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Performance Evaluation Using Moving Bed Biofilm Reactor Process

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ABSTRACT: Discharge of undressed sewage is the most important source of water pollution in India. There is a large gap in quantity of sewage generated and the available treatment capacity. The existing treatment capacity of the sewage treatment plant is also not effectively employed due to operation and conservation problem. In quest of comparing three effective and provident treatment processes this study is carried out by comparing three different natural styles a successive Batch Reactor (MBBR) system, Membrane Bioreactor (MBR), and Moving Bed Biofilm Reactor (MBBR) to treat sewage. The results showed that technically, MBBR was the most effective technology, of which the chemical oxygen demand (COD), total suspended solids (TSS) effectiveness were 90 and 98.2 independently. MBR, on the other hand, had a similar COD junking performance. Economically, MBBR was a more attractive option for an artificial-scale plant since it saved 70.4% of the capital expenditures and had the same functional expenditures as MBR. MBBR has significantly lower suspended solids product followed by MBR. The MBBR system also had lower environmental impacts compared with SBR and MBR processes, since it reduced the consumption of electricity and decolorizing agent. By comparing the physical and some chemical parcels of sewage water the results are batted.

KEYWORDS: Moving bed biofilm process, Sequencing Batch Reactor and Membrane Bioreactor, PH, BOD, COD and turbidity test.

I. INTRODUCTION

Discharge of undressed sewage is the most important source of water pollution in India. There is a large gap in quantity of sewage generated and the available treatment capacity. The subsisting treatment capacity of the sewage treatment factory is also not effectively used due to high operation and preservation cost. This study is varied out with the aim to identify an effective sewage treatment system which retains lower installation as well as functional cost.

II. OBJECTIVE

To study the area of the sources of sewage water from inlet and outlet of industry. To evaluate treatment process by comparing different parameters such as water effluent, water quality, required area, energy consumption, overall efficiency operational expenditure etc., testing of water sample by using different standards such as pH test, turbidity test, hardness test, chlorine test etc. To determine the graphical representation by comparing the TDS and chlorine, BOD and COD, Total dissolved hardness and Total suspended solid. It is used to determine most efficient treatment process by comparing MBBR, MBR and SBR technology.

III. LITERATURE REVIEW

- Moving mattress biofilm reactor generation in municipal wastewater treatment: A overview Alessandro di Biase, Maciej S Kowalski, Tanner R Devlin, Jan A Oleszkiewicz.
- To examine the overall performance of biocarriers in moving mattress biofilm reactor (MBBR) generation and kinetics of biofilm for retrofitting the existing cardio remedy systems: Anjali Barwal, Rubina Chaudhary Transferring bed biofilm reactor to deal with wastewater JC Leyva-Díaz, J Martín-Pascual, JM Poyatos.



IV.METHODOLOGY

The method of systematical, theoretical analysis applied to a field of study is called methodology, it comprises the theoretical analysis of the body of method and principles associated with the branch of knowledge.

- Introduction
- Literature Review
- Sample Collection
- Initial Testing
- MBBR Process
- Final Testing
- Analysis
- Conclusion

V. SAMPLE COLLECTION

1. STUDY AREA AND SAMPLE COLLECTION

The three WWTPs representing different technologies installed by institutional, artificial domestic associations are described briefly in the table below. During site visits data related to treatment technology, site condition, financial and directorial conditions of the plants are captured. The data attained is also collected and comparisons are drawn to analyze the feasibility of the three WWTPs studied

SITE LOCATION	DESIGN CAPACITY	METHOD
Tiruchengode 500 KLD MBBR	500 KLD	MBBR
Pallipalayam 100 KLD SBR	100 KLD	SBR
S.P.Pudur 10 KLD MBR	10 KLD	MBR

The above-mentioned technologies under this study are analyzed based on feasibility factors such as efficiency of the technology, land use, ease of operation, requirement of technical expertise, effluent quality, capital investment, operation and management and perspective of user.

2. LOCATION

Tiruchengode, Vivekanandha Educational Institutions for MBBR process the samples were collected from Vivekanandha Education Institution. Here most of the sewage were treated and reused. Vivekanandha Educational Institutions. Pallipalayam, Industrial building. Sample for SBR process were collected from an Industrial building which is located in Pallipalayam, Namakkal. Both inlets and outlets are collected and preliminary and final tests were conducted respectively. S.P.Pudur, Residential Building. Samples for MBR process were collected from an apartment containing a STP plant. The capacity of STP is about 120kl/d. It is situated in S.P.Pudur, Namakkal.

3. COLLECTION OF WATER SAMPLES

The test is about the comparison of MBBR, MBR and SBR process hence the samples were collected before and after the experiment of Treatment.

4. TEST CONDUCTED

Tests are conducted on both inlet and outlet of the water samples based on Beuro of Indian Standards. The test conducted are pH, Electrical Conductivity, Turbidity, Total Dissolved Solids, Total Suspended Solids, Biological Oxygen Demand, Chemical Oxygen Demand, Alkalinity, Total Hardness and Chloride.

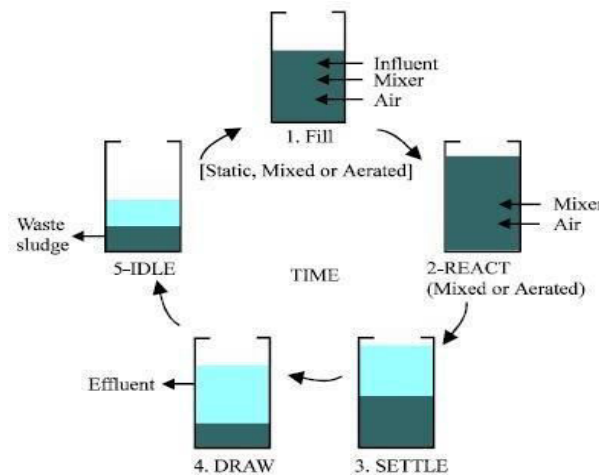
VI. TREATMENT PROCESS

1. MOVING BED BIOFILM PROCESS

On this gadget the effluent from primary Remedy is fed into the MBBR tank. This tank can be of one level or stage Relying on particular needs. The tank consists of heaps of biofilm providers Wherein bacteria grow on the inner floor of the providers and breaks down organic Be counted. The aeration gadget continues the plastic carriers in consistent moving. The Effluent is also transferred to clarifier tank protected with the aid of bar covers to prevent entry of the plastic carriers.

2. SEQUENCING BATCH REACTOR

Sequencing batch reactors (SBR) or successional batch reactors are commercial Processingtanks for the treatment of wastewater. SBR reactors treat waste water Comparable as sewage orwork from anaerobic digesters or mechanical natural Remedy establishments in batches. Oxygen is trickled through the waste water toReduce biochemical oxygen demand (BOD) and chemical oxygen demand (COD) To make appropriate for discharge into sewers or to be used on land. While there are Several configurations of SBRs the fundamental procedure is similar. The installation Consists of as a minimum two identically equipped tanks with a commonplace inlet, which can Be switched between them. The tanks have a Device, with raw wastewater (prosperous) coming in at one stop and treated water(effluent) flowing out the other. At the same time as one tank is in settle/decant mode the alternative is Aerating and filling.

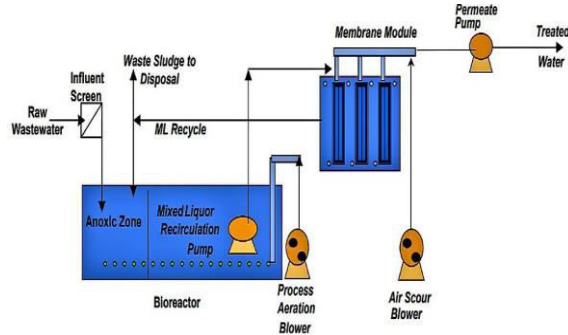


3. MEMBRANE BIO REACTOR

Membrane Bioreactor combine traditional organic treatment (e.g., Activatesludge) tactics with membrane filtration to offer an advanced Degree of organic and suspendedsolids removal. Whilst designed consequently, these Systems also can offer a sophisticated stage ofnutrient removal. In an MBR device, the membranes are submerged in an aerated organic reactor.The membranes have Porosities starting from zero.Half microns to 0.4 microns (relying at the Manufacturer), that is considered between micro and ultrafiltration.



VII. COMPARISON OF MBBR, MBR AND SBR PROCESS



VIII. TESTING RESULT OF PARAMETER

Parameters	Units	MBBR		SBR		MBR		Desirable limits
		Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	

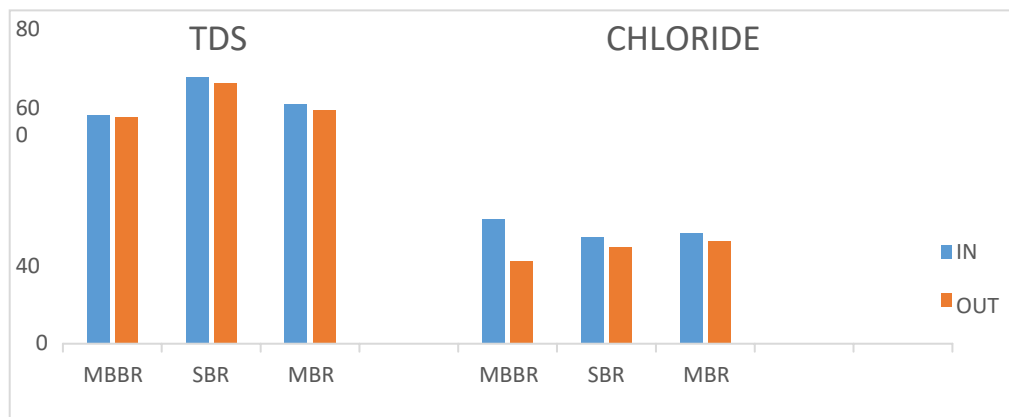
PARAMETERS	MBBR	SBR	MBR
Effluent Water Quality	Excellent	Medium	High
Required Area	Medium	High	Low
Energy Consumption	Low	High	High
Initial Installation Expenditure	High	High	High
Operational Expenditure	Low	Moderate	High
Environmental Impacts	Less	Moderate	High
Overall Efficiency	High	Low	Medium

pH	-	6.7	7.86	7.2	7.92	6.3	7.8	6.5-8.5
Electrical Conductivity	µS/cm	910	902	1024	998	912	897	<750
Turbidity	NTU	15	3.9	16	6.2	18	5.1	5
Total Dissolved Solids	mg/L	583	578	682	665	612	598	500
Total Suspended Solids	mg/L	119	22	178	28	183	19	10
Chemical Oxygen Demand	mg/L	97	24	84	18.4	72	14.9	5
Biochemical Oxygen Demand	mg/L	63	7.6	45	9	39	8.8	3
Alkalinity	mg/L	36	23	55	35	39	33	20-200

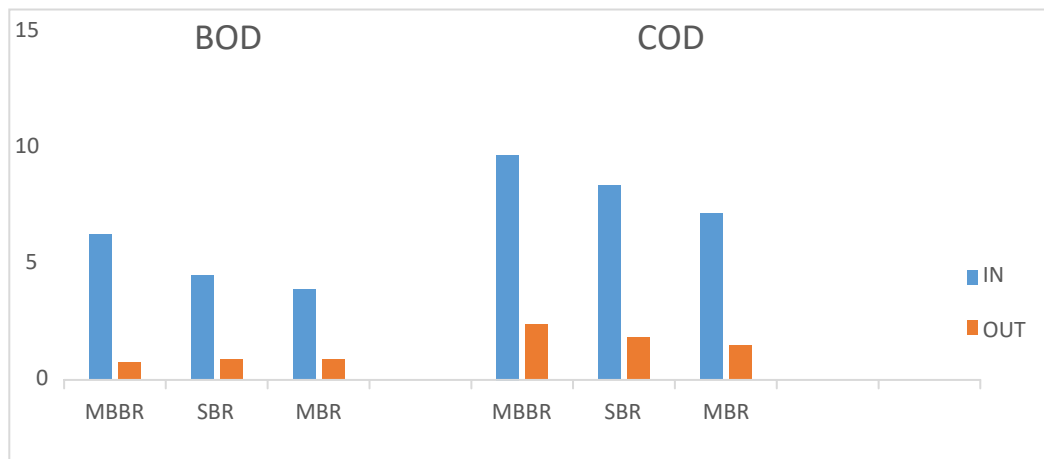


Hardness	mg/L	132	119	165	158	175	169	300
Chlorides	mg/L	319	211	273	246	281	263	250

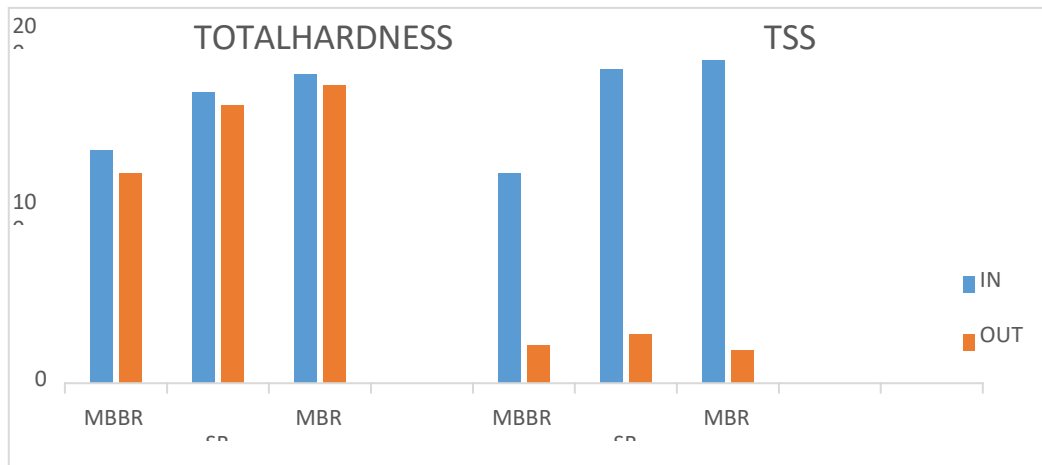
IX. ANALYSIS BY USING GRAPHICAL REPRESENTATION



Graphical representation of TDS and Chloride



Graphical representation of BOD and COD



Graphical representation of total Hardness and TSS

X. CONCLUSION

After carrying out the comparative study in three sewage treatment plants with SBR, MBR and MBBR technologies, MBBR showed that it was a better alternative than SBR, with a comparable COD removal rate to MBR and a more efficient color reduction, while the treating capacity was doubled. Although the MBR was the most efficient technology for organic compounds and color removal, the economic study suggested that MBBR is a more attractive option for wastewater treatment at an industrial-scale plant. MBBR had the same Operational Expenditure as MBR, both lower than that of the SBR system, but MBBR had lower investment costs and lower Capital Expenditure, which was 68% less than the Capital Expenditure of MBR. MBBR also largely reduced the environmental impacts of different categories with respect to SBR and MBR processes in general. MBBR reduces the environmental impact as compared with the other two processes. Here MBBR process is the most efficient process in all aspects.

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