



Biorenewable Insights: Non-Ester Renewable Diesel

Non-Ester Renewable Diesel is one in a series of reports published as part of NexantECA's 2019 Biorenewable Insights program.

Overview

While hydrogenated vegetable oil based renewable diesel (HVO) has emerged as a competitive alternative for a drop-in solution, FAME remains the current dominant bio-based alternative to diesel—though HVO is expected to increase market share in the future. Biomass gasification based routes (e.g., BG-FT) hold promise as an alternative in longer term; however, these long heard promises have not yet yielded concrete results. The long term future of renewable diesel technologies will include FAME, due to lower capital and technological hurdles, though HVO (and potentially BG-FT) will play an important role, taking more significant market share in the long term due to the product properties—though FAME will always have a market due to its functionalities as well. Other technology routes (e.g., fermentation routes to diesel) are not expected to produce any significant volumes in the foreseeable future.

Many chemical and energy companies have committed to carbon neutrality by 2050. Renewable fuels are expected to play a large role in meeting these goals.

Technologies

The term renewable diesel encompasses a range of products derived from bio-based sources that can be substituted – either directly or via blending – with conventional, fossil-based, diesel fuel. This report primarily covers non FAME renewable diesel products as follows in accordance with their production route:

- **Hydrotreated Vegetable Oil (HVO):** Otherwise known as Hydroprocessed Esters and Fatty Acids (HEFA) or green/renewable diesel, diesel from HVO is an advanced biofuel that can be produced from a range of feedstocks including food and non-food crops and is the closest of the various alternatives to FAME biodiesel to reaching appreciable scale.
- **HVO co-processing with Petroleum:** HVO Co-processing incorporates fats and oils to the distillate stream being processed in a petroleum refinery. These products' properties are very similar to conventional diesel fuels
- **Biomass Pyrolysis Diesel:** This produces a pyrolysis oil which can be hydrotreated and used as renewable diesel. This process is not yet at a commercial stage.

- **Biomass Integrated Gasification Fischer-Tropsch (BG-FT):** Produced via the gasification of a range of biomass product followed by conversion to liquid fuels, using the Fischer-Tropsch process, advanced BG-FT biodiesel is currently not at commercial scale, but several projects are in the pipeline which should see it taking an appreciable role in the future.
- **Other** – includes fermentation routes

Process Economics

Cost of production models for USGC, Brazil, Western Europe and China are shown for:

- **HVO:**
 - UOP Ecofining
 - Haldor Topsoe Hydroflex
 - Neste NexBTL
- **Thermochemical Routes:**
 - FT Diesel
 - Pyrolysis Diesel
- **Other Developmental Routes**
 - Mercurius Catalytic Route
 - Amyris Fermentation Route

Capacity

NexantECA has catalogued all existing renewable diesel capacity and announcements of planned capacity (by technology type) out to 2023 and provides project profiles.



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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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