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PERP Report 2017-3: Polyvinyl Chloride

“Polyvinyl Chloride (PVC)” is one in a series of reports published as part of the 2017 Process Evaluation/Research Planning (PERP) Program.

Overview

Polyvinyl chloride (PVC) is a commodity thermoplastic resin that is produced by the polymerization of vinyl chloride monomer (VCM). PVC's properties and ability to be compounded makes it very versatile with applications ranging from rigid pipe used in construction to thin, clear film used in packaging. PERP reports involve detailed reviews of the available literature (scientific and trade journals, patents, etc.), as well as extensive liaison with industry (technology licensors, producers, EPC contractors), and Nexant know-how. This report covers:

- Technology-Suspension, emulsion, mass, microsuspension polymerization processes
- Major Licensors-INEOS, JNC, KEM ONE, and Vinnolit
- Process Economics-feedstock VCM (ethylene and acetylene-based), major PVC polymerization processes
- Commercial Applications-resins and compounds, fabrication methods, major markets, end use applications
- Market Analysis-consumption, capacity, and supply/demand/trade for global, North America, Western Europe, and Asia Pacific

PVC market dynamics are governed by the construction industry, with the major application being in piping. Some PVC is being replaced by other materials; however, its competitive cost position in many end use markets allows it to continue to grow. The PVC business has to deal with environmental issues as a result of its use of chlorine, carcinogenic VCM, and the use of additives (especially plasticizers). Despite this, the business has continued to exhibit steady growth. The following issues are addressed in this report:

- What is the effect of environmental and legislative regulations on the PVC industry?
- What are the major technologies for PVC production? How do the technologies differ? What technologies are available for license?
- How do the process economics compare across different geographic regions?
- What is the current market environment for PVC?

Commercial Technologies

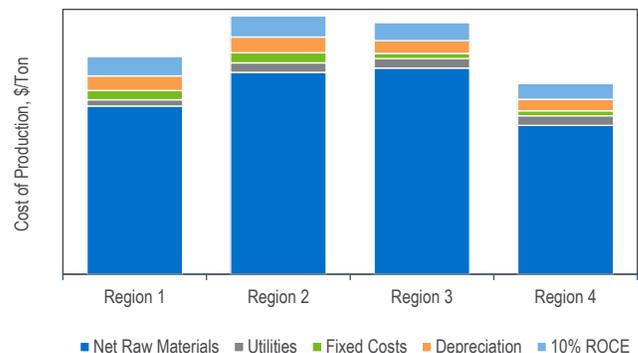
The commercial routes to PVC are based on the batch polymerization of VCM. The most widely used process is the suspension polymerization process. The other major commercial processes are emulsion, mass, and microsuspension. Suspension processes license by INEOS Technologies, JNC, KEM ONE, and Vinnolit are described, along with the KEM

ONE's mass and microsuspension processes. There are a number of major PVC producers who have their own process technologies that are not licensed to third parties.

Process Economics

Detailed cost of production estimates for the suspension polymerization PVC process are presented for USGC, Western Europe, coastal China, and inland China locations. Estimates for the VCM feedstock are also included, with market-priced ethylene used for balanced oxychlorination in the USGC, Western Europe, and coastal China, and mine-mouth-priced coal for the acetylene-based process in inland China. For the benchmark USGC location, cost of production estimates were also developed for the mass, emulsion, and microsuspension processes.

REGIONAL COST OF PRODUCTION COMPARISON FOR SUSPENSION POLYMERIZATION



Commercial Market Review

Global PVC consumption was more than 42 million tons in 2016 with pipe and fittings the major end use, followed by profile and siding. Film and sheet applications are also significant, along with wire and cable. Demand growth is expected to pick up with the global economy and will be driven by the Asia Pacific region. An overview of the supply, demand, and trade of PVC on both a global and regional basis is provided in this PERP report.

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