Creamer Media's ENGINEERING NEWS Online

Synfuels technology developing at a rapid pace

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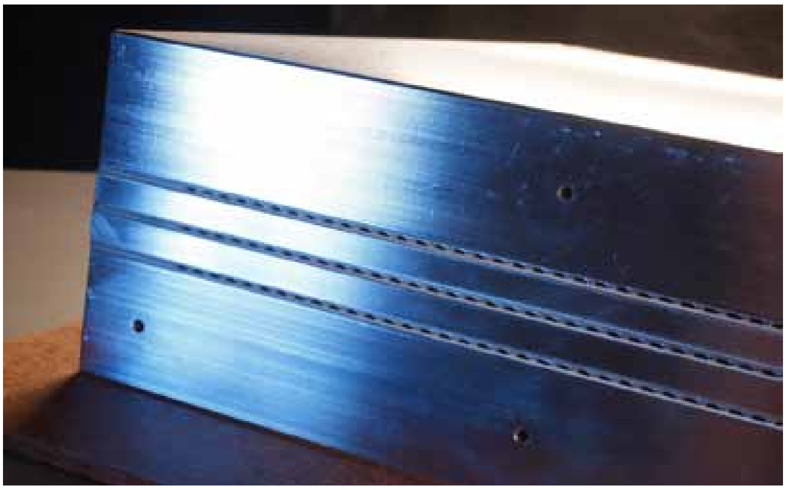
Published: 21 Oct 11



Synthetic fuels (synfuels) technology is being developed at a rapid pace as the demand for synfuels increases, says technology innovator for clean synfuel production, Oxford Catalysts Group business development manager **Tad Dritz**.

He says synfuels technology development tends to be cyclical, as it is driven by a variety of price combinations, such as high oil prices and low alternative feedstock prices, including biomass and natural gas.

"Currently, the price spread is good, because oil is high and gas is low, which is the preferred feedstock for synfuels, and, in North America, the biggest factor driving synfuels development is the spread between natural gas prices and oil prices," Dritz explains.

Another driver behind the growth in synfuels is concern surrounding energy security; however, Dritz says this was the rationale about five years ago and the intensity is waning.

Further driving interest in the gas-to-liquids (GTL) technologies is antiflaring regulations. There has been a lot of pressure around the world to reduce the number of gas flares, particularly in places such as Russia and Brazil, which are trying to be proactive in reducing the amount of flaring.

Dritz notes, however, that the most significant technological advances in synfuels have been within innovative reactor technology. Oxford Catalysts Group has designed a microchannel Fischer-Tropsch (FT) reactor technology that has advanced heat dissipation more efficiently than other reactors, the company states.

"Heat transfer is a significant factor because FT reactors are exothermic and give off a lot of heat. This is a major limitation in most fixed-bed reactors, as the reaction of gases has to be controlled at a rate as fast as the heat can be removed," says Dritz.

This is not the case with the microchannel technology as the heat is removed more efficiently.

The microchannel reactor is a compact reactor, which has channels with critical dimensions in the millimetre range. The smaller channels dissipate heat more quickly, compared with conventional reactors that have larger tube diameters in the 2.5 cm to 10 cm range, allowing more active catalysts to be used.

Mass and heat transfer limitations in conventional reactors reduce the efficiency of the large conventional high-pressure reactors. The use of microchannel processing makes it possible to greatly intensify chemical reactions to enable them to occur at rates of between 10 and 1 000 times faster than for conventional reactors.

Microchannel reactors are especially suited to economical production on a small scale.

"Synfuels technology has reached its limits in terms of having world-scale plants. Large plants limit the number of applications for GTL technology or eliminate any other synfuels because of the logistics of gathering biomass or other alternative feedstocks," Dritz explains.

He adds that Oxford Catalysts Group aims to bring synfuels conversion plants down to a smaller scale to target smaller resources.

Meanwhile, some of the challenges facing the synfuels industry are that synfuel beds are notoriously difficult to operate and these need to operate in specific windows.

Further, the catalysts deactivate over time and the temperatures need to be increased; however, this results in the catalyst burning out faster. The other challenge is the high cost of the facility, which sees limited companies wanting to implement synfuels technologies.

"Those who are implementing them are making a long-term bet that the price spread between the feedstock and resulting product will remain large for some time," Dritz states.

He adds that, when establishing a synfuels facility, there is probably about a ten-year window until a profitable operation is seen because energy markets are fairly volatile.

Meanwhile, the company has received two supply orders for three of its reactors. Two of the reactors are for an Oxford Catalysts Group partner, SGC Energy, for a biomass gasification plant in Brazil.

The other is for a US-based plant. The buyer, the name of which was not disclosed, is involved in the distributed production of synfuels, and plans to use the reactors in a commercial synfuels plant in the US.

Further, the US plant, with a nominal capacity greater than 50 bbl/d, is expected to begin operating in 2012, and additional plants are planned following the successful completion and operation of this first facility.

Some of the reactors are under construction and some have been completed and are being readied for shipment.

Further, the company's reactor technology is being considered for a larger GTL plant in North America and the company is being included in the engineering study.

Oxford Catalysts Group is looking to take its technology to the next level, as the facilities that it has sold are mainly biomass-based facilities and it is looking to start a GTL demonstration unit in Brazil, in November.

This will be a 6 bl/d integrated GTL plant using both Oxford Catalysts Group's technology and that of subsidiary Velocys for the steaming and reforming and for the FT process.

"It will be an important demonstration for us and we are already looking ahead to the demonstration after that, where we would like to produce hundreds of barrels a day of synfuels," says Dritz.

Advantage of Microchannel FT Reactors

“Microchannel FT reactors offer substantial advantages over conventional technology, and make it possible to convert a range of carbon-containing feedstocks into clean synfuels.

“Its high conversion efficiencies, in the range of 70% for each pass, and modular nature make it particularly useful for distributed production, because capacity can be easily increased by linking together additional FT reactor modules. We are excited to have the opportunity to work with this major corporation to deploy our technology in its first commercial plant,” says Oxford Catalysts Group commercial director **Jeff McDaniel**.

Synfuels can be produced from a variety of hydrocarbon, waste and biomass feedstocks through the FT process. Because these feedstocks are often only available in relatively small quantities and at scattered locations, it is not economic for them to be used in large centralised production plants, and they are often wasted. Distributed production (the production of synfuels in small-scale plants located near the source of the feedstock) is based on the use of microchannel reactors and provides a means to convert an unused resource into a valuable commercial product.

This is the third commercial order received by the Oxford Catalysts Group for its micro- channel FT technology. Two orders for the microchannel reactor and associated FT catalyst were received from renewable- energy company SGC Energia in December 2010 and April this year for use in a 50 bl/d biofuels plant, due to start operating in Brazil in 2012.

In addition, the group’s microchannel FT and steam methane reforming reactors have been incorporated in a skid-mounted GTL demonstration plant at the Petrobras’s Lubnor refinery in Fortaleza, Brazil. The demonstration plant, which is scheduled for start-up later this year, will operate for about nine months.

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