International Journal of Engineering Applied Sciences and Technology, 2016
Vol. 1, Issue-2, ISSN 2455-2143, Pages 19-21
Published Online December – January 2016 in IJEAST (http://www.ijeast.com)

WASTE WATER MANAGEMENT FOR ACHIEVING ZERO DISCHARGE BY MEMBRANE BIO REACTOR

Aastha Rajpal
Dept. Of Environmental Engineering
Delhi Technological University

***Abstract*— Due to increasing industrialization, load on our natural environment is also increasing. Specifically chemical industries are affecting the water quality. It is necessary to reuse waste water produced in order to meet the water requirements. This paper discusses the use of Membrane Bio Reactor (MBR) as an effective tool for waste water management.**

Keywords - BOD: Biological Oxygen Demand, COD: Chemical Oxygen Demand, ETP: Effluent Treatment Plant, MBR: Membrane Bioreactor, NTU: Nephlelometric Turbidity Unit, TDS: Total Dissolved Solids , TSS: Total Suspended Solids

I. INTRODUCTION

The Treatment plants are faced by many pollutants, such as dioxins, heavy metals and polychlorinated biphenols (PCB's), which they cannot treat or remove, so the chemicals pass into lakes, rivers, and oceans. These can prove toxic to aquatic life, interfere with reproduction and biomagnify and bio accumulate in the food chain. We have reached the stage where the entire hydrosphere, with the possible exception of polar ice caps, is contaminated by our industrial pollutants.
Zero discharge requires that the steady state water quality of circulating water is consistent with the requirements of product quality. The quantity of materials removed from the water circuit equals the quantity entering the water circuit at steady state. The removal of these materials from water circuit takes via product contamination and via waste products. The concentration of the extraneous materials in recirculated water is not zero in a zero discharge treatment process, but has to meet process water specifications.
If sufficient water is available, the desirability of zero discharge is determined by

- Economic advantage of zero discharge versus treatment for discharge.
- The technical feasibility of treating effluent to meet all statutory requirements.

In several instances, zero discharge treatment is less expensive than treatment for discharge because there may be constituents in the water phase which are difficult to remove, but do not adversely affects product quality if water is recycled.
In general the feasibility of removing components entering the wastewater (relevant to a chemical company) in 'end of pipe' ETP is shown below:

Component	**Removal in ETP**
COD	**Feasible**
Volatile COD	**Feasible**
Trace toxic COD	**Feasible**
TDS: sodium, sulphates, chlorides	**Not feasible**

TABLE 1: SHOWING FEASIBILITY OF REMOVING COMPONENTS BY ETP

The main dissolved inorganic components of TDS in the effluent are sodium, sulphate and chloride. These are not removed in the effluent treatment plant. At lower concentrations, anaerobic treatment can remove sulphates as hydrogen sulphide in biogas. Chlorides and sodium are not removed in any of the processes and will increase during reuse of water.

II. EXECUTIVE SUMMARY

The membrane activated sludge reactor (MBR) is an aerobic biological oxidation process with a membrane module to

International Journal of Engineering Applied Sciences and Technology, 2016
Vol. 1, Issue-2, ISSN 2455-2143, Pages 19-21
Published Online December – January 2016 in IJEAST (http://www.ijeast.com)

retain bacterial sludge. The effluent is free of suspended solids. The sludge age is very high and it is possible to retain extremely slow growing bacteria. Pesticides degrading bacteria are usually very slow and the MBR process is ideally suited for the treatment of effluents containing pesticides. The MBR process is generally robust with conventional activated sludge process. MBR can be operated as an extended aeration system with low bacterial sludge.
The MBR process combines conventional biological treatment with membrane technology which facilitates high level of effluent treatment. The membranes are submerged in an aerated biological reactor which has porosities ranging from 0.035 microns to 0.4 microns. It eliminates the need for sedimentation and filtration. MBR systems are extensively being used in waste water treatment. It is a high tech equipment which requires a professional operation.(2)

The following figure shows a schematic diagram of Membrane Bioreactor:

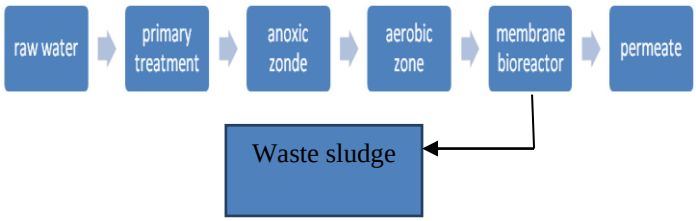

Figure1: showing sxchematic diagram of membrane bioreactor

The advantages of MBR include :

- The main advantage of MBR is small plant footprint.
- No reliance upon achieving good sludge settleability, hence quite amenable to remote operation. (1)
- It produces low sludge because of long sludge area.
- Effluent produced after treatment can be readily discharged to surface streams or can be reused.
- Indicative output quality of MF/UF systems include SS < 1mg/L, turbidity <0.2 NTU and up to 4 log removal of virus (depending on the membrane nominal pore size). In addition, MF/UF provides a barrier to certain chlorine resistant pathogens such as Cryptosporidium and Giardia.(1)
- Effluent contains low concentration of bacteria, TSS, BOD and phosphorous which implies high level of disinfection.

III. RESULTS AND DISCUSSIONS

Following table shows the reduction achieved for two products in a chemical factory after using membrane bio reactor:

EFFLUENT	PARAMETER	BEFORE TREATMENT	AFTER TREATMENT	REDUCTION ACHIEVED(%)
Product 1	COD(mg/lt)	17952	240	82.17
	BOD(mg/lt)	10771	90	88.86
	Oil and grease(mg/lt)	780		
	TSS(mg/lt)	124	45	
Product 2	COD(mg/lt)	14658	246	77.61
	BOD(mg/lt)	9775	148	79.82
	Oil and grease(mg/lt)	879		
	TSS(mg/lt)	131	75	

TABLE 2: Showing reduction in various parameters after treatment by MBR.

Samples of product 1 drawn from inlet and oulet of the reactor were analysed. The inlet COD was 17952, the outlet was 240. Which indicayes a good performance of the reactor. The BOD values also shows a considerable decrease.
Similarly high BOD and COD reduction percentage is recorded for product 2.
MBR also requires improvement in various fields. The most significant disadvantage of MBR is it's cost. MBR also encounters some operational problems like fouling which limits the flux and leads to required cleaning which stops operation. Aeration problems can also arise, because of high biomass concentration.

III. CONCLUSION

The above table 2 shows the results obtained after the treatment of effluent of different products in a chemical plant with the help of Membrane Bioreactor.

There is a remarkable reduction achieved in the parameters BOD,COD and TSS.

International Journal of Engineering Applied Sciences and Technology, 2016
Vol. 1, Issue-2, ISSN 2455-2143, Pages 19-21
Published Online December – January 2016 in IJEAST (http://www.ijeast.com)

The above mentioned results clearly indicates that MBR is the most significant and effective tool/equipment in neutralising the effluent for achieving zero discharge.

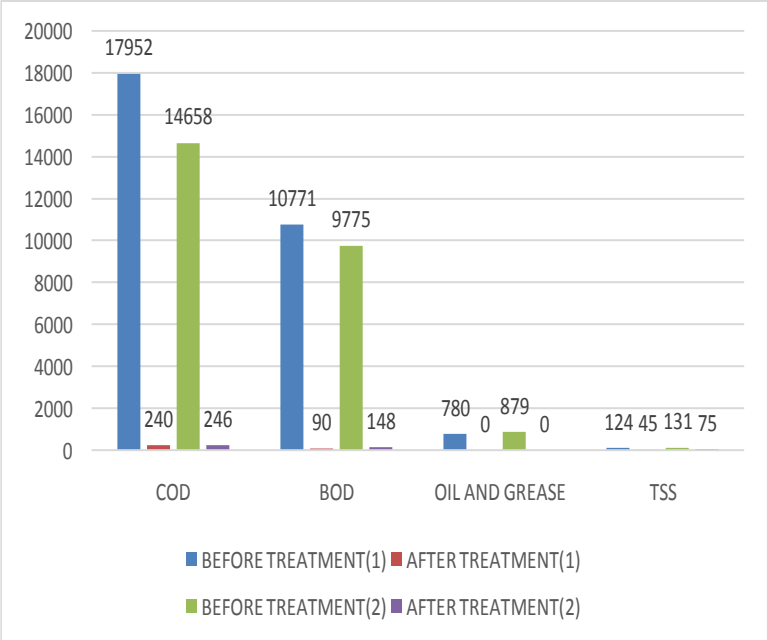

Figure2: Showing comparison in various parameters in both the products.

IV. REFERENCES

LITERATURE:

CHAPMAN, S.; LESLIE, G.; LAW, I. (n.y.): Membrane Bioreactors (MBR) for Municipal Wastewater Treatment – An Australian Perspective(1)

FITZGERALD, K.S. (2008): Membrane Bioreactors.

LARSSON, E.; PERSSON, J. (2004): Viability of Membrane Bioreactor Technology as an Advanced Pre-Treatment for Onsite Wastewater Treatment

RADJENOVIC, J.; MATOSIC, M.; MIJATOVIC, I.; PETROVIC, M. (2008):Membrane Bioreactor (MBR) as an Advanced Wastewater Treatment Technology

Metcalf & Eddy .(2003) waste water treatment and reuse.

S.K. Garg.(2013). Sewage disposal and Air pollution Engineering.

Cicek, N.(2003). A review of membrane bioreactor and their potential application in treatment of agricultural waste water.\

Stephensen,T.&Simson J.(2000) Membrane bioreactor for waste water treatment.

Internet:

www.sswm.info(2)
www.wikipedia.com
www.google.com