MEMBRANE FILTRATION TESTS FOR DAIRY WASTEWATER SEPARATION

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Abstract

Dairy industry, as one of the most water-based food technology, produces large amount of wastewaters that has high concentration of organic matters with high chemical and biological oxygen demand (*COD* and *BOD*). Without proper treatment, discharging wastewaters into sewerage and living waters is a risk that may lead to serious environmental damage such as eutrophication. Compared to conventional dairy sewage treatments, membrane filtration is a promising method, as it reduces organic load to a large extent, in addition the process runs on mild conditions, high fluxes and low transmembrane pressures, that is, a relatively economical process. Also, combined with membrane module vibration, membrane fouling, a main drawback of membrane separation techniques can be reduced. This method produces reusable water and the retentate with high organic concentration, could be recycled as biogas.

In this study, vibratory shear enhanced ultrafiltration (*UF*) and nanofiltration (*NF*) processes for synthetic dairy wastewater purification were carried out. The surface characteristics of 5, 7 and 10 kDa molecular weight cut-off (*MWCO*) *UF* membranes were also investigated via contact angle measurement. In membrane separation experiments, the operational parameters, such as pressure and module vibration amplitude were examined on the filtration efficiencies: fluxes and membrane rejections of turbidity, total dissolved solids, conductivity and *COD*.

In contact angle measurements the volume of dropped samples and residence time of the droplets were investigated in order to compare different membranes.

Our results show that membrane filtrations can be successfully applied when our aim is to produce as low as possible *COD* permeates for discharging, or the goal is to achieve a concentrate with the highest possible *BOD*, for post-treatment in order to gain sufficiently high biogas production. 5 kDa *MWCO* membrane showed the best results for both purposes. In terms of membrane attributes, the time the droplets spent on the surface was only considerable with the highest cut-off membrane, and the droplets were the most stable in time on 10 kDa membrane.

Key words: dairy wastewater, contact angle, filtration, vibration

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