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Modified cesspool system with upflow sludge tank and low-cost photobioreactor treating blackwater

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ABSTRACT

Cesspool system is widely used for household's blackwater treatment in developing countries. Typically, this is a biological treatment process under anaerobic condition, which results in unsatisfactory effluent quality. Effluent or liquid from cesspool system normally seeps into surrounding soil in turn causes groundwater contamination. In this modification, blackwater was treated by a series of upflow sludge tank, photobioreactor and cesspool tank. In the photobioreactor, symbiotic relationship between algae and bacteria was found under aerobic condition, in which the oxygen produced was consumed by bacteria to degrade organics and others. The modified system could achieve much higher removal efficiency than the existing cesspool or the septic tank. In the series of upflow sludge tank and photobioreactor tank of lab-scale experiments with the 2 d of hydraulic retention time, the average effluent chemical oxygen demand concentration was about 120 mg/L, which could possibly meet the effluent standard of Thailand. The flushing effect should be considered for the application in realistic condition. This modification system could be a promising low-cost technology to enhance treatment performance of cesspool system.

Keywords: Blackwater; Cesspool; Photobioreactor; Upflow sludge tank

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