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Abstract

Pyrolysis gasoline, or Pygas, is a by-product of high-temperature naphtha cracking during ethylene and propylene production. Pygas is a naphtha-range product containing C_5- to C_{12}-range aromatics, di-olefins, olefins, and paraffins. Pygas has a high octane value, and thus is potentially a good blending material for motor gasoline after some treatment. It can also be further fractionated in various cuts, which can be used as feedstock to produce high-value products.

The focus of this review is to evaluate the value of upgradation routes for the Pygas C_5 cut. In this study, we have done a technoeconomic evaluation of the most recent GTC Technology process to produce polymer-grade isoprene, piperylene, and dicyclopentadiene (DCPD). The main product of the process is isoprene, while piperylene and dicyclopentadiene are by-products. We also assess and describe the differences between the older GTC process and the newer (current) version of the technology. (It should be noted that the older version was never offered by GTC for license.)

This review also presents technical and economic evaluation of a process for production of polymer-grade DCPD. In addition, a CDEtherol® process for production of TAME (tertiary amyl methyl ether) based on an isoamylene-rich stream as feedstock is presented.

The process economics include estimated capital costs and production costs; variable cost, plant cash cost, and plant gate cost are also presented separately as part of net production costs. A brief market overview summarizes the global supply and demand end-use market and demand drivers.

This review is based on data drawn from public information sources (mainly patents) with guidance from GTC Technology. Aspen Simulation Workbook™ models are developed for both the cases to evaluate the process economics (CAPEX and OPEX) with the help of the proprietary IHS PEP Cost index. Some of the technical and economic information used in the design was based on the author's own engineering judgment.

The production economics presented in this review are based on a US Gulf Coast location and are in English units. However, we also attach an iPEP Navigator module with the PDF file of this review to allow a quick conversion of the process economics in other major regions (i.e., China, Germany, Japan, the Middle East, and Canada). With the selection of each competing process, the module also allows production economics to be reported in each region in either English or metric units.

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