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ABSTRACT

SIMULTANEOUS REMOVAL OF ORGANICS AND NITROGEN FROM MACAU WASTEWATER USING SEQUENCING BATCH REACTOR

by

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The regulations for organics content in the effluent wastewater (40 mg/L BOD and 150 mg/L COD) currently in force in Macau are higher than those of many other developed regions. And what makes the situation even worse is that the nutrient components (e.g., various nitrogen and phosphorus compounds) of the effluent wastewater to be directly discharged into the open sea are not yet being monitored. Such effluent wastewater, without proper treatment in terms of organics and nutrients, would result in a lot of environmental problems which may take generations to resolve.

In this research, mixed liquor suspended solids collected from the Taipa wastewater treatment plant (WWTP) on Taipa Island in Macau, China, were seeded into a lab-scale sequencing batch reactor (SBR). Natural influent wastewater obtained from the said plant was pumped into the SBR for reaction. Different operational modes & lengths of reaction periods were tried, and measures to facilitate nitrification and denitrification were derived. Furthermore, effects of chloride concentration in the course of salinity period were explored.

Results showed the removal of ammonium-nitrogen was up to 95%, while that of organics, measured as COD, was up to around 80% in a 6-hour cycle and 95% in a 9.5-hour cycle. External carbon source, methanol in this case, did show a positive effect towards denitrification. A figure of less than 30 mg/L nitrate was commonly obtained in the effluent from the reactor. And the organics removal efficiency was not compromised after the addition of external carbon, that is, a figure of 85% removal efficiency was still maintained.

This study showed the effluent wastewater coming from the reactor met the regulations currently in force in Macau. In addition, the Taipa and Coloane WWTPs are at present being operated in a so-called "UNI-Tank" system, which is comparable to the SBR process. As a result, this research would gain a better insight into the practicability of modifying the existing running modes of the WWTPs to achieve simultaneous organics and nitrogen removal.