



Anaerobic biodegradation of personnel care products (PCPs) wastewater in an up-flow anaerobic sludge blanket (UASB) reactor

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ABSTRACT

The influence of transient changes in influent organic loading rate (OLR) on process stability of up-flow anaerobic sludge blanket reactor (UASB) reactor treating personnel care products (PCPs) wastewater was investigated at constant hydraulic retention time (HRT) of 24 h. The OLR of the reactor was increased stepwise from 1.49 to 4.0 kg COD m⁻³ d⁻¹. The chemical oxygen demand (COD) removal efficiency and methanogenesis process was increased from 40 to 68.7% and from 52.6 to 54.7% with increasing OLR from 1.49 to 2.9 kg COD m⁻³ d⁻¹, respectively. Nevertheless, increasing the imposed OLR from 2.9 to 4.0 kg COD m⁻³ d⁻¹ caused a considerable reduction in the COD removal efficiency (45%) and methanogenesis process (38%) implying that the UASB reactor was overloaded. In a subsequent experiment; the UASB reactor was operated at optimum OLR of 2.5 kg COD m⁻³ d⁻¹ and a HRT of 24 h for a period of 156 days. The UASB reactor achieved a removal efficiency of 65% for COD_{total}; 60% for COD_{soluble}; 71.2% for TSS and 57.3% for oil and grease. Moreover, 0.3391 CH₄ g COD depleted⁻¹ d⁻¹ was produced. Accordingly, it is recommended to apply such a system at an OLR not exceeding 2.5 kg COD m⁻³ d⁻¹ and a HRT of 24 h.

Keywords: Personnel care products (PCPs); UASB; COD; Methanogenesis; Biodegradability

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