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Removal of Phenol under Aerobic Conditions by a Hollow Fibre Membrane Bioreactor

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Extended Abstract

Phenols, which are the member of the class of aromatic compounds, are among the most important pollutants taking place in industrial waste waters. Wastewaters including phenols and phenolic compounds must be treated, not to be a threat with human health and not to lead to the serious ecological risks. Several methods with different removal performance and cost levels are available for the treatment of phenolic wastewaters. Commonly used ones are adsorption,chemical oxidation and biological treatment processes.[1,2]

A bioreactor integrated to a membrane module system is usually referred as membrane bioreactor (MBR). The advantages of a MBR are high biomass concentrations producing a higher rate of removal of BOD and COD, a smaller excess sludge production and the production of solids free water [3,4]]

In this study the removal of phenol, an important industrial pollutant, was investigated in a cross-flow membrane bio-reactor. The volume of the reactor operated under aerobic conditions and in continuous regime was 1.9 L. Biomass used in the study was taken from the aeration tank of Wastewater Treatment Plant in Erzincan city and acclimated to the medium including phenol. During the study, temperature and pH were kept constant at about 26±1ºC and 6-7, respectively while solid retention time (SRT) was maintained to be 20 days. Phenol loading rates changing between 0.36-7.2 g/day were applied to the reactor, and removal efficiencies varying between 51 and 99% were obtained depending on these loading rates. Changes in MLSS with increasing phenol concentrations were observed. For hydraulic retention time (HRT) of 6.3 h, phenol load of 7.2 g/day was removed as efficiently as 99%. After that HRT was reduced to 3.2 h, but removal yield was found to remain constant in spite of the same phenol loading. It was also determined that suspended solids (SS) was consistently increasing until the maximum loading value reached up to the phenol concentration of 500 mg/L and the phenol load of 7.2 g/day. Concentration of sludge was found to decrease in two successive days following that value. Removal yield also decreased and this loading was paused at a yield rate of approximately 53%. A hydraulic retention time of 3.2 h, which was applied for the load of 7.2 g/day, was also applied for the loading value of 5.04 g/day and yield was estimated to be around 51%[5]

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