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Sewage water Treatment Using Moving Bed Bio-Film Reactor over SBR

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Abstract - *Biofilms are a key feature of the Moving Bed Biofilm Reactor (MBBR) system, which combines both the Activated Sludge Process (ASP) and the Bio-filter Process, being able to make use of both suspended biomass and attached biomass. Moving Bed Biofilm Reactor (MBBR) media have been used in this study as an attached media to evaluate organic matter removal efficiency. A study was conducted to investigate the effect of factors such as Aeration Time on the performance of a reactor in order to remove Organic Matter. This study investigated the performance of the MBBR and SBR at a lab-scale during batch operation while changing Aeration time of 30min,60min and 90min.MBBR shows best result with aeration time of 90min allowing removal efficiency of 97% for Bod and 95% for COD while comparing both the SBR and the MBBR.*

Key Words: MBBR, AERATION TIME, BOD, COD, TSS

1. INTRODUCTION

The sewage wastewaters are essentially produced from the latrines, showers, showers, kitchen sinks, laundries and a few little ventures. The assessed sewage generation from Class I and Class II towns 29129 MLD. Current sewage age from metropolitan regions in the nation is assessed at 72,368 MLD against which sewage treatment limit of 31,841 MLD is accessible. Sewage water is portrayed by high biochemical oxygen interest (Body) and compound oxygen interest (COD) focuses, and by and large contains Disintegrated oxygen, Chlorine, Hardness along with cleansers and disinfecting specialists. Because of the great release of burden from the homes, shops, workplaces, limited scope processing plants, ranches, and so on Assuming the water from these sources is left untreated without appropriate treatment or by somewhat treating it might create a few serious natural issues. In addition, the Indian government and the contamination control leading group of both focal government and state has forced extremely severe guidelines and Guidelines for the profluent release to safeguard the climate. Consequently, it is important to properly take care of the treatment strategies which are required in order to fulfill the gushing release guidelines by government.

Sewage efflux contains solvent natural matter, suspended solids. These com-ponents contribute generally towards high natural oxygen interest (Body) and substance oxygen interest (COD). The shade of the new sewage is marginally dark in variety and normally is somewhat antacid in nature and become acidic quickly some of the time. The suspended matter in like protozoa, microbes and infections or rot of plants or creatures. The contamination impact of sewerage squander is requiring prompt and high oxygen interest. The attributes of sewage wastewater contain Temperature, Colour, pH 6.5-8.0, DO, Body, COD, Broke up solids, suspended solids, chlorides, sulphate. It relies generally upon the amount of sewage created each day and the waste let into the channels. Notwithstanding water from the local area water supply, squander water comprises of human excreta (dung and pee), water from the restrooms, and food arrangement squanders. It likewise contains nitrogen and phosphorus got from human waste, as well as cleansers and sanitizers utilized in washing. It has high sodium content from the utilization of harsh soft drink for cleaning in ventures. MBBR media is displayed in figure 1.

- Borghei et al., (2004) carried out the study on using Moving Bed Biofilm Reactors in treating different domestic and industrial wastewaters. Currently, there are more than 400 units of full scaled wastewater treatment plants based on this process.

- James Mcquarrie carried out the study on process includes a submerged biofilm reactor and liquid–solid separation unit. The MBBR process shows Capacity to meet similar treatment objectives as activated sludge systems, with respect to carbon oxidation and nitrogen. Biomass retention is clarifier-independent. The MBBR is a continuous-flow process that does not require a special operational cycle for biofilm thickness control. Liquid–solid separation can be achieved with a variety of processes, including conventional and compact high-rate processes.

1.2 Sub Heading 2

Figure 1: MBBR Media

2. METHODOLOGY

2.1. Materials

Moving bed bio film reactor is a type of wastewater treatment process. It utilizes floating high-capacity microorganism Biochips media within the aeration and anoxic tanks. MBBR media is a free-floating media which houses huge quantity of active biomass. Within the bioreactor, the floating media serves as a non-clogging medium once submerged. Unlike other technologies, there are no channels or dead spots. Depending on reactor design and effluent requirements, movement is caused either by aeration or mechanical stirring. The MBBR media represents flexibility and new engineered potentials in waste water treatment plant operation. Technical specifications of MBBR media are mentioned in Table no 1.

Table -1: Technical Specifications of MBBR Media

Material	Virgin HDPE
Effective Specific Surface Area	400 m2/m3
Media Height	15 mm/ 10 mm
Media Diameter	22 mm
Weight per unit surface area	0.37 kg/m2
Specific Gravity	0.90-0.95 g/cm3
Density	0.93 g/cm3
Media fill rate range	25-55% of volume

3. Experimental Setup

The reactor was setup at the Sewage treatment plant lab Deagoan Solapur. A rectangular shaped tank built of glass with 0.45 m length, 0.25 m width and 0.30 m depth. The lab scale reactor (Model) prepared for conducting tests on water is in figure 2. To mix the carriers and supply oxygen to the microbial mass, air diffusers were installed at the bottom of the reactor at a constant flow rate of 2.5 l/min.

The laboratory scale basin is fabricated using 5 mm thick glass material. There is tank model comprising of basin. A volume of waste water treated in 27 Lit. tank in which 12 Lit wastewater is treated. Valves are provided at different sections and at different depths for sampling purpose. Inlet valve is provided at the top to control the influent flow rates and the outlet valves are provided for cleaning and sludge wastage. Decanting is done using a pipe and is controlled with a valve. The readings are taken for three different intervals of COD and BOD.

It consists of an aeration tank (similar to an activated sludge tank) with special plastic carriers that provide a surface for biofilms to grow on. The carriers are made of a material with a density close to the density of water (1 g/cm3). An example is high-density polyethylene (HDPE) which has a density close to 0.93 g/cm3. As the carriers are mixed in the tank by the aeration system, they will have good contact with the substrate in the influent wastewater.

Figure-2. Laboratory Scale Model of The Reactor

4. RESULT AND DISCUSSION

Effect of Aeration Time on the performances of reactor in terms of organic matter

Aeration time is an important operational variable which can be easily con-trolled. It is calculated by dividing the tank volume by daily average flow without regard to return sludge. Figure no 3 shows the wastewater before the treatment and after the treatment. The water after treatment is less turbidity.

The COD removal obtained for Aeration time of 30min, for 60 min, and for 90 min is shown in table 2

Table -2. Result of treated waste water for COD

Aeration time	Raw Wastewater	Treated With SBR	Treated with MBBR
30 min	310	50.2	30.38
60 min	310	43.4	22.9
90 min	310	36	18

The COD of Wastewater after different stages of experiment is shown in fig 3.

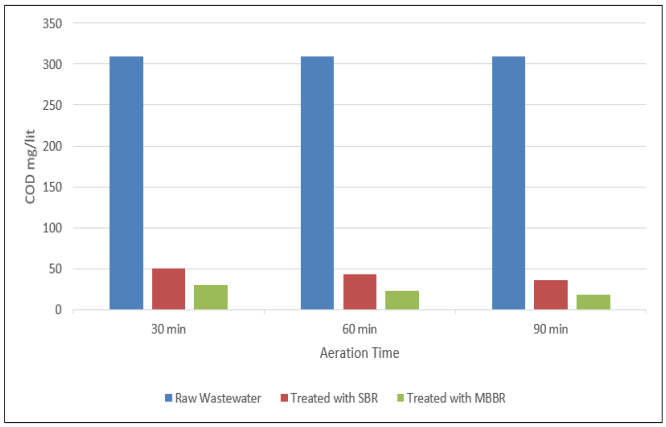

Fig.3. The COD of Wastewater after different stages of experiment

The BOD removal obtained for Aeration time of 30min, for 60 min, and for 90 min is shown in Table no 3.

Table -3. Result of treated waste water for BOD

Aeration time	Raw Wastewater	Treated With SBR	Treated with MBBR
30 min	110	14.41	10.12
60 min	110	10.4	6.11
90 min	110	7	3.3

The BOD of Wastewater after different stages of experiment is shown in fig 4.

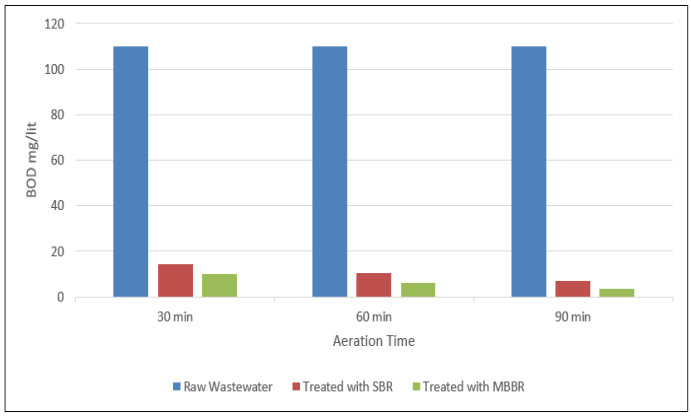

Fig.4. The BOD of Wastewater after different stages of experiment

The wastewater before the treatment and after the treatment is shown in fig 5 the water after treatment is less in turbidity.

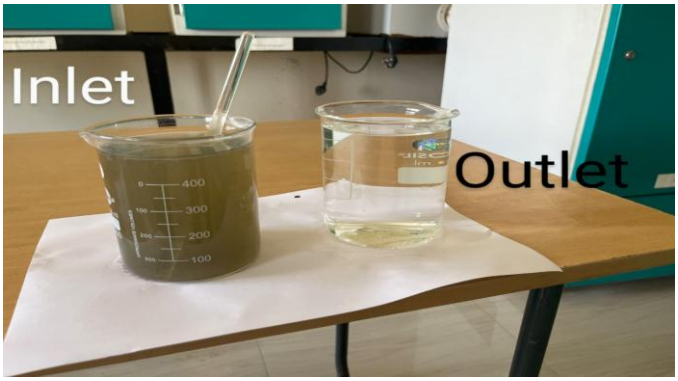

Fig.5. Wastewater before and after treatment

4. CONCLUSIONS

1. The MBBR shows to have a good performance to treat sewage wastewater, reaching a removal efficiency of 95% for COD and 97% for BOD for 90min of aeration.

2. After the tests carried out along this work, it is possible to conclude that, the COD efficiency is 95% for 90 min from the other two cycles of 60 min and 30 min of aeration for MBBR.

3. After the tests carried out along this work, it is possible to conclude that, the BOD efficiency is 97% for 90 min from the other two cycles of 60 min and 30 min of aeration for MBBR.

4. The cycles of BOD 60 min and 30 min of aeration fails to reach the permissible limit of BOD in SBR.

5. The MBBR has shown good results than the SBR while carrying out the tests.

6. The HRT required for MBBR is less than that of the SBR so it is energy saving.

7. Sample paragraph Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, sc, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

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