

## How to Convert CO<sub>2</sub> to Green Methanol

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### Abstract

Reducing CO<sub>2</sub> emissions of industrial plants is a major topic for Air Liquide and its customers. Hence Air Liquide Engineering & Construction is offering the well referenced, leading methanol synthesis technologies to the market, the so-called “Lurgi MegaMethanol™ process”. This methanol technology is well-known for its reliable performance and efficiency in the market for world scale capacities > 5000 tons per day.

One major trend in recent years is CO<sub>2</sub> utilization by producing methanol with the addition of hydrogen from regenerative sources. The reduction of CO<sub>2</sub> footprint as well as the valorization of CO<sub>2</sub> rich gases are of increasing interest for many industries and methanol is a perfect fit for energy storage, for clean fuels and as a building block for producing high value chemicals. The production of methanol as an intermediate is an effective way to meet both environmental requirements and economic constraints.

Concepts for methanol synthesis based on CO<sub>2</sub> and hydrogen exist but are not optimized for today’s challenges such as smaller capacities, integration into other processes and fluctuating operation. This is why Air Liquide is developing a new solution for methanol synthesis from low-carbon hydrogen and CO<sub>2</sub>.

This development draws on long time expertise in methanol production, dedicated pilot plants at our R&D facility in Frankfurt and the experience from 18 commercial plants licensed with the Lurgi MegaMethanol™ technology and more than 60 methanol licenses. Air Liquide’s unique experience with methanol technology sets the basis for optimized CO<sub>2</sub> based methanol. The key points of these recent developments are listed as followed:

- Develop economic model (max. CAPEX allowed, max. energy cost allowed, CO<sub>2</sub> tax, etc...)
- Improved all our model for methanol synthesis based on CO<sub>2</sub> rich feed gas to be able to offer the better economics combined with robust and guaranteed performance.
- Optimization of CO<sub>2</sub> based methanol process through innovative solution (reactor design, improved separation section, etc...)
- Continuous feedback from our partners and customers

Air Liquide is in position to propose tailor made solutions for conversion of CO<sub>2</sub> rich feedstocks to methanol for a wide range of capacities in an efficient way, combining lower investment costs with high productivity through process intensification to align with customers’ requirements.