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Abstract

Ethylene is the world's most important petrochemical, and steam cracking is by far the dominant method of production. In recent years, several economic trends have arisen that have motivated producers to examine alternative means for the cracking of hydrocarbons. Propylene demand is growing faster than ethylene demand, a trend that is expected to continue for the foreseeable future. Hydraulic fracturing in the United States has led to an oversupply of liquefied petroleum gas (LPG) which, in turn, has led to low ethane prices and a shift in olefin feedstock from naphtha to ethane. This shift to ethane has led to a relative reduction in the production of propylene. Conventional steam cracking of naphtha is limited by the kinetic behavior of the pyrolysis reactions to a propylene-to-ethylene ratio of 0.6–0.7.

These trends have led producers to search for alternative ways to produce propylene. Several of these—propane dehydrogenation and metathesis, for example—have seen large numbers of newly constructed plants in recent years. Another avenue producers have examined is fluid catalytic cracking (FCC). FCC is the world's second largest source of propylene. This propylene is essentially a byproduct of refinery gasoline production. However, in recent years, an effort has been made to increase ethylene and propylene yields to the point that these light olefins become the primary products. Also, in the refinery, the usual feed to an FCC unit is a heavy hydrocarbon. The question is, can a viable process be developed whereby naphtha is fed to an FCC unit that is optimized for light olefins?

This report attempts to answer that question. We examine two such technologies. SK Energy, in partnership with KBR, has developed a process called Advanced Catalytic Olefins® (ACO). This technology has been commercialized at KBR's Ulshan, South Korea location. We also examine the application of a downflow FCC technology to the cracking of naphtha. Finally, we present a design study for the production of ethylene from a condensate feedstock via steam cracking.

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