

## CHAPTER 4

### EXPERIMENT

#### Experimental Equipments

The full set of experimental equipments are shown in figure 4.1. These equipments can be separated into two major parts.

##### 1. Percolation Column part.

This part consists of the following items.

1. Steel cloumn with 6 inch in diameter and 75 c.m. high which is wraped with insulator. The cloumn was packed with ceramic balls at the bottom and 5 litres in packed volume of bauxite on top. Twenty micron filter cloth were put in between bauxite and ceramic balls to separate bauxite particle from out going oil from the column. Sika Thermometer were put on the side of column connecting with the temperature probe located inside the column. Sampling valve and drain valve were fixed at the bottom. Re-circulating valve and pressure guage were put on the top.

2. "Blackmer" Vane pump modelXB-1 with capacity 28 litre per minute which drived by 2 horse power motor was used.

3. Two "Blue White" flow meters were put in between outlet of the pump and inlet of the steel column.

4. Steel wire supported plastic hose.

##### 2. Stirred heating tank.

The stirred heating tank was used to warm up the oil to experimental temperatures. It consists of the following items.

1. Sixt litres steel drum.

2. Two 3000 watt heating coils.

3. Thermocouple (MSK) Type K(ca),Model JB-30.

4. TBC Temperature controller range 0-200 C,model T-96B.

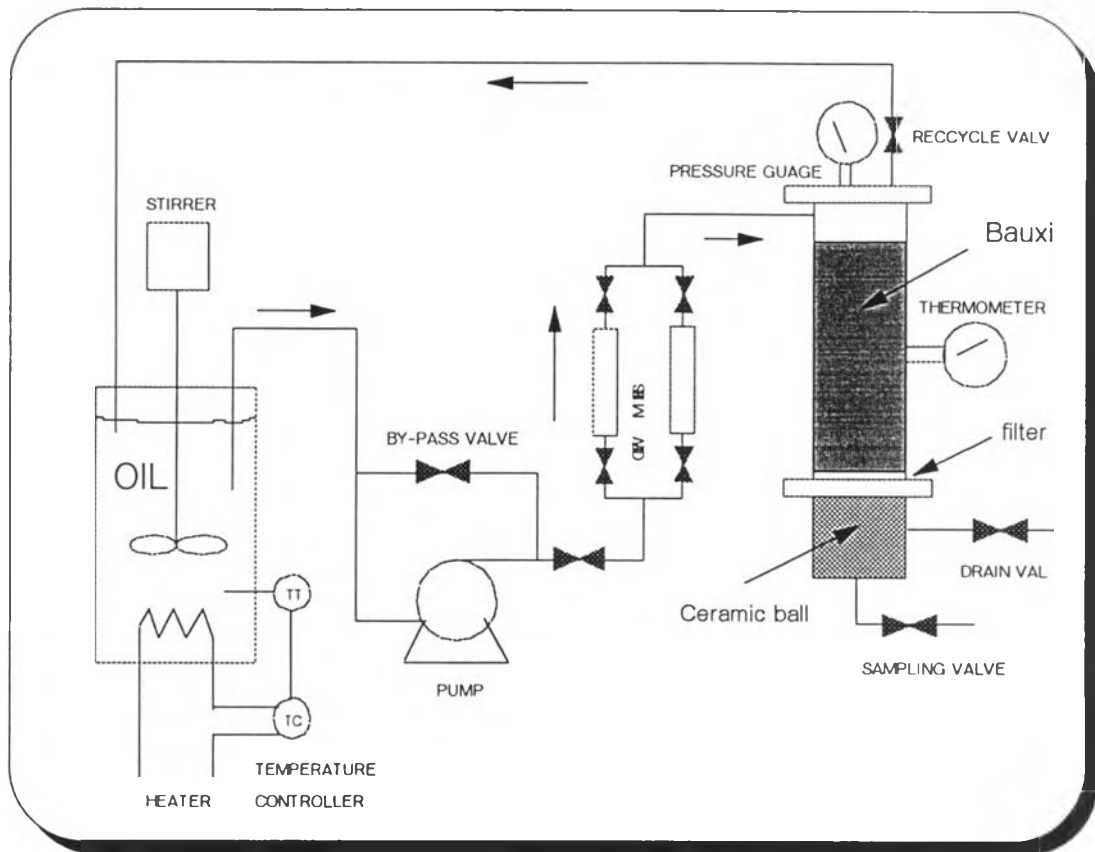


Figure 4.1 Laboratory Scale Percolation Column Equipment.

## Experimental Procedure

### 1. Experimental material and conditions.

1. Base oil used in experiment were 150 SN, 450 SN, 500 SN, and 600SN. Properties of these oils are shown in Table 4.1 .

2. Contact times were varied from 0,20,40,60,80,100 and 120 minute.

3. Temperature of feed oils were 60 C. and 100 C.

### 2. Procedure

1. Warm up the oil to be studied ,150 SN ,in the Stirred heating tank to 40 C and keep the temperature of oil to be constant by adjusting temperature controller.

2. Start pumping oil from the tank into the percolation column which re-circulating valve on the top is opened whilst drain valve and

sampling valve are closed. At this step air in the top space of column is removed via recirculating valve.

3. After the top space of column is filled up with the oil, close re-circulating valve and open drain valve immediately.

4. Adjust flowrate of oil to 250 ml./min. using by-pass valve of the pump.

5. Take 2 litre sample after oil flowrate has been kept constant for 15 minute.

6. Repeat section 4 and 5 but change oil flowrate to 125 ml./min., 83 ml./min., 63 ml./min., 50 ml./min. and 42 ml./min. respectively.

7. Repeat section 1 to section 6 but change oil temperature from 60 C. to 100 C .

8. Repeat section 1 to section 7 but change type of oil to 450 SN, 500 SN and 600 SN respectively.

9. Test all oil samples as mentioned in the next section.

Table 4.1 Physical and Chemical Properties of Base oils before Percolation Process

Test	150SN	450SN	500SN	600SN
Viscosity at 40 C.	33.52	89.15	96.87	123.70
Viscosity at 100 C.	5.37	10.46	10.91	12.47
Viscosity index	97.00	100.00	96.00	95.00
% Sulphure	0.46	0.55	0.29	0.35
% Aromatic	4.68	6.13	6.62	8.01
% Paraffinic	63.10	64.30	68.95	66.91
% Naphthenic	32.22	29.57	24.43	25.08
Color	1.00	2.00	L 3.0	L 1.5
Air release value @ 50 C.	3.00	8.00	6.30	6.80

### Test Methods and Test Equipments

After all oil samples were collected ,the properties of oils were tested using the methods and equipments shown in Table 4.2 .

Table 4.2 Test Methods and Test Equipments used for sample analysis.

Tests	Methods	Equipments/model	Appendix
Viscosity at 40 C	ASTM D445	ISL VH1 automatic houillon viscometer	Appx. A
Viscosity at 100 C	ASTM D445	ISL VH1 automatic houillon viscometer	Appx. A
Viscosity Index	DS 39B	ASTM viscosity index table	-
Sulphur content	ICP	ARL 3410+	Appx. B
Aromatic content	Brandes	Perkin-Elmer FTIR 1650	Appx. C
Paraffinic content	Brandes	Perkin-Elmer FTIR 1650	Appx. C
Naphthenic content	Brandes	Perkin-Elmer FTIR 1650	Appx. C
Air release value	IP 313	Stanhope Seta 15880-3 and 15850-3	Appx. D
Color	ASTM D1500	Stanhope Seta 1525	-