IHS CHEMICAL

PEP Review 2015-08

Polyvinyl Chloride by JNC Suspension Polymerization Process

December 2015

ihs.com

PEP Review

Process Economics Program

Syed N. Naqvi
Sr. Principal Analyst

PEP Review 2015-08

Polyvinyl Chloride by JNC Suspension Polymerization Process

Syed N. Naqvi, Sr. Principal Analyst

Abstract

This review presents a techno-economic evaluation of a polyvinyl chloride (PVC) production process based on the most widely used PVC manufacturing technology—suspension polymerization. The particular technology being analyzed here is used and licensed by JNC Corporation (hereafter referred to as JNC). JNC formerly operated under the name Chisso Corporation. Chisso Corporation, more famous as a supplier of liquid crystals for LCDs, was renamed JNC Corporation in 2011. Since 2014, licensing of the JNC's suspension PVC (S-PVC) and VCM stripping technologies plus the associated services to those technologies are offered jointly by JNC Corporation and KBR Inc. KBR, a global provider of technologies, engineering, and construction services for the process industry, is licensor for the aforementioned S-PVC technology.

For this review, we specifically selected a process that produces general-grade PVC, which is by far the largest contributor in the overall global production of PVC. Major outlets for this type of PVC include pipes, sheets, films, cables, and molded items. The operating parameters for the process have been selected so as to produce a product having matching properties to those of JNC PVC K66-grade. (JNC's portfolio of PVC grades is provided.) Our process design is based on nonconfidential process information received from the JNC.

The hallmark of the JNC technology is its proprietary design of the VCM stripping column, which results in low-energy (steam) consumption at a high separation rate of VCM from the polymer. The overall process efficiency is also high (low consumption of VCM per ton of PVC). VCM concentration in the final PVC product is claimed to be less than 1 ppm (weight basis). The overall process system allows greatly reduced gas emissions, a positive from the environmental standpoint. Changeover time from one product grade to another is relatively low (1–2 hr).

While the details of the technology and its economics are not presented here in the abstract, the capital and production costs—among the most important economic aspects of the overall process—are provided. According to our estimates, a grassroots plant that produces 250 thousand metric tons/annum (MTPA) of general-grade PVC (~K66-grade) at 0.9 plant stream factor through JNC's technology is likely to cost about $250 million in the US Gulf Coast region. This total fixed capital (TFC) includes a 25% contingency factor. Production cost is estimated to be nearly 48¢/lb ($1,058/MT). Plant cash costs are equivalent to 41¢/lb ($904/MT). General-purpose PVC spot price in the United States is currently in the range 68–72¢/lb.

It may be important to note that if the contingency cost factor is controlled at 10% by thorough planning and proficient execution of the project, the TFC of the above plant is reduced to $215 million (see the economics of this case inside).

More details about the process and its economic parameters (design criteria/assumptions, process description, material and energy balance, process discussion, utilities consumption, equipment listing with the sizes, capital costs breakdown, production costs breakdown, raw materials and utilities cost, plant operational sensitivity analyses, etc.), are contained in the review.

The economic analysis presented in this review is based on the US price/cost parameters. However, we have also included with the review an Excel-based interactive costing module, iPEP Navigator, that can be used to calculate capital investment and production costs for abovementioned PVC technology for some other countries (China, Germany, and Japan). iPEP Navigator gives a snapshot of the production economics for the United States and the aforementioned countries.

Contents

Tables

Figures

IHS Customer Care:

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