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Treatment of Dairy wastewater by UASB reactor Integrated with Advanced Oxidation process

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ABSTRACT-

In recent years, we have been progressing towards increased industrial development. The dairy industry is a significant contributor to pollution within the food sector, as it generates substantial wastewater characterized by high levels of BOD, COD, nutrients, inorganic substances, and biodegradable materials that can adversely affect both aquatic and terrestrial ecosystems. The wastewater produced from these highly processed industrial activities is inherently problematic. Therefore, it is crucial to treat such wastewater prior to its disposal into rivers, streams, and other bodies of water. The UASB study provides a general understanding of the usability and functionality of wastewater treatment in the industry through the UASB method. The Upflow Anaerobic Sludge Blanket process represents a recent advancement in the field of anaerobic treatment. The UASB process is recognized as one of the most effective and beneficial methods of anaerobic treatment. To enhance the quality of aerobically treated effluent to meet irrigation standards, the integration of a UASB reactor with advanced oxidation processes (AOPs) may serve as a superior solution for nearly complete removal of color, COD, and disinfection of pathogens.

Index Terms- COD, BOD, Hydrogen peroxide, advanced oxidation processes, dairy wastewater.

INTRODUCTION

Milk may be defined as the whole, fresh, clean, lacteal secretion obtained by the healthy milk animals. Dairy industry contains high amount of organic constituents. This may result in affecting the quality of aquatic and human life. There are large numbers of milk dairies in India, which play a key role in the economy of our nation.[1] These milk dairies generate huge quantity of dairy waste water which carries a high organic load.
The wastewater generated by the dairy industries includes:

- Washing and cleaning operations in the tanks, trunks, pipes etc.
- Spillage by leaks and overflow.
- Processing loss involves, discharge from bottles and washer, sludge discharge from clarifiers , splashing and container breakage in automatic packing equipment. and, evaporator entrainment
- Spoiled products, returned products or by products
- Detergent and other compound used in washing and sanitizing solution that are discharge as waste.
- Entrainment of lubricants from conveyers, stackers and other equipment. Milk products are some time deliberately wasted sometime whey and butter [2]

OBJECTIVES

In these works taking after destinations have been set to think about the Anaerobic Treatment of Dairy wastewater by UASB reactor Coordinates with chemical Oxidation process
To ponder the show squander water treatment Prepare in Dairy
To ponder physico-chemical characteristics of dairy squander water
Selection of the Post treatment strategies for Evacuation of BOD, COD, P from effluent
To ponder the Progressed oxidation handle for dairy squander water.

ADVANCED OXIDATION PROCESS

For the treatment of wastewater, a group of chemical oxidative technologies classified as advanced

oxidation forms (AOPs) has gathered a noteworthy level of intrigued scholastically and mechanically over the final three decades [3]. All Progressed oxidation prepare are characterized by the generation of exceedingly non-reactive and receptive hydroxyl radicals, which are the most grounded oxidants

in an watery medium.[4]Hydrogen peroxide (H2O2) may be a solid oxidant and its application within the treatment of different inorganic and natural toxins is well set up. [5]The particles of H2O2 comprise of two hydrogen particles and two oxygen molecules

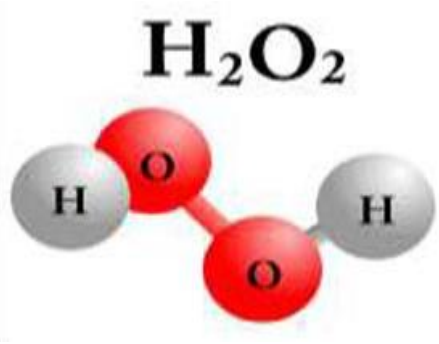


Fig. 1 Molecular Arrangement of Hydrogen Peroxide

MATERIAL AND METHODS

1. The treatment given to squander water in dairy is UASB, Within the UASB (Up stream Anaerobic Slime Cover) reactors, the COD evacuation and generation of Biogas take place.
2. The influent enters at the foot by means of special distribution system which guarantees great contact between the influent and the biomass. This framework has got to be flushed routinely. As the influent streams up, natural matter is changed over to methane, carbon dioxide. Three components occurring
3. Hydrolysis process
4. Acidogenesis process
5. Methanogenesis process

A. Experimental setup

- AOP is utilized for the treatment of dairy effluents after UASB prepare. The Supply is made up of glass with a add up to working volume of 55L.
- Six containers of one liter capacity are taken and in each container squander water amount of 1 liter is added.
- Temperature of Supply was kept up at 25
- 0 c
- pH of squander water is balanced to 3 and measurements of H2O2 shifting from 0.5 to 3 ml is included to each measuring utencils .
- After expansion of H2O2 a response time of 1Hr is kept up for explore. pH was controlled with arrangements of NaOH and H2SO4.
- After response time of 1 hr the readings of TDS, BOD, Oil & Oil, Chlorides, Phosphate and COD were observed

pH of waste water is adjusted to 3 and dose of H2O2 varying from 0.5 to 3 ml is added to each beakers .

- After addition of H2O2 a reaction time of 1Hr is maintained for experiment. pH was controlled with solutions of NaOH and H2SO4.
- After reaction time of 1 hr the readings of TDS, BOD, Oil & Grease, Chlorides, Phosphate and COD were observed

Fig. 2 Experimental Setup

RESULTS AND DISCUSSION

The exploratory work is carried out for different measurements and different parameters are controlled to optimize them for expanding effectiveness of progressed oxidation prepare. By the separation into water and oxygen, H2O2 can moreover supply oxygen for microorganism in natural treatment offices and in bioremediation of sullied locales. It can be utilized as a cleaning specialist within the control of undesirable bio-film development. H2O2 can be deteriorated into water and oxygen by enzymatic and non- enzymatic routes.

Sr.no	Month of Sampling	BOD		COD		P		Oil and Grease	
		Influent	Effluent	Influent	Effluent	Influent	Effluent	Influent	Effluent
1	11/04/2017	510	100	2544	280	7	6	14	10
2	13/04/2017	580	110	2272	290	7	5	16	12
3	15/04/2017	590	118	2496	270	8	6	13	10
4	13/08/2017	470	95	2455	310	8	6	12	9
5	18/08/2017	490	98	2272	300	8	5	9	7
6	20/08/2017	500	96	2448	310	7	6	10	8
7	11/01/2018	570	100	2278	280	8	5	8	9
8	13/01/2018	530	96	2450	286	7	5	7	6
9	17/01/2018	560	95	2480	288	8	5	8	7

Table III. Variation in various parameters after post treatment with H2O2

Table IV. Percentage removal (%) change in various parameters after post treatment

Sr.no	Dose in ml	Percentage removal (%)						
		pH	TDS mg/l	COD	BOD	P	Cl	Oil &Grease
1	0.5	4.16	26.35	3.70	47.36	16.66	3.76	30
2	1	5.55	26.51	5.92	66.31	50	10.76	40
3	1.5	5.55	27.90	8.88	70.52	66.66	16.92	50
4	2	6.94	27.90	9.62	72.63	83.33	21.53	60
5	2.5	6.94	30.23	10.37	73.68	83.33	23.07	70
6	3	6.94	31	10.37	73.68	83.33	24.61	70

Table V. Efficiency change in various parameters after post treatment

Variation of BOD: The BOD values were measured After 1 hr from the addition of H2O2.The Graph Doses v/s BOD shows that values ranged from a high of 50 to a low of 25.After the 2 ml the values of BOD does not shows any variation.

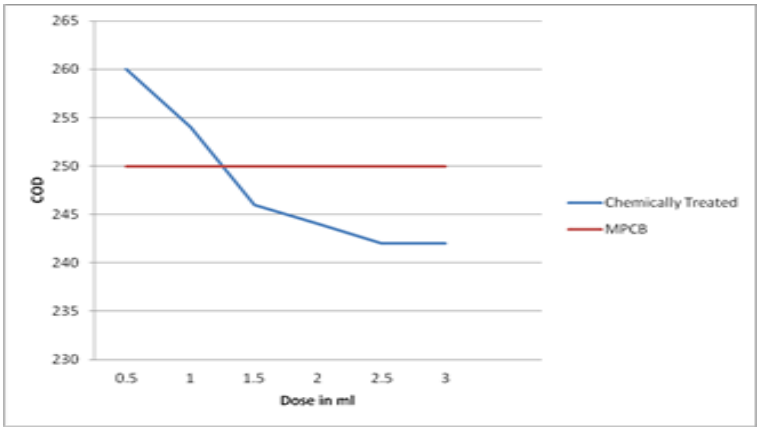
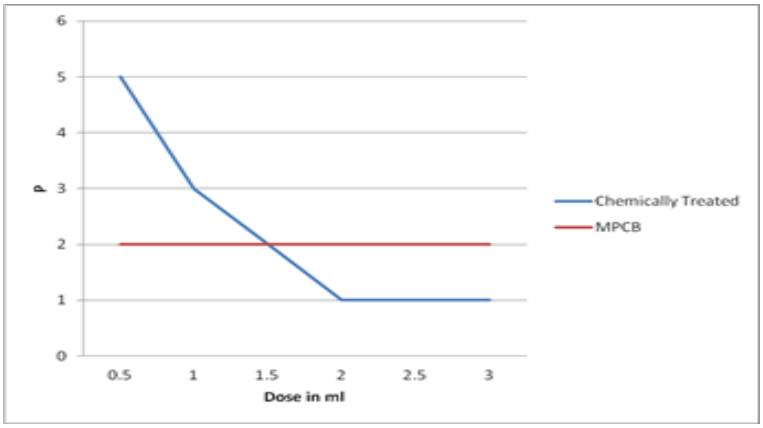


Fig.4 COD Reduction rate at various doses Variation of COD: The COD values were measured After 1 hr from the addition of H2O2.The Graph Days v/s COD shows that values ranged from a high of 260 to a low of 242.After the 2 ml the values of COD does not shows any variation



Sr.no	Dose in ml	Efficiency (%)						
		pH	TDS mg/l	COD	BOD	P	Cl	Oil &Grease
1	0.5	95..03	73.64	96.24	52.63	83.33	96.92	70
2	1	94.44	73.48	94.07	33.68	50	89.23	60
3	1.5	94.44	72.09	91.11	29.47	33.33	83.07	50
4	2	93.05	72.09	90.37	27.36	16.66	78.46	40
5	2.5	93.05	69.76	89.72	26.31	16.66	76.92	30
6	3	93.05	68.99	89.72	26.31	16.66	75.38	30

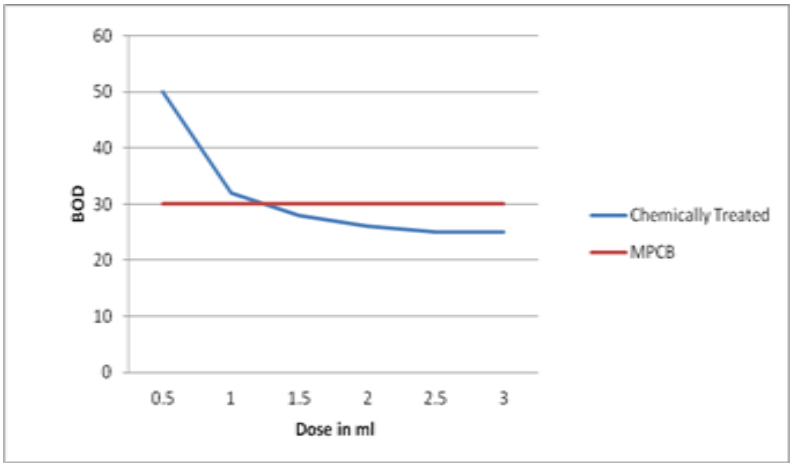


Fig.5 P Reduction rate at various doses Variation of P: The P values were measured After 1 hr from the addition of H2O2.The Graph Days v/s P shows that values ranged from a high of 5 to a low of 1.After the 2 ml the values of P does not shows any variation

CONCLUSIONS

Fig.3 BOD Reduction rate at various doses The Progressed Oxidation forms ponder was explore the productivity of H2O2 to treat dairy squander water and after that optimization of different test working parameters on the evacuation of evacuation of toxins from dairy effluents.

For post treatment in terms of BOD and COD evacuation of UASB-treated emanating, AOPs are exceedingly productive and doable for evacuating both the parameters quickly.

The comes about of this ponder appear that the parameters were in satisfactory restrain of MPCB The issues of odor, well water defilement, are eliminated. COD diminishment was exceedingly critical which suggests that H2O2 is proficient and, so AOPs are proficient techniques that can be utilized in dairy emanating medications

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