

Submerged Plate Membrane Module for Membrane Bioreactors (MBR)

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Introduction

A membrane bioreactor (MBR) is a waste water treatment process combining membrane filtration with biological treatment. This innovative technology offers several advantages over the conventional activated sludge process. Among these advantages are higher biomass concentration, elimination of the settling unit (small foot print) and improved water quality. One problem in MBR processes is the fouling of the membrane, which in many cases is suppressed by frequent chemical cleaning. Since chemical cleaning causes a lot of problems (additional costs, stand still of the plant, formation of chlorinated hydrocarbons), in this work only aeration and short pauses were used to prevent fouling of the membrane.

Experimental Set Up

The biological treatment took place in a 6 m³ reactor with a biomass concentration of 12 g/l. Incoming water was mechanically pretreated waste water from the municipal water treatment plant at Gießen (Mittelhessen). Plate modules from Weise Water Systems (Micro Clear) were used in the filtration unit. The membrane used is an ultrafiltration membrane made of PES with 150 kD cut off (approx. 0,05 µm pore size). Each module contains 24 parallel membrane plates with a distance of 5,5 mm to each other and a surface area of about 3,5 m².

Results

In fig. 1 flux and permeability are shown over time. A decrease in flux from about 30 to 20 l/m² h can be observed over a period of about 9 months. However a flux of 20 l/m²h or a permeability of 200 l/m²h bar respectively is still a high value, considering that no chemical cleaning was used. So it seems possible to run an ultrafiltration unit in a MBR over a long period without chemical cleaning and still have a high permeability. During the experiments the aeration volume for membrane cleaning (per module) was reduced from 10 m_N³/h to 6 m_N³/h and pauses from 1 min every 9 minutes to 15 seconds every 4,75 minutes.

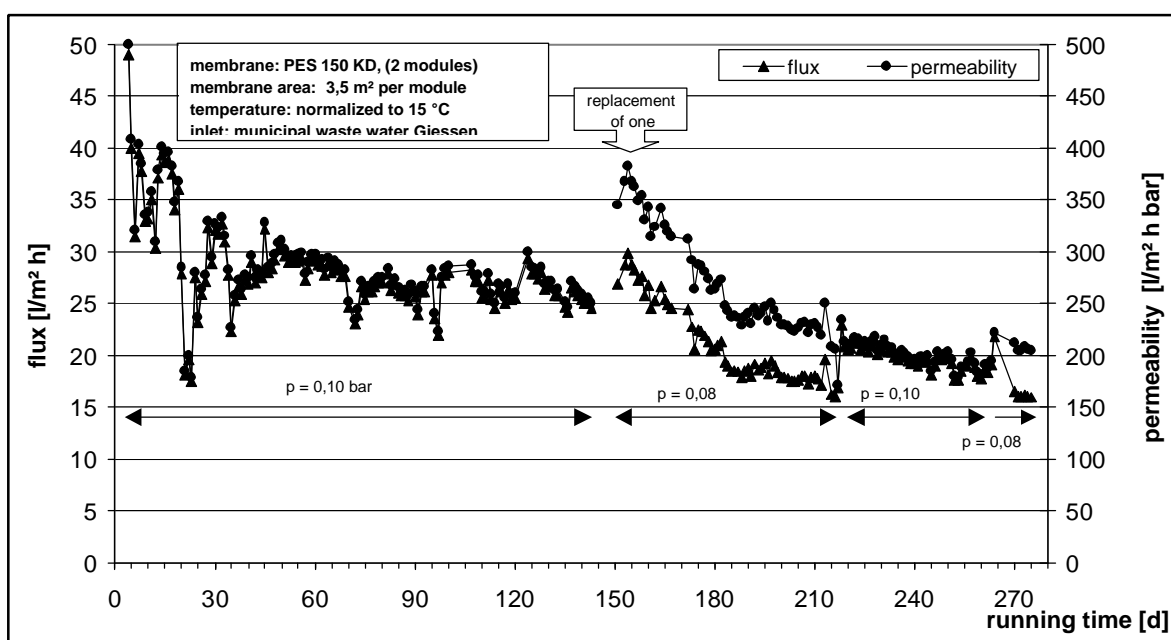


Fig. 1: flux and permeability over time for the ultrafiltration unit in the MBR