

ABSTRACT

The wastewater discharged from industries, municipalities, domestic water treatment plants and various other sources consists of a high concentration of suspended solids, organic matter, colloids and heavy metals which must be treated before this water is discharged into water bodies.

Keeping this in view, we have fabricated a submerged Ceramic Membrane Bioreactor (sCMBR) system for microfiltration of wastewater in order to improve its quality. Tubular ceramic membranes have been used for filtration and treatment performance of MBR on important parameters such as Chemical Oxygen Demand (COD), Dissolved Oxygen (DO) and turbidity has been investigated. This project has been carried out in collaboration with **Ceramic Technological Institute - Bharat Heavy Electricals Ltd.**

Studies on permeate flux reported that with increase in membrane fouling, the flux gradually decreased with time until a critical value of flux was reached at which the membranes became non-functional due to the complete blocking of the pores on the membrane surface. The membranes were then taken out and chemically cleaned which helped in the regeneration of their surface. Transmembrane pressure (TMP) increased with increase in membrane fouling and reached a maximum value at which the membranes had to be taken out and cleaned chemically for regeneration purposes.

The filtration data collected during batch operation of MBR has been fitted into two mathematical models- Standard Pore Blocking model (SBM) and Complete Pore Plugging model (CPBM) to determine the nature of fouling taking place inside the membranes. It was observed that a more accurate fit was observed for the CPBM model suggesting that the membrane pores were getting completely plugged by particles whose sizes were dimensionally similar to the average pore size of the membrane.

The MBR system produced an effluent possessing superior quality in terms of COD, DO and turbidity. Upto 62% reduction in COD was observed in the effluent after treatment in the bioreactor. A clear difference in the colour and odour characteristics could also be observed between the influent and effluent. The changes in these parameters, according to standards set by **Central Pollution Control Board** makes the effluent suitable for discharge in inland surface waters and marine coastal areas without any additional treatment. This effluent can also be reused by industries for various washing and process operations.