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FACTORS AFFECTING BIOLOGICAL SULPHATE REDUCTION IN TANNERY WASTEWATER TREATMENT

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Abstract

A pilot scale Upflow Anaerobic Filter (UAF) treating tannery wastewaters was operated for 160 days. The UAF was fed with low COD/SO_4^{2-} ratio (SO_4^{2-} = 1810 mg L^{-1}, COD_{total} = 2530 mg L^{-1}) for the investigation of sulphate and COD removal as a function of substrates limitation and ammonia and sulphide inhibition. Sulphate-reducing bacteria (SRB) out-competed methanogenic bacteria due to the low influent COD/SO_4^{2-} ratio, the high concentration of sulphide and the presence of inhibiting compounds in tannery wastewater. An average sulphate removal of 53% and an average COD removal of 42% were obtained. Ammonia and sulphide concentrations were found to play a major role in the process, and their effect was quantified. A simplified mathematical model was calibrated under semi-steady conditions and no substrate limitation, and used to describe sulphide and ammonia inhibition. Half-inhibition constants for ammonia (K_{NH4}) and sulphide (K_{HS}) of 180 mg L^{-1} and 480 mg L^{-1}, respectively, were obtained. No improvements of the biodegradability between the untreated tannery wastewater and the UAF effluent were observed through respirometric tests.

Key words: ammonia inhibition, hydrogen sulphide, sulphate reduction, tannery wastewater, upflow anaerobic filter

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