NexantECA

Technology and Costs

Biorenewable Insights: Methanol to Gasoline

Methanol to Gasoline is one in a series of reports published as part of NexantECA's 2024 Biorenewable Insights program.

Overview

As part of the industry's ongoing decarbonization efforts, alternative solutions to reduce carbon intensity in the passenger transportation sector are currently being developed. Renewable drop-in gasoline is seen as a transition option to directly reduce lifecycle emissions of internal combustion engine (ICE) vehicles.

Methanol to Gasoline (MTG), a conventional process that has been around since the 1970s, has seen renewed interest especially with the integration of methanol feedstock derived from renewable and sustainable sources. Recent notable developments, initiated by Saudi Arabia-based Aramco/ENOWA and Chile-based Highly Innovative Fuels Global, involve the production of synthetic gasoline from e-methanol.

The renewable gasoline blend allows for better energy security given its versatility in being derived from a wide range of renewable feedstock sources, offering direct substitute for fossil-based gasoline.

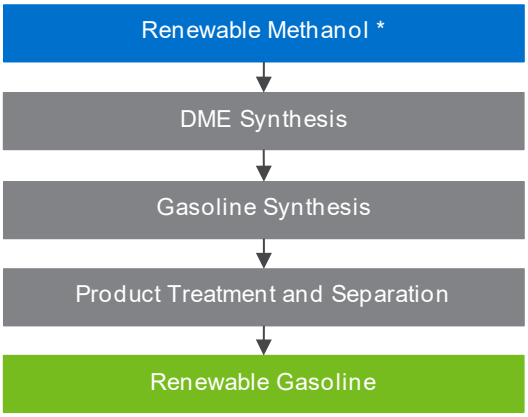
This report discusses the recent development surrounding MTG including,

- Technology overview
- Feedstock comparison
- Technology comparison and process economics
- Capacity analysis
- Carbon intensity

Technologies

The MTG process converts methanol to gasoline through intermediate dimethyl ether (DME) in a continuous process. The technology yields gasoline very close to conventional gasoline, requiring minimal end processing.

The cost-effective production of methanol from renewable and sustainable feedstocks, such as biomass, municipal solid waste (MSW), carbon dioxide and green hydrogen, remains a major barrier to the widespread adoption of MTG technology.



** Renewable methanol includes bio-methanol, MSW-based methanol and e-methanol*

Process Economics

Cost of production (COP) estimates for key MTG technologies derived from three renewable methanol sources (e.g., bio-methanol, MSW-based methanol and e-methanol) are presented for three locations (United States, Western Europe and China).

Carbon Intensity

This report includes models of scope 1 and 2 emissions for the abovementioned MTG process pathways with three renewable methanol feedstock sources, as well as regional carbon intensity baselines.

Commercial Impact

MTG using renewable feedstock is a sustainable approach for producing gasoline that addresses the challenges of environmental pollution and supply of crude oil.

Wide substitution of this process is highly dependent on cost-effective production of renewable methanol production along with regulator and policy drivers in closing the price gap between gasoline derived from renewable MTG and conventional fossil fuel-based gasoline.

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The BI program (sister program to the world renowned 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 renewable energy and chemical industries.

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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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