CHAPTER III

EXPERIMENTAL

3.1   Equipment and Chemicals

This work was done by using Parr reactor model 4576A to measure MMP and controlled the reactor temperature using controller model 4848. Carbon dioxide (CO_2) pressure outlet from CO_2 gas tank was controlled by a high pressure regulator (Morris Engineering Works LTD., USA) 0-1000 psi. Nitrogen (N_2) pressure outlet from N_2 gas tank was controlled by a pressure sensor (IFM Electronic GMBH., Germany) 0-36.3 psi. Petroleum samples were condensate API 63.9 from PTT exploration and production public company limited (PTTEP) and liquid hydrocarbon (n-decane purity 99.0 % from Sigma-Aldrich). CO_2 gas tank and N_2 gas tank with a purity of 99.99 % were supplied by Praxair Co.

3.2   Experimental setup

The pressure decay technique was used to determine MMP. Figure 3.1, A process consisted of the Parr reactor, reactor temperature controller, back pressure regulator, pressure sensor, solenoid valve, CO_2 gas tank and N_2 gas tank. The system measured the pressure in a Parr reactor by pressure transducer and temperature by thermocouple. The temperature in the Parr reactor was controlled by the reactor temperature controller which is heated by a heater and cooled by a water bath which the cooling water was flown in the cooling coil inside the reactor vessel. The reactor vessel capacity was 250 mL. The N_2 pressure was controlled by a pressure regulator (0-150 psi) and pressure sensor (0-36.3psi). The pressure of CO_2 was controlled by a pressure regulator (0-1000psi) and needle valve.
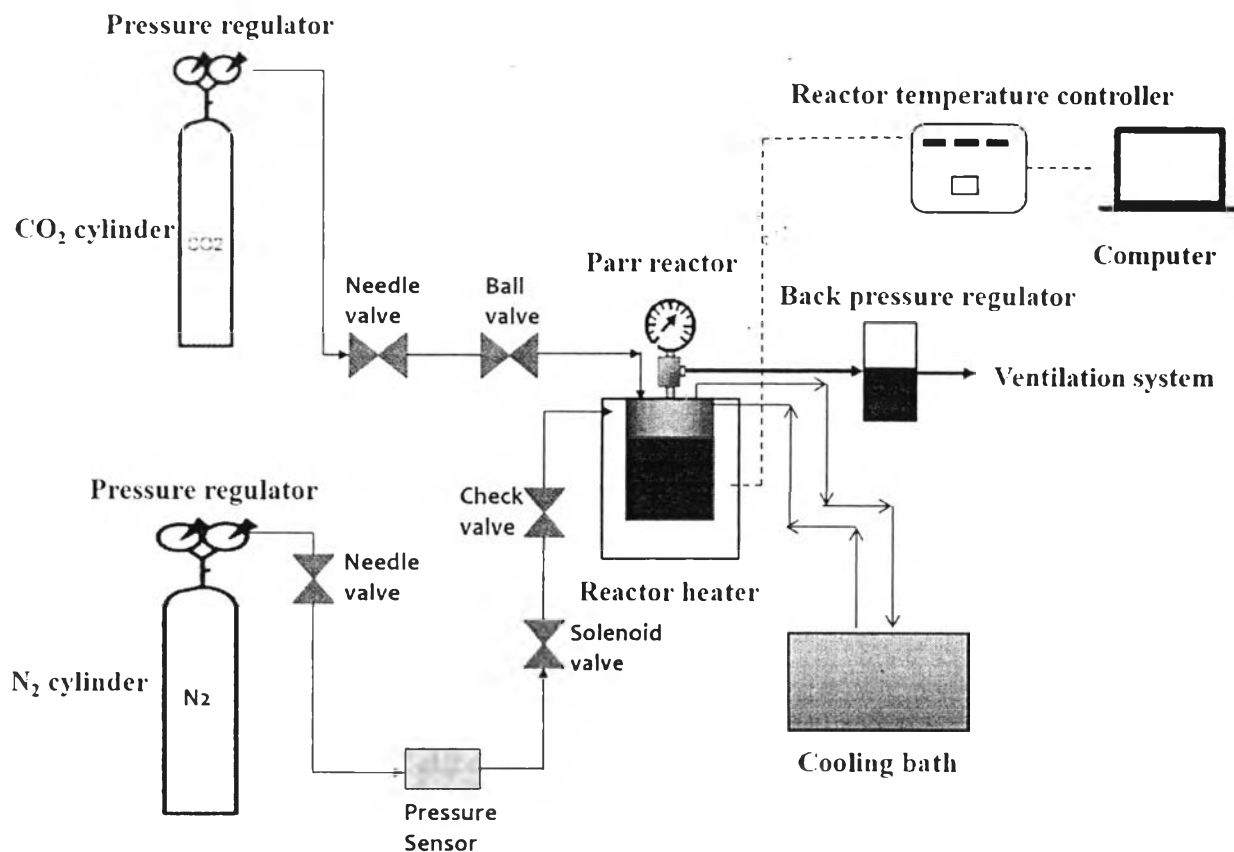
Figure 3.1 Schematic diagram of extraction experiment.

3.3 Pressure Decay Experiment Procedure

Mixed condensate and hexane by ratio 50:50 to decrease molecular weight of oil sample. Oil sample 100 mL was loaded into the Parr reactor and controlled temperature by cooler and heater (Figure 3.2). CO_2 was injected into the Parr reactor to pressurize the system, allowed 4 hours for condensate (MW 113.64), oil sample (MW 107.15) and 2 hours for n-decane to collect the data (Figure 3.4). Oil sample was changed in every experiment. For condensate and oil sample, the experiment was carried out at two different temperatures (20 °C and 30 °C), n-decane at 20 and 25°C. For the effect of gas impurity, pressure was set by the pressure sensor then injected N_2 gas into the Parr reactor (Figure 3.3), after that CO_2 was injected into the Parr reactor. The experiment was carried out at two different percentage of N_2 (1 % and 3 %) in CO_2 gas.

To determine MMP, in the first plotted pressure drop curve from total pressure drop was plotted against the initial pressure. The MMP point was the maximum point of the pressure drop curve.
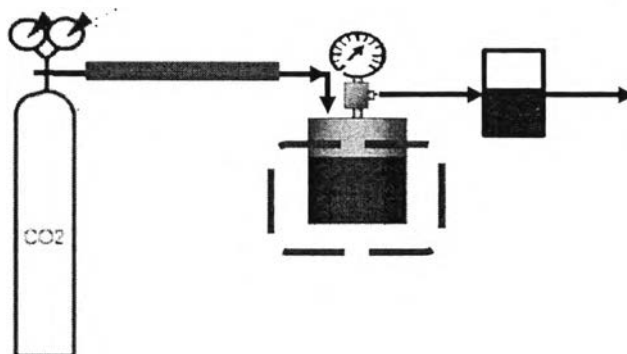

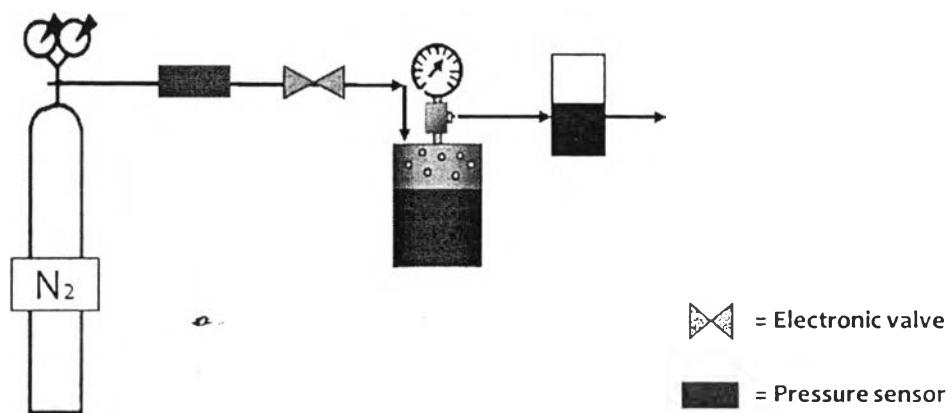**Figure 3.2** Oil sample (Condensate, Oil sample, n-decane) loading.
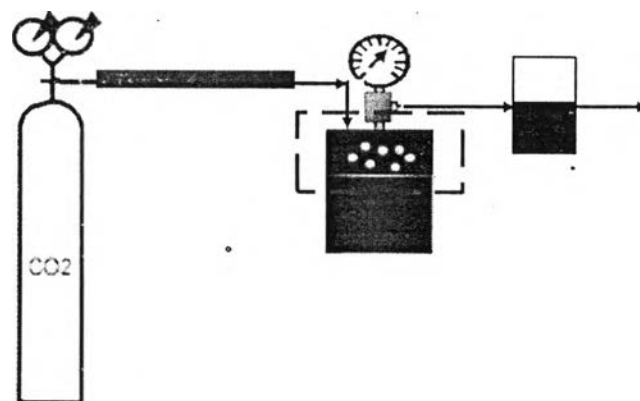

Figure 3.3 Nitrogen gas feeding in Parr reactor.

Figure 3.4 Carbondioxide gas feeding in Parr reactor.