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APPLICATION OF HYBRID MEMBRANE BIO REACTOR FOR TEXTILE WASTEWATER.

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Abstract

Continued population growth ,contamination of both surface and groundwater, uneven distribution of water resources and periodical draughts have forced water agencies to search for new source of water supply. water reuse is already an important element in water resource planning. For water reusing ,MBR is the best technology which produce high quality water, which is free from suspended solids and also there is low level of bacteria, so it is suitable for benifical purpose. Besides the benefits of use of MBR has a potential limitations, such as a membrane fouling.Among the method to control fouling is using HMBR. HMBR gives better handling of contamination like heavy metals, refractory compounds, shockloads etc, also better removal of nutrients like phosphrous as compared to CMBR.Thus HMBR gives best quality of water.

Keywords: *Membrane bio reactor, fouling control, ferrous sulfate as a coagulant, Hybrid MBR.*

Introduction

Industries have usually different production & large changes in product categories ,which increase the difficulty of industrial wastewater treatment. Industrial wastewater contain large amounts of suspended material, through the efficient separation membrane these suspended solids &turbidity of waste water come close to zero. There are some limitations of conventional activated sludge process.There may be inefficient removal of solids in SST leading to carry over of solids in treated effluents and sludge with lower concentration of solids. MLSS concentration may not be maintained in aeration tank due to recycling of sludge. Hence frequent addition of fresh sludge needs to be done to maintain the biomass in the aeration tank Conventional ASP required SST which required considerable land SST often suffers from the problem of rising and bulking sludge where the settlement of sludge is not proper. MBR (Membrane bioreactor) technology is an excellent modern wastewater treatment technology, having the several advantages over conventional activated sludge processes. Membrane bioreactor technology is membrane separation technology and biological treatment combination of new wastewater treatment technology**.**

Treatment technology

- **INTRODUCTION**

MBR (Membrane bioreactor) technology is an excellent modern wastewater treatment technology, having the several advantages over conventional activated sludge processes. Membrane bioreactor technology is membrane separation technology and biological treatment combination of new wastewater treatment technology. Membrane Bioreactor when combined with physico chemical treatment like addition of coagulants, activated carbon can help to overcome limitations of conventional MBR when it comes to treatment of industrial wastewater. Hybrid Membrane Bioreactor is a process where in two stages i.e. Physico-chemical treatment and Biological Treatment are fused into single treatment process in the bioreactor.Physio-chemical treatment can be in form of direct chemical addition or use of technology like electro coagulation or any other suitable form. In CMBR fouling is big problem ,this problem can reduced by using HMBR. Hybrid MBR shows much lower membrane fouling than conventional MBR.The

effluent COD in CMBR is 44 mg/lit, but it dropped to 24.5 mg/lit in HMBR, thus for achieving more higher quality water we have to use HMBR. Chemical washing was of 57-65 days in CMBR, while in HMBR it was prolonged to 92days or longer.

- **Types of Hybrid**
- Addition of coagulants
- Addition of Adsorbents
- Bio-film MBR

- **Addition of Coagulant**

- The main problem of MBR is fouling .Coagulation process is mainly used to reduced this fouling problem. Coagulant are the chemicals which cause destabilization of colloidal particles . coagulants have positive charge ,when they are added in to waste water they first attract the negative charge particles and then formed a large particles. This process is know as a coagulation process. Many types of coagulants are used for coagulation process in market. For an examples lime,alum,ferrous sulfate, ferric chloride,ferric sulfates ,poly aluminum chlorides etc.
- Here , ferrous sulphate is used as a coagulant for this project because of these reasons Easily available,High performance as primary coagulants,No adverse effect on bacteria ,Chloride free, Excellent for the treatment of wastewater for removal of oil, color, SS, COD, Lower dosage are required to achieve wastewater treatment goals,Flocs are heavier than alum flocs and therefore settles more rapidly,Costing is very low as compared to others.

- *Following table shows the result of jar test when ferrous sulfate is used.*

Dosage(ppm)	***COD results(ppm)***
50ppm	*405*
100ppm	*550*
200ppm	*766*

According to above jar test 50 ppm ferrous sulphate is used as a coagulant.

- ***EXPERIMENTAL PROCEDURE***

- ***Acclimatization of bacteria***

  Bacterial seeding is often used to jumpstart the biological system. Usually there are two approaches involved.

  - *Dry seeding (using bacterial culture in powder form)*
  - *Wet seeding (sludge obtained from the existing treatment plant)*

- ***Running the plant on glucose water***

Glucose was added as per theoretical oxygen demand. Therefore,192 g O_2 is required to degrade 180 g of $C_6H_{12}O_6$ .Thus, 1.07 g of oxygen is required to degrade 1 g of glucose. So a solution of 1500 ppm COD can be prepared by adding 1.4 g glucose in 1 liter water .

➢ ***Feed water characteristics :*** *Sample collected from textile industry ,Narol*
Feed=sewage+20%textile wastewater

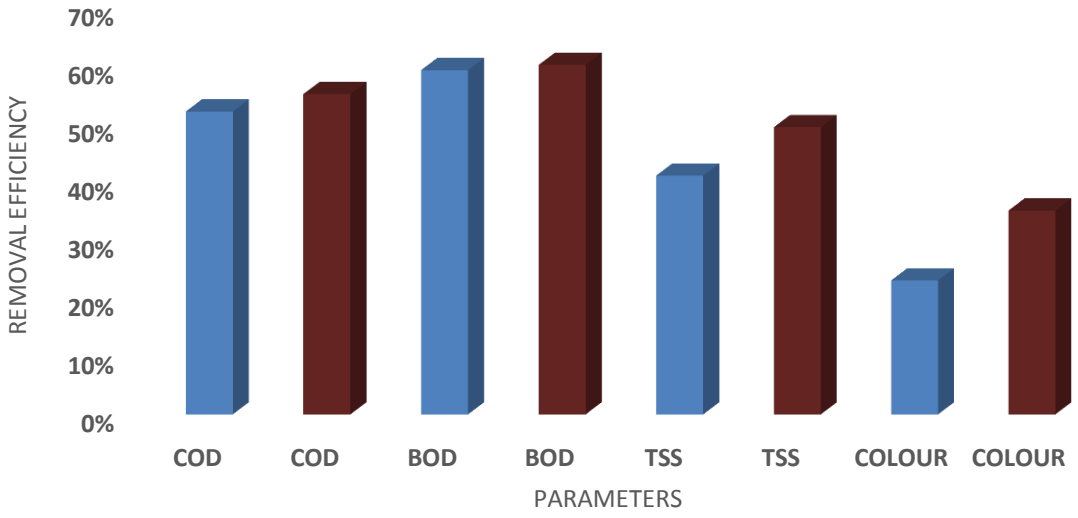
Parameter*	***Unit***	***Value***
pH	***-***	***10***
COD	***mg/L***	***810***
BOD	***mg/L***	***240***
TSS	***mg/L***	***300***
Colour	***CU***	***405***

FIG. 1. MBR REACTOR

- ***Outlet characteristics of permeate***

*Parameter**	*Unit*	*CMBR*	*%Removal*	*HMBR*	*%Removal*
pH	-	*7.5*	-	*7.5*	-
COD	*mg/L*	*384*	*52%*	*364.5*	*55%*
BOD	*mg/L*	*98*	*59.1%*	*96*	*60%*
TSS	*mg/L*	*177*	*41%*	*152*	*49.3%*
COLOR	*cu*	*311.8*	*23%*	*263.25*	*35%*

- ***Comparison between CMBR and HMBR***



- **Conclusion:**

It is clear from above study Hybrid MBR is better than CMBR .it does not only remove BOD ,COD,COLOR but also by reducing the organic load is helps in improving the life of membrane as well as resulting in to fouling control.

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