UNIVERSITI TEKNOLOGI MARA

EFFECT OF DIFFERENT TEMPERATURE USING SAFETY ANALYSIS FOR POWER TO METHANOL PRODUCTION PLANT

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ABSTRACT

Global warming has become worst for the past 50 years due to the greenhouse effect. Carbon dioxide is the most important greenhouse gases that contribute to global warming. This emission of the CO_2 need to be reduces in order to preserve the Earth. There are strategies to reduce the emission of CO_2, for examples Carbon Captured and Storage (CCS) and Carbon Captured and Utilization (CCU). The example of CO_2 utilization is as the raw material to produce methanol. This methanol can be produced when CO_2 react with hydrogen where the H_2 can be produce in electrolysis of water. The limitation of this plant is that researchers had done the research on CO_2 captured producing methanol but they only focusing on the conversion and selectivity without consider the risk that might occur. Therefore, in this research project, the objectives are to design and simulate power to methanol production plant using different temperature in the reactor and to analyze the risk on the power to methanol production plant using different temperature in the reactor. The plant is designed using Aspen Hysys and the risk that being analyzed is toxicity, vapor cloud explosion and flash fire using Quantitative Risk Assessment (QRA). Threat zone were generated by ALOHA and being export to the MARPLOT to observe the area affected by the case study. It is found that plant 3 with pressure 442 bar and temperature 210^oC has the highest risk and the safest plant is plant 2 with pressure 76 bar and 280^oC.

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CHAPTER ONE
INTRODUCTION

1.1 Research Background

Global temperature has increase rapidly for the past 50 years (MacMillan, 2016). By definition, global warming means rises of Earth average atmospheric temperature makes the changes of the climate due to the greenhouse effect where greenhouse effect means heating phenomenon of the atmospheric that trap heat radiating from earth towards the space. Water vapor, carbon dioxide, methane and nitrogen oxide are the gasses that act as thermal blanket for the Earth absorbing heat and warm the Earth surface (Lallanila, 2016). The most important component of the greenhouse gases is the carbon dioxide.

In 2015, at the United Nations Climate Change Conference held in Paris, with the aim to reduce the temperature of Earth where the increase should not more than 2°C, 195 countries agreed on a plan to decreased the emissions of CO_2 and other greenhouse gases (Anderson, Hawkins, & Jones, 2016). As we burn fossil fuels, the concentration of CO_2 is increasing by years which will warm the planet and enhances the natural greenhouse effect (Anderson et al., 2016). In 2013, 58% of the human source of CO_2 is contributed by the burning of fossil fuels. Not only burn of fossil fuels, there is other source of CO_2 such as cement production and deforestation which comes from human activities. There are also natural sources of CO_2 that are decomposition, ocean release and respiration. Since the Industrial Revolution, the atmospheric concentration of CO_2 has been rose up extensively and reached the dangerous level (Levin, 2013). Although the human source of CO_2 is much smaller than the natural source, it has troubled the natural balance by adding extra CO_2 to the atmosphere.

Solution for this problem had been found that is energy efficiency renewable energy production and CO_2 capture and storage (CCS). CCS is an effective strategy to reach CO_2 mitigation targets while sustaining the source of energy supply. To make the CCS practicable, economic methods to capture CO_2 from flue gases of power plants and also to store the captured CO_2 is needed (Liu et al., 2012). In order to capture the CO_2, there must be methods of doing it. One of the most profound method is chemical