An Experimental Project on Treatment of Dairy Waste Water Using Rotatory Biological Contactor

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Abstract—Dairy industry is one of the biggest industries in India next to the sugar industry. As this wastewater contains protein, fats, which are organic in nature and biodegradable and create colour and turbidity. Irrigation utility of treated dairy wastewater is a common discharge alternative but treatment needs to be extended up to Tertiary Treatment. Rotary Biological Contactor (RBC) is one of biological methods available for treatment of wastewater. RBC is a low cost, natural and energy saving technology for wastewater treatment. The study focused on the efficiency of modified RBC with respect to BOD, COD, TSS, pH, and turbidity of wastewater and design of RBC for improvement of efficiency. The water sample used in this study is collected from Dins-haw dairy. A laboratory scale Rotary Biological Contactor assembly was designed and tested on lab scale. A use of stainless steel was adopted as biological media which was sustained up to 5 days against disintegration. The model was operated at a detention time of 90 hours and rotational speed of 5 rpm. The analysis of the performance of wastewater sample was carried out on the basis of different parameters like BOD, COD, TSS, turbidity and pH are performed.

INTRODUCTION

The first RBC was installed in West Germany in 1959, later it was introduced in the United States and Canada. A rotating biological contactor or RBC is a biological fixed-film treatment process used in the secondary treatment of wastewater following primary treatment.

- There are two methods of performing RBC
- 1. Primary treatment process
- 2. Secondary treatment process

RBC is the attached growth process in which microorganisms are attached to a media by developing a film. RBC is a secondary Wastewater treatment process that provides both acceptable effluent quality and organic removal. Secondary wastewater treatment is a biological process that employs an ample variety of microorganisms, primarily bacteria. Attached-growth processes (also known as fixed-film processes) are biological wastewater treatment processes with the biomass attached to some type of media. The media normally found at wastewater treatment plants are rock, ceramic, plastic materials, and slag. The use of this process is later expanded to include nitrification and denitrification of wastewater. Secondary wastewater treatment is a biological process that employs an ample variety of microorganisms, primarily bacteria. These microorganisms; contained in wastewater; transform biodegradable organic matter into basic substances and extra biomass (Lee et al., 2001). Biological treatment processes include attached growth and suspended growth processes. For the former, microorganisms are attached to a solid surface, while for the latter, the microorganisms are in suspension. Trickling filters and rotating biological contactor (RBC) are attached growth processes while activated sludge (AS) process and membrane bioreactor (MBR) are the suspended growth processes.

REVIEW OF LITERATURE

- 01- Modified Rotary Biological Contactor using Bio-Media in Dairy Wastewater Treatment.
 This study focused on efficiency of modified RBC Biomedia is used here is banana leaves which was sustained upto 20 days.
 The model was operated at detention time of 24hrs rotational speed of 10rpm.
 The test performed are BOD, COD, TSS Sawant N. S.1, Dr. S. B. Thakare2
- 02- DAIRY WASTEWATER TREATMENT USING THREE-STAGE ROTATING BIOLOGICAL CONTACTOR.

A three stage system, NRBC was fabricated as a bench scale unit for lab experiment, to remove organic carbon from the whey NRBC h several advantages such as quick startup, high biomass. In this study the Cod removal efficiencies of 80 and 83% was achieved at HRT of 16-20 hrs respectively while the HRT was increased to 36hrs. G.D. Najafpour

03- Treatment of Grey Water By Modified Rotating Biological Contactor (RBC)

The reactor had four blade search of size 350 mm \times 100 mm attached to a shaft at an angle of 90°.

The partially treated effluent from RBC was allowed to pass through three columns of filter connected in series.

The experiments were run for two different filter media namely, granite, stone and coal separately.

The experiment was conducted for different influent substrate concentrations and different speeds of rotating blades and total rotational speeds of 4.5 and 6 rpm.

S. Syed Enayathali and V. GopalasamI

04- Treatment of dairy wastewater using rotating biological contactors

In India, Dairy Industry is one of the major industries causing water pollution.

Dairy wastewater is enriched in organic matter & also contains biodegradable carbohydrates.

The biofilm model was implemented for three-stage Rotating Biological Contactor on a laboratory scale experimental set up. Prashant A. Kadu1 Rajshre

III.METHODLOGY

We have studied various research papers and on the basis of that various tests were performed on dairy waste water. A rotating biological contactor (RBC) unit was fabricated which fulfilled our requirement that dairy waste water from an industry named Dinshaw was collected. The media was identified on the basis of information gathered from a research paper which was identified as stainless steel scrub. Moving further, various different tests were performed on dairy waste water as initial testing tests like BOD, COD, TSS, turbidity and pH. The treatment of dairy waste water using RBC units was done at 5 rpm for 90 hrs, As a result minute deposition was obtained on day 4, and there was a certain increase in deposition on day 5 and wastewater was sufficiently treated. All the above tests were again performed to obtain the final results of the treated dairy waste water. The final results were then compared with the standard values of water required for irrigation.

IV.RESULTS AND CONCLUSION

SR NO	NAME OF TEST	TEST METHOD	UNIT OF MEASUREMENT	TEST RESULT
1	pH at 25 ⁰ C	IS 3025 (Part 11)-2022	-	7.2
2	Turbidity	IS 3025 (Part 10)-1984	NTU	375
3	Total Suspended Solid (TSS)	IS 3025 (Part 17)-2022	Mg/ltr	500
4	Chemical Oxygen Demand (COD)	US EPA 410.4	Mg/ltr	940
5	Biochemical Oxygen Demand(BOD)	IS 3025 (Part 44)-1993	Mg/ltr	230

Initial Test Result

2 Final Test Result

SR NO.	NAME OF TEST	TEST METHOD	UNIT OF MEASUREMENT	TEST RESULT
1	pH at 25 [°] C	IS 3025 (Part 11)-2022	-	4.69
2	Turbidity	IS 3025 (Part 10)-1984	NTU	657
3	Total Suspended Solid (TSS)	IS 3025 (Part 17)-2022	Mg/ltr	2133
4	Chemical Oxygen Demand (COD)	US EPA 410.4	Mg/ltr	3370
5	Biochemical Oxygen Demand (BOD)	IS 3025 (Part 44)-1993	Mg/ltr	818

V. SUMMARY AND CONCLUSION

The ultimate aim of the treatment process was to treat the water at such a level that it can be used for irrigation purposes. Various tests are conducted on dairy waste water with the RBC unit, media taken as stainless steel. Tests such as pH, Turbidity, TSS, BOD, COD were performed. The results of these tests are on a higher side compared to standard value of waste water which can be used for irrigation, except pH and cod which comes under acceptable zones. Hence, these treatments conclude that the dairy waste water treated by stainless steel on RBC unit for 90 hrs has unsatisfactory value of BOD, Turbidity, TSS which are on higher side than the water which can be used for irrigation. As a result the water requires further treatment so that the values of BOD Turbidity TSS satisfy the irrigation standard.

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