eMethanol™ - electrified methanol

Methanol for a more sustainable **future**

Electrified chemicals

HALDOR TOPSØE

Electrify methanol production for a **sustainable** business

Electrifying the chemical industry
Electrification is expected to be the key enabler for the production of sustainable chemicals both with respect to decarbonizing the heat input (fuel) and acting as a pseudo feedstock via electrolysis.

When embarking on electrification, it becomes paramount to partner with a technology provider, who understands the interaction between electrical power and chemical engineering. This insight combined with a state-of-the-art catalyst will help chemical producers embrace electrification.

Methanol is the perfect choice of chemical to start the journey towards electrification. eMethanol™ can be produced from feedstocks obtained by utilization of waste streams, electrolysis hydrogen and CO_2 capture.

Most simple and most efficient
By combining the world's best methanol catalyst with a reliable and flexible process design tailored to the individual client project, Topsoe can provide the most simple and most efficient solutions.

Production of sustainable chemicals adds complexity due to new feedstocks being processed. This complexity is counteracted by utilizing a simple and efficient design combined with a catalyst optimized for processing of new feedstocks.

Our long experience within gas cleaning and optimization of integrated processes ensures the best client solutions.

Topsoe offers a complete design including everything from raw materials to Grade AA methanol. Optimal performance is obtained by delivering a solution based on the projects of each individual client. This is regardless of whether or not the feedstock is based on waste streams or electrolysis hydrogen and CO_2.

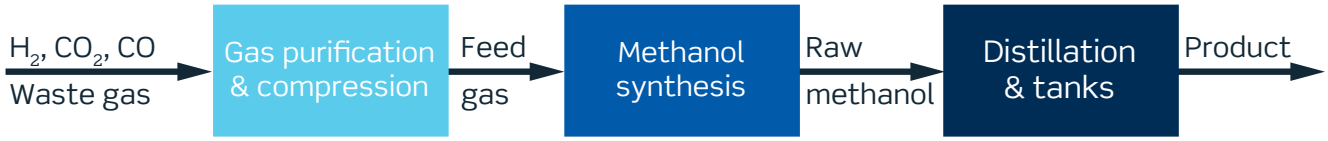
Working with projects in both ends of the feedstock spectrum, Topsoe offers unmatched competencies and profound insights into the areas of sustainable methanol and electrification.

Methanol syntesis catalyst
Conversion of CO_2 into methanol changes the chemical processing conditions for the methanol catalyst. The concentration of water and CO_2 is much higher than that of a traditional operation. Scientists worldwide have been working to find the optimal catalyst formulation that can deliver efficient and stable conversion despite severe operation conditions.

Based on Topsoe's extensive knowledge within copper based methanol synthesis and more than 20 years' of experience within CO_2 utilization for production of methanol, we have developed MK-317 SUSTAIN™, which can help achieve a high and stable conversion rate over a long period of time.

Unmatched selectivity
MK-317 SUSTAIN™ has superior selectivity for the formation of methanol from CO_2 and hydrogen. High selectivity suppresses byproduct reactions and favors methanol formation. In addition, the high activity allows a relatively low-temperature operation, further reducing the formation of byproducts.

In combination, this means significantly lower amounts of by-products, resulting in lower distillation costs as well as increased hydrogen and overall process efficiency.



eMethanol™ block diagram

Process description
Carbon oxides and hydrogen act as feedstock to the methanol synthesis. These gases can also originate from different waste streams from chemical plants or directly from an electrolyzer. They can also be captured from a stack.

Gas purification is essential for the efficiency and cost of the methanol production. Catalyst poisons or compounds contaminating the methanol must be removed prior to the synthesis. Topsoe has a broad portfolio of adsorbents to solve this problem.

Methanol synthesis is most efficient at about 90 bar pressure. Topsoe's proprietary cooled reactor and recovery solutions ensure a very efficient and compact design. The reaction heat is recovered as middlepressure steam. Topsoe has more than 100 references for the methanol reactor.

Methanol recovered from the reactor will contain organic impurities and water. Topsoe offers an efficient and reliable distillation design to ensure that the quality of the methanol meets international standards such as Grade AA and IMPCA.

TABLE 1
Consumption per ton of Grade AA methanol

Electricity - kWh	500*
LP steam, kg	1600
CO_2 - Nm^3 (kg)	715 (1400)
H_2 - Nm^3	2130

Production per ton of Grade AA methanol

MP steam, kg	670

**Based on partly pressurized electrolyzer and ambient pressure CO_2*

Depending on capacity and purity requirements

Haldor Topsoe is a world leader in catalysis and surface science, committed to helping our customers achieve optimal performance. We enable companies to get the most out of their processes and products, using the least possible energy and resources, in the most responsible way. We are headquartered in Denmark and do project development, R&D, engineering, production, and sales & service across the globe.

Get in touch today
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