

## **Project - Synthesis of Dimethyl Ether in a Reactive dividing-wall column**

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### Background & Description:

DME is a 'Second Generation Biofuel' it has a slight ethereal odor. It liquefies under slight pressure, much like propane. It is relatively inert, noncorrosive, non-carcinogenic, almost non-toxic, and does not form peroxides by prolonged exposure to air. Its physical properties make it a suitable substitute (or blending agent) for liquefied petroleum gas (LPG, a mixture of propane and butane). The largest use of DME is currently as substitute for propane in LPG used as fuel in household and industry. DME has two other primary applications: as a propellant in aerosol canisters, and as a precursor to Dimethyl sulfate as an aerosol propellant, DME is useful as a somewhat polar solvent. It can also be used as a refrigerant.

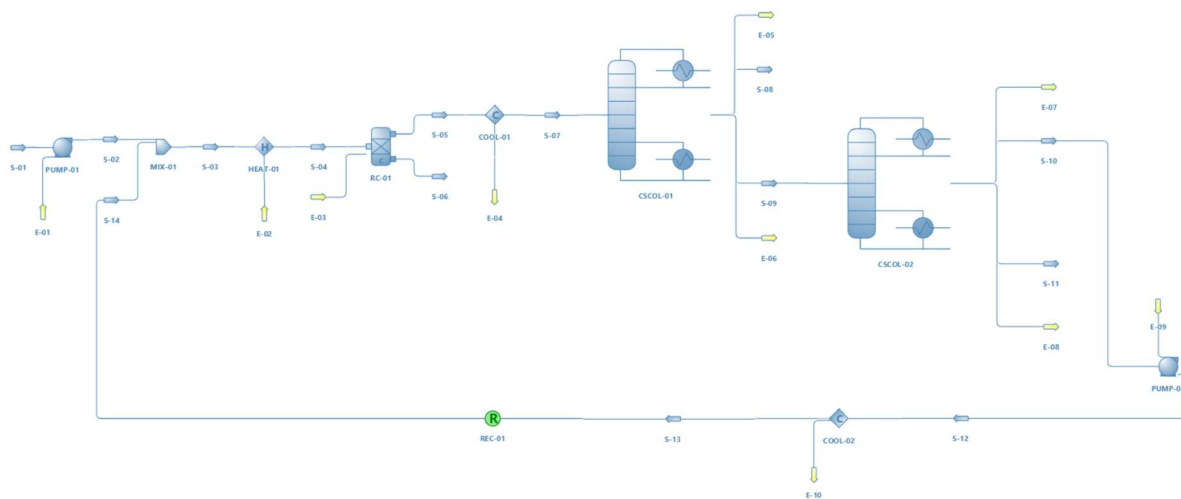
The reaction of DME synthesis is mainly dehydration of methanol that is exothermic and reversible.

Methanol dehydration reaction :  $2 \text{CH}_3\text{OH} \leftrightarrow \text{DME} + \text{H}_2\text{O}$

### **System of units**

Temperature - °C, Pressure – kPa, Mass flow rate – kg/h, molar flow rate – kmole/h, other units – SI.

Thermodynamic Model used – NRTL



## Result :-

Mole fractions of compounds in different streams after separation <b>Compounds</b>	<b>S-08</b>	<b>S-09</b>	<b>S-10</b>	<b>S-11</b>
<b>DME</b>	0.999983	0.0189	0.0555	$3.608 \times 10^{-9}$
<b>Methanol</b>	$1.673 \times 10^{-5}$	0.3151	0.9034	0.0099
<b>Water</b>	$1.406 \times 10^{-7}$	0.666	0.04107	0.99