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In-Situ Sludge Minimization Using Integrated Moving Bed Biofilm Reactor for Industrial Wastewater Treatment

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Abstract : The management and secure disposal of the biosludge generated from widely commercialized conventional activated sludge (CAS) treatments become a potential environmental issue. Thus, a sustainable technological upgradation to the CAS for sludge yield minimization has recently been gained serious attention of the scientific community. A number of recently reported studies effectively addressed the remedial technological advancements that in monopoly limited to the municipal wastewater. Moreover, the critical review of the literature signifies side-stream sludge minimization as a complex task to maintain. In this work, therefore, a hybrid moving bed biofilm reactor (MBBR) configuration (named as AMOMOX process) for in-situ minimization of the excess biosludge generated from high organic strength tannery wastewater has been demonstrated. The AMOMOX collectively stands for anoxic MBBR (as AM), aerobic MBBR (OM) and an oxic CAS (OX). The AMOMOX configuration involved a combined arrangement of an anoxic MBBR and oxic MBBR coupled with the aerobic CAS. The AMOMOX system was run in parallel with an identical CAS reactor. Both system configurations were fed with same influent to judge the real-time operational changes. For the AMOMOX process, the strict maintenance of operational strategies resulted about 95% removal of NH4-N and SCOD from tannery wastewater. Here, the nourishment of filamentous microbiota and purposeful promotion of cell-lysis effectively sustained sludge yield (Yobs) lowering upto 0.51 kgVSS/kgCOD. As a result, the volatile sludge scarcity apparent in the AMOMOX system succeeded upto 47% reduction of the excess biosludge. The corroborated was further supported by FE-SEM imaging and thermogravimetric analysis. However, the detection of microbial strains habitat underlying extended SRT (23-26 days) of the AMOMOX system would be the matter of further research.

Keywords : tannery wastewater, moving bed biofilm reactor, sludhe yield, sludge minimization, solids retention time
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