NexantECA

Technology and Costs

TECH: Linear Alpha Olefins - 2024

Linear Alpha Olefins is one in a series of reports published as part of NexantECA's 2024 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?
- What are the recent technology developments for LAO production?
- How do the process economics compare across processes and geographic regions?
- How does carbon intensity change for the different technologies explored for LAO production?

Commercial Technologies

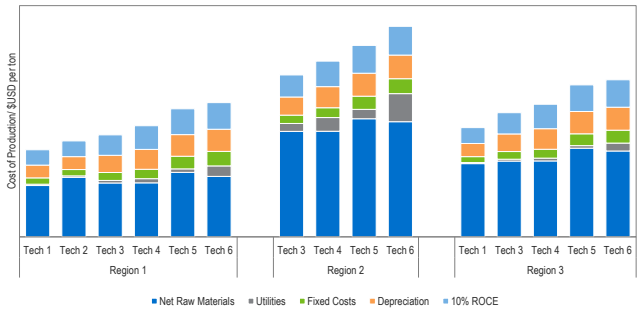
Full-range technologies are based on ethylene oligomerization, which produces a wide distribution of products, ranging from butene-1 (C_4) to triacontene (C_{30}) and beyond. In general, the major technology holders are the major producers, and most do not license their technology. Due to the number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

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. Technologies developed by Axens, Lummus Technology, Chevron Phillips and Sasol, among others, are explored.

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.

Regional Cost of Production Comparison for Full-Range LAO Technologies



Commercial Overview

Butene-1 is the largest fraction, accounting for 42 percent of demand. The largest end-use for LAOs is for the production of LLDPE, which accounts for over half of global demand, with total polyethylene comonomer demand accounting for over 60 percent of LAO consumption. A breakdown of capacity by producer for butene-1, hexene-1, octene-1, and HAO (decene-1 and higher) on a global and regional (North America, Western Europe, Asia Pacific and Rest of the World) basis is provided in this TECH report.

For more information. please contact
Technology@NexantECA.com or www.NexantECA.com

NexantECA

Technology and Costs

TECH: Linear Alpha Olefins - 2024

Subscribe to TECH

The TECH program (formerly known as PERP) is globally recognized as the industry standard source of process evaluations of existing, new and emerging technologies 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
- 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 analysis, including capacity tables of plants in each region
- Carbon intensity analysis, and regulatory and environmental issues where relevant

Subscription Options

A subscription to TECH comprises:

- PDF reports including detailed technology analyses, process economics, as well as commercial overviews and industry trends
- Cost of production tables in spreadsheet format
- Consultation time with the project team

An annual subscription to TECH includes twenty reports published in a given program year. Reports can also be purchased on an individual basis, including reports from previous program years.

For more information, please contact
Technology@NexantECA.com or www.NexantECA.com

NexantECA

NexantECA Subscriptions & Reports provide clients with comprehensive analytics, forecasts and insights for the chemicals, polymers, energy and cleantech industries. Using a combination of business and technical expertise, with deep and broad understanding of markets, technologies and economics, NexantECA provides solutions that our clients have relied upon for over 50 years.

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.

Americas
Tel: +1 914 609 0300
169 Mamaroneck Avenue
2nd Floor, Suite 100
White Plains, NY 10601
USA

Europe, Middle East & Africa
Tel: +44 20 7950 1600
110 Cannon Street
London EC4N 6EU
United Kingdom

Asia Pacific
Tel: +662 793 4600
22nd Floor, Rasa Tower I
555 Phahonyothin Road
Kwaeng Chatuchak
Khet Chatuchak
Bangkok 10900
Thailand

For more information. please contact
Technology@NexantECA.com or www.NexantECA.com