



SUGGESTIVE METHOD FOR TREATMENT OF WASTE WATER DISCHARGE FROM BALRAMPUR SUGARMILL

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ABSTRACT: The study was designed to treat the effluent from sugarcane sector. As cane itself contains 67.5% of water out of which 13.4% goes in bagasse, 2.6% in filter cake and 0.6% in molasses. The use of fresh water in sugarcane industry and results in a huge amount of waste water is not a secret to anyone. The use of chemicals in large quantities has caused a great risk and damage to the groundwater, soil and ultimately leads to the destruction of our environment. Treatment of industrial sugarcane waste water is not an easy task. The purpose of our study is to treat and reuse it for a different purpose. Coagulation with alum, ferric chloride is done in this process. The result of the study discloses that BOD and COD were in a huge amount which was successfully treated.

Index Terms:: Waste water minimization, BOD, COD, Alum.

INTRODUCTION

Water is the most vital and more valuable source for all living organisms because of rapid urbanization and industrialization. Sugar is produced in 120 countries and global production is around 180 million tonnes a year. In developing countries like India, sugar is one of the significant agricultural products and the sugar industry is one of the agro-based industries in India. India is the largest producer of sugar, surpassing Brazil. Brazil alone accounts for 25% of world production. And in India, U.P. is considered the largest producer of sugar, which is directly proportional to the amount of waste it generates, especially waste water. And in U.P., one of the biggest sugarmills is BCML (Balrampur Chini Mills Limited), which has a crushing capacity of 14,000 tonnes per day, so the amount of waste water generated can easily be known. It is reported in the literature that by using different coagulants like alum, ferric chloride, and ferric sulphate, a better result is achieved on 6-8 pH. Coagulation is an essential and effective step in different industries, and sugar industry effluents are mostly deposited in agricultural land or in fresh water canals. In general, the waste water of the sugar industry contains high BOD, nearly neutral pH, nutrient deficiency, and sulphate. Physicochemical treatment will be adequate but can be used as a rough unit. In contrast, a modern approach to waste water management aims at optimizing the production process and minimizing the generation of wastewater, then managing the unavoidable waste in an environmentally acceptable and economical manner. In most environmental problems, the cheapest and most effective way is to reduce pollution and, if possible, avoid the production of waste. Industries can modify their production processes so that lesser quantities of wastes are generated or the waste generation is reduced.

AIMS AND OBJECTIVE

1. To reduce the water consumption.
2. To achieve a sustainable reduction in power bills.
3. To reduce the waste water generation.

LITERATURE REVIEW

1.J.Prabhakaran(2016)- The sugar industry effluent which is untreated highly contains COD, BOD, TSS, TDS, TS and low contents of DO which is toxic, to plants. So it is not permissible for irrigation. * The treated effluent of sugar industry which is well balanced of chemicals will be suitable for irrigation purpose. Effluent Type Greengram Paddy Control 100%, 96.60% , Treated Effluent , 100% ,98.40%.Untreated Effluent 67.90% 61.90% International Jour Technology, Treated Effluent released from sugar industry may be utilized for industrial processing again and it is economically profitable for sugar industry.

2.Nitin P Sonaje(2017)- The sugar factory is one of the most popular and second largest agro based industries and there are about 600 plus sugar industries in India playing a vital role in economic development of the country. These industries are using huge quantities of water and raw material in their production process. The raw water requirement for sugar industry is 200- 400 lit/tonne and wastewater produced is about 200-300 lit/tonne of sugarcane crushed. In the production of sugar bye-products such as, Press mud (3.5-4%), Bagasse (28-32%) and Molasses (3-4%) are produced. The darker side of growth of the sugar industries in the country is environmental deterioration i.e. water, soil and air pollution. These environmental problems are affecting the future prospects for sugar industry development in the country.

3.Satoto Endar Nayono(1989)- From the results of this study, it can be concluded that there is the possibility to use granular sludge from one UASB reactor as an inoculum for another UASB reactor, although the sludge can be categorized as relatively inactive and due to a long storage period without feeding. It supports the report that granular sludge can be stored for many months without losing its activity (Lettinga et al., 1980 in Polprasert et al. 2001). Granular sludge has the ability to increase its activity by applying a proper organic loading rate, considering the “readiness” of methanogenic bacteria to utilize the products of fermentive and/or acetogenic bacteria.

CASE STUDY

The name of the industry under study is “BALRAMPUR CHINNI MILL” it is situated in Balrampur district , Uttar Pradesh The industry work from month of October to June .It is the time when sugarcane is available in field .The industry runs in 3 shift for 24 hours .there are about 1000 workers working in the industry .It has high capacity utilization rate, good recovery of sugar and well diversified business model .Over the year balrampur has increased the scale of operation through capacity expansion and acquisition. It is a 0% waste producing industry as it reuses all its waste in different person .The environment is very excellent and the people are very cooperative over there. Industry uses 3 lakh of water per day .The industry has developed greenery also .The treatment of waste water is done in completely different section using ETP. Lab are also present for testing of untreated and treated waste water.RO facility is also present in the industry.

FROM THIS CASE STUDY FOLLOWING POINTS TO CONCLUDED:

- 1: Sugar waste water is an area that has adequately explored but the characteristic of sugar waste water is lot more fluctuating depending upon the size.
- 2: In sugar industry there is the large scope of recirculation and reuse of water.
- 3 :The waste water is highly organic in nature.
- 4: Physiochemical are also getting popularity nowadays and the most important problem in biological treatment is seasonal nature of industry.

METHODOLOGY

Treatment of sugar industry require a process that combine mechanical, chemical and biological treatment measure. Screening ,grit removal,equalization and sedimentation are used to remove suspended solid load .

The methodology is divided into two was –

- 1 .Biological treatment method
- 2.Physio chemical treatment method

MANUFACTURING OF SUGAR

The sugarcane are cut into pieces and cut in the series of roller to extract the juice in the mill house.The milk of is then added to juice and heated when all the colloidal and suspended impurities are also coagulated.The coagulated juice is

then clarified to remove the sludge. The sludge is further filtered through filtered press. The clarified juice is then preheated and then concentrated in evaporator and vacuum pan. The partially crystallised syrup is then transferred to crystallizer, where complete crystallization of sugar cane occurs. The sugar is then dried and packed for transport.

SOURCES OF WASTE WATER:

Waste water from the mill includes the water used as splashes to extract maximum amount of juice and those used to cool the roller bearing. As such the mill house contains waste water with high BOD. The filter cloth used to filter needs cleaning for which also needs cleaning. The periodical washing of floor also contributes a great lot of pollution load.

EFFECT OF WASTE WATER

The fresh effluent from sugar industry decomposes rapidly after few hours of stagnation. It has been found that it causes considerable difficulty when their effluent gets access to the water course. The rapid depletion of oxygen due to biological oxygen followed by anaerobic stabilization of the waste causes the secondary pollution of waste and odour.

WATER CONSUMPTION

The sugar industry consumes large quantity of water in manufacturing process and resulting in huge waste water generation. The water used in sugar industry is of two types: one is cold and other is hot water. The cold water is used as makeup water, consumption water and hot water are used in boiler feed water, juice dilution, lime and sulphate preparation.

1- MILLING SECTION

COLD WATER-

For mill bearing cooling-30m³/hr

For shredder bearing cooling-20m³/hr For gearing cooling-76m³/hr

HOT WATER-

For mill ambition-85.8m³/hr

2- CLARIFICATION OF JUICE

COLD WATER

For sulphate station-11m³/hr Air compressor-20m³/hr

Pump gland cooling-8m³/hr

HOT WATER:

For milk and lime preparation- 10.4m³/hr

Filter washing-13m³/hr

3- EVAPORATION :

HOT WATER

For molasses conditioning: 5.2m³/hr Melter-13m³/hr

COLD WATER: Injection water for vacuum pan- 4640m³/hr

4-BOILER FEED: Hot water as a boiler feed water:170m³/hr

Cold water as boiler makeup water:13.9m³/hr RO plant reject-4.17 m³/hr

TABLE:NORMS FOR SUGAR INDUSTRY:

SR.NO.	PARAMETERS	STANDARD PRESCRIBED BY BOARD
		Limiting concentration inmg/l
1	pH	5.5-9
2	OIL AND GREASE	10
3	BOD(3 days 27C)	100
4	SULPHATE	1000
5	SUSPENDED SOLID	100
6	TOTAL DISSOLVED SOLID	2100

WATER CONSERVATION TECHNIQUE ADOPTED:

- Recirculated the cooling waters.
- Sulphur Burner Water used is recirculated and connected to spray pond.
- Oliver Filter Instead of using fresh water, spray pond water is used to create vacuum at vacuum pump and barometric condensers
- Hot water condensate is used for filter cake. Water required to wash sugar masccutte in centrifugal machine is condensate from evaporator bodies.
- Hot water is used instead of fresh water. Cooling water Mill drive, mill bearing, power house turbines, compressor, cooling and vertical crystallizers is also cooled condensate instead of fresh cold water.

PROCESS MODIFICATIONS

Now-a-days it is a necessary to establish co-generation unit along with sugar industry from economic sustainability point of view and also raw material required for this is available in the form of bagasse, which is byproduct of sugar industry. In this co- generation plant either condensing or back pressure turbines can be used. From the water minimization point of view, back pressure turbine shall be preferred instead of condensing turbine as a process modification. Also cooling towers in condensing turbines requires huge amount of fresh cooling water which can be minimised to zero by installing air cooled condensers for these turbines. The Excess condensate is get contaminated to certain extent after repetitive recycling as it catches some of the sugar traces. This condensate water shall be treated by installing condensate polishing unit so that instead of taking the fresh water from the nature this treated water can become a by-product of sugar industry.

TREATMENT OF WASTE WATER IN BALRAMPUR SUGAR MILL-**EFFLUENT TREATMENT PLANT:(ETP)**

The consumption of large volumne of water and the generation of organic compound as liquid effluent are major environmental problem in sugarcane industry. The inadequate and indiscriminate disposal of this effluent in soil and water bodies have received much attention .Like any other industry the pollution load in sugar mill can also be reduced with better water and material economy. The operation of ETP is such that it will give an effluent of such standard prescribe by the MPCB (Maharastrian pollution control board).

THE MILL HAS PROVIDED ETP AND THE UNITS OF ETP ARE:-

- 1) Screening chamber cum oil & grease tank.
- 2) Equalisation tank
- 3) Mixing tank
- 4) Aeration tank with aerator
- 5) Clarifier

A.SCREENING CHAMBER CUM OIL & GREASE TANK-

The screen chamber or bar screen used to remove the large floating object .The untreated effluent contain large floating solid paper etc. The screening chamber prevent these material from choking pipe system and other equipment of the chamber. All these material are remove by bar screen which are 10 mm wide and 50 mm deep, arranged with spacing of 20 mm between two adjacent bar . Then the material reach the oil and grease chamber which are used for the removal of oil and grease from the effluent which may cause damage to the pumping unit.

B.EQUALIZATION TANK-

Equalization basin may be used for temporary storage. Basins provide a place to temporarily hold incoming sewage during plant maintainance and a means of diluting and distributing batch discharge of toxic or high strength waste which might otherwise inhibit biological secondary treatment.

C.MIXING TANK- Mixing tank are generally provided for thorough mixing of the effluent which is present in the equalization tank. The mixing carried out with the help of mechanical stirrer.

D.AERATION TANK WITH AERATOR: Aeration is the process by which air is circulated through , mixed with or dissolved in a liquid . Hence aeration tank are provided to aerate the waste water by the biological treatment.

E. CLARIFIER Clarifiers are the settling tanks built with mechanical means for continuous removal of solids being deposited by sedimentation. A clarifier is generally used to remove solid particles or suspended solids from liquid for clarification and thickening. Concentrated impurities discharge from the bottom of the tank, while the particles that float to the surface.

RESULT

The treatment of wastewater purely depends upon how we decrease its BOD and COD. COD TEST- COD of untreated water ranges from 2000 to 3000. So we take a sample of 20ml of untreated water and add 1 to 2 gm of sulphuric sulphate then we add 10ml of potassium dichromate, 30 ml of conc. H₂SO₄ slowly and some quantity of silver sulphate which will break the particles. Then we heat the solution for up to 2hr at the temperature of 90 to 120 C. Then we cool the solution at room temperature and add ferrous indicator and start titration and stop it when it turns yellow and measure the COD.

FORMULA USED-

COD TEST - $(A - B) \times 8000 \times 0.1 = \text{COD}$

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B=BLANK (NORMAL CONSTANT VALUE)=24

A=SAMPLE VALUE WHICH WE WILL GET FROM TITRATION

COD constant=8000 Normality=0.1

The COD of untreated water was 3200mg/l And the value of A came after testing =18

Now putting the value in formula =

$$\frac{(24 - 18)}{20} (8000) \times 0.1 = 240 \text{ mg/l}$$

after treatment which is suitable for drinking.

BOD TEST-This test takes 5 days for result when the sample is kept at 22.5C for 5 days or 27C for 3 days.

The BOD came out after the treatment was=79mg/l

TECHNIQUE ADOPTED FOR WASTE WATER MINIMIZATION:

1-MILLING SECTION-

A-Oil and grease can be sold as low grade lubricant or burnt in boiler after mixing with bagasse or may be used directly on open gearing.

B-Collect leakage in the pit and recycle into process.

C-Recycle the cooling water.

2-VACUUM PUMP- Recycle the cooling water.

3-BOILER HOUSE-Water used for cooling can be used for different irrigation purposes.

4--Design of the industry in such a way that it reduces the pollutants.

5-Use material scraping system for cleaning rather than solvent.

6-Allocate waste treatment and disposal cost directly to the department which produces maximum amount of waste.

7-Chemical precipitation, Nano filtration, Algae treatment mechanism, reverse osmosis treatment method should be used.

8-Waste water treatment using MFC (Microbial Fuel Cell)

This technique has a unique advantage of utilizing microorganisms in wastewater to generate power to drive industrial processes and to decontaminate the wastewater.

CONCLUSION: Water is the most costly and instantly affecting natural resource .Scarcity of water is the major problem throughout the world,so the conservation of water is essential for every junction.Conservation of water is significant aspect of enviromental and economical sustainability. Sugar industry demand large quantity of water .There is the considerable amount of water generated which has large potential of being reused back in the industry for various purpose ,which reduces the demand of raw water..The process like milk of lime preparation ,mill ambition,washing etc require large amount of water.So to make the industry as zero water intake industry treatment is required.This reduction in raw water intake also reduce the water bill.it also reduce the quantity of waste water generated.Thus process like use of back pressure turbine instead of condensing turbine ,efficient operation and maintenance of industry with optimum use of water will lead to achieve water minimization in sugar industry.

FUTURE SCOPE

- 1.Water which is recycled in the treatment can be used for electricity generation.
- 2.Waste water treatment will reduce the water need,with UN reports warning of water stress faced due to increasing global population so water treatment is very much required.
- 3.Ethanol production will also inhance due to this treatment.

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