

IHS CHEMICAL

PEP Report 267A

Propane Dehydrogenation Process Technologies

October 2015

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PEP Report Process Economics Program

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Abstract

In a propane dehydrogenation (PDH) process, propane is selectively dehydrogenated to propylene. As one of the “on-purpose” propylene production routes, PDH has recently received much attention, and propylene production capacity via PDH is slated to grow rapidly over the next several years. Dozens of new PDH installations have been announced worldwide, and many of them are already under construction. The single feed/single product feature is one of the most attractive aspects of PDH, especially for propylene derivative producers looking to back-integrate for a secure and cost-effective source of propylene.

Despite its simple chemistry, industrial implementation of PDH is very complicated owing to side reactions such as deep dehydrogenation, hydrogenolysis, cracking, polymerization, and coke formation. Important aspects in catalytic dehydrogenation of propane entail near-equilibrium conversion while minimizing side reactions and coke formation. Historically, catalyst design breakthroughs have made major contributions to the development of commercial PDH process technologies. Significant efforts to improve process configurations and catalyst formulations are still being undertaken.

In this report, technological progress and the industrialization of propane dehydrogenation process technologies are analyzed. We also develop and present process designs and preliminary economics of propylene production by the three commercialized PDH process technologies: the CATOFIN PDH process licensed by Lummus Technology, the Oleflex PDH process licensed by UOP and the STAR PDH process with oxydehydrogenation licensed by ThyssenKrupp Uhde.



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