CHAPTER 5

CONCLUSIONS AND SUGGESTIONS FOR FUTURE WORKS

5.1 Conclusions

The measurements were performed on a 400 liters tank with surface aerator to investigate the effect of surfactant and power input on oxygen transfer coefficient (K_La). The results showed that, in clean water, the increase in the oxygen transfer observed for power input from 13.2 to 52.7 Watts/m^3 was due to the increasing of flow velocity. The addition of surfactant to clean water leaded to reduce the bubble size, increased the resistance to transfer and made the interface rigid. These also decreased the oxygen transfer coefficient. The experimental results of this study on surface aerator can be concluded as follows:

1. The oxygen transfer coefficients are influenced by the turbulent condition, the power input and the surfactant concentration.

2. The optimum values for oxygen transfer coefficients in the presence of surfactant with the variation of power input are different. The more power input creates greater agitation with resulting in greater turbulence, which leads to better mixing. The more power input introduces the more water expose into the air result in increasing the more oxygen transfer into water. From this reason, it also creates the more oxygen transfer from the gas phase to the aqueous phase.

3. For the smaller propeller (10.7 cm diameter), the difference of K_La values in each power input is less significant at 10 mg/L of surfactant concentration. Because at this concentration, the effect of surfactant is greater than the effect of power input in the range of this study. However, at 0 mg/L and 5 mg/L of surfactant concentrations, a significant difference in K_La values is observed. The effect of power input is enough to reduce

the effect of surfactant for these two surfactant concentrations. It can be concluded that at high surfactant concentration, the effect of surfactant, which reduces the efficiency of oxygen transfer, is greater than at low surfactant concentration.

4. For the larger propeller (15 cm diameter), the difference of K_La values in each power input is relatively identical at every surfactant concentration. It can be observed that the more turbulence caused by a larger propeller can reduce the effect of surfactant.

5. The experimental results can be demonstrated that the effect of surfactant reduces the efficiency of oxygen transfer process. The oxygen transfer coefficients decrease when increasing the surfactant concentration.

6. The relationship between K_La values as a function of surfactant concentration and power input can be mathematically expressed by fitting the experimental results as a linear line.

5.2 Engineering significance

For engineering application, this study can be used as a guideline to determine the optimum oxygen transfer.

K_La values for a practical range of surfactant concentration can be determined by using the proposed equations. The designing engineer can estimate the values of K_La to obtain the oxygen transfer rate of aerator. Then the required total power input can be calculated to meet the oxygen requirements in each condition. The scale up of the power input per unit volume can be used directly if the condition of the field such as tank geometry, type of aerator, and contaminant are similar to the experimental condition.

In the real situation, if the oxygen transfer is incorrectly underestimated, the cost will be greater. If the transfer rate is incorrectly overestimated, then the plant

will fail and the retrofit cost could be even greater. The power input to meet the optimum oxygen transfer can be determined and these problems can be reduced.

5.3 Recommendations for Future Works

For further research on study of oxygen transfer in water and wastewater, the following studies are recommended:

1. The effect of dispersion, characterization, foam formation, and volatilization of surfactant existing in water to oxygen transfer should be considered.

2. Further investigation into other chemicals that can affect the oxygen transfer should be determined to find the correlation between the contaminant to oxygen transfer.

3. The effect of reactor volume and tank geometry and different types of aerator on oxygen transfer should be considered.

4. Comparative study of the performance of a model and a pilot plant should be performed. The scale up should be done to confirm the result that can be applied in field condition.