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Technology and Costs

TECH 2021-4: Vinyl Acetate

Vinyl Acetate is one in a series of reports published as part of NexantECA's 2021 Technoeconomics – Energy & Chemicals (TECH) program.

Overview

VAM is a highly versatile and important intermediate used in the production of polyvinyl acetate (PVAc), polyvinyl alcohol (PVOH), and vinyl acetate copolymers.

The industrial manufacturing of vinyl acetate monomer (VAM) was first developed by Klatte via the liquid phase reaction of acetic acid and acetylene during the early 1910s. After the introduction of the vapor phase route in 1921, virtually all VAM was produced by this technology until the 1960s when the introduction of selective transition metal oxidation catalysts enabled the replacement of acetylene by ethylene as the feedstock.

Although the VAM industry is today mature, developments on catalyst performance have continued to be made. Today, only the heterogeneous catalytic systems (vapor-solid systems) are in use.

This TECH report provides an updated overview of the conventional technological, economic, and market aspects of VAM. The following issues are addressed in this report:

- What are the main routes for VAM production? Who are the major technology holders and how do they differ?
- How do the process economics compare across processes and different geographic regions? Which technology offerings provide the lowest cost of production, and which regions in the world provide attractive investment opportunities?
- How is the supply of VAM distributed in major regions of the world today? Which companies will be adding capacity in the short term?

Commercial Technologies

The industrial process for the manufacture of VAM has evolved over the last century. Currently, the two main commercial routes to produce vinyl acetate are an acetylene-based route and an ethylene-based route. A number of other technologies for the production of VAM have been considered but so far, some of these have yet to be commercialized.

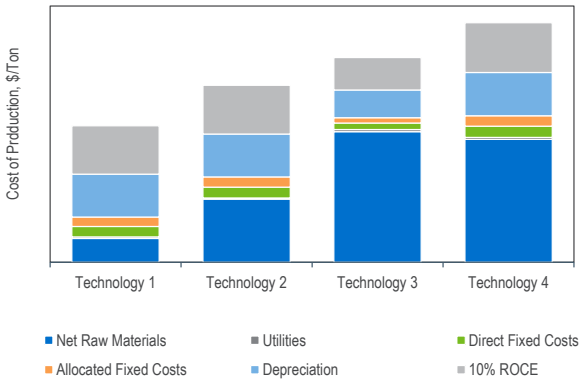
Process technology for VAM worldwide is offered by a few licensors that offer vapor phase ethylene-based processes with main producers owning proprietary routes. Based on fixed bed reactors, licensors utilize similar processes that differ on feed ratios and operating conditions.

While there are no commercial direct biorenewable routes to VAM, the feedstocks (i.e., acetic acid and ethylene) use to make VAM can be derived from bio-based sources such as ethanol.

Process Economics

Detailed cost of production estimates for two different production routes to VAM are mainly presented for USGC, China, and Western Europe. Estimates are developed for conventional fixed and fluidized beds routes to VAM. Economics for bio-based VAM are developed in India. Sensitivity analyses on feed pricing, economy of scale, and capital investment were also developed. Additionally, a return on investment and investment attractiveness analysis for VAM production facility is provided for the fixed bed route and regions studied in this report.

VAM Production Costs



Commercial Overview

Global VAM demand declined by 6.5 percent in 2020 to 5.9 million tons, due to a decrease of its downstream derivatives during the COVID-19 pandemic. Capacity has been slowly increasing, growing at an average of close to 2 percent per year since 2010. The most dramatic rates of capacity change have been in China and the Middle East.

Supply, demand, and trade of VAM on both a global and regional basis are provided in this TECH report.

For more information. please contact
Technology@NexantECA.com or www.NexantECA.com

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

NexantECA serves its clients from over 10 offices located throughout the Americas, Europe, the Middle East, Africa, and Asia.

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

Europe, Middle East & Africa
Tel: +44 20 7950 1600
110 Cannon Street
London EC4N 6EU
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@NexantECA.com or www.NexantECA.com