CHAPTER 5

CONCLUSIONS

The performance of the SBR plant was observed under two operating conditions whereby the variable studied was the total cycle time of the SBR process:

- 8-hour cycle mode
- 6-hour cycle mode

The effluent quality of the plant was compared against standard effluent quality limits to determine the plant's performance in terms of reduction of BOD, COD, SS, ammoniacal nitrogen, nitrate nitrogen and phosphorus.

Influent and effluent wastewater quality data was collected for June-July 1999 (8-hour mode), August-October 1999 (6-hour mode) and November-December 1999 (revert to 8-hour mode).

The results show that the SBR performed well in terms of BOD, COD and SS which meet the specified limits under both operating conditions. Biological oxygen demand (BOD), chemical oxygen demand (COD) and suspended solids (SS) levels in the effluent wastewater from the SBR plant were consistently very good, complying with Standard B levels 100% of the time. BOD, COD and SS are the common and accepted parameters by which sewage treatment plants in Malaysia are judged in

terms of performance. Thus, this study has shown that the SBR system performs equally well under both 6-hour cycle mode and 8-hour cycle mode.

The more significant parameters to be observed in this study are the behaviour of biological nutrients under these two operating conditions.

From the results, it can be observed that the effluent quality in terms of ammoniacal nitrogen complied with the regulatory limits 100% of the time, with a treatment efficiency of between 92% and 99%, when the SBR plant was operated on 8-hour cycle mode. However, when the SBR plant was operated on 6-hour cycle mode, the system was only able to comply with the regulatory limits about 20% of the time, with a treatment efficiency of between 75% and 79%. Since ammoniacal nitrogen is known to be consumed during the aerobic phase, the low compliance level for the 6-hour cycle mode indicated that the time allowed for aeration was not sufficient for adequate nitrification of the ammoniacal nitrogen. Thus, it can be concluded that in order to achieve good ammoniacal nitrogen removal, the longer cycle time of 8-hours is necessary. This is because, the longer cycle time provides a much longer aeration time which is essential for nitrification to take place.

The laboratory results obtained for nitrate nitrogen concentration in the effluent was very good, with a compliance level of more than 95% at any time. Treatment efficiency of the system varied between 70% and 79%. In conclusion, good nitrate nitrogen levels in the effluent can be obtained under both operating conditions.

The laboratory results showed that the effluent quality in terms of phosphorus content was good (about 98% compliance and 88% efficiency) for the 8-hour cycle mode studied in June-July 1999. When the plant switched to 6-hour cycle mode, the compliance level for phosphate dropped drastically to about 20%, with treatment efficiency of about 66%. On reverting back to the 8-hour mode in November-December 1999, however, there was no reduction in phosphorus levels. Thus the performance of the plant in terms of phosphorus levels was variable. From literature survey, it is thought the SBR would require that a stabilisation period of at least three months for optimum phosphorus removal conditions.

It can be concluded from the study that, if the plant is operated under the 8-hour cycle mode, the SBR plant performs well both in terms of ammoniacal nitrogen, nitrate nitrogen and the conventional performance parameters (BOD, COD and SS). The performance in terms of phosphorus removal was variable.

The SBR plant provides excellent treatment performance for conventional parameters of BOD, COD and SS at both 6-hour and 8-hour cycles.