Decomposition of MTBE in a Reactive distillation column

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Problem Statement:

Decomposition of MTBE in a Reactive distillation column that produces Isobutene and Methanol as products.

System of Unit: The system of units taken in this Flowsheet is C5, molar flow in kmole/hr, pressure in bar, temperature in degree Celsius.

Background:

In production processes involving chemical transformations, reaction and separation are usually handled in distinct devices. A simpler design integrating reaction and separation by distillation or distillation/liquid extraction in the same unit is in many instances possible and realized in one piece of equipment, a reactive distillation setup.

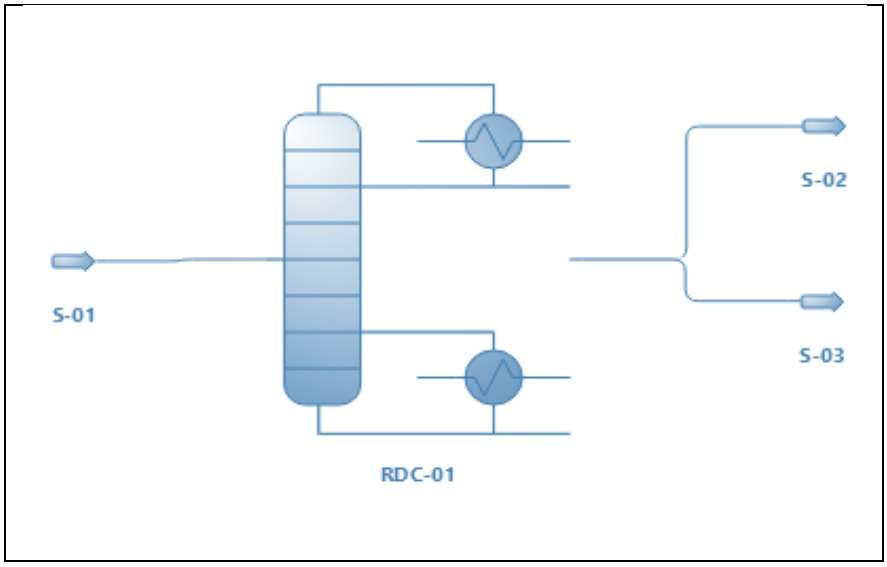
The standard configuration of a reactive distillation column includes a rectification section, a reaction section and a stripping section. A set of reactive trays or reactive packing is used as a reaction section.

Description of the flowsheet:

In this simulation, a reactive distillation column has been used that produced isobutene and methanol from the decomposition of methyl tert butyl ether (MTBE). The reactive distillation column has 16 stages, a partial reboiler, and a total condenser. The column fed is with pure MTBE. The reactive stages range from 6 to 11.

After simulation;
Isobutene is a top product in this column and Methanol is a bottom product of this column. Whose molar composition are 0.850056 and 1.0000 as respectively get in this simulation.

Flowsheet:



Results:

RESULT TABLE				
Object	S-01(FEED) (MTBE)	S-03(BOTTOM PRODUCT) (METHANOL)	S-02 (TOP PRODUCT) (ISOBUTENE)	
Temperature	154.1	142.406	73.7803	°C
Pressure	11.15	11.15	11.15	bar
Molar Flow	10.00	8.23607	11.7639	kmol/h
Molar Fraction(Overall Liquid) / Methanol	-	1	0.149944	
Molar Fraction (Overall Liquid) / Isobutene	-	1.94902E-12	0.850056	

Conclusion: Isobutene and Methanol get as products in this simulation.

Reference:

https://www.researchgate.net/publication/291659419_SIMULATION_OF_THE_SEPARATION_OF_INDUSTRIALLY_IMPORTANT_HYDROCARBON_MIXTURES_BY_DIFFERENT_DISTILLATION_TECHNIQUES_USING_MATHEMATICAC