Treatment of soy oil effluent using ultrafiltration

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Abstract: A pilot-scale ultrafiltration (UF) system is applied to determine UF process feasibility for treating soy oil effluent. Effluent pollutions consist of turbidity, total solid (TS), biochemical oxygen demand (BOD), chemical oxygen demand (COD), and oil and grease. Permeate flux and rejection percentages of pollutants are evaluated at different temperatures and transmembrane pressures (TMPs) using nitrocellulose membrane. Permeate flux is increased with increasing temperature and TMP. Considerable amount of effluent pollutants is reduced by used membrane as the rejection percentage for TS, BOD, COD, and oil and grease are about 50%, 70%, 70%, and 55%, respectively. The best separation performance of nitrocellulose membrane is in reduction of effluent turbidity which is almost 95%.

Keywords: Nitrocellulose membrane, TS, BOD, COD, Turbidity, Oil and grease

1 Introduction

Soy oil is one of the most important and applicable vegetal oils. Its processing discharges vast amount of effluents which may result in severe pollution of environment; therefore, treatment of this kind of effluent seems to be essential (Ritter et al., 2005). Several pretreatment technologies have been developed and applied to treat oily effluent which divided to physical methods such as mixing, sedimentation, coagulation and flocculation; and also chemical methods like chemical sedimentation, absorption and disinfection. Pretreated effluent from these processes have considerable amount of biological and chemical oxygen demand (BOD & COD), oil and grease and also some other pollutants. In order to eliminate these pollutants, conventional biological treatments of aerobic and anaerobic treatments or facultative digestion are the most commonly used (Wong et al., 2002). However, these biological treatment methods need proper maintenance and monitoring because these methods depend solely on microorganisms to degrade the pollutants. The microorganisms are very sensitive to the changes in their environment and thus great care is needed to ensure that a suitable environment is maintained for the microorganisms to grow in the process (Harmmer, 2007; Chooi, 1994). Other methods like multiple effect evaporation or incineration are highly energy intensive and hence, very expensive. These disadvantages emphasize the need for further research using novel separation methods (Sridhar et al., 2002).

According to development of the membrane processes and their applications in water and waste water industry, these processes are well established and used as the standard procedures for different effluent treatments containing organic matter (Koyuncu et al., 2001; Wenzel et al., 1996; Buckley, 2002) which can cause high BOD, COD, odour and taste and also increases the corrosion and biofilm growth in distribution network. Membrane separation processes offer significant advantages such as low energy and space requirement, high efficiency and in many water and wastewater treatment cases, final water can be recovered and commercially utilized because it is relatively clean and can often be directly reused with a minimum or no further treatment (Baker, 1994; Strathmann, 1976).

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