UNIVERSITI TEKNOLOGI MARA

THE OPTIMIZATION OF LNG DEHYDRATION PROCESS

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ABSTRACT

Natural gas is the one of the most important energy in this era. It being delivered to the consumers via pipelines by compressing the gas or liquefying the gas which is known as liquefied natural gas (LNG). Due to technical and economic reasons, LNG is more favourable process to transport the gas. Hydrocarbon contains water vapour since it is found deep in underground reservoirs at high temperature and pressure. This water vapour can form the hydrate and cause corrosion in pipelines. Therefore, this research is done to simulate a gas dehydration process and to optimize the parameters in absorption dehydration process. The parameters are the type of glycol used, the glycol flow rate, number of stages in absorber column, reboiler temperature and gas inlet temperature on glycol dehydration unit. The software used for this research is Aspen HYSYS. Based on the simulated data, the optimized parameters of dehydration process has been proposed. It is showed that triethylene glycol (TEG) is the most effective type of glycol followed by diethylene glycol (DEG) and ethylene glycol (EG). The higher the number of trays, the lower the amount of water content in the dry gas. Furthermore, the lower water content in the dry gas stream can be achieved by decreasing the temperature of the inlet gas of the absorption column. Results also shown that the higher the temperature of the reboiler the lower the water content of the natural gas stream. The optimum parameters of gas dehydration were at 12 number of stages with 200^{o}C reboiler temperature and 20^{o}C inlet gas temperature.

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TABLE OF CONTENT

CHAPTER ONE
INTRODUCTION

1.1 Research Background

Natural gas is one of the primary sources of energy in the world and expected to grow rapidly in the future. Since it yields lesser undesirable by products per unit energy compared to petroleum and coal, it can be categorized as clean source of energy. The generation of waste heat by a natural gas turbine to supply energy to a steam turbine is 60% efficient in natural gas combined-cycle power plants.

Natural gas is extracted by drilling wells through the geographic layers into the underground. There are two main types of natural gas in industry that are conventional and unconventional gas. Conventional gas exists in large permeable sandstone reservoirs and use traditional well drilling techniques to be extracted. However, unconventional gas exists in other places besides permeable sandstone reservoirs. It is typically extracted by horizontal drilling and hydraulic fracturing for the purpose of economic reasons (Jackson et al., 2013). Unconventional gas can be categorized into coal seam gas and shale gas. Coal seam gas exists in coal deposits 200 until 1000 metres underground. On the other hand, shale gas is produces in shale rock deposits and it requires deeper well to extract the gas.

Natural gas system consists of four segments which are production, gathering and processing, transmission and distribution. Production involves the activity of obtaining the raw natural gas by drilling into underground. Once the natural gas is extracted, it needs to be processed to remove the impurities and other hydrocarbons which are found in the natural gas to meet pipeline quality natural gas. On the other hand, transmission is where the natural gas is transports from the processing plant to the industrial end user. This process involves a wide network of high pressure pipelines. Then, the natural gas is distributed to the consumers such as the residential, commercial and industrial area by using the major pipelines.