# The Methoxy-Methyl-Heptane Process

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## Introduction

The chemical 2-methoxy-2-methyl heptane (MMH) has been developed from the methanol and 2 methyl –1- heptane; but there is one undesirable reaction which produce dimethyl ether and 2-methyl-2-heptanol. So, separation of that all produced compounds and the reactor's optimum condition are studied in the selected literature[1]. Here, we try to simulate that proposed flowsheet with the DWSIM.

## Development of flowsheet in OpenModelica

Most of all specification for the unit operation and the information about thermodynamics packages are elaborated in literature. So, we just use that all specification as it is.

Foe more detail about the Unit operation specification and stream property, please go through the flowsheet and the literature.

### Description of flowsheet

methanol at rate of 50 kmol/hr and 2 methyl –1- heptane at rate of 49.51 kg/hr are feed into the reactor where

$$CH_3OH + C_8H_{16} \rightarrow C_9H_{20}O$$
$$2CH_3OH + C_8H_{16} \rightarrow C_2H_6O + C_8H_{18}O$$

Reaction take place where 91.88% methanol converted into the desired product (2-methoxy-2-methyl heptane) and 2% methanol converted into the undesired product (dimethyl ether and 2-methyl-2-heptanol) then reactor effluent feed at the 8$^{th}$ tray of 12 tray distillation tower which separate the DME from mixture. Remain mixture again feed at the 23th tray of 42 tray distillation tower which remove the unreacted reactant which again recycle to the reactor. The remain mixture feed at the 9$^{th}$ tray of 22 tray distillation tower which separate the 2-methoxy-2-methyl heptane and 2-methyl-2-heptanol.

## Result

| Object | Methanol feed | 2 methyl –1- heptane feed | 2-methoxy-2-methyl heptane Produce | 2-methyl- 2-heptanol produce | dimethyl ether produce | unit |
|---|---|---|---|---|---|---|
| **Molar Flow** | 50 | 49.51 | 48.9826 | 0.490768 | 0.533102 | kmol/h |
| **2-Methoxy-2-Methyl-Heptane** | 0 | 0 | 0.999 | 0.001 | 0 | Mol/mol |
| **2-methyl-1-heptene** | 0 | 0 | 0.00013 | 0 | 0 | Mol/mol |
| **Methanol** | 1 | 1 | 0 | 0 | 0.001 | Mol/mol |
| **Dimethyl ether** | 0 | 0 | 0 | 0 | 0.999 | Mol/mol |
| **2-Methyl-2-Heptanol** | 0 | 0 | 0.00086 | 0.999 | 0 | Mol/mol |

## Reference:

1. William L. Luyben, "Design and Control of the Methoxy-Methyl-Heptane Process", Ind. Eng. Chem. Res. 2010, 49, 6164–6175