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Authors: Kundan Samal, Rajesh Roshan Dash, Puspendu Bhunia



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Effect of hydraulic loading rate and pollutants degradation kinetics in two stage hybrid macrophyte assisted vermifiltration system

Kundan Samal^a, Rajesh Roshan Dash^{a,*}, Puspendu Bhunia^a

^a School of Infrastructure, Indian Institute of Technology Bhubaneswar, 752 050, Odisha, India

^{a,*} Corresponding Author

Assistant Professor, School of Infrastructure, Indian Institute of Technology Bhubaneswar, Odisha, 752 050, India

Email: rrdash@iitbbs.ac.in, Phone: + 919439864561

RESEARCH HIGHLIGHTS

- Effect of HLR on performance of two stage hybrid MAVF has been evaluated.
- First order kinetics and theoretical OTR of the reactors have been calculated.
- Comparison of results has been done with previously reported MAVF data.
- Growth of *Canna indica* and population growth of *Eisenia fetida* have been analysed.

Abstract

Three cylindrical vertical flow (VF) (1st stage) and three horizontal flow (HF) vermifilters (2nd stage) were designed and planted with *Canna indica* to study the effect of HLR. The vermifilters were loaded (to VF) with synthetic dairy wastewater at three HLRs of 0.3, 0.6 and 0.9 m d⁻¹ and operated for 100 days. Removal rate constants were higher at HLR 0.6 m d⁻¹ and the value of K_{BOD5}, K_{COD}, K_{NH4+-N}, K_{TN}, K_{TP} (for VF+HF unit) were 0.51, 0.41, 0.32, 0.23, 0.26, respectively. Efficiency of VF reactor were higher than HF reactor in case of all types of pollutants. The average removal of BOD₅ was found to be 90.43 % at HLR 0.3 m d⁻¹ and 85.75 % at HLR 0.6 m d⁻¹, while for COD it was found to be 85.59 % and 79.64 %, respectively. In the present study, the overall theoretical oxygen transfer rate (OTR) for HLR 0.3, 0.6 and 0.9 m d⁻¹ (VF+HF unit) were

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