Moving bed biofilm reactors (MBBRs) for removal of pharmaceuticals in biological wastewater treatment

Torresi, Elena; Polesel, Fabio; Smets, Barth F.; Andersen, Henrik Rasmus; Plósz, Benedek G.; Christensson, Magnus

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MBBR for removal of micropollutants

Micropollutants (MPs) are recalcitrant chemicals (i.e., pharmaceuticals, illicit drugs, hormones and personal care products) that are found in wastewater effluents at ng/L to µg/L concentration range.

Moving Bed Biofilm Reactors (MBBRs) have recently been deployed as a core unit process in conventional staged A2B processes to enhance the elimination of pharmaceuticals during activated sludge treatment (Chhetri et al., 2011; Falås et al., 2012; Hapeshi et al., 2013; Torresi et al., 2016).

Three different operations of MBBR

MBBR 1: Pre-denitrification

The pre-denitrifying MBBR is designed to offer maximum treatment capacity, especially during low wastewater flows or in stormwater treatments. The reactor is typically operated in the anoxic mode, allowing for biological denitrification of nitrate and nitrite to dinitrogen (N₂).

MBBR 2: Nitrification

The nitrifying MBBR is designed to enhance the removal of nitrite and nitrate to form nitrate (NO₃⁻) and then to ammonia (NH₄⁺). The reactor is typically operated in the aerobic mode, allowing for biological nitrification of ammonia to nitrate.

MBBR 3: Post-denitrification

The post-denitrifying MBBR is designed to complete the nitrogen cycle by denitrifying nitrate back to dinitrogen (N₂). The reactor is typically operated in the anoxic mode, allowing for biological denitrification of nitrate and nitrite.

Comparison with CAS

Anoxic-Kaldnes CAS systems with the goal of biologically treat wastewater under anaerobic conditions have been used for decades to enhance the removal of several micropollutants (methanol and ethanol) influences denitrification and removal of MPs.

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References


Contact information

Technical University of Denmark

Elena Traimou, Veolia Water Technologies AB, AnoxKaldnes, Lund, Sweden

Veolia Water Technologies AB, AnoxKaldnes, Lund, Sweden