ph Study in Optimization of Bio-Methanation Process of High TDS Spent Wash Obtained from Distillery

LALITHA D[1], DR. N S SATHISHA[2], DR B MANJU[2], DR. B M KIRAN[3]
[1] *Assistant Professor, Department of Engineering Chemistry, G.E.C, K.R.Pete, Mandya , Karnataka, India.*
[2] *Principal, G.E.C, K.R.Pete, Mandya, Karnataka, India*
[3] *Professor and H.O.D, Department of Engineering Chemistry, M.I.T, Mysuru, Karnataka, India*
[4] *Associate Professor, Department of Civil Engineering, A.I.T, Chikmagaluru, Karnataka, India*

Abstract— Generally distilleries based on cane sugar produce ETHANOL from Molasses in large quantities. This is the major product obtained in the industry in several countries of the world. are than 15.8 billion gallons per year of alcohol from molasses produce in total world's production. The aqueous distillery waste is stream known as spent wash. It is a dark brown colored highly organic effluent and is approximately 11- 14 times more by volume of the actual product alcohol. The more complex substituent includes very high chemical and biological oxygen demand values with too vary pH values. This is high concentrated organic substituent and therefore distillery spent wash is acting as able vital source of renewable energy.

Most industries usually discharge untreated effluents into the neighboring fields or drains. These effluents not only contain nutrient that may stimulate growth of many crops but also have toxic chemicals which may retard Germination

Presently these technologies used by distilleries for treatment of waste are Bio-methanation followed by a two-stage biological treatment and study with respect to pH values modifies the values near to neutral it y and disposal using water courses for utilization on land for irrigation process.

Index Terms— Molasses, Spent wash, pH, acetic acid, sodium acetate, Bio-methanation, anaerobic digestion

I. INTRODUCTION

Being a rich source of organic matters and nutrients like nitrogen, phosporous, potassium, calcium and sulphur, spent wash even contains sufficient micro-nutrients like iron, zinc, copper, manganese, boron and molybdenurn. As the nutrients are very high its acidity or alkalinity may also affect very larger so it may directly effects on the pH values of the spent wash. From distilleries after extraction of alcohol from molasses the obtained beneficial by product is spent wash. lt is a plant extract derived from sugar cane and contains nutrients and easily oxidizable organic matters. lt does not contain any toxic heavy metals and hazardous constituents. lt also increase soil fertility for an increase's the yield. Since the spent wash have a lot of organic inputs. It is used for bio-methanation (biogas generation), the techniques now used by distilleries for the treatment of waste H2O are bio-methanation followed by 2 stage biological treatment and disposal in water outlets with neutralization of pH values and for use on land for agricultural purposes or for compositing with or without bio-methanation and concentration and incineration. Certain limitations are also there in this process.

lot of energy in the form of methane gas will be losses by this method . This is also of national priority. This new work is an attempt to neutralize the spent wash followed by pH study of the gained products through continues process and for Biomethanation for high TDS spent wash. The replacement of fossil fuels with reduction of green house gases can also be done by anaerobic digestion of Biomethanationated waste like spent wash. This leads to generate Energy in multiple way. The use of methane from the waste is not a recent

technology. By 330 distilleries in India about 4.8 billion liters of alcohol will generate annually and this leads the generation of approximately 60 billion liters of waste water per year but this has the potential to produce around 1100 million cubic meters of biogas. Distillery waste water contains more than 6.2million BOD that is if we compare this study with respect to Indian organic pollution means that will be of 7 times greater than the entire Indian population. Generally wastewater from distilleries produces a maximum part of spent wash that is nearly 12- 15 times the total production of alcohol. Nearly forty billion liters of this vast quantity waste water effluent if discharged out in an untreated manner can cause considerable risk on the water outlets leading to widespread damage to marine/aquatic lives

II. METHODOLOGY

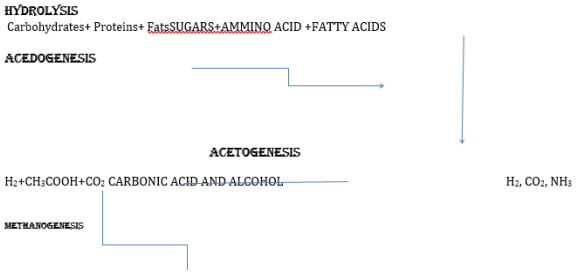
In a Biological optimized anaerobic digestion process, the organic carbon which is converted more often to carbon dioxide (most oxidized) and methane (more reduced). Methane which will be the major product obtained here is a mixture of methane and carbon dioxide along with traces of other gases such as H2S and H2. This process involves many groups of microorganisms therefore the process is considered as sensitive and complex. So this makes it a suitable subject for control with further optimization.

Bio-methanation is a biological process of generating methane from organic matter which is catalyzed by micro-organisms. Three different groups of microorganisms involved in this process of Bio-methanation and are as follows:

Hydrolytic Fermentative Bacteria, Acetogenic fermentative bacteria and Methanogenic fermentative bacteria

The four key steps of anaerobic digestion are as follows:

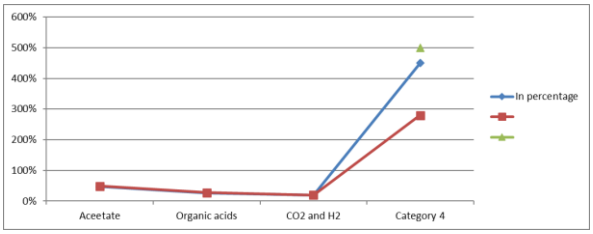
i. Hydrolysis
ii. Acidogenesis
iii. Acetogenesis
iv. Methanogenesis



CH_4 and CO_2

RESULTS AND DISCUSSIONS

Up flow anaerobic sludge blanket (UASB) system with batch experiments were employed to analyse the performance of anaerobic digestion for the treatment of high concentrated Methyl alcohol waste water in this study this is a two stage process. By maintain the constant pH as 5.4 to 6.5 by using actetic acid with sodium acetate buffer. The fermentative bacteria produces acetate (47%, 48.9% and 51%), organic acids (26.4%, 28% and 30%) and hydrogen with carbon dioxide (19%, 20.1% and 21.0%). Along with acedogenesis sequential integration of different bioprocesses such as bioanoxygenesis and bioelectrigenesis that holistically treats the waste and produces a wide range of products like acetate, organic acids and carbon dioxide with hydrogen. These were obtained during the USAB study.



Fermentative bacterial study(it produces) at the pH 5.4 to 6.5			
	In percentage		
Aceetate	47%	48.9%	51%
Organic acids	26.4%	28%	30%
CO_2 and H_2	19%	20.1%	21.0%

The actual work is an attempt to provide suitable microbes with constant pH for biomethanation with very high Total Dissolved Solids spent wash:

CONCLUSION

Spent wash is obtained in distilleries but it is a beneficial by-product. It must be treated in a proper and suitable manner to be disposed into the environment. Bio-methanation is the procedure in which spent wash is treated so as to produce methane and simultaneously to reduce COD, BOD and pH. This process enables the industries to obtain energy in terms of methane gas for heating with producing electricity.

This treated spent wash can be sprayed on mud to getting composited press-mud which can then be used as biofertilizer. This results in this technique becoming more beneficial along with a zero pollution method.

The complex and sensitive process of anaerobic digestion change in environmental conditions. A best online maintaining processs must be based on suitable indicators. It can be controlled and consequently improve the economy of the biogas plants. When compared with the total investment and operating costs of the working plant the system must be vigorous and have less maintenance requirement along with low economic costs. An excellent aid to support decision making and problem solving for the plant operators are obtained by online information and also with resources.

REFERENCES

[1] DISTILLERYWASTEWATERTREATMENTAND DISPOSAlBYLtColManthaNagaraj*,DrArvind Kumar**

[2] MethanEmissionbyGutSymbiontsofTe1mites 1V.Gomathi,1K. Ramasamy, M.R.V.P. Reddy,1A. Ramalakshmiand1A.Ramanathan

[3] Acid resistance of methan ogenic bacteriaina two-stage anaerobic process treating high concentration methanol waste water. ZHOUXuefei(d)I, RENNanqi2

[4] Vaviline, V. A., Lokshina, L. Y., Rytov, S . V., Kotsyurbeko,O.R.,Nozhevinikova, A. N., andParshina.S.N.Modellingmethanogenisisduringanaerobicconversionofcomplexorganicmatteratlowtemperatures.WaterScienceandTechnology.vol36,(6-7),pp53l-538,(1997).

[5] Batstone,D.J.,Pind,P.F.&Angelidaki,I.Kinetic softhe1mophilicanaerobicoxidationofstraightandbranchedchainbutyratedandvalerate. BiotechnologyandBioengineering,vol84,(2),pp195-204(2003).

[6] Dr. S. Manjappa andresearch promotion scheme students."Designand OptimizationofBiomethanationforhighTDSspentwashfromOlioresinextractionofAgrobiochemindustriesfortheyear2007-2008.

[7] Chandraju,S.,H.C.Basavaraju&C.S.Chidankumar,2008.lnvestigationofimpactofIrrigationof Distilleryspentwashonthenutrientsofcabbageandmintleaf.Indian sugar.39:19-28.

[8] Globalwarmingmethanecouldbefarmorepotentthancarbondioxidenewmediaexplorer.org.Retrieved 17.08.07.

[9] NationalNon-FoodCropsCenter.EconomicAssessmentofanaerobicDigestionTechnology&its suitabilitytoUKFarmingandwastesystems(Report, 2ndEdition),NNFCC10-010.

[10] SeaDumpingSewageSludge.Encyclopedia.com.Retrieved.22. 2.2010

[11] GEJenbacherBiogasengines,www.clark-energy.com,accessed 15-04-11

[12] Omprakash Sarkar, S Ventakesh Mohan Waste bio refinery,2018

[13] *Smt.Lalitha D, Dr.N S Sathisha,Dr B Manju, Dr. B M Kiran. Optimization of biomethanation process for high TDS spent wash from distilleries IJSRR Volume 10 (2018).