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Process Simulation of 1-Butene Separation from C4 Mixture by Extractive Distillation

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Abstract : Technical mixture of C4 containing 1-butene and n-butane are very close to each other with regard to their boiling points i.e. -6.3°C for 1-butene and -1°C for n-butane. Extractive distillation process is used for the separation of 1-butene from the existing mixture of C4. The solvent is the essential of extractive distillation, and an appropriate solvent plays an important role in the process economy of extractive distillation. Aspen Plus has been applied for the separation of these hydrocarbons as a simulator. Moreover, NRTL activity coefficient model was used in the simulation. This model indicated that the material balances in this separation process were accurate for several solvent flow rates. Mixture of acetonitrile and water used as a solvent and 99% pure 1-butene was separated. This simulation proposed the ratio of the feed to solvent as 1: 7.9 and 15 plates for the solvent recovery column. Previously feed to solvent ratio was more than this and the number of proposed plates were 30, which shows that the separation process can be economized.

Keywords : extractive distillation, 1-butene, aspen plus, ACN solvent
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