

Pushing FCC for Maximum Chemicals Production

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Abstract

Fluid catalytic cracking (FCC) has been a major refinery conversion process for nearly eight decades. The technology is mature, but it continues to evolve in the areas of mechanical reliability, feedstock and operational flexibility, and regulatory requirements. While FCC units have traditionally been operated to maximize gasoline or distillate production, the interest in maximizing light olefins, particularly propylene, has gained traction in recent years. Slowing demand growth for transportation fuels coupled with an expectation for continued petrochemical demand growth has many refiners looking to move their operations toward an increased conversion of crude oil to petrochemicals. FCC catalyst formulation and process technology improvements now give refiners the flexibility to boost propylene yields from traditional levels of 4–6 wt% to beyond 20 wt%. Slowing propylene supply growth from steam cracking, which is the principal source for propylene production, also opens up potential opportunities for high-olefins FCC to help fill the mounting propylene supply-demand gap.

This report provides an overview of fluid catalytic cracking developments in catalyst, process, and hardware technologies with a focus on high olefins processes. A general review of the technical field and recent process developments is included. Detailed technical and economic evaluations are presented for three high olefins FCC technologies, two of which are commercial and the third is under development. Specific assessments are provided for the following technologies:

- Axens/TechnipFMC HS-FCC™
- Lummus/IOCL Indmax (I-FCCSM)
- Reliance MCC

The analysis and techno-economic design results for HS-FCC and Indmax are based on a feed rate of 80,000 barrel per day of vacuum gas oil, while the design for MCC is based on sequential cracking of multiple feedstocks. The capital and production cost results herein are presented on a US Gulf Coast basis, but the accompanying iPEP Navigator Excel-based data module (available with the electronic version of this report) allows users to view results of other major regions along with conversion between English and Metric units.

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