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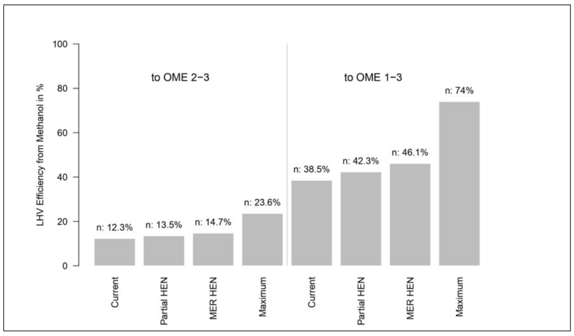
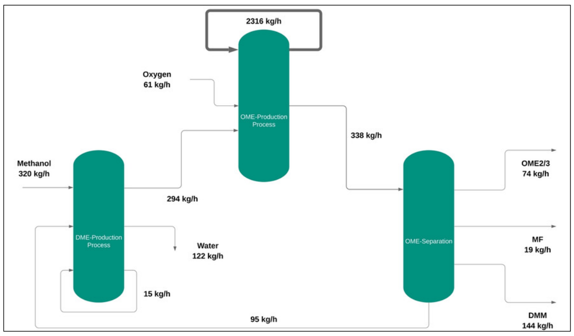
Subject Area	Energy and Environment

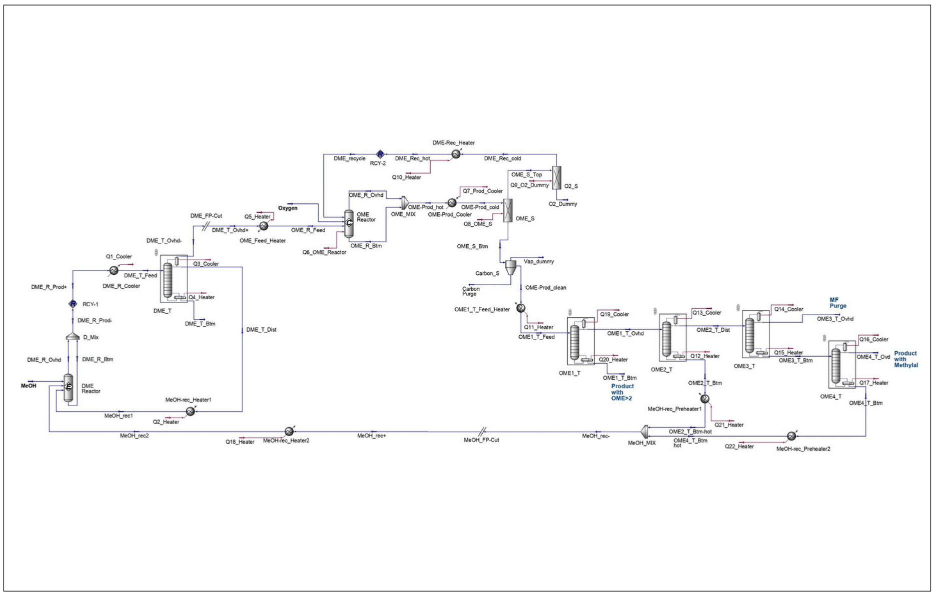
Concept For A Laboratory Plant For The Production Of The Alternative Diesel OME



Efficiency with respect to the lower heating value (LHV) from methanol to OME for different heat recovery levels
Own presentment



Calculated mass balance to show waste and product streams as well as the high recycling loop due to the low conversion
Own presentment



Final simulated production process in ASPEN HYSYS
Own presentment

Introduction: To fight against climate change, a broad research area is focusing on different energy technologies to lower emissions. In addition to reduction targets in heat and electricity consumption, cuts in the mobility sector are becoming increasingly urgent. Apart the successful market entry of electric cars, a powerful part of the vehicles will continue to be driven with fossil fuels. To implement renewable solutions within a few years, the so-called "drop-in" efuels show promising behavior. These alternative fuels can either be a replacement or can be added to existing fuels. In addition to the Fischer-Tropsch fuels, which are known for some time, the oxygenated fuels with oxymethylene dimethylether (OME) have become the focus of research for alternative diesel.

Objective: Next to a deep literature research and the reworking of the basic known process steps, this work mainly focuses on the concept development and a comparison of those. The best process passes from methanol over the synthesis of dimethyl ether to OME. A detailed concept will be drawn up, the process is simulated to conclude to all mass, energy and mole balances and the relevant equipment is sized.

Result: The process achieves an efficiency based on methanol to OME of 38.5-46%, based on the lower heating value, which is lower compared to other Power-to-Liquid processes. Theoretical considerations for the hydrogen efficiency show, that there is a potential in this route to dominate others and to compete other PtL processes. It was possible to show that the costs of providing methanol are the most relevant cost driver, followed by energy costs, which are actually too high for an exothermic process. The costs are 1.50-3.10 CHF/kg OME based on renewable methanol and are about twice as much as fossil diesel, due to the halved energy content of OME. Thanks to the done pinch analysis, the needed heat flows are at a useful potential. Over 90% of the heat can be provided under 90 °C, where the excess heat must be released via air.