

Investigation of Wood Chips as Internal Carbon Source Supporting Denitrification Process in Domestic Wastewater Treatment

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Abstract : Nitrogen removal from wastewater is accomplished by nitrification and denitrification processes. Successful denitrification requires carbon, therefore, if placed after biochemical oxygen demand (BOD) and nitrification process, a carbon source has to be re-introduced into the water. To avoid adding a carbon source, denitrification is usually placed before BOD and nitrification processes. This process however involves recycling the nitrified effluent. In this study wood chips were used as internal carbon source which enabled placement of denitrification after BOD and nitrification process without effluent recycling. To investigate the efficiency of a wood packed aerobic-anaerobic baffled reactor on carbon and nutrients removal from domestic wastewater, a three compartment baffled reactor was presented. Each of the three compartments was packed with 329 g wood chips 1x1cm acting as an internal carbon source for denitrification. The proposed mode of operation was aerobic-anoxic-anaerobic (OAA) with no effluent recycling. The operating temperature, hydraulic retention time (HRT), dissolved oxygen (DO) and pH were 24 ± 2 °C, 24 h, less than 4 mg/L and 7 ± 1 respectively. The removal efficiencies of chemical oxygen demand (COD), ammonia nitrogen ($\text{NH}_4\text{-N}$) and total nitrogen (TN) attained was 99, 87 and 83% respectively. TN removal rate was limited by nitrification as 97% of ammonia converted into nitrate and nitrite was denitrified. These results show that application of wood chips in wastewater treatment processes is an efficient internal carbon source.

Keywords : aerobic-anaerobic baffled reactor, denitrification, nitrification, wood chip

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