CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Oily wastewater is composed of large amounts of organic compounds which have negligible solubility in water. In this study an oily wastewater was simulated from distilled palm oil and water. Preliminary studies on oil biodegradation reveal the process to be very slow. In order to improve the rate of degradation of organic compounds, pretreatment was carried out by using surfactant. In this research, the experiments were divided into 2 parts: solubilization, and biodegradation and biogas production. In the solubilization studies, the effect of a nonionic surfactant system on the solubility of oil was examined at various surfactant concentrations and reported as % enhanced solubilization and the ratio between the amounts of solubilized carbon with the amounts of nonionic surfactant as compared with the control (no addition of surfactant). For biodegradation and biogas production studied, the synthetic oily wastewater was treated in UASB reactor with a 16-liter working volume at an optimum temperature of 37°C and uncontrolled pH. A mixed bacterial culture obtained from Suksomboon palm oil Co. Ltd., Chonburi, Thailand, was applied to the reactor with 20 g/l of TSS. In this part, percent oil removal (measured as COD and oil content in % v/v), biogas production rate, and hydrogen content in the produced gas were the main parameters observed. Moreover, microbial growth was reported in term of MLSS.

In the solubilization studies, the result was found that the addition of surfactant greatly enhanced the solubilization of hydrocarbons in the oil. The enhancement of the hydrocarbon solubilization increased with increasing surfactant concentration and reached its maximum value at a specific concentration or optimal concentration well above the critical micelle concentration of each surfactant. Nevertheless, the nonionic surfactant system provided the best optimization on the solubilization of hydrocarbons in the oil at the concentration of 0.10% w/v which is equivalent to weight ratio of oil to surfactant of 18.8:1. The enhancement of the solubilization of

hydrocarbons was related to their water solubility, which nonpolar solutes are generally less soluble in the surfactant micelles than polar compounds.

In the biodegradation and biogas production studies, the effect of COD loading rate (10–80 kgCOD/m^3d) was first examined with the addition of nonionic surfactant concentration 0.10% w/v (which is equivalent to weight ratio of oil to surfactant of 18.8:1) and it was shown that the highest biodegradation, biogas production, and also H_2 production were achieved at 20 kgCOD/m^3d loading. Under these optimal conditions, 68.9% of COD removal and 89.9% of oil removal were achieved. Moreover, the H_2 content and the specific H_2 production rate were found to be 10.1% v/v and 0.22 m^3 H_2/m^3d, respectively. Lastly, the effect of surfactant on biodegradation and biogas production was observed and the results confirmed that surfactant can enhance the biodegradation and the biogas production.

5.2 Recommendations

The pH has the effect on the biodegradation and biogas production. This study did not control this parameter because of the difficulty to control mixing in the reactor. So reactor modification should be provided for further study. Moreover, for the real application the real oily wastewater should be applied.