Methanol

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Abstract

Methanol is a large-volume commodity chemical that belongs to the alcohol family of products. In 2018, its worldwide production was over 79 million metric tons. Globally, methanol production capacity more than doubled over the past decade. Northeast Asia accounted for more than three-quarters of the new capacity brought onstream during that period. Interestingly, China is the sole producing country in the Northeast Asian region.

Methanol is commercially a very important chemical as it is used not only in its native state of methanol in many industrial applications but also finds wide use as a raw material for a host of industrial chemicals as outlined in this report. Major sources of methanol production are natural gas and coal. Several types of methanol technologies have been developed by various licensors. Notable among those licensors are Lurgi, Johnson-Davy, Haldor Topsoe, Casale, and Mitsubishi Gas Chemicals. Besides these licensors, there are several other licensors that also license their own version of the methanol technologies. Included in those licensors are companies such as Uhde, Toyo, Jacobs, etc. Other companies like Foster Wheeler and Linde are also well known in the realm of methanol production as licensor for syngas reformer technologies.

In view of the increasing commercial importance of methanol, Process Economics Program (PEP) of IHS Markit decided early this year to carry out a detailed technoeconomic study of the major methanol manufacturing technologies based on the latest developments taking place in those technologies. This PEP report presents the results of that study.

As a brief prelude for the readers, four licensed technologies are examined and analyzed from a technoeconomic point of view.

- Haldor Topsoe Autothermal Reforming-based Methanol Production Technology
- Casale Combined Reforming-based Methanol Production Technology
- Lurgi Combined Reforming-based Methanol Production Technology
- Johnson Matthey/Davy Gas-Heated Reforming-based Methanol Production Technology

Each evaluation of the technology entails a series of steps involving a brief process review, followed by a presentation of more detailed parametric information about the technology such as key features of the technology, process operation key conditions, process description, material and energy balance, equipment sizes, utilities consumption, and finally a pictorial representation of the process in the form of process flow diagram. Process economics are presented toward the end of each chapter.

One of the key points of evaluation in this report is that the process waste heat recovery scheme is designed in a thermally balanced way so that there is no export or import of steam from the process.

The plant requires only electricity, (makeup) cooling water, and some process water from an external supply source. Oxygen is supplied from an integrated air separation plant.

Based on above scheme, capital cost and production cost estimates are presented for each process producing 5,000 metric tons/day of AA-grade methanol.

Also attached with the report is iPEP Navigator, which is an interactive costing tool that allows report readers to select and compare the processes economics in different regions of world.

These and other technologies—past, present, and emerging ones, for PO production are reviewed with a bibliography and abstracts for relevant patents since the 1950s. The industry status is updated, the modern PO processes are summarized in terms of comparative economics and the key process indicators (KPI) of capital intensity, energy intensity, carbon efficiency, and carbon intensity. Lastly, the iPEP Navigator PO tool is attached to the electronic version of this report. The iPEP Navigator interactive module provides an economic snapshot for each process, allowing the user to select and compare the processes, units, and regions of interest.

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