

TREATMENT OF DAIRY WASTEWATER BY USING MBBR

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Abstract -

An innovative biological method for wastewater treatment based on the aerobic concept is the Moving Bed Biofilm Reactor (MBBR). The BOD and COD removal from wastewater from the dairy industry was examined in this study using lab scale experiments employing the MBBR process with polypropylene media. At varying hourly of 1, 2, 3 and 4 hrs, the system's effectiveness in the removal of BOD and COD was evaluated. Similar BOD and COD removal efficiencies of 60% and 88%, respectively, were attained with 4 hours of hourly, and a 4 hour settling time was also noted. Finally, our study shows that MBBR using IFAS procedure and polypropylene media as biofilm carrier has highly excellent removal of BOD and COD from Dairy waste water.

Key Words:

Dairy Wastewater. MBBR Process, Biofilm, COD and BOD.

1. INTRODUCTION

The dairy business is for the most part viewed as the biggest wellspring of food handling wastewater in numerous nations. With expansion sought after for endlessly milk items, numerous dairies of various sizes have come up in better places. These dairies gather the milk from the makers, and afterward either essentially bottle it for advertising, or produce different milk food sources as indicated by their abilities. Huge amount of wastewater begins because of their various activities. The natural substances in the squanders comes either in the structure in which they were available in milk, or in corrupted structure because of their handling. Thusly, the dairy squanders through biodegradable, are serious areas of strength for extremely nature. A few techniques are accessible to decrease the high burden content of contaminations in Dairy wastewater. Among them Moving Bed Biofilm Reactor (MBBR) is thought of as one of the promising systems for wastewater treatment. The essential standard of moving bed process is the development of biomass on plastic backings that move in the natural reactor through tumult created by air circulation frameworks (high-impact reactors) or by mechanical frameworks or by anaerobic reactors

1.1 THE SCOPE OF THE STUDY

Poorly treated or untreated dairy wastewater with high levels of pollutants creates major Environmental problems when discharged into surface water. Such problems may include contamination and deoxygenating of streams and waterways by direct discharge or runoff of inadequately treated wastewater. Excessive concentration of nutrients such as Nitrogen and Phosphorus in wastewater, which contribute to excessive growth of plants and algal blooms in surface water bodies, which makes the downstream water unsuitable for Domestic, Agriculture and Industrial use. The industrial wastewater contains pathogens and Nutrients which lead to the spread of diseases and smell nuisance, when discharged in water bodies.

1.2 OBJECTIVES OF STUDY

1. The installation of an MBBR unit, determining the ideal operating parameters batch MBBR process operation have been achieve the goals of the study.
2. To the effectiveness of bod and cod removal at various Hours at amount of 10 liters wastewater, Organic loading, Retention time, Varying Bed area growth of the media studied.
3. The research will be executed on a lab and pilot size.

2. MATERIALS AND METHODOLOGY

The study was conducted under specific environmental conditions.

2.1. MEDIA

Media is the significant boundary of the MBBR framework. Media gives surface region to microorganisms for the development as biofilm. This media can move unreservedly into wastewater and increment contact between the substrate accessible in wastewater and microorganisms present on media. For the most part this media is made by the polypropylene.

2.2. Prefabrication of Reactor

MBBR Reactor was fabricated. Laboratory scale was used to having volumetric capacity 10 L. Reactor is made by the glass. Two diffused aerators were also kept at the bottom of the reactor for providing the required aeration. Partition is provided in reactor for allowing flow of water from the one compartment which is a MBBR reactor to the other compartment which is sedimentation tank for IFAS process.

2.3. WORKING PRINCIPLE

K1 media functions physiologically as a static medium, however its main function in this regard is to trap solids. The structure of the medium traps suspended particles, which may then be removed by backwashing (most effective with air). The mechanical filtration of the Nexus K1 Filter is based on this.



Fig 1- Polypropylene Media.

ACCLIMATIZATION.



Fig2: Acclimatization.

Biofilm development is the first step in the MBBR. At the time of bio-film development sludge gets penetrate into the media. This accumulated sludge adheres to the surface of media. The adhered biomass starts to grow on the

media. It is called as bio film. The duration of this process is 3hours.

Table -1: Characteristics of Diary wastewater Before test

SL.NO	PARAMTERS	OBTAINED VALUE	UNITS
1.	pH	7.5	-
2.	Total solids	1490	mg/L
3.	Chlorides	735.90	mg/L
4.	Nitrates	35	mg/L
5.	COD	2365	mg/L
6.	BOD	790	mg/L
7.	Total Alkalinity	450	mg/L
8.	Sulphate	763.05	mg/L
9.	Phosphate	4.2	mg/L
10.	Potassium	34	mg/L
11.	Sodium	685	mg/L
12.	Turbidity	35	-

3. RESULTS AND DISCUSSIONS

the results obtained during the study are show in the in below.

Table 2.

SL.NO	PARAMTERS	I.R	E,R	REMOVAL EFFICIENCY
1.	pH	7.5	7.0	78
2.	Total solids	1490	930	83
3.	Chlorides	735.90	660	86
4.	Nitrates	35	22	74
5.	COD	2365	850	78
6.	BOD	790	360	84
7.	Total Alkalinity	450	297	76
8.	Sulphate	763.05	450.1	80
9.	Phosphate	4.2	3.1	88
10.	Potassium	34	2.2	82
11.	Sodium	685	586	80
12.	Turbidity	35	29	94

PH VARIATION OF DAIRY WASTEWATER :

The pH Value of the Dairy wastewater has been decreasing for every different Retention time of loading with an perfect pattern.

While comparing the pH value of initial and final retention time i.e 1 and 4hrs of loading there has been decrease in the level of pH from 7.5-6.9 respectively.

TS :

Total solids are one of major parameter that has been removed in the Aeration process. It can been reduced from 1490mg/L to 840 mg/L with a removal of 80% during 3hrs retention of the sample in dairy wastewater. The percentage removal of TS observed during the retention time of 1,2,3 and 4 hrs was 30%, 50%,60% and 74% respectively.

BOD :

BOD is one of major parameters that can been removed in the MBBR. It also has been reduced from 790 mg/L to 210 mg/L with a removal of 78% during 3 hrs retention of sample in dairy wastewater. The percentage removal of BOD observed during the retention time of 1,2,3 and 4hrs was 46%, 56%,75% and 83% respectively. This reduction in the Bod value indicates MBBR process is effective in the treatment of Dairy wastewater since BOD is one of major parameters to be minimized in the treatment process. The organic matter present in the wastewater sample was breakdown into simpler matter due to presents aerobic process.

COD:

Along with reduction of the BOD value, The value of COD has also been reduced by the aeration procedure. The maximum reduction of COD Was observed during the Retention time of 3hrs of sample in the aeration tank with a percentage of removal of 86%. For a Retention time 1,2,3 and 4hrs, the reduction of about 20%, 45%,75% and 86% respectively.

CHLORIDE :

The chloride of Dairy wastewater was reduced in MBBR during different retention times for 1, 2,3 and 4hrs of loading. The removal efficiency which was increased by 25%, 38% ,65% and 78% respectively. The maximum of the removal efficiency was observed for just 4hrs retention time which is about 74% respectively.

NITRATE :

The nitrate of Dairy wastewater was reduced in MBBR during different retention time for 1, 2,3 and 4hrs of loading. The removal efficiency which was increased by

25%, 45%,70% and 84% respectively. The maximum of the removal efficiency was observed for just 4hrs retention time which is about 70%. The nitrate content present in the wastewater sample was reduced from 35mg/L to 21 mg/L respectively.

PHOSPHATE :

The Phosphate of Dairy wastewater was reduced in MBBR during different retention times for 1, 2,3 and 4hrs of loading. The removal efficiency which was increased by 20%, 30%,60% and 88% respectively . The maximum of the removal efficiency was observed for just 3hrs retention time which is about 60%. The Phosphate content present in the wastewater sample was reduced from 4.2mg/L to 3.0 mg/L respectively.

SULPHATE :

The sulphate of Dairy wastewater was reduced in MBBR during different retention time for 1,2,3 and 4hrs of loading. The removal efficiency was increased from 36%, 49%,62% and 80% respectively. 4hrs retention time which is about 80%. The sulphate content present in the wastewater sample was reduced from 765.05mg/L to 360mg/L respectively.

POTASSIUM:

The potassium of Dairy wastewater was reduced in MBBR during different retention time for 1, 2,3, and 4hrs of loading. The removal efficiency which was increased by 40%, 68%,75% and 88% respectively. The maximum of the removal efficiency was observed for just 4hrs retention time which is about 84%. The potassium content present in the wastewater sample was reduced from 3.4mg/L to 2.1mg/L respectively.

TOTAL ALKALINITY:

The total alkalinity of Dairy wastewater was reduced in MBBR using different retention time for 1, 2,3 and 4hrs of loading. The removal efficiency which was increased by 26%, 52%,70% and 76% respectively. The maximum of the removal efficiency was observed for just 4hrs retention time which is about 76%. The total alkalinity content present in the wastewater sample was reduced from 450mg/L to 230mg/L respectively.

SODIUM:

The sodium of Dairy wastewater was reduced in MBBR during different retention time for 1, 2,3 and 4hrs of loading. The removal efficiency which was increased by 36%, 55% 68% and 80% respectively. The maximum of the removal efficiency was observed for just 4hrs retention time which is about 76%. The sulphate content present in the wastewater sample was reduced from 685mg/L to 586mg/L respectively.

TURBIDITY:

it has been found that the turbidity changes 29NTU at 1hrs HRT and decreases up to 94NTU at 4hrs loading. The desirable limit of turbidity is found to be 94NTU. Then the Maximum reduction of turbidity obtained at the varying HRT of 4hrs, which is the optimum turbidity.

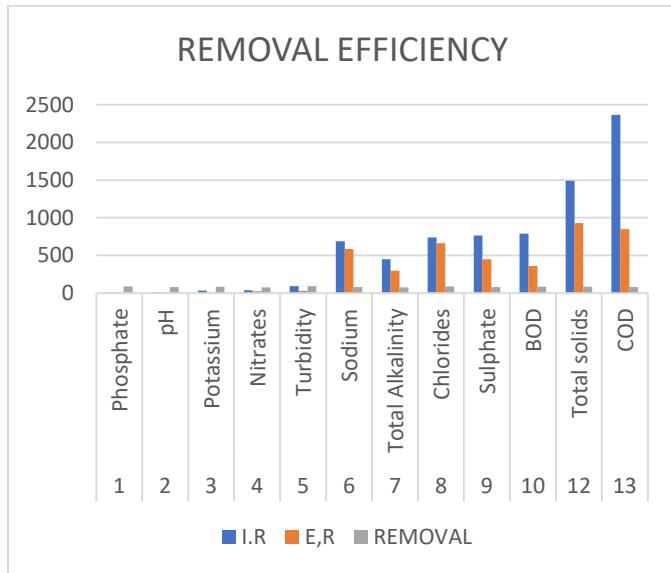


Chart -1: Removal Efficiency

4. CONCLUSIONS :

From the experimental results, we have concluded that among the chosen varying HRT, showed a better coagulation and turbidity removal for selected dairy wastewater. The characteristics of untreated dairy wastewater are pH-7.5 Turbidity -94 NTU, BOD-1975mg/l, COD- 2365mg/l, Total solids - 1490 mg/l, phosphate-4.2 mg/l, potassium34mg/l, sodium-685mg/l, sulphate-763.05mg/l, Total alkalinity-450mg/l, Nitrate-35mg/l, Chloride- 735.90mg/l. The pH is reduced to 7.0; turbidity decreases to 29NTU; BOD is decreased to 380 mg/l; COD is reduced to 850mg/l and TDS decreases to 930mg/l, phosphate-3.1 mg/l, potassium-2.2mg/l, sodium-586mg/l, sulphate-450mg/l, Total alkalinity-297mg/l, Nitrate-22mg/l, Chloride- 660mg/l. Among the four varying Hours, the maximum reduction of turbidity, BOD, COD and total solids is found to be 88%, 60% and 37.5% with 4hours; hence 4 hours is suggested for more effective treatment of dairy wastewater. MBBR doesn't have a common problems such as sludge bulking and rising, poor settling and foaming. Strong resistance to impact makes it easier to operate. MBBR process is proven to be comfortable and efficient upgrade for the improved efficiencies of poorly performing WWTP.

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