

**UNIVERSITI TEKNOLOGI MARA**

**THE STUDY OF MASS DIFFUSION IN COLD-  
FINGER EQUIPMENT DURING WAX DEPOSITION  
ANALYSIS**

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## **ABSTRACT**

### **STUDY OF MASS DIFFUSION IN COLD-FINGER EQUIPMENT DURING WAX DEPOSITION ANALYSIS**

Wax deposition occurs at many stages in the production of crude oil. Most of petroleum productions of every oil field exist in the form of water in oil emulsion. The present of interfacial barrier prevent coalescence of the dispersed water droplets. This is due to the present of asphaltenes and wax in crude oil. Wax deposition in surface and subsurface pipelines reduces the oil flow area, increases the friction loss and power costs. This situation may lead to higher pressure in the case of a re-start after transmission stop, and can even lead to wax solidification in the pipeline, resulting in great economy losses. The effective way to predict the amount of wax deposition in pipeline is chemical method. The experiment use laboratory device names cold finger equipment. From this analysis, the concentrations of the inhibitors are set to 500ppm, 1000ppm, 1500ppm and 2000ppm.

# CHAPTER 1

## INTRODUCTION

### 1.1 RESEARCH BACKGROUND

According to Investopedia crude oil is natural product which is petroleum product consist of hydrocarbon deposits and organic materials. Product such as diesel, gasoline, and various form of petrochemicals are from crude oil. Crude oil is nonrenewable resources. It is also known as fossil fuel because it cannot be replaced naturally. Crude oil is a complex mixture that is produced together with salted water to form stable emulsions (Fabiane G. Antes, 2016). The water produces is emulsified when fluid flow through pipes, forming emulsions that could stabilized by compounds naturally present in crude oil such as asphaltenes, resins, and solids (J.Djuve, 2001). Therefore crude oil is limited resources. Crude oil is very important resources in the world industry. It is become “source of industry”. Crude oil has been one of the highest demands in the world. Countries around the world usually imported large amount of crude oil. In 2015, United States imported 3.66 billion of crude oil, China 3.36 million tons, India 1.95 million tons, Japan 1.68 million tons and so on (Zhihua Ding, 2016). Oil price affect many aspect in every country around the world. It affected country’s economic development, social stability and the lives of its citizens (Zhihua Ding, 2016).

Wax deposition has become common problems in oil industry. Wax deposition occurred during crude oil production and transportation process and has brought economy losses around the world (Kaifeng Fan, 2015). According to KU Tertiary Oil Recovery Program, the composition of oil, velocity of fluid, temperature and pressure determine the wax deposition thickness. The wax will completely plug the flow or cause the whole pipeline to be stopped and cause economic loss in worst condition (Z. Huang H. L., 2011). The problem of wax deposition become more complex especially for long subsea pipelines as