TREATMENT OF TEXTILE WASTEWATER BY ANAEROBIC REACTOR

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ABSTRACT

The textile industry was famous for discharging "waters of many colors." It contains toxic constitute which are obstruct the aerobic process. The aim of this paper was to removal of color, COD, BOD_5, and observation of gas production. Which was present in textile wastewater due to the various dye constitutes are used in textile finishing mills. In this study anaerobic reactor took as a plastic 3L container for this treatment process. The textile wastewater was characterised as pH: 7, COD: 2200 mg/L, BOD_5 : 900 mg/L , TDS: 800 mg/L , TSS: 620 mg/L , color (on pt-co scale): 415. By the anaerobic treatment it was observed that color removal efficiency was achieved on 35.83% , 65.00 %, 78.00 %, COD was found to reduce ranging from 63.6 % to 81.8% , BOD was found to reduce ranging from 26.67 % to 76.6% on 3,7,14 days respectively. In the process of anaerobic there was a reduction of pH from maximum 7.45 to 5.6 indicating various stages of anaerobic process like Hydrolysis, Acitogenesis, Acidogenesis and Methanogenesis. At maximum COD removal the gas generation at the end of 14th day was found to be 1.7L as measured by balloon.

Keyword: *Anaerobic treatment, Color, COD, BOD_5 removal,, Gas generation Textile wastewater,*

1. Introduction

Textile mills are major consumers of water consumption of finished product and consequently one of the largest groups of industries causing severe water pollution. Generated wastewaters comprise different effluents coming from different manufacturing unitary operations such as sizing, desizing, scouring, bleaching, dyeing, soaping and softening.[2] These complex operations, subjected to frequent changes as a result of shifting consumer‟s preference, are the cause of the variable volume and the wide diversity of chemical products found in these wastewaters. Though their characteristics depend on the specific operations performed, they commonly present suspended solids, high temperature, unstable pH, high chemical oxygen demand (COD), biological oxygen demand (BOD) and high colorization. Color of textile effluents is caused by dyes employed in dyeing processes. Anaerobic biological treatment generally used biological matter to reduce the biodegradable matter and in the end process it will give a methane gas as well as carbon dioxide gas. The carbon dioxide gases are very useful in colourless dying of cloth. This method was first used in digestion of sludge but now a days it is also helpful in treatment of wastewater [4] The anaerobic treatment process is generally adopted in actual project to treat high concentration wastewater. Anaerobic bacteria are very sensitive to physical condition like temperature, pH, and other parameters. The initial parameter observed in textile wastewater was as pH: 7, COD: 2200 mg/L, BOD_5 : 900 mg/L , TDS: 800 mg/L , TSS: 620 mg/L , color (on pt-co scale):415.The treatment was successfully applied in pharmacy or in dairy wastewater treatment.

2. Material and methods

In this study The clarified set-up comprised of anaerobic reactor, made of a PVC material with a cylindrical 110 mm internal diameter; 1500 mm height. The reactors were encouraged from the influent tank through PVC tube by means of a gravitational flow. A PVC check valve of 10 mm size was altered at the bottom of the reactor to facilitate the sludge withdrawal. The gas was collected in plastic urinal non return valve bag having capacity of 3L. For the efficient mixing of wastewater one of the gear motor was also mounted on the top of reactor which is connected with the 12V DC connector, in the addition of this laboratory thermometer also mounted on top of the reator to know the inner temperature within the reactor.

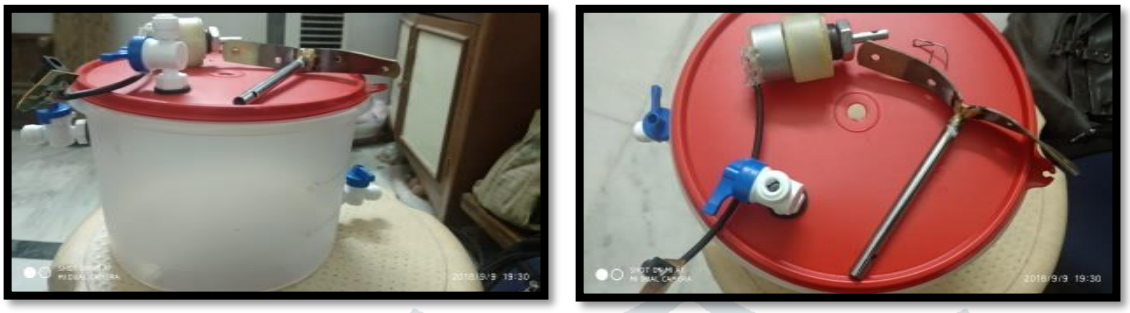


Fig 1: anaerobic reactor

Sr.no.	Physical parameter	size
1	Height	150mm
2	Diameter	200mm
3	Volume	1.88 m3
4	Gas collection point	0.5 cm
5	Mixing rpm	12-15 RPM

Table 1: physical dimension of anaerobic reactor

Bacterial culture for anaerobic reaction grown by the combination of cow dung and textile waste water, bacterial culture was grown in plastic bottles which are enclosed with plastic bag on the top side. After the addition of cow dung and textile waste water in composition of 30% and 70% respectively it was further incubate at 37°c for 7 days.

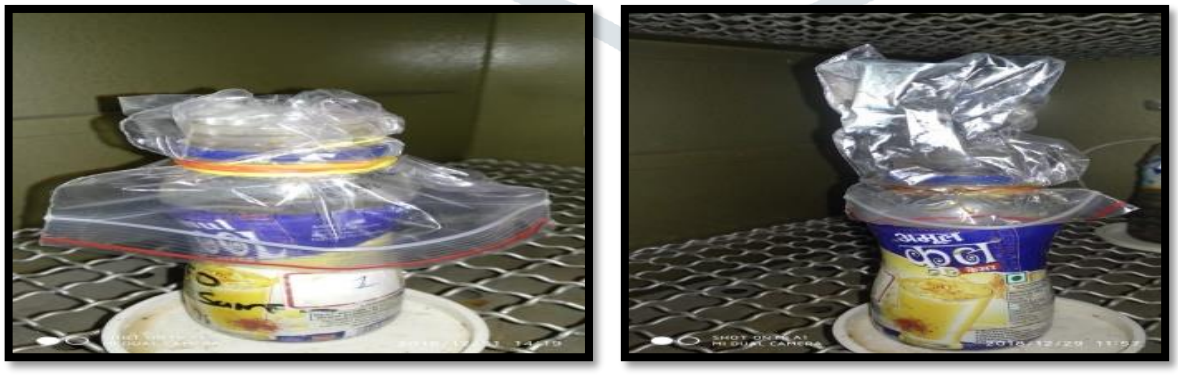


Fig 2: growth of anaerobic bacteria

In further process the bacteria was streak on petri dish which contain thioglycolate medium and as indicator methlyne blue was used which change the color blue to colorless in presence of anaerobic bacteria as shown in Fig 3.

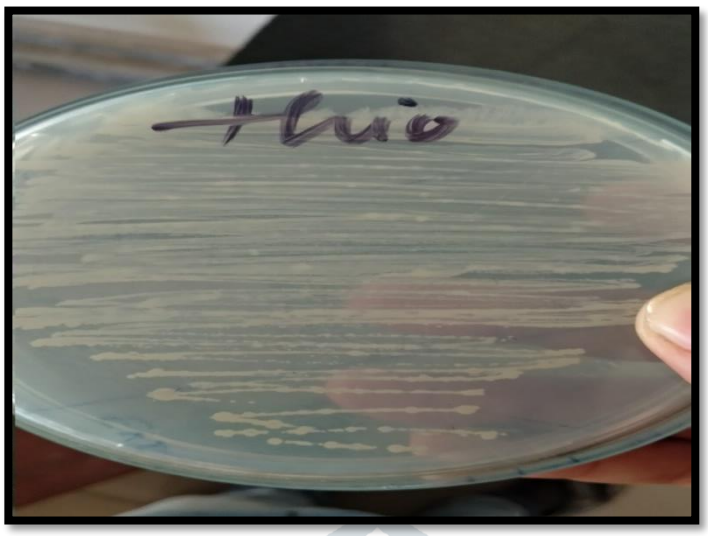


Fig 3: streaking of bacterial culture

Then after we feed real textile wastewater at the rate of 0.2kg.COD/m^3 with nutrients and initial substrate as glucose, the glass bit was also added to support the microbial growth. The anaerobic reactor was sealed with silicon foil to maintain the inner temperature and obstruct the sunlight. In further process the anaerobic reactor was placed in hot water bath or in incubator at 36° - 37°c for providing physical condition which are suitable to anaerobic digestion.

Fig 4: Hot water bath for anaerobic reactor

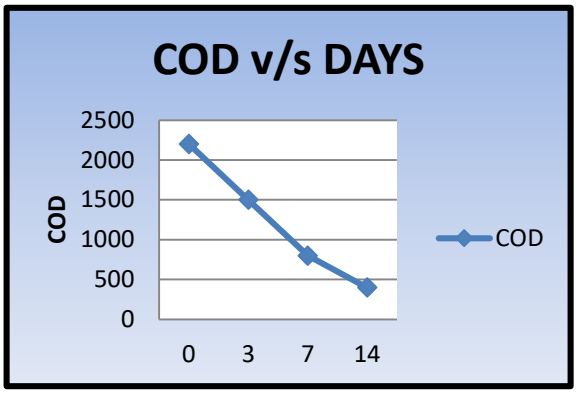
3. Results and conclusion

In this chapter, results and discussion on the experimental data obtained from anaerobic reactor based on batch mode of operation is presented. The performance of the reactor has been evaluated. The anaerobic reactor was continuously placed in hot water bath or in incubator at 36° - 37°c upto 15 days. The result was carried out at 3, 7 and 14 days. At different oraganic loading rate applied to anaerobic reactor as follows:

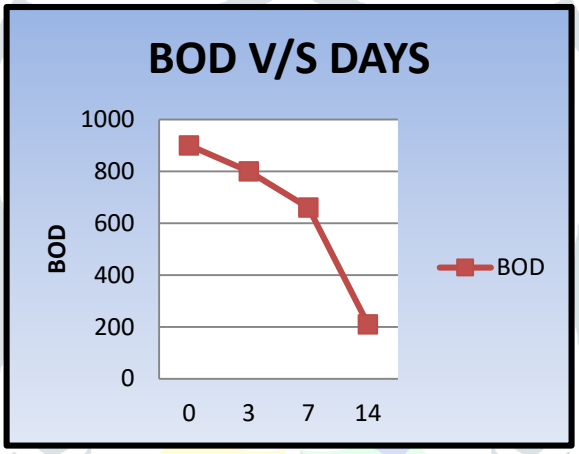
Table 3.1 Organic loadig rate

Sr. no.	day	Organic loading rate	unit
1	1st day	0.2	Kg.COD/m^3
2	3rd day	0.32	Kg.COD/m^3
3	7th day	0.46	Kg.COD/m^3

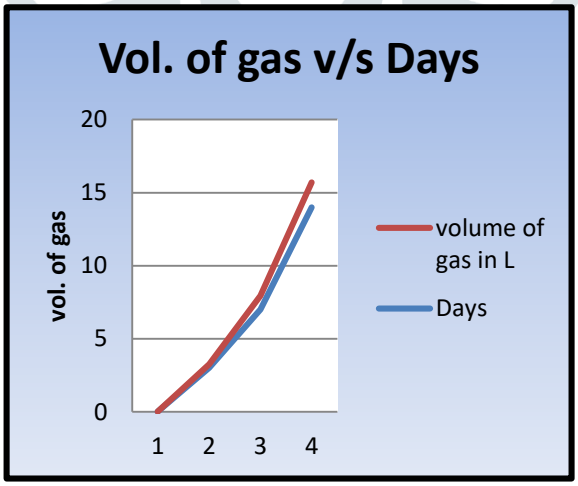
As per above different organic loading rate the result of reduction in COD was 1500 mg/L,800 mg/L,400 mg/L at 3, 7 and 14 days.



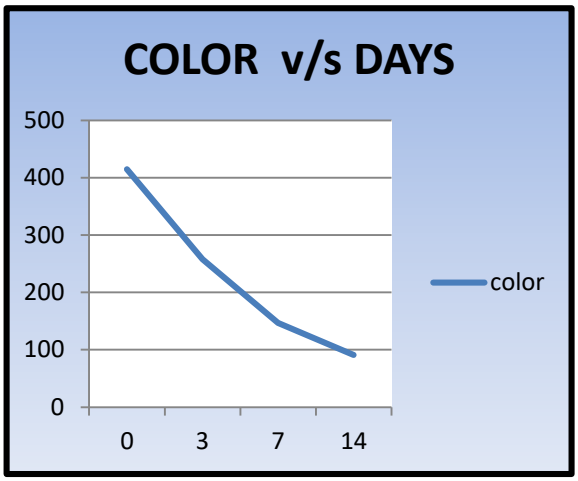
The BOD removal during anaerobic digestion was 800 mg/L,660 mg/L,210 mg/L, at at 3, 7 and 14 days.



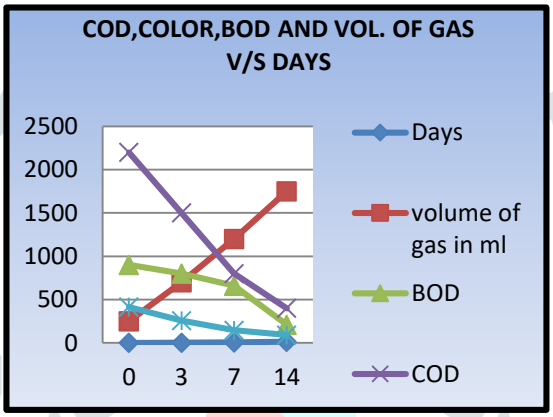
The volume of generated gas was being measured by non-return valve urine bag. The generation of gas was 0.25 L, 0.95 L, and 1.75 L at 3, 7 and 14 days respectively.



By the anaerobic treatment it was observed that color removal efficiency was achieved on 35.83% , 65.00 %, 78.00 %,



In anaerobic treatment the reduction of COD, BOD_5, colour and production of gas rate v/s days had shown as below:



4. CONLUSION

Based on the observations and the results obtained from this study, the following points could be concluded:

- The COD was found to reduce ranging from 63.6 % to 81.8% i.e. an average of 72.7 % reduction.
- The BOD was found to reduce ranging from 26.67 % to 76.6% i.e. an average of 51 % reduction
- The colour was found to reduce ranging from 64.57 % to 78.07% i.e. an average of 71.32 % reduction.
- In the process of anaerobic there was a reduction of pH from maximum 7.45 to 5.6 indicating various stages of anaerobic process like Hydrolysis, Acitogenesis, Acidogenesis and Methanogenesis.
- At maximum COD removal the gas generation at the end of 14^{th} day was found to be 1.7L as measured by balloon.

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