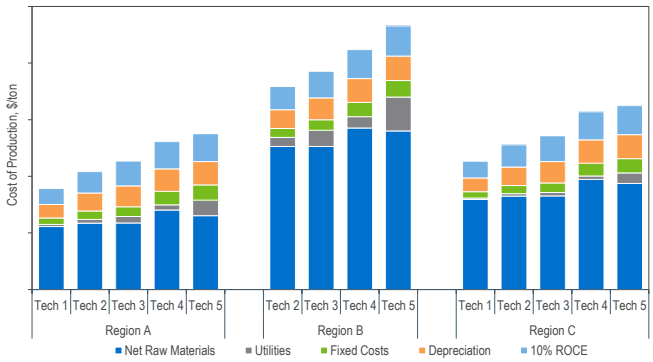
Full-range technologies are based on ethylene oligomerization, which produces a wide distribution of products, ranging from butene-1 (C_4) to triacontene (C_{30}) and beyond. In general, the major technology holders are the major producers, and most do not license their technology. Due to the number of products made and the differing applications for each, downstream integration is important for a full-range producer.

Development of on-purpose technologies (including extraction from byproduct streams) has been driven by higher demand for short-chain LAOs, mainly for polyethylene production. Butene-1 is produced via extraction from mixed C_4 streams and ethylene dimerization; hexene-1 via ethylene trimerization and extraction from Fischer Tropsch syngas; octene-1 via extraction from Fischer Tropsch syngas, butadiene telomerization, and ethylene tetramerization; and decene-1 via a bio-based metathesis process.

Process Economics

Detailed cost of production estimates for various technologies are presented for different locations, including USGC, Western Europe, Middle East, China, Japan, and South Africa. Estimates are developed for full-range technologies, as well as on-purpose butene-1, hexene-1, and octene-1 technologies, based on ethylene and other feedstocks.

Cost of Production Comparison for Full-Range LAO



Commercial Overview

Global linear alpha olefin consumption was 5.7 million tons in 2018. Butene-1 is the largest fraction, accounting for 37 percent of demand. The largest end-use for LAOs is for the production of LLDPE, which accounts for almost half of global demand. Overall growth for the next five years will average 3.4 percent per year. An overview of the supply, demand, and trade for LAO, butene-1, hexene-1, octene-1, and HAO (decene-1 and higher) on a global and regional (North America, Western Europe, 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.

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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 (formerly known as PERP), the Biorenewable Insights program (BI), the Sector Technology Analysis, 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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