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Sewage treatment using an integrated system consisting of anaerobic hybrid reactor (AHR) and downflow hanging sponge (DHS)

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ABSTRACT

This paper presents an evaluation of a combined wastewater treatment train consisting of an anaerobic hybrid reactor (AHR) followed by a downflow hanging sponge (DHS) system. The combined system was operated at a total constant hydraulic retention time (HRT) of 8 h (AHR: 6.0 h and DHS: 2.0 h) and an average organic loading rate of 1.9 kg COD/m^3.d for AHR and 2.1 kg COD/m^3.d for the DHS. The combined system was able to remove 95 and 89% of the BOD_{5total} and COD_{total} with residual values in the final effluent of only 10 and 49 mg/L, respectively. Ammonia concentration was reduced by 83%. The geometric mean of faecal coliform count was reduced by 4.7 log_{10}. Residual count in the final effluent ranged from 10^2 to 10^3 MPN/100 ml. Average concentration of trapped biomass amounted to 20 g VSS/L of sponge volume. The SRT of DHS system was 121 d. Calculated average sludge yield coefficient for the DHS system was 0.08 g TSS/g $COD_{removed}$. Analysis of wastewater samples collected at the outlet of each segment along the DHS revealed that most of the organic matter, as expressed by the COD fractions values is removed in the 1st and 2nd segments of DHS system. This was followed by nitrification in the next two segments.

Keywords: Sewage treatment; AHR; DHS; Nitrification; Faecal coliform

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