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Anaerobic Treatment Of Brewery Industry Waste

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Abstract- Brewery industries in India cover a range of production processes due to their wide variety of beverages, which leads to the generation of effluents with different physicochemical characteristics. Furthermore, these leftovers have a great deal of potential for the production of biogas and bioenergy, but it is often disposed of untreated.Anaerobic digestion can be implemented to treat brewing effluent, promote its energy recovery, reduce environmental pollution, and produce environmentally friendly biological products: biogas and biofertilizer. Thus, this review explored the potential of AD for brewery waste management. The aim of experiment was to find how well anaerobic digesters treated wastewater from the brewery industry and produced methane additionally removing total solids & BOD from the system. When organic material is biologically broken down by bacteria in an anaerobic environment, biogas is produced. Following feeding of effluent that had pH of 7 to 8, a digesting facility was set up in a lab and used until the twelfth week. The system included of 1 digester, 10 liters of cow manure slurry, and the addition and removal of 1000 mL of waste product from the beer industry. The T.S., V.S., F.S., B.O.D., C.O.D., SO4, NO3 removal efficiency results from this system are 62.50%, 51.34%, 53.00%, 59.85%, 56.1%, 50.45%, and 53.19%.21.56 milliliters of biogas is generated once all solids have been removed, and 69.25 milliliters are generated from the elimination of all B.O.D.

Index Terms- Total solids, BOD, anaerobic digester, wastewater, and biogas

1. INTRODUCTION

A company that produces and distributes beer is known as a brewery or brewing company. A brewery or a beer house is the location where beer is produced commercially. In ancient Mesopotamia, commercial beer making dates back at least 2500 BC. Brewers received societal approval and divine protection from the goddess Ninkasi. In the beginning, brewing was a side business carried out at homes. By the ninth century, monasteries and farms were manufacturing beer on a bigger scale and selling the extra, and by the eleventh and twelfth centuries, larger, dedicated breweries employing eight to ten people were being constructed. The variety of procedures, levels of automation, and types of beer produced in breweries correspond to the of brewery sizes. Usually, a brewery is separated into discrete areas, each of which is dedicated to a certain step in the brewing process.

i. OBJECTIVE OF STUDY

1. To identify the features of wastewater.
2. The anaerobic digester fabrication.
3. To calculate the biogas generation rate per grams of TS removed.
4. To ascertain the successfulness of removing various criteria, such as solids, phosphate, nitrate, COD chloride, and BOD.

2. MATERIAL & METHODOLOGY

i. FABRICATION AND EXPERIMENTAL SETUP

The reactor's digester, Aspirator Bottle No.1 has an 8-liter operating volume and a 10-liter capacity. The digester is connected to a second 5.0L aspirator container, which is intended to house the NaOH solutions.It is displayed in Fig. The generated gas is collected using the water displacement method in a different container. The second aspirator bottle's NaOH solution is accumulated in the measuring cylinder, and the volume of gas generated is measured.

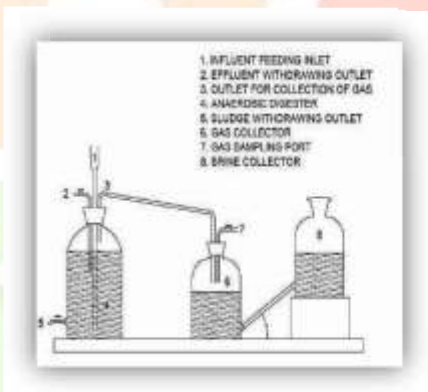


Fig 1: Diagrammatic schematic of experimental setup of digester

ii. STARTUP OF REACTOR

1. As seed sludge for the initial startup, septic tank waste and cow dung slurry are added to the digester to allow for acclimatization.

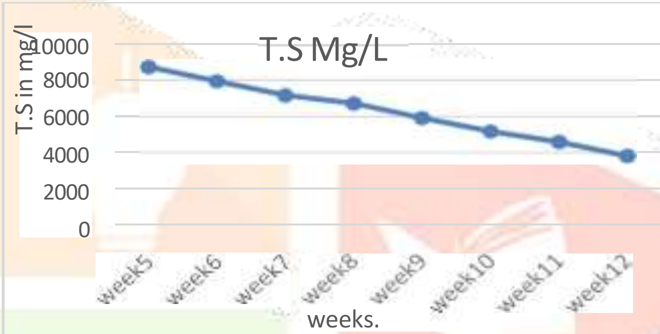
2. The reactor receives 2 liters of filtered cow dung slurry, which is combined with around 100 milliliters of septic tank effluent to make a total volume of 8 liters.

3. Following the addition of seed sludge, the digester is given time to stabilize, often for 20 days.
4. Following stabilization, various organic loadings were added to the reactor, and various parameters were checked for the effluent.

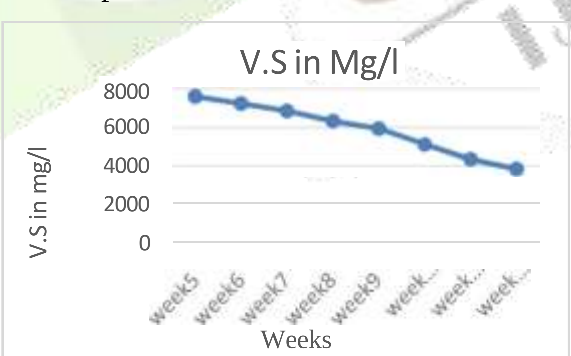
Fig 2: Experimental Setup of Digester

3. RESULTS & DISCUSSIONS.

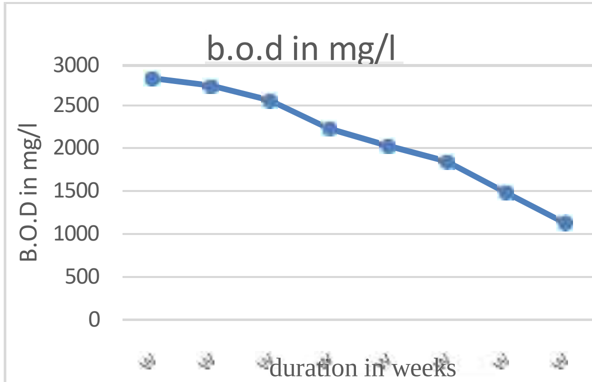
The results describe the characteristics of brewery wastewater & also the percentage reduction in influent and effluent in anaerobic digester of the waste. The graphs below show the reductions occurring.



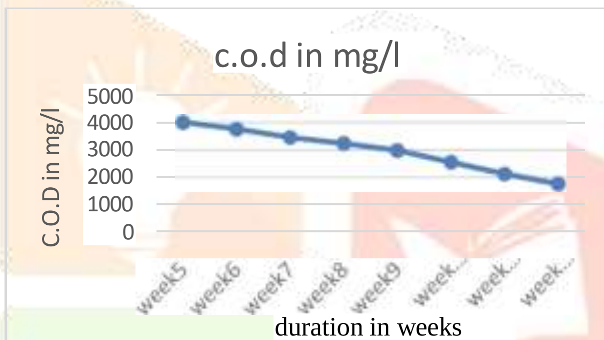
The trial showed a 62.5% decrease in total solids. One crucial indicator of biodegradation is the decrease in total solids measured; the graph above, which slopes downward, shows an increase in total solids breakdown.



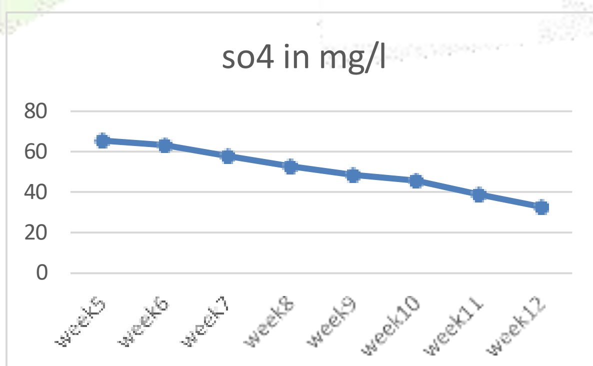
The highest decrease of VS is 51.34%. The stabilizing effect of an anaerobic system is indicated by the lowering of volatile solids. It is a measurement of the quality of water derived from the loss of total suspended



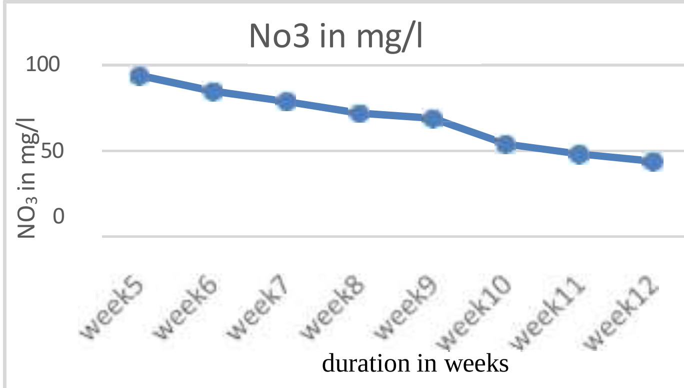
In this experiment, the biochemical oxygen demand (BOD) is reduced to a maximum of 59.85%.



In this experiment, the maximum COD decrease is 56.1%. This represents the total amount of compounds in the water that can undergo oxidation.



So4 is lowered up to 50.45% in this experiment.



In this experiment, the maximum NO3 concentration of the physiologically chemically treated wastewater reduction is 53%.

Gas production

Analysing the AD process's performance is 1 of the work's primary goals. The data in the graph above show how B.O.D. influences both the generation of biogas and anaerobic degradation. Initial BOD minus final BOD represents the digester's total gas output. * Digester volume/1000

Gas production= ml. of gas produced/gm of B.O.D removed

=(2815-1130)-1685mg/L

1685mg/L 10L)/1000=16.85gm

Production=1166M1/16.85gm=69.25ml/gm.

Analysing the AD performance is one of the work's primary goals. The results in the B.O.D. graph above support both the production of biogas and anaerobic degradation. Initial TS minus end TS equals the digester's total gas production. * Digester volume/1000

Gas generation = mL of gas produced/gm of total solids removed(8700-3789) = 4911mg/L

4911mg/L 10L)/1000=49.11gm

production1166M1/49.11gm=21.43mL/gm.

5. CONCLUSION

1. The wastewater is slightly basic and creamish yellow in colour

2. It is highly organic and biologically decomposable as observed from BOD/COD ratio and has high volatile Solids.

3. The anaerobic digester has efficiency in removal of total solids up to 62.50% volatile solids 53%,BOD 59.85%COD up to 56.1% at the end of twelfth week.

4. The bio-gas generation is 21.56ml/gm from total solids removal and 69.25ml/gm from total BOD removal.

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