

Ternary Extractive Distillation of Benzene-Cyclohexane-Toluene Using DMF

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A. Background

Aromatic compounds such as Benzene, Toluene, and Cyclohexane have a number of industrial applications. Distillation columns are employed for separating individual components from this mixture. Since Benzene and Cyclohexane form azeotropic mixture extractive distillation process is employed in separating them. Here DMF (dimethyl formamide) is used as the extractive solvent.

B. Process Description

The feed consists of 30 mole % benzene, 30 mole % cyclohexane and rest toluene. The feed enters at 50°C and 1 bar. The molar flow rate of feed is 100 kmol/h. CAPE-OPEN Unit Operation flow sheeting object is used for extractive distillation column. The bottom product from the last distillation column (DC 3) is recycled and mixed with the make up solvent (0.5 kmol/h) and enters the first distillation column (DC 1).

C. Results and Conclusion

The results from the Flow sheet is as follows

Master Property Table							
Object	S9 Top-3	S8 Bottom-2	S7 Top-2	S6 Bottom-1	S5 Top-1	S10 Bottom-3	
Molar Flow	40.7136	61.596	24.2062	85.8022	35.3129	20.8824	kmol/h
Molar Fraction (Mixture) / Benzene	0.00282513	0.00186829	0.445002	0.126883	0.541252	2.78284E-06	
Molar Fraction (Mixture) / Toluene	0.988187	0.854204	1.11088E-06	0.61322	2.94515E-07	0.592983	
Molar Fraction (Mixture) / Cyclohexane	0.00898578	0.00594373	0.554997	0.160841	0.458748	1.27666E-05	
Molar Fraction (Mixture) / N,n-dimethylformamide	2.39209E-06	0.137984	5.18846E-18	0.0990564	3.42841E-18	0.407001	

Unit system: SI

Temperature - °C

Pressure – bar

Molar flow – kmol/h

Heat duty - MW