IHS Markit™

Floating Methanol Production

PEP Review 2020-05

December 2020

Praveer Joshi
Associate Director

Process Economics Program

PEP Review 2020-05

Floating Methanol Production

Praveer Joshi, Associate Director

Abstract

This review examines the technology and economics of a methanol producing plant, which is built on a floating production, storage, and offloading (FPSO) vessel used in oil and gas production.

Conventionally, methanol is produced from natural gas (NG) through steam-methane reforming (SMR) or autothermal reforming (ATR). The reforming of NG produces a mixture of CO and H_2 (synthesis gas), which is subsequently converted to methanol. Methanol can also be produced by direct hydrogenation of CO_2. There is another process for methanol production, which involves steam-methane reforming with CO_2. This steam-methane-CO_2 reforming technology is also referred to as Steam-CO_2 Combined Reforming (SCR). As SCR consumes CO_2 as a raw material, the CO_2-rich gas produced on FPSO can be utilized without a CO_2 separation unit. The raw material used is the by-product gas and steam generated during the heat recovery phase from the process system.

The configuration or baseplate of the process analyzed in this review is extracted from a paper titled "*The process design and simulation for the methanol production on the FPSO (floating production, storage and off-loading) system*". Authored by Won Seok Kim et al., this paper was published in *Chemical Engineering Research and Design* (2014). The evaluation process entails a series of steps involving a brief process review, followed by more detailed parametric information about the technology, such as process operation key conditions, process description, material and energy balance, equipment sizes, utilities consumption, and a process flowsheet. Process economics are presented in the latter part of the review.

The floating methanol production technology is a two-step process. The first step is the production of H_2-rich syngas by the endothermic steam-methane reforming reaction over a Ni-based catalyst, in an externally heated tubular reformer. The CO_2-rich associated gas produced on the FPSO is cleaned and successively fed to a prereformer and reformer, along with steam in a molar ratio of 1 to 2. The syngas, thus produced, is then fed to the methanol synthesis reactor. The crude methanol stream exiting the reactor is cooled, scrubbed, and purified using distillation columns. The purified methanol is finally sent to storage.

In the end section of the review, the economics of a floating methanol production unit are presented. IHS Markit PEP's estimates indicate that the net production cost of methanol is 9.06 ¢/lb. The production of methanol on an FPSO vessel provides the benefit of reducing flaring and could also result in increased oil production capacity. The economic impact of increased oil production, however, has not been accounted for in the calculation of the economics.

Confidential. © 2020 IHS Markit. All rights reserved.

Contents

Confidential. © 2020 IHS Markit. All rights reserved.

Tables

Figures

Figures for Appendix C

Confidential. © 2020 IHS Markit. All rights reserved.

IHS Markit Customer Care:

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

Disclaimer

The information contained in this presentation is confidential. Any unauthorized use, disclosure, reproduction, or dissemination, in full or in part, in any media or by any means, without the prior written permission of IHS Markit Ltd. or any of its affiliates ("IHS Markit") is strictly prohibited. IHS Markit owns all IHS Markit logos and trade names contained in this presentation that are subject to license. Opinions, statements, estimates, and projections in this presentation (including other media) are solely those of the individual author(s) at the time of writing and do not necessarily reflect the opinions of IHS Markit. Neither IHS Markit nor the author(s) has any obligation to update this presentation in the event that any content, opinion, statement, estimate, or projection (collectively, "information") changes or subsequently becomes inaccurate. IHS Markit makes no warranty, expressed or implied, as to the accuracy, completeness, or timeliness of any information in this presentation, and shall not in any way be liable to any recipient for any inaccuracies or omissions. Without limiting the foregoing, IHS Markit shall have no liability whatsoever to any recipient, whether in contract, in tort (including negligence), under warranty, under statute or otherwise, in respect of any loss or damage suffered by any recipient as a result of or in connection with any information provided, or any course of action determined, by it or any third party, whether or not based on any information provided. The inclusion of a link to an external website by IHS Markit should not be understood to be an endorsement of that website or the site's owners (or their products/services). IHS Markit is not responsible for either the content or output of external websites. Copyright © 2020, IHS Markit™. All rights reserved and all intellectual property rights are retained by IHS Markit.