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Integrated cumene-phenol/acetone/Bisphenol A- Part I: Cumene

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Dipti Dave
Associate Director

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Dipti Dave, Associate Director

Abstract

All commercial production of cumene proceeds via alkylation of benzene with propylene at elevated temperature and pressure in the presence of an acid catalyst. While cumene manufacture was dominated by processes using solid phosphoric acid (SPA) catalyst systems for decades, the industry landscape changed dramatically beginning in the mid-1990s with advances in zeolite catalyst technology. By now, most merchant cumene producers have converted to zeolite catalyst, and almost all new investments are in zeolite technology.

Conversion of SPA-based process units to zeolite catalyst results in a dramatic increases in capacity, lower energy, maintenance and raw material costs, and improved product quality. Zeolite catalysts can be regenerated, have longer life, and eliminate the environmental considerations involved with SPA catalysts. The newest generation of zeolite catalysts offers even greater efficiency per pass, increased conversion of propylene, improved transalkylation properties, and higher selectivity.

Research and development efforts around zeolite-based cumene production have continued to advance. This report evaluates recent developments in technologies for zeolite-based cumene production. A general review of the technical field is provided, along with detailed economic evaluation for cumene by Badger process technology.

The analysis and technoeconomic results that follow are based on a design capacity of 500,000 metric tons (1.1 billion pounds) per year of cumene. Alternative investment and production cost estimates are also provided for plant capacities, which are 250,000 metric tons per year and 750,000 metric tons per year. While the capital and production cost results herein are presented on a US Gulf Coast basis, the accompanying iPEP Navigator Excel-based data module (available with the electronic version of this report) allows for viewing results for other major regions, along with conversion between English and metric units.

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IHS Markit Customer Care:

CustomerCare@ihsmarkit.com
Americas: +1 800 IHS CARE (+1 800 447 2273)
Europe, Middle East, and Africa: +44 (0) 1344 328 300
Asia and the Pacific Rim: +604 291 3600

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