Abstract
Process Economics Program Report 128D
TECHNOLOGIES FOR THE PRODUCTION OF SECONDARY PROPYLENE
(November 2004)

This report, PEP Report 128D, reviews the technology for producing propylene other than the resources, such as steam cracking and FCC. It presents economics of processes for the production of propylene, which are listed below:

- Propylene from Propane by Dehydrogenation--Oleflex® Process and Catofin® Processes
- Propylene from Ethylene and Butylene by Liquid-phase Metathesis
- Propylene from Methanol by Catalytic Conversion--Lurgi MTP Process and UOP/Hydro MTO process

The two propane dehydrogenation processes are economically comparable with the Lurgi MTP process in both battery limit investment and product value. Although, the MTP process requires relatively high off-site investment, it has high by-product credits, which offset the high indirect costs, resulting from its high total fixed capital.

The metathesis process requires the lowest capital investment among the processes due to its simplicity in operation. However, its propylene product value is significantly affected by its high costs of raw materials, namely ethylene and raffinate II. As to the UOP/Hydro MTO process, which co-produces ethylene and propylene, it is expected that the process requires the highest capital investment. This causes high indirect costs for the production cost of propylene. These high indirect costs are totally offset by the by-product credits of ethylene and C4+ hydrocarbon rich gas, resulting in the lowest propylene product value among the processes.

The worldwide production of propylene in 2003 is estimated at about 72 million metric tons. Currently, 61% of the worldwide propylene production is supplied from steam cracking, which typically provides co-production of propylene and ethylene with a weight ratio of propylene to ethylene ranging from 3.5:10 to 6.5:10, depending on the type of naphtha or gas oil, and on cracking severity. In case of ethane used as feedstock, the ratio varies from 0.2:10 to 0.4:10. Another 36% is produced as a by-product from petroleum refineries, and only about 3% is produced from on-purpose processes, using aforementioned technologies.

World consumption of propylene for chemical uses in 2003 is estimated at 62 million metric tons, of which about 36.6% is accounted for by the consumption in Asia. The United States and Western Europe each account for 27.3%. In application, about 60% of the total consumption is for the production of polypropylene, 9% for acrylonitrile, about 7 % each for propylene oxide and oxo chemicals, and 6% for cumene.
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