COMPARATIVE STUDY FOR CO2 ABSORPTION–DESSORPTION PROCESS BETWEEN SOLUTION OF MEA AND MDEA/PZ.

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Abstract

This work evaluated the energy performance and removal of CO₂, by comparing the use of MEA as base case versus the MDEA / PZ blending in aqueous solution. In addition a cost saving analysis between these alternatives has been done showing the positive effects of MDEA/PZ combination in typical absorption-desorption process.

Primary a absorption a column evaluation was developed through a theoretical mathematical model using 250 Y structured packing type with aqueous solution of MEA at 30% wt. The model served to learn the behavior in the absorption process with reaction.

The subsequent simulation work developed through the ASPEN Plus V8.4 Model RadFrac Rated Mode program for both the 30% wt MEA solution and the 10/20% wt MDEA / PZ solution, to study the CO₂ removal effects of the air mixture of 5000 Nm³/h with energy needs mainly through of the rate of reflux variation. In addition of energy demand effect evaluated, different types of contact devices inside the columns were, for closed cycle simulations. The process conditions inputs for the closed cycle were originated from an open cycle interaction results. The closed-loop interaction, with recirculation of the bottom stream of the desorption column plus some fresh amine, might be the most probably approach of real process regime. The close cycle interaction served for comparison of the efficiency of removal of CO₂, energy demand in desorption purposes and basis for the economical study presented in this work.

The results based on close cycle in terms of thermal energy demands and utilities cost saving between the base case with MEA solution process and MDEA/PZ for 97 % CO2 removal efficiency considered for both amine are presented in this study.