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SIMULATION OF CO_2 CAPTURE PROCESS USING DIFFERENT TYPE OF SOLVENTS

MOHAMAD HIDAYATUR RAHMAN
B MOHAMAD NAZIR

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ABSTRACT

High amount of carbon dioxide is not suitable for the Earth as it can cause various environmental problems such as greenhouse gas effect as well as rise of Earth temperature. This phenomena can cause the elevation of sea water level due to melt of iceberg in North Pole and South Pole. However, the amount of carbon dioxide gas can be reduced by capturing the gas by using absorption process. This research project used Aspen HYSYS V8.8 in order to simulate the absorption process that consist absorber tower. distillation column, heat exchanger and pump. The feed of flue gas come from coal power plant which is about 5.35 % of carbon dioxide. Blending of piperazine (PZ) and monodiethanolamine (MDEA) was used in this study as the solvent in capturing carbon dioxide. The solvent can be regenerated by using stripper column that generate heat from the boiler thus strip the carbon dioxide from solvent. From this simulation, 0.1 MDEA and 0.1 PZ with 0.8 of water composition was chose as the best solvent which can fully absorbed carbon dioxide present which was 7820.9508 kg/h. Later on, the absorber tower was tested with solvent temperature in range 40° C - 100° C. Increasing feed solvent temperature will reduce the CO_2 absorption capacity.

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CHAPTER 1
INTRODUCTION

1.1 Background Study

Carbon dioxide is a colourless and odourless gas with chemical formula CO_2. It is an important gas for plant to make photosynthesis process. The gas is needed for making foods for human and animals. Carbon dioxide emission both come from natural and human sources. Decomposition, respiration and ocean release were come from natural sources while for the human sources, it come from burning of fossil fuels, deforestation and cement production.

Due to the ever growing of industrial revolution, many waste that can pollute the environment is produced. Thus, many waste materials are produced which can pollute the environment. One of the major pollution is carbon dioxide emissions. Natural sources emission are much bigger compared with human sources however human sources have disturbed the natural balance that exist thousand years ago due to human activities (Denman et.al, 2007). Natural sinks absorbs the same amount of carbon dioxide (CO_2) that are released by natural sources which kept carbon dioxide balanced. However, due to CO_2 released from human sources, it disturbed the cycle.

Various method were reported to be used to capture the CO_2. Membranes, cryogenics, adsorption and absorption are commonly used in carbon dioxide treatment. In this research, absorption concept is the main interest. Absorption is a process to absorb desired gas or liquid into the absorbent. One of the advantages of this process is this process is that the solvent can be regenerated. However, rate of absorption are also depends on the pressure and temperature. Based on the literature, amines group is the most type of absorbent used in capturing the carbon dioxide gas. Amines is a compound with a nitrogen atom and a lone pair attached. It is derivatives of ammonia, NH_3. Replacement of hydrogen atoms with alkyl or aryl group gives different chemicals name and functions.