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DECARBONIZATION STUDIES IN DISTILLATION COLUMNS

Hríbik D.[1], Variny M.[1]

[1] *Department of Chemical and Biochemical Engineering, Faculty of Chemical and Food Technology, Slovak University of Technology in Bratislava, Radlinského 9, 812 37 Bratislava, Slovak republic*

xhribik@stuba.sk

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Distillation is considered one of the main separation and purification processes in industrial applications. It is widely used for separating different types of liquid mixtures. The energy efficiency of distillation columns is constantly advancing, to reduce the dependence on fossil fuels for heating these columns. Therefore, it is essential to address decarbonization in connection with distillation columns as well. In this work, we focused on the study of decarbonization of the distillation column used for the separation of a propane–propylene mixture, also known as a C3 splitter. Propane and propylene have similar boiling points and relatively high volatility, which results in high energy demands for their separation. C3 splitters usually operate at different pressure levels, with high-pressure columns (2 MPa) working in the conventional way, and low-pressure columns (1 MPa) usually operate with an integrated heat pump. The heat pump is used to recompress the overhead vapors, which provides heat through compression work and is subsequently used in the column reboiler. This study focused on several possible configurations of C3 splitters and their hydrocarbon footprint. It compares the decarbonization of different operational modes of the C3 splitter. In addition to comparing the amounts of emissions, an economic analysis was also performed based on the changes in energy prices, mainly for natural gas and electricity. This demonstrates, how the operating costs of different configurations of the C3 splitter would be affected by significantly fluctuating prices of enegies.

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