

EKC 316
Separation Process
Semester I 2020/2021
Integrated Design

Course Outcome

CO3: Synthesize the design strategies of advanced distillation based on short-cut method and residue/distillation curves.

CO4: Make effective engineering report on the design strategies in the unit operation sizing.

CO5: Work effectively in a team setting in deciding the design strategies in the sizing of unit operation.

Introduction

Propane dehydrogenation method produces mixture of propylene, hydrogen gas and unreacted propane. Propylene purification is carried out in distillation column where 95 wt. % of propylene gas is recovered as the top product. The separation is enhanced by the top stream is being condensed and refluxed into the column again. The bottom product, unreacted propane is recycled back to the feed stream. The distillation column is operated at 80 °C and 30 bar.

Based on the provided information and references, carry out the following task;

1. Perform mass balance analysis (based on stream table in Reference A) to achieve 99% recovery of propylene at the top stream of distillation column.
2. Review on the vapor-liquid equilibrium of the binary system of propylene and propane determined using different methods and experimental results reported in different references including NIST Database in Aspen Plus.
3. Determine the minimum number of plates, N_{min} and minimum reflux ratio, R_{min} of the distillation column using short cut method and Aspen Plus. Comment on the obtained results.

Prepare a technical report with proper format such as table caption, figure caption, citation, reference list and attachment that includes calculation sample and Aspen report. Peer review form must be submitted individually.