CHAPTER I
INTRODUCTION

Recently, the amount of world's oil consumption is over the amount of world's oil production even in Thailand. In 2010 Thailand's oil consumption was around 35,187 kilo ton of oil equivalent (ktoe), while the crude oil production was around 7,411 ktoe. From Thailand energy statistics, the number of oil consumption is increasing every year resulting in more imported crude oil (Department of Alternative Energy Development and Efficiency, 2012). When conventional oil reserve is declined, heavy oil or residue oil that still stays in reservoir is become more interesting.

Nowadays the importance of heavy oil or residual oil is growing too fast when number of oil reserve is declining. A major obstacle to economic recovery of heavy oil is its high viscosity that makes it immobilize or difficult to mobilize at a reservoir condition. Anyhow, the viscosity of heavy oil can be reduced by injecting diluents which could be gases or light hydrocarbon. A technique that is used to recover heavy oil or residue oil from the reservoir is called tertiary recovery or enhance oil recovery (EOR). A decrease in heavy oil viscosity is also related to gas solubility of injected gas or mass transfer.

Diffusion coefficient plays an important role in recovery process. According to Fick's first law, diffusion coefficient is a screening criteria parameter of principle properties to calculate the rate of mass transfer especially diffusivity of gas-liquid system from one phase to another phase.

Experimentally, the methods which are used to determine diffusion coefficient can be categorized into conventional and unconventional methods. For a conventional method, it can be divided into direct and indirect method. This method is expensive and time-consuming because it requires compositional analysis (Sigmund, 1976; Upreti *et al.*, 2000). The unconventional method has several ways to determine diffusion coefficient and/or diffusion parameters, such as pressure decay method (Riazi, 1996; Zhang *et al.*, 2000; Tharanivasan *et al.*, 2006; Unatrakarn *et al.*, 2011), constant pressure dissolving gas volumes (CPDGV) (Renner, 1988; Jamialahmadi *et al.*, 2006) X-ray computed-assisted tomography

(Song *et al*, 2010), and dynamic pendant drop volume analysis (DVDPA) (Yang and Gu, 2005).

A main objective of this work was to determine diffusion coefficient of carbon dioxide (CO_2 - 99.99% purity) in Lan Krabue crude oil using a Parr reactor. The pressure decay method was used to measure pressure as a function of time elapses, and the gathered data were used to calculate the diffusion coefficient of CO_2 in Lan Krabue crude.