Sequencing Batch Reactor (SBR) for Dairy Wastewater Treatment

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Abstract : Sequencing Batch Reactor is a advance treatment which is used for the wastewater treatment now a days. This research work includes laboratory scale model for the dairy wastewater analysis and check the various reductions such as BOD, COD etc. We have Performed three phases with different reaction time with increase in reaction time further we found more reductions in BOD, COD respectively.

Index Terms— SBR, Batch Process, Phases, BOD, COD, pH, TSS

1 INTRODUCTION

India has vast resources of livestock, which play an important role in the national economy and also in the socioeconomic development of millions of rural households. Sequencing Batch Reactor (SBR) is one of the advanced treatment options can be used for treatment of Dairy Wastewater. SBR is a modification of ASP which utilizes a fill-draw reactor employing complete mix conditions during batch reaction step and where the subsequent steps of aeration and clarification occur in the same tank. . Here we Made laboratory scale model for the Dairy wastewater analysis and check the various reductions such as BOD, COD etc. We have Performed three phases with different reaction time with increase In reaction time further we found more Reductions in BOD, COD Respectively.

2 MATERIALS AND METHODS

2.1 Sample Collection

The effluent was collected at the outlet of Fat Removal Tank from Gokul Dairy. Thus effluent used for the treatment was primary treated. Daily collection of effluent was done in order to check efficiency of treatment by using Sequencing batch Reactor. It was analyzed for pH, COD, BOD, TS, TDS, TSS according to standard methods

2.2 Experimentation

The reactor was fabricated of transparent Acrylic sheets with square cross sectional area & total volume of 8 lit (20 x.20 x 20 cm) and a working volume of 6 lit (20 x.20 x 15 cm). The volume of reactor was decided considering the volume of treated wastewater (reactor effluent) required for carrying out the analysis. The height of the reactor was fixed with an experimental determination of agitating depth of water by the air pump. A pipe grid was immersed into a water tub & was connected to air pump for this height determination.

Cycle Operation

After the acclimatization of microbes in the reactor, it was operated at rate of one cycle (6 Hrs) per day with dairy wastewater as feed. Since the cycle time for treatment of sewage by SBR is about 6 Hrs. The same duration was chosen to start the treatment of Dairy wastewater

Sr. No	**Step**	**Time in minutes**		
		6Hr Cycle	**7Hr Cycle**	**8Hr Cycle**
1	Fill (25%)	90	105	120
2	React (35%)	126	147	168
3	Settle (20%)	72	84	96
4	Draw (15%)	54	63	72
5	Idle (5%)	18	21	24
	Total (100%)	**360**	**420**	**480**

Table 1: Time Distribution For various Phases SBR

3 RESULTS AND DISCUSSIONS

We have made the laboratory scale model of SBR and checked various parameters like BOD, COD. For this we first have to ckeck the actual parameters which are as follows

Parameter	Unit	Min	Max	Average
pH	-	7.10	7.88	7.49
BOD	mg/l	1067.5	1364.17	1171.47
COD	mg/l	1981.25	2633.33	2250.86

Table no2: Dairy wastewater characteristics

Phase 1 Operation In the first phase SBR Performance was analyzed for pH, BOD, COD for 6 Hr cycle BOD, COD reduction is 84.22%, 83.40% etc.

Phase 2 Operation In the second phase SBR Performance was analyzed for pH, BOD, COD for 7 Hr cycle BOD, COD reduction is 88.63%, 88.82% etc.

Phase 3 Operation In the Third phase SBR Performance was analyzed for pH, BOD, COD for 8 Hr cycle BOD, COD reduction is 89.30%, 89.26% etc.

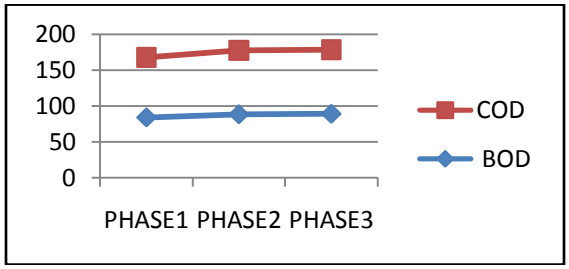

Fig no.1: BOD, COD % Reductions

4 CONCLUSIONS

- With the present study it can be concluded that SBR is applicable for dairy Wastewater treatment.
- To increase removal efficiency further the react time need to be increased so as to bring limit exceeding parameters below the expected levels (MPCB Standards).
- Also, In order to increase suspended solids removal efficiency settling time can be increased.
- In the first phase SBR Performance was analyzed for pH, BOD, COD for 6 Hr cycle BOD, COD reduction is 84.22%, 83.40% etc.
- In the second phase SBR Performance was analyzed for pH, BOD, COD for 7 Hr cycle BOD, COD reduction is 88.63%, 88.82% etc.

In the Third phase SBR Performance was analyzed for pH, BOD, COD for 8 Hr cycle BOD, COD reduction is 89.30%, 89.26% etc.

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Abbreviations and Acronyms

- A.I.-Artificial Insemination
- ASP-Activated Sludge Process
- BMC- Bulk Milk Coolers
- BNR -Biological Nutrients Removal
- BOD -Biochemical Oxygen Demand
- BPR -Biological Phosphorous Removal
- CETP- Common Effluent Treatment Plant
- CIP- Cleaning In Place
- COD- Chemical Oxygen Demand
- CPCB -Central Pollution Control Board
- DO -Dissolved Oxygen
- F/M -Food to Microorganisms Ratio
- HRT- Hydraulic Retention Time
- MLSS -Mixed Liquor Suspended Solids
- MLVSS- Mixed Liquor Volatile Suspended Solids
- MPCB-Maharashtra Pollution Control Board
- OLR -Organic Loading Rate
- PHE-Plant Heat Exchanger
- PLC - programmable logic controllers
- RMRD- Raw Milk Revolution Department
- RAS -Return Activated Sludge
- SBR- Sequencing Batch Reactor
- SRT- Solids Retention Time
- SS -Suspended Solids
- STP- Sewage Treatment Plant
- TDS -Total Dissolved Solids
- TSS -Total Suspended Solids
- VSS- Volatile Suspended Solids