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Optimization of Dairy Waste Water Characteristics is Bio-reactor using Bioreactor Process

Guide Name - **Prof. Nilesh Pal Sir**
Civil Engineering Department,
J D College Of Engineering
Nagpur, Maharashtra, India

Group Members -

1. Nikhil Shende
Civil Engineering Department, JDCOEM Nagpur,

2. Harshal Gaidhane
Civil Engineering Department, JDCOEM Nagpur,

3. Aishwarya Barsagade
Civil Engineering Department, JDCOEM Nagpur,

4. Roshni Dakhare
Civil Engineering Department, JDCOEM Nagpur, Maharashtra, India

5.Himanshu Ramtekkar
Civil Engineering Department, JDCOEM Nagpur, Maharashtra, India

6. Sonali Dhoke
Civil Engineering Department, JDCOEM Nagpur, Maharashtra, India

ABSTRACT

In India dairy industry is largest source of food production industry and Dairy industry is among the most polluting of the food industries in regard to its large water consumption .According to the figure from the Indian ministry of Indian agriculture from 2017 more than 355 million cows and buffalos are kept in India for dairy production in 2018-19 the milk production in India is 187.7 Million tonnes (Source : Basic Animal Husbandry statics) and average generate 6-8 litres of waste water per litre of the milk processed. Dairy is one of the major industries causing water pollution. Considering the increased milk demand, the dairy industry in India is expected to grow rapidly and have the waste generation and related environmental problems are also assumed increased importance. In anaerobic process the micro-organism converts the organic matter into biomass and cell biomass. The main objectives of this research is to investigate biogas generation. Such as ph, temperature, etc.

The investigated result shows the biogas is the cheapest renewable energy source produce from the treatment of dairy waste

Now a days the demand of dairy products is increasing, which increasing in the development of the dairy industries and increase in generation of wastes the generated waste water contains high nutrient concentration, BOD, COD and organic and inorganic content also they can contain different sterilizing agents and high range of acid and alkaline detergents the dairy industries affect Air Soil Water quality pollution.

Key words: Anaerobic digestion, waste water treatment, Bio- reactor.

Introduction:

Dairy industries is the example of food industries which produce the many types of products such as milk packets, milk powder, butter, cheese, ice cream, curd etc. They generate huge amount of solid and liquid waste. A rise in demand of milk products in country has led to growth of dairy sector in country. The dairy industries is the one of the largest source of the industrial waste effluents. The fast growth of industries increases the productivity and also increase the toxic substances harmful to the environment. It is the serious problems caused by raw wastewater directly discharge in the environment.

Water is the main component of dairy industries, in average generate 6-8 litres of wastewater per litre of the milk processed. Dairy wastewater contains Suspended Solids, dissolved solids trace and high soluble organic components, lactose, nutrients, fats, sulphates, chlorides, and high biological oxygen demand (BOD) and chemical oxygen demand (COD). Dairy wastewater is treated through biological and Physcio-chemical methods. Biological methods are mostly preferred because of cast with reagents and limited removal of COD with the Physcio-chemical method. Environment protection agencies provided the guidelines and rules for waste water treatment process. To protect the environment these agencies has started the strict vigil with some non-governmental organization. In many countries there is a need to develop reliable technologies must be efficient, cheap, having simple design, high treatment efficiency with low operating and capital cost. Due to rapid urbanization the availability of land is also a major factor. So the technologies should provide high result within the small factory area.

The dairy effluent is responsible for environmental impact. The common types of effluent generated by the dairy processes, such as a cleaning tanks, canes, washing disinfection etc. The dairy waste generally contains suspended solids and organic matter high content of nitrogen and phosphorous and presence of oil grease. Dairy products processing results large amount of chemically modified liquid.

- **Objective:**

The objective of this research are as follow:

1. To determine the current situation of dairy industries in India and to find the characteristics of dairy waste and give proper treatment.
2. To minimize the overall dairy waste water treatment cost.
3. To improve the treatment efficiency of wastewater by using the conventional treatment methods
4. Recycling of dairy wastewater and reuse for operational purpose
5. To treat the wastewater in minimum time.
6. To determine suitable method of disposal of final effluent.
7. To minimize the time taken to treat the dairy waste water.

- **Parameters commonly presented in effluents from the dairy industry**

1. Suspended solids and organic matter
2. Residue of cleaning products
3. Nitrogen and phosphorus
4. Sodium chloride
5. Milk fermentation
6. Oils and greases

A. Wetland treatment:

Wetland are considered a sustainable type of wastewater treatment, they have the same function of the conventional treatments it is more economical, eco-friendly and energy efficient .in wetland includes using of microbial communities for wastewater improvement, this system uses natural process. In this treatment used hydrophytes, aggregates and micro-organisms is specially suitable for utilization with dairy effluents in developing countries, it is simple in construction and lack of sludge recycling. It is more flexibility in pollutant loading. Simple in construction and no need of complex infrastructure. This treatment presents some disadvantages, which include utilization of large

surface area potential risk for both surface and ground water, presence of insects and presence of dangerous volatile substances.

Aerobic condition is used for dairy wastewater treatment. Heavy loaded dairy wastewater is treated in facultative wetland, 85% of BOD reduction can be achieved in aerobic pond with dairy waste in 5 days at 20-30 degree C. wetlands is successfully used for the treatment of dairy industrial wastewater in some countries.

B. Aerobic systems:

In aerobic treatment systems, bacteria, in the presence of oxygen, convert the organic components of the waste to carbon dioxide, water and bacterial biomass. All aerobic treatment systems have the potential to cause odors if operated incorrectly. The industry worldwide has tried many forms of aerobic treatment. These have included trickling filters, rotating biological con-tractors and various forms of mechanically aerated lagoon systems. In New Zealand only extended aeration activated sludge systems are used. Typical treatment parameters for an activated sludge plant treating dairy plant wastewater are 94 % COD, 99 % BOD5 70 % TKN and 50 % total phosphorus removal.

C. Anaerobic Treatment:

Considerable experimental work has been undertaken on the anaerobic digestion of whey from casein and cheese plants. Various forms of high rate anaerobic digestion systems have been investigated with whey. However, few anaerobic systems treating whey have been installed, despite such systems being operationally viable and the value of methane produced from these systems as the industry values the components of the whey more highly. In an anaerobic digester, anaerobic bacteria, acting in the absence of oxygen, convert the organic components in the wastewater to methane, carbon dioxide and water. Organic forms of nitrogen are converted to the ammonium nitrogen form. Anaerobic digestion may be carried out in low rate lagoon systems or in high rate reactors. The more recent anaerobic digesters which have been installed in the dairy industry have been high rate digesters, usually with two stages to obtain better control of the anaerobic processes.

Anaerobic digestion is a natural and multi-stage process. It occurs in oxygen free condition, where organic method gets decomposed under a mixed consortium of different species of anaerobic micro-organism that transform organic matter into bio-gas. This process is called bio-methanation. There is low specific growth rate of methanogenic micro-organism due to which startup and operation of the anaerobic degradation process can become problematic & instability occurred. In last 30 years the use of anaerobic digestion as a means of treating dairy waste water is increasing.

D. Anaerobic Digestion Theory:

There are many bacteria affecting anaerobic digestion such as acetogens and methanogens. There are four biological and chemical stages of anaerobic digestion.

1. Hydrolysis
2. Acidogenesis
3. Acetogenesis
4. Methanogenesis

Hydrolysis: A chemical reaction where particulates are solubilized and large polymers converted into simpler monometers.

Acidogenesis: A biological reaction where simple monomers are converted into volatile fatty acid.

Acetogenesis: A biological reaction where volatile fatty acid are converted into acetic acid, carbon dioxide and hydrogen.

Methanogenesis: A biological reaction where acetates are converted into methane and carbon dioxide, while hydrogen is consumed.

E. Physcio - Chemical Treatment:

Physcio-chemical treatment can be achieved to reduction and destruction of milk fat and protein colloids. The important Physcio-chemical treatment step is flocculation which helps the treatment of industrial wastewater. Physcio-chemical method reduces the suspended and colloidal impurities responsible for turbidity of water and helps in the reduction of organic substances responsible for COD and BOD content. Coagulation addition results destabilization of particles .

• Conclusion

1. Anaerobic treatment is a proven method to produce biogas that can be used for production of heat, power and compose like output.
2. The investigated result shows the bio-digestion is the cheapest method for treating dairy waste water.
3. Anaerobic process is an imperative tools for the production of clean energy source such as methane, biogas, etc. Thus it is also a valuable renewable energy source for both developed & developing countries in future.

• References:

1. Buyer Kiran D. Bhuyar, Sanvidhan G. Suke, S.D. Dawande, 2015, "Treatment of milk wastewater using up-flow anaerobic packed bed reactor" Vol. 17, No 2, Polish Journal of chemical Technology, 17, 2, 84-88, 10.1515/pjct-2015-0034.
2. (2). Bhuyar Er. Kiran D., 2013,"Treatment of diary wastewater in an up flow anaerobic packed bed reactor "International Journal of Advanced.
3. (3). Amani T., M. Nosrati, and T.R. Shreekrishna, "Anaerobic Digestion from the viewpoint of microbiological, chemical, and operational aspect-review" Environ. Rev. pp.255-278.
4. (4). Deshpande D.P. Patil P. J. and Anekar S.V. (April 2012), Biomethenation of Dairy waste, Research Journal of Chemical Science, ISSN 2231-606X Vol. 2(4),35-39.
5. American Public Health Association (APHA) (2005) In: Eaton AD, Clesceri LS, Rice EW, Greenberg AE (eds). Standard methods for the examination of water and wastewater. 21st edn, American Water Works Association: Water Pollution Control Federation. Washington. DC.1368p.
6. Barnett JW, Robertson SL and Russell JM (2010) Environmental issues in dairy processing. Environment Portfolio, New Zealand Dairy Research Institute, Private Bag 11029, Palmerstone
7. Deshannavar UB, Basavaraj RK, Naik NM (2012) High rate digestion of dairy industry effluent by up flow anaerobic fixed-bed reactor. J Chem Pharm Res 4(6):2895–2899 Deshpande DP, Patil PJ, Anekar SV (2012) Biomethanation of dairy waste. Res J Chem Sci 2(4):35–39
8. Ferguson AH (1976) Acceptability of wastewater effluents by soils. In: Sanks RL, Asano T (eds) Land treatment and disposal of municipal and industrial wastewater. Ann Arbor Science, Ann Arbor, pp 85–100.
9. Kolhe AS, Ingale SR and Bhole RV (2009) Effluent of dairy Technology. Shodh, Samiksha aur Mulyankan Int Res J 2(5):459–461 Oneţ C (2010) Characteristics of the untreated wastewater produced by food industry. Analele Universitatii din Oradea 15:709–714
10. Rana K, Moemen B, Fouad D, Jalal H, Samir T (2011) Characterization, physicochemical and biological treatment of sweet whey (major pollutant in dairy effluent). In: Environment and chemistry IPCBEE, vol 2. IACSIT Press, Singapore Tawfika A, Sobheyb M, Badawya M (2008) Treatment of a combined dairy and domestic wastewater in an up-flow anaerobic sludge blanket (UASB) reactor followed by activated sludge (AS system). Desalination 227:167–177
11. Wheatley A. Anaerobic digestion: a waste treatment technology. London and New York: Elsevier Applied Science; 1990.
12. Bangsbo-Hansen DI. Treatment of dairy wastewater in the developing countries –the Danish experience. Ind Environ 1985; 8:10-2.
13. Van-Oostrom AJ, Cooper RN (1988) Temperature controlled, aerated static pile composting of

slaughterhouse waste solids. In: Bhamidimarri R (Ed) Alternative waste treatment systems. Elsevier Applied Science, London, pp 174–184