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Evaluation of biofouling phenomenon in suspended and attached growth membrane bioreactor systems

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Abstract

This article aims to examine fouling mechanism in attached and suspended growth membrane bioreactors (MBR) for three different biomass concentrations of 6, 10, and 15 g/L of MLSS. Laboratory scale experiments were conducted with two different sets of submerged MBRs: suspended (without media) and attached growth (with moving media) MBRs. The media used in the attached growth system was cylindrical polypropylene rings having outer and inner diameters of 4 mm and 3 mm, respectively, and a nominal density of 1.001 kg/m^3. Synthetic domestic wastewater was fed to the reactors at 2 h HRT and 500 mg/L COD. The biofouling phenomenon in the reactors was monitored by changes in transmembrane pressure (TMP) as a function of operating time. It was found in both reactors that the increase in fouling was associated with increasing MLSS concentration. However, the presence of moving media in the attached growth reactor could reduce the membrane fouling. The fouling mechanism that was proposed in the attached growth reactor was associated with the suspended and colloidal particles combination as a result of the movement of the media in the attached growth reactor. Thus, in biofouling along with EPS formation, particle size distribution plays a predominant role.

Keywords: Fouling mechanism; Membrane bioreactor (MBR); Attached growth; Suspended growth.

1. Introduction

At present, there has been growing interests in the use of attached growth systems (biofilm processes) which are related to biomass growth on support media [1,2]. The advantages of the attached growth systems over conventional activated sludge process (CAS) include better oxygen transfer, high nitrification rate and biomass concentrations, more effective organic removal, and relatively

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