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PERP Report 2017-7: Methanol

"Methanol" is one in a series of reports published as part of the 2017 Process Evaluation/Research Planning (PERP) Program.

Report Overview

Methanol applications have long been split between 'traditional' end-uses and 'emerging' end-uses. As recently as 2005, traditional applications (MTBE, acetic acid, formaldehyde, and others) accounted for nearly all of methanol demand (about 97 percent). A decade later, traditional applications comprised only 59 percent of methanol demand, and by next year emerging end uses (Olefins, gasoline blending, DME, and biodiesel) are forecast to command over 50 percent of global methanol consumption. Demand into olefins production, the fastest growing of the emerging markets, is currently the largest single outlet for methanol.

The most dramatic rates of capacity change have been in China and the United States. China has increased its largely coal based capacity at an average 16 percent per year since 2010, driven by strong demand for olefins and an abundance of low-cost coal. The smaller capacity base in the United States has seen an average 31 percent per year increase since 2010, driven by the availability of shale gas, domestic demand into traditional end-uses, and a growing export-oriented business model.

This PERP report provides an overview of both gas-based and coal-based methanol technologies offered for license. The key difference in the two approaches is the process employed to produce synthesis gas (a mixture of hydrogen and carbon monoxide) that is then catalytically converted to methanol. Gas-based technologies for synthesis gas production include steam reforming, combined reforming, autothermal reforming, and gas heated reforming, while coal-based synthesis gas is produced by coal-gasification. The following issues are addressed in the report:

- What are the major technologies for synthesis gas and methanol production? How do the technologies differ?
- Who are the major licensors and what technologies do they offer?
- How do the process economics compare across different geographic regions? What are the key drivers of production cost for each technology?
- Which technology offerings provide the lowest cost of production, and which regions in the world provide attractive investment opportunities?

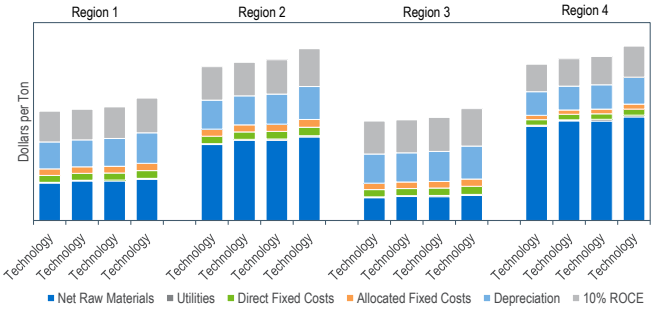
Commercial Technologies

Major licensors covered in this report include Air Liquide, Casale, Haldor Topsøe, Jacobs, Johnson Matthey, Mitsubishi, and Toyo. They offer a broad range of technologies including feed gas pretreatment, synthesis gas production, methanol conversion, methanol distillation, and catalysts for both reforming and methanol production. Not all licensors can provide a turnkey plant, but many do bring technology offerings or engineering/design capabilities that provide unique benefits which are discussed in this report.

Process Economics

Detailed cost of production estimates for five different production routes to methanol are presented for a world-scale methanol plant. Steam reforming, combined reforming, autothermal reforming, gas heated reforming, and coal-based methanol production are covered. Coal-based evaluations are based on an inland China location near coal mining operations (mine-mouth). A comparison of production cost is presented for China (inland and coastal), Middle East, United States, and Western Europe.

REGIONAL COST OF PRODUCTION COMPARISONS



Commercial Market Review

Global methanol demand reached 86 million tons in 2016 led by volume and percentage growth into olefins production in China. Methanol capacity growth has been strong in recent years, growing at an average ten percent per year since 2010, with the greatest changes in China and the United States. The PERP report provides an overview of the supply, demand, and trade of methanol on both a global and regional basis.

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