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Design and Performance of Grey Water Treatment Plant

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Abstract: ***Advanced Oxidation Processes (AOPs), Moving Bed Biofilm Reactor (MBBR) systems, and Constructed Wetlands (CWs) to enhance efficiency of organic and inorganic pollutant removal. MBBR system consists of an aeration tank it is similar to a activated sludge tank with plastic media which surface biofilm can grow. Initially grey water feed to AOP system then MBBR and finally pass through wetland construction. AOP and MBBR is a recent and beneficial biofilm technology which has many properties which includes anti-load ability, High treatment efficiency. AOP and MBBR technology became more popular and widely utilized worldwide due to fact that need for clean water keeps to rapidly increase with increase in population of the world grows year by year. Greywater from Bathroom Water used in hand washing and bathing generates around 50-60% of total greywater and is considered to be the least contaminated type of greywater. Greywater is specifically washing water like bath, dish and laundry water excluding toilet wastes and free of garbage-grinder residues. Gray water shows the Initial characteristics TDS, pH and SS are 900 mg/l, 8.5 and 413 mg/l. After treating with AOP shows the TDS, pH and SS are 750 mg/l, 8.3 and 327 mg/l, after MBBR treatment TDS, pH and SS are 400 mg/l, 8.3 and 104 mg/l and Final wet land construction treatment TDS, pH and SS are 118 mg/l, 8.3 and 50 mg/l.***

Keywords: Gray water, MBBR, SS, TDS reduction, Biofilm media.

I. INTRODUCTION

Greywater is specifically wash water like bath, dish and laundry water excluding toilet wastes and free of garbage-grinder residues. Greywater can be a valuable resource which horticultural and agricultural growers as well as home gardeners can benefit from. It can be valuable to landscape planners, builders, developers and contractors because of design and landscaping advantages of on-site greywater treatment.

Greywater a source of pollution for lakes, rivers and ground water which are excellent nutrient sources for vegetation when wastewater is made available for irrigation. Moving bed bio film reactor (MBBR) is a treatment process of wastewater that was initially invented by Prof. Hallward at Norwegian University of Science and Technology in the late 1980s. There are over 700 wastewater treatment systems both municipal and industrial systems installed in more than 50 countries. Now a day, there are various suppliers of MBBR technology. The MBBR system consists of an aeration tank it is similar to a activated sludge tank with plastic media which surface.

II. COMPOSITION OF GREYWATER

Greywater from Bathroom Water used in hand washing and bathing generates around 50-60% of total greywater and is considered to be the least contaminated type of greywater. Common chemical contaminants include soap, shampoo, hair dye, toothpaste and cleaning products. It also contains bacteria and viruses through body washing. Greywater from Cloth Washing Water used in cloth washing generates around 25-35% of total greywater.

III. EXPERIMENTAL ANALYSIS

A. Raw Materials and Chemicals

1) Fe reagent/H_2O_2
2) MBBR Media
3) Alkali/acid
4) Grey Water Sample

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B. Apparatus

1) Measuring Cylinder
2) Beaker
3) Glass Ro
4) Aeration Pump
5) MBBR Setup
6) Aerobic and anaerobic tank

C. Experiment Procedure

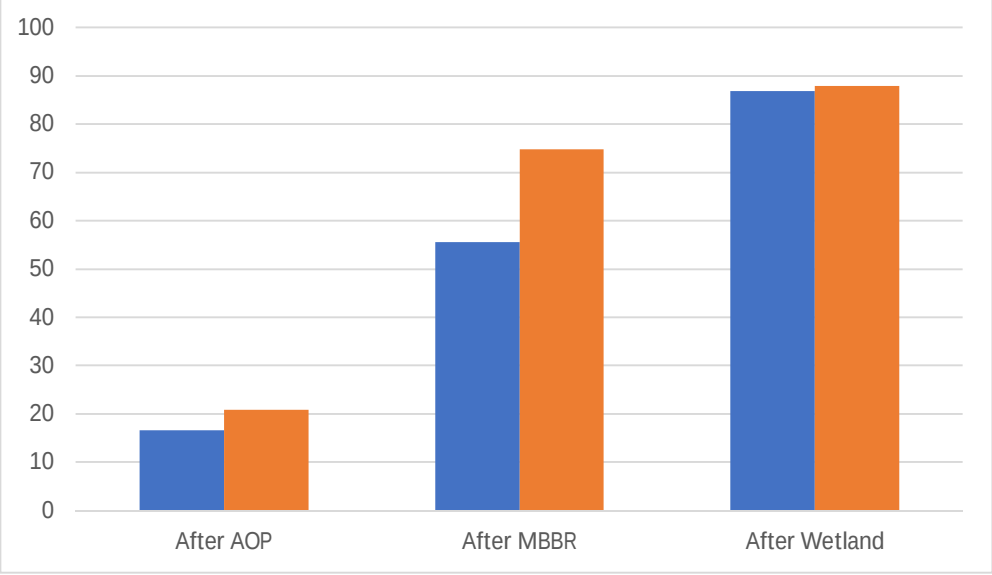
1) Take 5–10-liter grey water.
2) Check initial pollutant concentration unit or absorbance using spectrophotometers/ colorimeters.
3) Add grey water in AOP tank for treatment.
4) Pass through moving bed in bioreactor tank.
5) Start air blower and purge air in bioreactor.
6) Add biological culture in bio reactor chamber.
7) After biological treatment pass the grey water in wetland construction.
8) Take grey water sample for analysis and measures its absorbance.
9) After retention time of water get over flow into primary setting tank.
10) After setting of sludge, we can take sample for analysis.
11) Measure the % of removal of COD, BOD, TDS, pH etc. from the waste water.

IV. RESULTS AND DISCUSSIONS

The characteristics of gray water before and after treatment. The sample withdrawal after various time of intervals. Gray water shows the Initial characteristics TDS, pH and SS are 900 mg/l, 8.5 and 413 mg/l. After treating with AOP shows the TDS, pH and SS are 750 mg/l, 8.3 and 327 mg/l, after MBBR treatment TDS, pH and SS are 400 mg/l, 8.3 and 104 mg/l and Final wet land construction treatment TDS, pH and SS are 118 mg/l, 8.3 and 50 mg/l.

Treatment Method	TDS mg/l	pH	SS mg/l
Initial Value	900	8.5	413
After AOP	750	8.3	327
After MBBR	400	8	104
After Wetland	118	7.5	50

Table Characteristics of Gray Water before and after Treatment



% Reduction of TDS and SS
% Reduction = [(final value-initial value)/Final value] *100

% Reduction of TDS
1. After AOP treatment
% Reduction of TDS = [(900-750)/900] *100
= 16.66
2. After MBBR Treatment
% Reduction of TDS = [(900-400)/900] *100
= 55.55
3. After Treatment of wetland construction
% Reduction of TDS = [(900-118)/900] *100 = 86.88

% Reduction of SS
1. After AOP treatment
% Reduction of TDS = [(413-327)/413] *100
= 20.82
2. After MBBR Treatment
% Reduction of TDS = [(413-104)/413] *100
= 74.81
3. After Treatment of wetland construction
% Reduction of TDS = [(413-50)/413] *100
= 87.89

A. Observation for % Reduction of TDS and SS

The % reduction of TDS and SS from gray water using MBBR treatment for 3 hrs. time of intervals. % Reduction in TDS and SS for 3, 6 and 9hrs. time of interval are 16.66, 55.55, 86.66 and 20.82, 74.81, 87.89 resp. The ate of reduction increase with increase in contact time.

Treatment Process	% Reduction in TDS	% Reduction SS
After AOP	16.66	20.82
After MBBR	55.55	74.81
After Wetland	86.88	87.89

% Reduction of TDS and SS

B. Graphical Representation for % Reduction of TDS and SS

Fig. shows graphical representation of the % reduction of TDS and SS from gray water using AOP, MBBR and wetland construction treatment. Graph shows the % reduction in TDS and SS using AOP, MBBR and wetland construction treatment are 16.66, 55.55, 86.66 and 20.82, 74.81, 87.89 resp.

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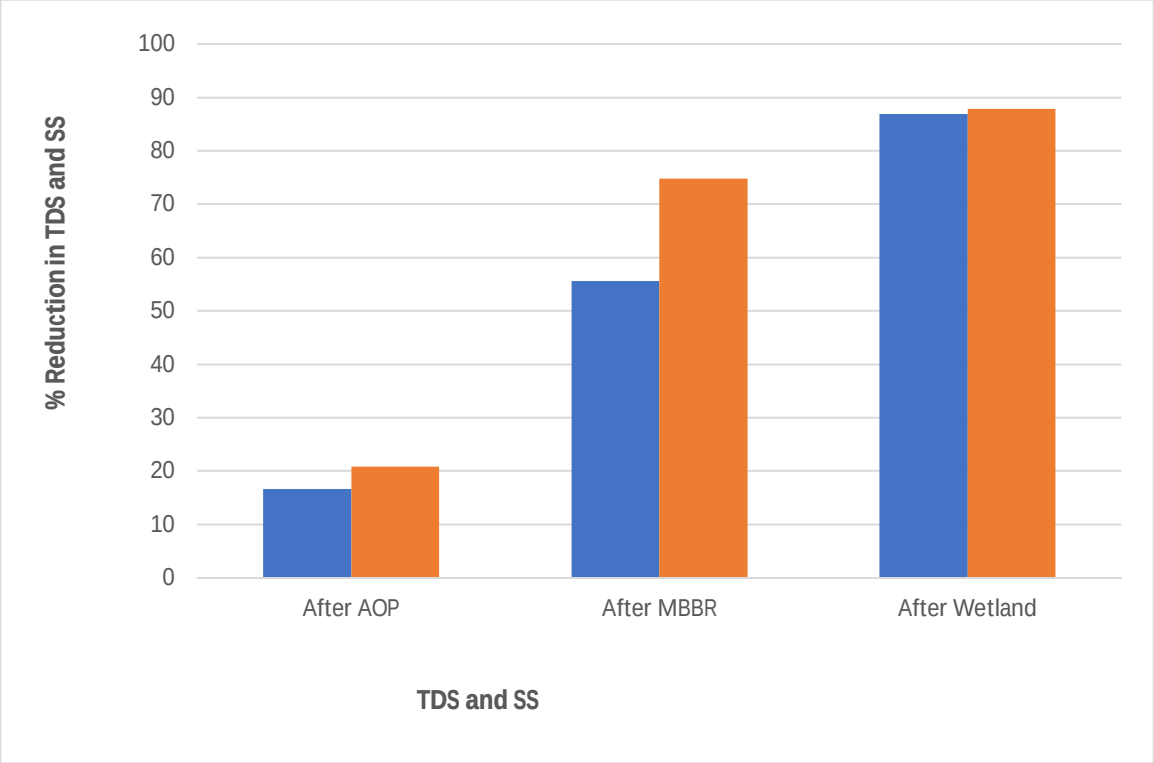


Fig. Graphical Representation

V. CONCLUSION

Greywater is specifically wash water like bath, dish and laundry water excluding toilet wastes and free of garbage-grinder residues. MBBR technology became more popular and widely utilized worldwide due to fact that need for clean water keeps to rapidly increase with increase in population of the world grows year by year. the % reduction of TDS and SS from gray water using AOP, MBBR and wetland construction treatment. Graph shows the % reduction in TDS and SS using AOP, MBBR and wetland construction treatment are 16.66%, 55.55%, 86.66% and 20.82%, 74.81%, 87.89% resp.

VI. FUTURE SCOPE AND BENEFITS

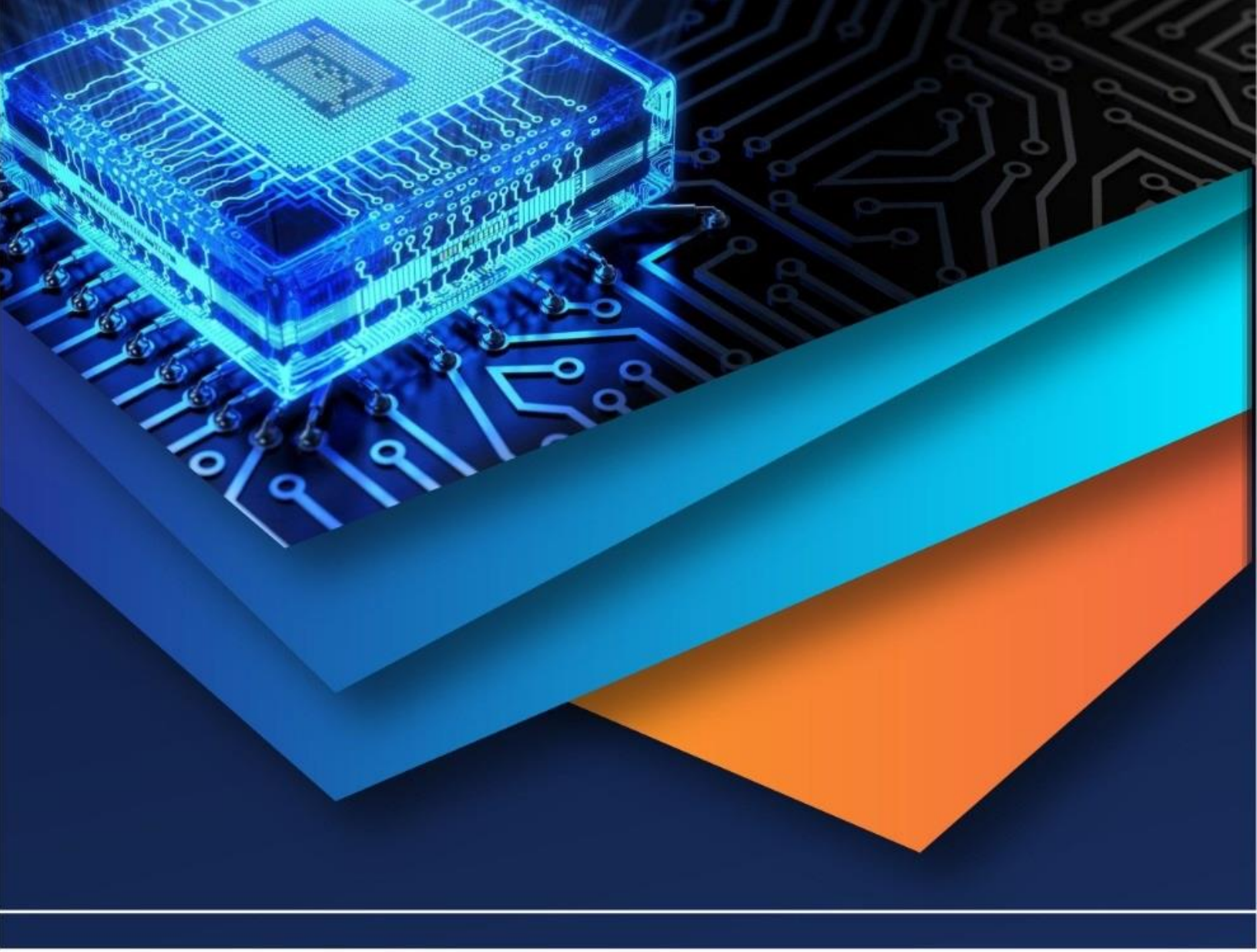
AOP, MBBR and wetland construction treatment one of the alternatives and efficient methods for treating wastewaters at a variety of conditions. AOP, MBBR and wetland construction treatment became more popular and widely utilized worldwide due to fact that need for clean water keeps to rapidly increase with increase in population of the world grows year by year. Due to the rapid urbanization grey wastewater has continuously and excessively released into environment causing significant impacts on human and wild life. Many organic compounds in grey wastewater are detected in different types of wastewaters, affecting water quality, human health and biodiversity in the ecosystems. Using greywater to irrigate landscape plants can conserve water and electricity and reduce water bills by recycling water otherwise destined for a wastewater treatment plant. Since an estimated 30 to 50% of home water use produces greywater, significant savings can be realized by reusing this source of nonportable water to irrigate landscape plants. Reduce strain on septic system or treatment plant. The quality of groundwater and surface waters are much better preserved by the natural purification processes the grey water undergoes in the top layers of the soil than by any engineered water treatment.

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