Cis-2-pentene to cis-2-hexene and cis-2-butenen in Reactive Distillation column

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Problem Statement:

Cis-2-pentene to cis-2-hexene and cis-2-butenen in Reactive Distillation column.

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

Background:

Reactive distillation is a process where the chemical reactor is also the still. Separation of the product from the reaction mixture does not need a separate distillation step which saves energy (for heating) and materials.

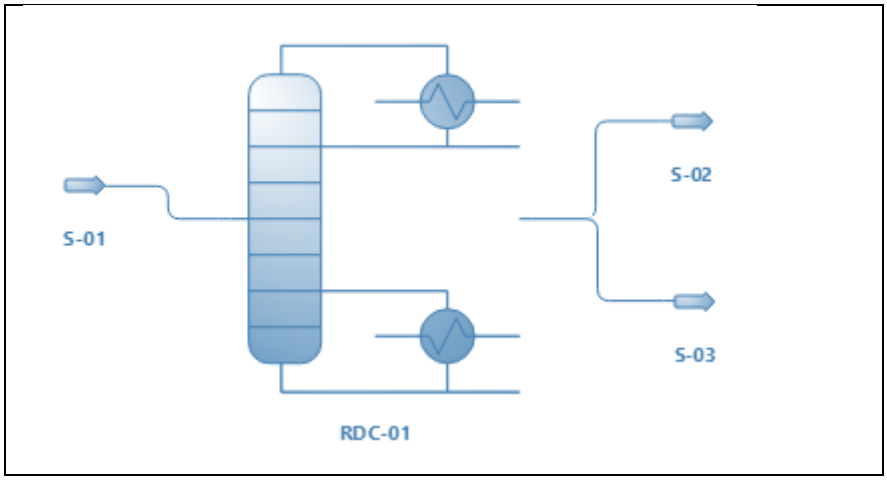
The standard configuration of a reactive distillation column includes a rectification section, a reaction section and a stripping section. A set of reactive trays or reactive packing is used as a reaction section.

Description of the flowsheet:

In this simulation, a reactive distillation column has been used that produced cis-2-butene and cis-2-hexene from cis-2-pentene. The pure reactant cis-2-pentene is fed to a reactive distillation column operating at a pressure of 3 atmospheres with 13 plates; the feed stage location is stage 5, the reactive stages go from stages 2 to 7. The feed flow rate is set to 100kmol/hr.

After simulation;
Cis-2-butene is a top product in this column and cis-2-hexene is a bottom product of this column. Whose molar composition are 0.9963 and 0.9999 as respectively get in this simulation.

Flowsheet:



Results:

RESULT TABLE				
Object	S-01(FEED) (CIS-2-PENTENE)	S-03(BOTTOM PRODUCT) (CIS-2-HEXENE)	S-02 (TOP PRODUCT) (CIS-2-BUTENE)	
Temperature	73.20	108.1	36.62	°C
Pressure	304	304	304	KPa
Molar Flow	100	49.8168	50.1832	kmol/h
Molar Fraction(Overall Liquid) / cis-2-butene	-	1.47827E-06	0.996336	
Molar Fraction (Overall Liquid) / cis-2-hexene	-	0.9999995	0.00364412	

Conclusion: cis-2-butene and cis-2-hexene 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