

**UNIVERSITI TEKNOLOGI MARA**

**PREDICTION OF CO<sub>2</sub> ABSORPTION  
CAPACITY OF MEA ABSORPTION  
SYSTEM IN THE PRESENCE OF HSS**

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## **ABSTRACT**

Heat Stable Salt (HSS) accumulation has a detrimental impact on amine system operations as it can reduce the effective capacity of the amine solution, contribute to corrosion and aggravate operational problems such as foaming, amine loss, and fouling. It was reported in a refinery; operational problems arise only when the HSS accumulate at high concentration especially at the absorber column. The main aim of this research is to study the effect on CO<sub>2</sub> loading in the rich amine coming out from the absorber. This is done with the presence of sulfate, acetate, and formate at different temperatures, pressures and HSS concentrations. MEA is chosen as the lean amine because it is the most common amine used in the industry. It is observed that the presence of HSS lowers the CO<sub>2</sub> absorption performance. Temperature and HSS concentration have significant effect on the CO<sub>2</sub> loading in the rich amine stream while there are almost no changes when pressure changes. By forecasting the parameter that affect the HSS in the absorber, mitigation measures can be taken at early stage to prevent these unwanted problems and reduce downtime for the HSS removal treatment.

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# **CHAPTER ONE**

## **INTRODUCTION**

### **1.1 OVERVIEW OF NATURAL GAS**

Natural gas is one of the most important non-renewable resource that fuels a country daily activity. The demand for natural gas has increase radically due to its combustible characteristic for domestic and industrial purposes. Malaysia is blessed with large gas reserves which hold for the 14<sup>th</sup> largest gas reserves in the world (Candiah, 2005). According to Malaysian Gas Association (2016), Malaysia's total natural gas resources are estimated to be 100.7Tscf that would last up to 40 years. Malaysia is highly dependent on natural gas as its main source of energy. Natural gas typically comprises of methane, ethane, carbon dioxide (CO<sub>2</sub>), hydrogen sulphide (H<sub>2</sub>S), nitrogen, and water (H<sub>2</sub>O). Natural gas is referred as sour gas when the sulphur content is high.

Natural gas needs to be treated for contaminants before it can be used for various task. H<sub>2</sub>S and CO<sub>2</sub> in natural gas are identified as contaminants that cause problems such as corrosion, erosion, health and environmental hazard. It is compulsory for all company to clean the natural gas. Not only mechanical problem but H<sub>2</sub>S is very dangerous to living organism as it can lead to death at high concentration. While CO<sub>2</sub> may disrupt the later gas processing, it can be used back for enhanced oil recovery (EOR). These contaminants can also poison the catalysts in the other processes. Furthermore, the natural gas would be more suitable and more uses after the gas sweetening process is done.

Natural gas usages are endless in this rising era such as fuel for vehicle, petrochemical plants, and even households use. To meet the high demand of clean natural gas, the acid gas removal units (AGRU) becomes compulsory to the oil and gas industry. AGRU as the name implied, works to remove these contaminants from the natural gas. By removing these contaminants, unwanted situation can be prevented in the further processing of natural gas. There are many type of acid gas removal processes