

UNIVERSITI TEKNOLOGI MARA

**EFFECTS OF REBOILER AND CONDENSER
BEHAVIORS DURING OVERFILLING OF
DEBUTANIZER COLUMN TO PRV SIZING**

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ABSTRACT

One of the most important operations during chemical and petrochemical processing was separation of liquids mixture into two or more components. This separation irregularly referred to fractionating column, fractional distillation or distillation column due to its ability to separate the mixture into its component part or fraction based on its differences in volatilities. Debutanizer column (de-butaniser) is part of the fractional distillation family. The target fraction unit for debutanizer column is to fractionation and produce butane products. Existence of overfilling during the process can affects plant performance, plant cost and environment. Overfilling or flooding is a condition where vapor flow is higher compare to liquid flow, thus liquid is unable to come down through down comer and happen if there any failure at the down comer of distillation column, where this event can cause overpressure in distillation column. Failure of down comer stream can occur when control valve (valve damage) at the bottom stream which is can't detect by control system of debutanizer column. Therefore, this work studies the effect of overfilling at thermosyphon reboiler and overhead condenser and its impact to PRV sizing for the debutanizer column profile which are phase flow condition, temperature and flowrate from its feed stream column and its importance for pressure relief valve sizing. The work was simulated using Aspen HYSYS simulation and manual calculation under four different debutanizer column profiles. From the result, it is a confirmed that each PRV has different in size, the mass flux are important subject in order to control PRV sizing.

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CHAPTER 1

INTRODUCTION

1.1 Background Study

Separation is “big business” in chemical processing due to its ability to separate one or more chemical mixture during the processing. The capital investment in separation equipments in chemical processing are higher compare to another which is took up to 40 until 50% of the total cost fluid processing unit (Chen & Lin, 2001). One of the separation equipments which is widely used in chemical industries in order to separate liquid and vapor is the distillation column. Distillation can be describing as a process or technique to separates two or more chemical components into an overhead distillate and also into bottom residue. The bottom residue product is in liquid phase, while the overhead distillate products are either in liquid, vapor or both phases (Azizi et. al., 2015). Other than that, distillation columns are one of the most important equipment in oil and gas industry due to its higher efficiency operation and higher economic performance. In order to determine the best design procedure of distillation column for rectifying troubleshoot, studies are still continuously required and been explored by researchers although art of distillation column has been practices for many years (Azizi et al., 2015).

There are many ways in which problems can affect distillation column performance and operation, one of the problems is overfilling. This is supported by Tham. (1997), which stated that the vapor, liquid and feed flow condition are main factor lead to performance and efficiency of distillation. Besides, another factor which is can contributes to performance of distillation column is the reflux condition, column diameter, state of trays and weather condition. He also added that, adverse from a flow condition can cause foaming, entrainment, weeping and flooding/overfilling. Overfilling in column is a condition where vapor flow is higher compare to liquid flow, and thus liquid is unable to comes down through downcomer (www.answer.com). In industries commonly overfilling called as flooding. An overfilling also affects the performance of parameters in reboiler, condenser and its downstream processes.