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Technology and Costs

TECH 2018-3: Vinyl Chloride Monomer / Ethylene Dichloride (VCM / EDC)

Vinyl Chloride Monomer/Ethylene Dichloride (VCM/EDC) is one in a series of reports published as part of Nexant's 2018 Technoeconomics – Energy & Chemicals (TECH) program.

Overview

Ethylene dichloride (EDC) is a chlorinated hydrocarbon that is used almost exclusively for the production of vinyl chloride monomer (VCM). EDC can also be used to produce other chlorinated compounds, as well as ethyleneamines, solvents and fumigants. Most of the VCM that is obtained from EDC is used to produce polyvinyl chloride (PVC), a widely used polymer in the construction and automotive industries. The vinyls value chain (EDC/VCM/PVC) is consequently one of the more important value chains in the petrochemicals industry.

While the global VCM market is very mature, with well-established methods of production, the most prevalent process route uses mercury-based catalysts that on occasion have had a negative impact on the environment. Collectively, these events have encouraged the global phase out of mercury in VCM production. Consequently, much of the successful research in VCM production has focused on developing alternative options for catalysis.

This TECH report provides an overview of the commercial and developing technologies for producing EDC and VCM by addressing the following questions:

- What are the major technologies for the production of EDC and VCM, and how do they differ?
- How do the process economics vary across different technologies and geographic regions?
- What are the key drivers of production cost for each technology?
- What is the market environment for VCM like today?

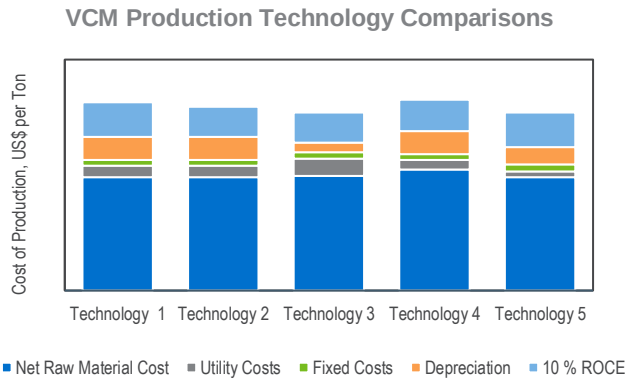
Commercial Technologies

EDC is synthesized at the commercial level through either the direct chlorination of ethylene with chlorine or the chlorination of ethylene with hydrogen chloride and oxygen. EDC then undergoes pyrolysis to produce VCM. This process sequence is common in regions where ethylene is relatively cheap, such as North America and the Middle East. In China, where coal is inexpensive and abundant, acetylene-based processes remain dominant.

Major technologies covered in this report include those developed by Johnson Matthey, INEOS, and Vinnolit. While the ethylene-based processes of INEOS and Vinnolit are well-established, JM recently introduced its DAVY VCM process, which revolves around an improved catalyst that eliminates the use of mercury chloride during the production of VCM from acetylene.

Process Economics

Detailed cost of production estimate for various technologies were developed for USGC, Western Europe, Middle East, and China locations. The processes studied include various methods of VCM production using acetylene-based and ethylene-based routes as used in world-scale facilities.



Commercial Overview

Global EDC consumption in 2017 reached about 40 million tons, while VCM consumption was 45 million tons in the same year. While China is a minor player in the EDC market, the country is a major force in the VCM market, having accounted for more than 40 percent of global demand in 2017. Going forward, average annual demand for VCM is expected to grow at about 3.3 percent through 2023. An overview of the supply, demand, and trade of EDC and VCM on a global and regional (North America, Middle East, Western Europe, and Asia Pacific) basis is provided in this TECH report.

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Technology@nexant.com or www.nexantsubscriptions.com

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Technology and Costs comprises the Technoeconomics – Energy & Chemicals (TECH) program (formerly known as PERP), the Biorenewable Insights program (BI), the Sector Technology Analysis, and the new Cost Curve Analysis. These programs provide comparative economics of different process routes and technologies in various geographic regions.

Nexant serves its clients from over 30 offices located throughout the Americas, Europe, the Middle East, Africa and Asia.

Corporate Headquarters
Tel: +1 415 369 1000
101 2nd St Suite 1000
San Francisco
CA 94105-3651
USA

Americas
Tel: +1 914 609 0300
44 S Broadway,
5th Floor White Plains
NY 10601-4425
USA

Europe, Middle East & Africa
Tel: +44 20 7950 1600
1 King's Arms Yard
London EC2R 7AF
United Kingdom

Asia Pacific
Tel: +662 793 4600
22nd Floor, Rasa Tower I
555 Phahonyothin Road
Kwaeng Chatuchak
Khet Chatuchak
Bangkok 10900
Thailand

For more information please contact
Technology@nexant.com or www.nexantsubscriptions.com