Abstract

In this research project a Sequencing Batch Reactor (SBR) plant was tested for performance in terms of Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), and Suspended Solids (SS), under different temporal conditions. In addition, the removal of biological nutrients, namely ammoniacal nitrogen, nitrate nitrogen and phosphorous in the form of phosphate, from the sewage, with anaerobic and aerobic operations using SBR was studied. 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; i.e. 8-hour cycle mode and 6-hour cycle mode. The effluent quality from the plant was compared against standard effluent quality limits to determine the plant's performance in terms of BOD, COD, SS, ammoniacal nitrogen, nitrate nitrogen and phosphate.

The BOD, COD and SS are the commonly accepted parameters by which sewage treatment plants in Malaysia are judged in terms of performance. The BOD, COD and SS levels in the effluent from the SBR plant consistently complied with Standard B effluent limits at all times. The compliance level for ammoniacal nitrogen, nitrate nitrogen and phosphorus was set at 5.0 mg/l, 10.0 mg/l and 2.0 mg/l respectively. For removal of ammoniacal nitrogen, treatment efficiency of over 90% and 100% compliance was recorded using 8-hour cycle mode, compared to a treatment efficiency from 76% to 79% with only 19% compliance using a 6-hour cycle mode. Since ammoniacal nitrogen is known to be consumed during the aerobic phase, 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 gave a compliance of more 88% at all times. The treatment efficiency recorded was between 73% and 80%. Thus, using a cycle time of 8-hours or 6-hours does not significantly affect the concentration of nitrates in the effluent. The study showed that removal of phosphorous or phosphate content was better using the 8-hour cycle mode (about 98% compliance and 89% removal efficiency) compared with the 6-hour cycle mode (approximately 20% compliance and 69% efficiency). However, the results obtained for the 8-hour cycle mode in November-December 1999 was gave a compliance level of only 10% with a treatment efficiency of 66%. It is believed that this was due to the insufficient period taken (1 to 2 months) to achieve stable conditions, which require at least 3 months.

In conclusion, the SBR plant performed well in terms of BOD, COD and SS removal under both 6-hour and 8-hour cycle modes. If biological nutrient removal to the proposed limits was desired, however, the SBR plant performed better when it was operated under the 8-hour cycle mode.