

Abstract
Process Economics Program Report 255
METHYL METHACRYLATE
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Due to global economic downturn, the methyl methacrylate (MMA), a high-value chemical intermediate for acrylic polymers production, saw just a modest growth rate in capacity, averaging 2.7%/yr from 1997 to 2002. Consumption of MMA in that period increased at an average annual rate of 3%. The demand started to rise in late 2002, initializing the upward part of the MMA business cycle. World MMA capacity is expected to grow at a rate of 3.9%/yr from 2002 to 2007, whereas the world market is projected to grow at an average annual rate of 4.5%.

While the conventional acetone cyanohydrin (ACH) route continues to stay as the most dominant route to MMA with a share in MMA output likely to further increase as under-construction and planned plants come onstream, other routes, based upon C₂ and C₄ feedstocks, received an increasing focus in the past fifteen years mainly due to the problems associated with the conventional ACH route (undesirable byproducts formation and handling of highly corrosive materials). Another stimulus for new MMA routes was production of MMA from raw materials, which could impart a supply freedom by providing independent sources for raw materials. Typical example is C₂ based raw materials, e.g. ethylene. Ethylene is easily available and can economically produce MMA in an environment-friendly way (BASF is producing MMA from ethylene since 1988). In C₃ or C₄ routes, the raw materials such as acetone, hydrogen cyanide, isobutylene, or t-butanol are the product or byproduct of a chain process, and hence, their availability is dependent on other materials/products. C₄ based routes are mainly commercialized in Japan where production of hydrogen cyanide (HCN) did not keep pace with the increasing demand of MMA. Low demand of isobutylene has also been a factor for the evolution of C₄ based MMA routes.

Apart from providing cost-effective new outlets to ethylene, propylene, isobutylene or t-butanol feedstocks, the recent C₂, C₃ and C₄ based MMA routes are less hostile to environment, and in several cases more economical than the conventional dominant ACH route. This Report examines and analyzes the techno-economics of some of those routes as listed below;

- Lucite Technology (ethylene based)
- Eastman Technology (ethylene based)
- Mitsubishi Gas Chemical Technology (acetone, HCN, and methyl formate based)
- Mitsubishi Gas Chemical Technology (acetone, HCN, and methanol based)
- Asahi MA Oxidative-Esterification Technology (isobutylene based)

In addition to detailed study of the above five processes, this Report also presents updated process economics for a t-butanol based commercial plant of Japan Methacryl Monomer.

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