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Nitrification Efficiency and Community Structure of Municipal Activated Sewage Sludge

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Abstract : Nitrification is essential to biological processes designed to remove ammonia and/or total nitrogen. It removes the excess nitrogenous compound in wastewater which could be very toxic to the aquatic fauna or cause a serious imbalance of such aquatic ecosystem. Efficient nitrification is linked to an in-depth knowledge of the structure and dynamics of the nitrifying community structure within the wastewater treatment systems. In this study, molecular technique was employed for characterizing the microbial structure of activated sludge [ammonia oxidizing bacteria (AOB) and nitrite oxidizing bacteria (NOB)] in a municipal wastewater treatment with intention of linking it to the plant efficiency. PCR-based phylogenetic analysis was also carried out for. The average operating and environmental parameters, as well as specific nitrification rate of a plant, was investigated during the study. During the investigation, the average temperature was 23±1.5oC. Other operational parameters such as mixed liquor suspended solids and chemical oxygen demand inversely correlated with ammonia removal. The dissolved oxygen level in the plant was constantly lower than the optimum (between 0.24 and 1.267 mg/l) during this study. The plant was treating wastewater with the influent ammonia concentration of 31.69 and 24.47 mg/l. The influent flow rates (ML/day) was 96.81 during the period. The dominant nitrifiers include: Nitrosomonas spp. Nitrobacter spp. and Nitrospira spp. The AOB had a correlation with nitrification efficiency and temperature. This study shows that the specific ammonia oxidizing rate and the specific nitrate formation rates can serve as a good indicator of the plant overall nitrification performance.

Keywords : Ammonia monooxygenase α-subunit gene, amoA, ammonia-oxidizing bacteria, AOB, nitrite-oxidizing bacteria, NOB, specific nitrification rate
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