Chapter III

MATERIALS AND METHODS

A pilot oxidation ditch of the Department of Sanitary Engineering Chulalongkorn University was constructed of concrete with a total surface area of 3.70 m^2 and over-all depth of 0.60 m. was used in this study. Figure 3 shows a plan of the oxidation ditch giving important details.

An aeration rotor is mounted and driven by a $\frac{1}{2}$ horse power electric motor. A set of wheels and belts regulated the speed to 30, 45, 60, 80, 100 and 120 RPM.

As the shaft of rotor could not be moved in a vertical direction, the depth of immersion of the aeration rotor blade was adjusted by raising or lowering the level of water in the tank. This meant that the water volume varied from 1.55 m^3 to 1.75 m^3.

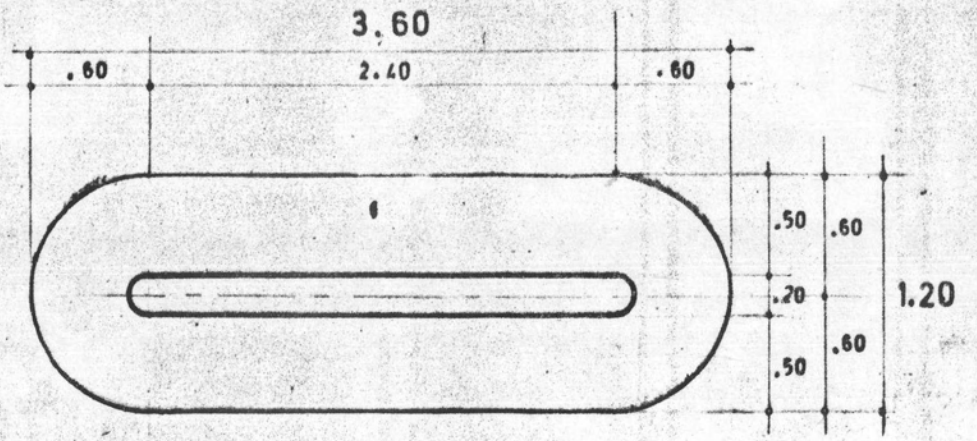
Rectangular Rotor No 1. was made of "perspex" (plastic) with 8 - 15 x 40 cm. blades was shown in detail in Figure 4. The overall outside diameter between tips of blades is 50 cm.

Rectangular Rotor No 2. had 6 rows of 5 x 23 cm. teak blades set 5 cm. apart and mounted on a 10 cm. diameter teak shaft. The overall outside diameter between tips of the blades is 56 cm. Figure 5 shows details of this rotor.

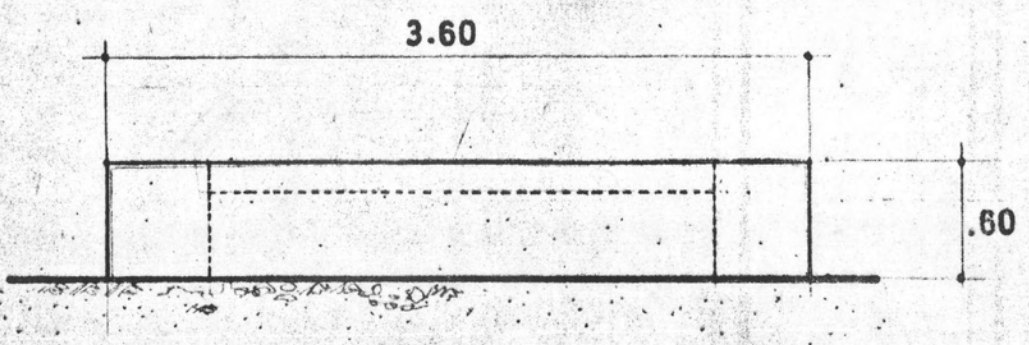
Rectangular Rotor No 3. had 10 rows of 1.25 x 25.0 cm. teak blades set 1.25 cm. apart and mounted on a 10 cm. diameter teak shaft. The over all outside diameter between tips of blades is 60 cm. Figure 6 shows details of Rotor No 3.

The overall length of these aeration rotors is the same and equal to 40 cm.

FIGURE 3 DETAIL FOR PILOT OXIDATION DITCH

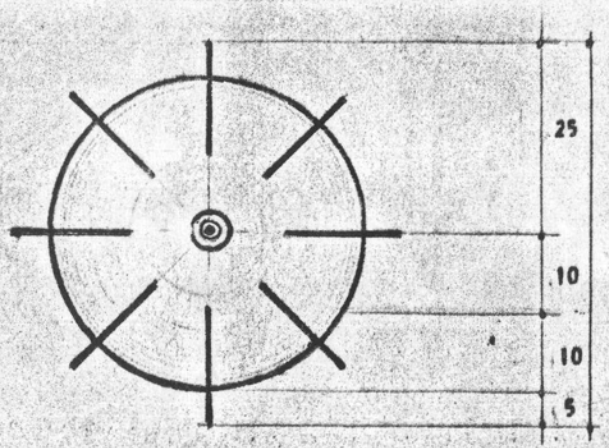


TOP DITCH 1:40

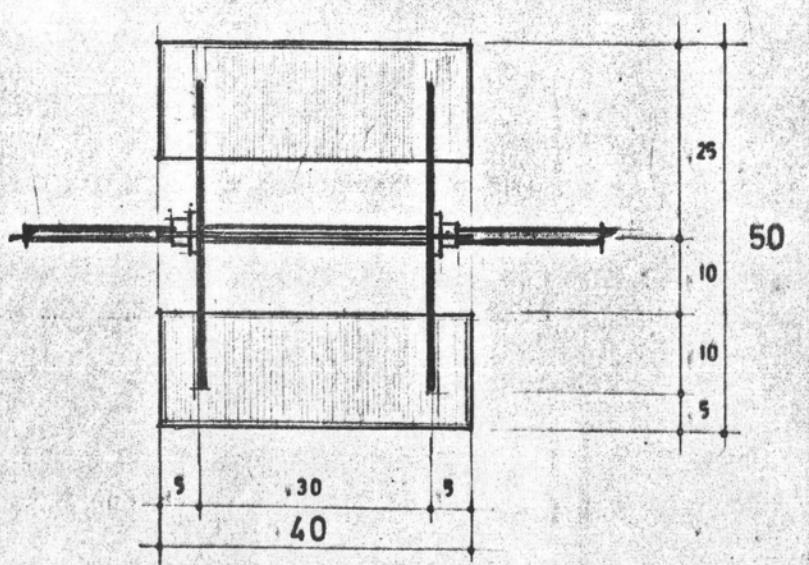


SIDE DITCH 1:40

FIGURE 4 DETAIL FOR RECTANGULAR ROTOR Nº 1



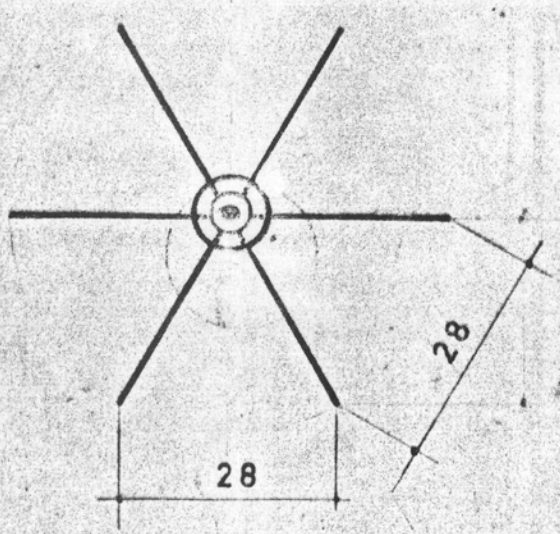
SIDE VIEW 1:10



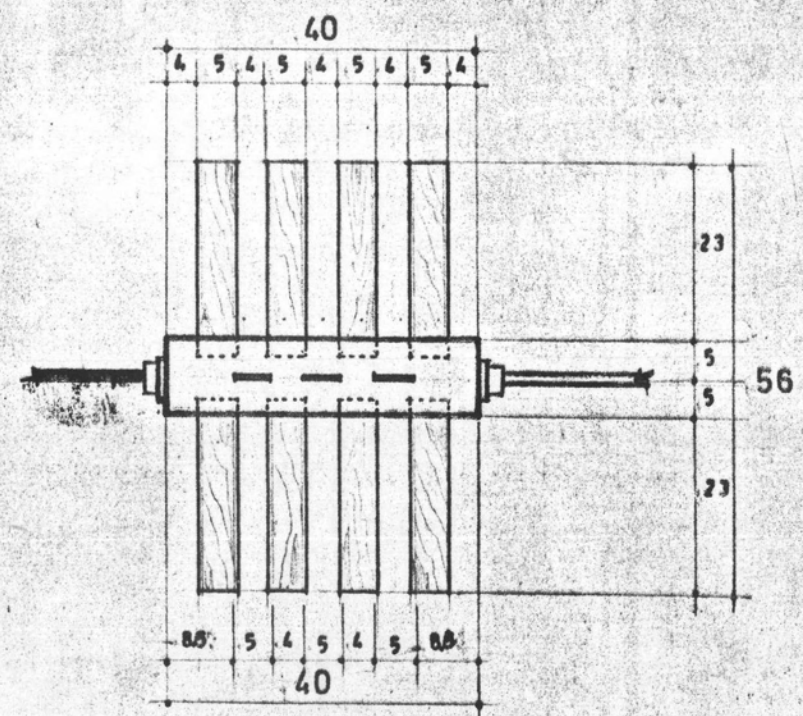
TOP VIEW 1:10

(UNIT IN C.M.)

FIGURE 5 DETAIL FOR RECTANGULAR ROTOR Nº 2



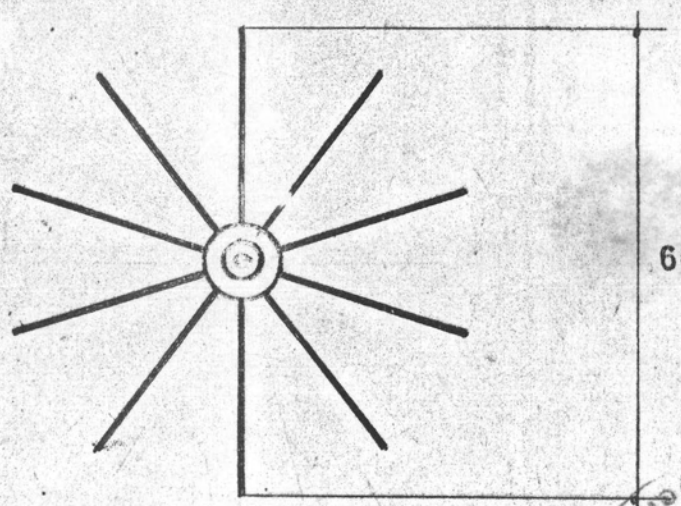
SIDE VIEW 1:10



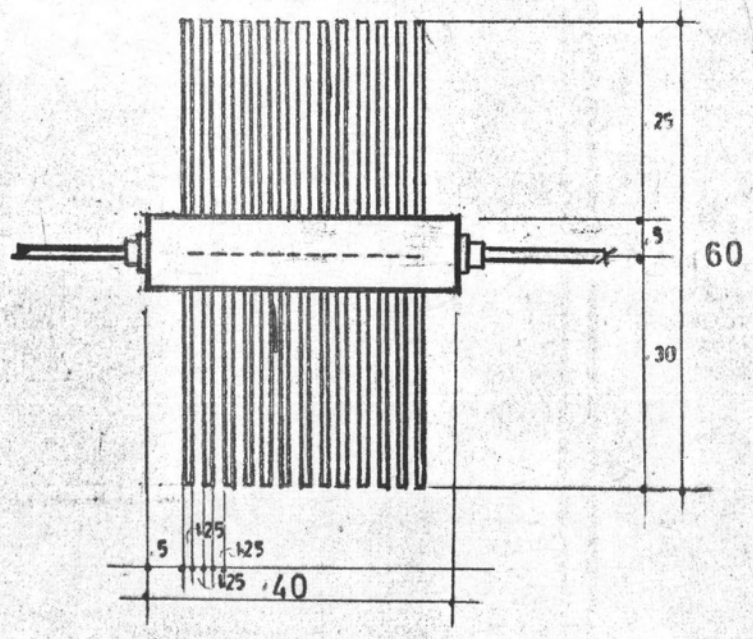
TOP VIEW 1:10

(UNIT IN C.M.)

FIGURE 6 DETAIL FOR RECTANGULAR ROTOR N2 3



SIDE VIEW 1:10



TOP VIEW 1:10

002418

(UNIT IN C.M.)

A "KYORITSU" Voltmeter-Ammeter and Weston Watt meter Model 432 were used in measuring the power consumption during the experiment.

The revolutions per minute of the rotor were checked by means of a "SMITHS" tachometer.

Tap water was introduced into the oxidation ditch before a scheduled experiment. The dissolved oxygen of the tap water in the aeration system(oxidation ditch with aeration rotor installed) was removed by means of sodium sulphite using cobalt chloride as a catalyst to slightly above 0.00 mg/L dissolved oxygen.

Detailed procedures followed in determination of overall oxygen transfer rate constant, K_{La}, during non-steady conditions were detailed below:

1. Remove the initial dissolved oxygen in the aeration system by adding sodium sulphite of about 7.88 mg/L per 1 mg/L of dissolved oxygen as suggested by Jones and his co-worker,(1969) and only 0.10 mg/L of cobalt chloride.

2. Thoroughly mix the ditch contents by use of aeration rotor or by means of a paddle when the rotor is set at 80 RPM or higher (which will introduce a high initial dissolved oxygen).

3. Sample for initial dissolved oxygen, C_L at t = 0 min. Two samples were taken using a BOD bottle with a rubber stopper provided with glass tubing to conduct the water to the bottom of the bottle and minimze oxygenation of the water sample by the air in the BOD bottle.

4. Start the aeration rotor at the desired operating rate sample for dissolved oxygen at fixed time intervals of 1,2,3,4,5,10... minutes or at least five samples before 90 percent oxygen saturation

of the water is reached as suggested by Eckenfelder (1966)

5. Record the temperature and measure power consumption.

6. Determine dissolved oxygen in water by Azide Alsterberg modification of Winkler method, as described in "Standard Method for Examination of water and Waste water" (APHA, AWWA, WPCF, 1970).

7. The Sample in this study were taken at about 10 cm. below the surface.