



TECH 2018-8: Toluene Diisocyanate (TDI)

Toluene Diisocyanate (TDI) is one in a series of reports published as part of Nexant's 2018 Technoeconomics – Energy & Chemicals (TECH) program.

Overview

Toluene Diisocyanate (TDI) is one of the most widely used isocyanates. The majority of TDI produced is used to make flexible polyurethane foams. Polyurethanes are manufactured by the reaction of an isocyanate and a polyol and are one of the most versatile plastic materials. Flexible polyurethane foams are just one of the materials possible and these can be found in mattresses, sofa cushions and car interiors.

This TECH report provides an overview of the commercial technologies for producing TDI and addresses these questions:

- What are the major production technologies for TDI and how do they differ? Is the technology available and who are the key technology owners and licensors?
- What are the key developments in TDI process technologies?
- What is the market, business and regulatory environment like for TDI today?
- What are the key factors that impact overall economics for producing TDI across different geographic regions?

Commercial Technologies

Toluene diisocyanate (TDI) is produced commercially via a three-step process:

- Two-step nitration of toluene to dinitrotoluene (DNT)
- Reduction of dinitrotoluene to toluene diamine (TDA)
- Phosgenation of TDA to TDI.

Each of these steps is considered in detail in the report, with analysis of the chemistry and process technologies.

All commercial production of TDI follows these steps, with some variation in configuration. For example, the most competitive TDI technology carries out the phosgenation step in the gas-phase.

Process Economics

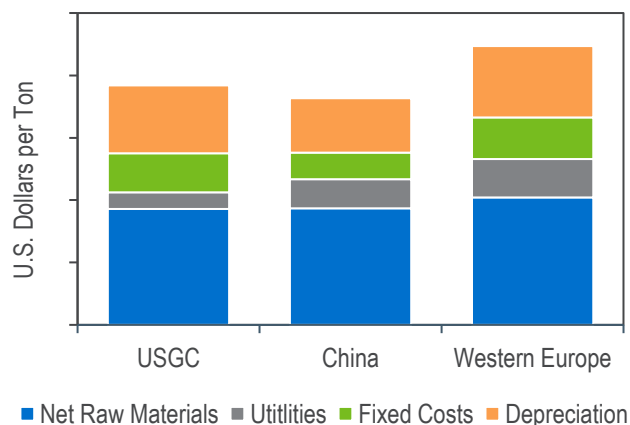
Detailed cost of production estimates for the DNT and TDI processes are presented for USGC, Western Europe, and China. Estimates are also provided for supporting processes, such as the production of nitric acid, hydrogen, carbon monoxide, chlorine and sulfuric acid. The analysis considers the impact of raw material prices, third-party processes, and chlorine economics on the cost of producing TDI.

Commercial Overview

Global TDI consumption is estimated to be 2.4 million tons in 2018. Growth in TDI demand is driven by the bedding/furniture and automotive sectors and is limited somewhat by its displacement by MDI in some end-uses.

An overview of the supply, demand, and trade of TDI on a global and regional (North America, Western Europe, Asia Pacific) basis is provided in this TECH report.

TDI Regional Cost of Production





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- Chemistry
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- Process economics – comparative costs of production estimates for different technologies across various geographic regions
- Overview of product applications and markets for new as well as established products
- Regional supply and demand balances for product, including capacity tables of plants in each region
- Regulatory and environmental issues where relevant

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