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Technology and Costs

Biorenewable Insights: Fischer-Tropsch Process

The Fischer-Tropsch Process is one in a series of reports published as part of NexantECA's 2024 Biorenewable Insights program.

Overview

The Fischer-Tropsch process for producing hydrocarbons from syngas is an old idea now taking on a new life for the low-carbon production of fuels and chemicals. The combination of net-zero manufacturing goals, zero-emissions transportation policies and government support for decarbonization has brought processes for synthetic hydrocarbons back to the forefront.

Technology for the Fischer-Tropsch process has continued to evolve from synthetic fuels proposals in the low-cost gas bonanza of the 2010s, and is now combining with green reforming technologies, green feedstock gasification, and electrolysis for hydrogen production to become one of the premier options for future net-zero manufacturing. New process configurations promise to minimize manufacturing carbon intensity while producing fuels with a net zero carbon footprint or chemical feedstocks independently of fossil carbon sources. At the same time, Fischer-Tropsch processes continue to have important limitations in addressing prominent applications such as SAF as well as cost and operational issues.

This report covers the latest Fischer-Tropsch process technology, focusing on updated offerings by major licensors and their applications in green fuels and chemicals manufacturing. It covers multiple process configurations in green manufacturing and provides insight on application and implementation in power-to-X, gasification, and other project scenarios.

Technologies

This report covers the Fischer-Tropsch process on a generic basis as well as with respect to the innovations and technology of major process licensors. Technology coverage is oriented towards green manufacturing, and includes major emphasis on:

- Low-CI light hydrocarbon reforming
- Optimization for hydrocarbon range
- Heavy ends hydrocracking

Process Economics

This report models Fischer-Tropsch manufacturing costs on the basis of currently best-available technology. Rather than focusing on differentiation between licensors, this report focuses on differing process configurations and manufacturing scenarios, including:

- Directing light hydrocarbons to reforming rather than fuel
- Optimization for SAF production
- Optimization for Middle Distillate production
- Intermittently operating electrolysis-integrated power-to-X manufacturing scenarios

Carbon intensity analysis is included on the basis of electricity sourcing scenarios with grid and 100 percent renewable bases.

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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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