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# Anaerobic Digestion Treatment of Tannery Waste Water

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## ABSTRACT
**In this article an attempt is made to study the highly complex and is characterized by high content of organic, inorganic and chromium, suspended solids and dissolved solids present in Tannery waste water. Treatment of tannery waste water is carried out by physical, chemical, biological or the combination of these methods. Up flow anaerobic sludge Banked Reactor (UASB) exhibited better performance for treating high strength tannery wastewater effectively, compared with conventional reactors. Both aerobic and anaerobic processes are employed for the treatment of tannery wastewater**

*Keywords* – **Tannary effluent ,Anareobic digestion, BOD, Effective Micro organism, Bio gas**

## I. INTRODUCTION
A important number of performances within a tannery is wet operations absorbing large amounts of water, chemicals and energy and leading to large amounts of polluted water. Via "process integrated" measures a significant reduction of water consumption and pollution load can be attained, however tanneries keep manufacturing wastewater requiring special medication. In cases where the potential for "process integrated" measures have worn out, further pollution minimization has to be found in the improvement of end-of-pipe measures.

One of the emerging problems faced by the world today is management of all types of wastes and energy crisis. Rapid growth of population and unhampered and unmonitored urbanization has created serious problems of energy requirement and solid waste disposal. tannery wastes cause to a great amount of pollution; hence, there has been a strong need for appropriate tannery waste management systems. tannery wastes that consist of of high fraction of appreciable organic matter cause serious environmental and health risks.
Biological transformation of biomass to methane has received increasing attention in recent years[1]. There are many technologies such as incineration and refuse derived fuel (RDF) etc., for producing energy from solid wastes. Among them, anaerobic digestion has come to be a promising technology particularly for recovery of energy from organic fraction of solid wastes. Many investigation works are being carried out for treating various types of organic solid wastes using an anaerobic digestion process. It has become a major focus of interest in waste management throughout the world. Anaerobic Digestion is possible environment-friendly technique produce energy in the form of biogas [2, 3] and residue, which can be used as soil conditioner[4- 6].

It is studied that organic waste substances such as tannery waste contain sufficient quantity of nutrients necessary for the growth and metabolism of anaerobic bacteria in biogas production [7]. tannery effluent was treated by anaerobic technology [8-11] in this paper. This method could not only reduce the sludge producing but also recovered part of resources.

A number of investigations have been reported on the bio conversion of biomass by different investigators. For example, the anaerobic digestion of solid refuses like municipal solid wastes[12-14], Barcelona's central food market organic wastes3, canteen wastes[15], market wastes[16-19]. The process of digestion and production of biogas depends on the composition of feedstock and the fermentation products of the tannery waste. The type of wastes generated varies considerably in quantity and composition.

## 2.MATERIALS AND METHODS

### 2.1 SOURCES OF TANNERY WASTE WATER

Tannery waste water which is generated from various tanneries situated in and around Erode city.The main source of tannery waste water is from the Animal hides. The treatment process of fresh leather hide gives hazardous waste water.

**2.2 MATERIALS**

The waste water used in this study is collected from various tannery industries. The fresh Cow Dung Slurry was added to the above waste water to supplement the reaction process. It is used as a seeding material for the reaction process in the UASB (Upflow Anaerobic Sludge Blanket Reactor). Effective micro organism was collected from Institute of micro biology was used to accelerate the reaction process.

**2.3 EXPERIMENTAL PROCEDURE**

Batch studies were carried out in batch reactors of 1000 ml Capacity The reactors were made of borosilicate glass. The effective volume of the reactors was maintained at 500ml. The reactor was provided with suitable arrangements for feeding, gas collection and draining of residues. The reactor was operated by draw and fill method. Experiments were carried out in the ambient temperature range. Each reactor was initially inoculated with 150 ml of sludge, and diluted to 500ml working volume. The characteristics of sample are shown in table 1

**Table-1 Chemical Characteristics of Sample**

| S.No | Parameters | Results |
|---|---|---|
| 1 | pH | 8.70 |
| 2 | T. Alkalinity mg/l | 3400.00 |
| 3 | T. Acidity mg/l | Nill |
| 4 | Chromium mg/l | 1.80 |
| 5 | COD mg/l | 11680 |
| 6 | $BOD_5$ mg/l | 3410 |

2.4 **Analytical methods:** pH was measured using digital pH meter.Total solids (TS), volatile solids (VS) were estimated according to the procedures recommended, standard methods of examination of water and waste water(APHA –AWWA 1992) as appropriate.

**3. RESULT AND DISCUSSION.**

Fig-1 shows the schematic representation of experimental setup

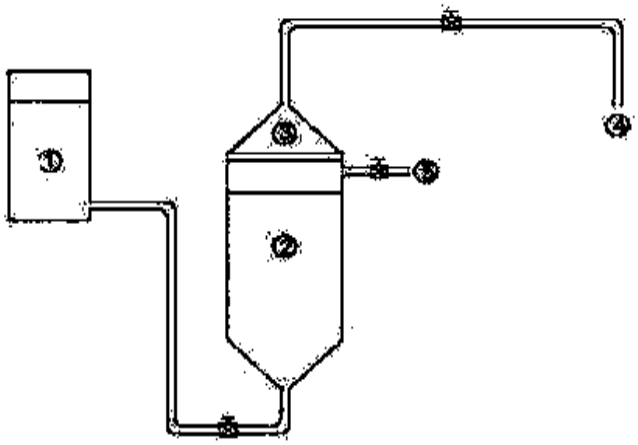

**Fig-1 UASB Reactor**

1.Tannery waste and cow dung,2.USAB reactor,3.gas/liq separator,4.bio gas, 5.Effluent out let, 6. Ball valve

The UASB reactor used anaerobic sludge as seed at medium temperature was started successfully in 48 days under appropriate condition. Table 2 shows the characteristics of effluent after 48 days.

**Table-2 Chemical Characteristic of Tannery Waste Water After 48 Days**

| S.no | Parameters | Results |
|---|---|---|
| 1 | pH | 8.0 |
| 2 | T. Alkalinity mg/l | 135 |
| 3 | T. Acidity mg/l | Nill |
| 4 | Chromium mg/l | 0.6 |
| 5 | COD mg/l | 2300 |
| 6 | $BOD_5$ mg/l | 2906 |

Table-3 indicates efficiency of the USAB for the digestion of tannery waste .

**Table-3 Operational Parameters And Treatment Efficiency Of UASB Reactor**

| Days | pH | COD | $BOD_5$ | Chromium | Acidity | Alkalinity |
|---|---|---|---|---|---|---|
| 0 - 5 | 8.7 | 11680 | 3410 | 1.8 | Nill | 3400 |
| 5-10 | 8.7 | 11673 | 3407 | 1.8 | Nill | 3400 |
| 10-15 | 8.7 | 11670 | 3102 | 1.8 | Nill | 3365 |
| 15-20 | 8.61 | 1904 | 2561 | 1.8 | Nill | 3321 |
| 20-25 | 8.61 | 1698 | 2332 | 1.76 | Nill | 2330 |
| 25-30 | 8.58 | 1668 | 2003 | 1.53 | Nill | 1655 |
| 30-35 | 8.42 | 1432 | 1980 | 1.42 | Nill | 1034 |
| 35-40 | 8.4 | 1322 | 1660 | 0.86 | Nill | 865 |
| 40045 | 8.15 | 1305 | 1653 | 0.73 | Nill | 605 |
| 45048 | 8 | 1130 | 1653 | 0.6 | Nill | 135 |

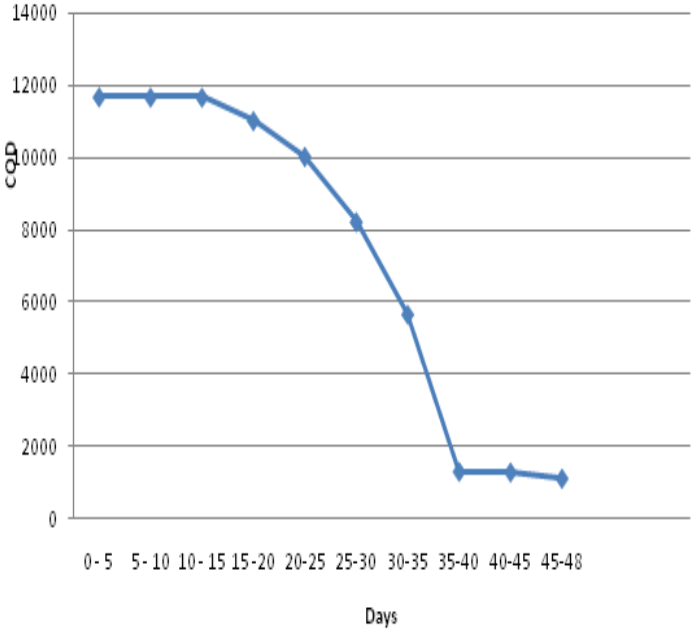


**Fig-3 COD of effluent changes with time**

However, fig.2 demonstrates that pH of the effluent is gradually reduced with increasing days. The similar trends as shown (fig-3-4) for the COD and BOD. The alkalinity and Chromium are decreased with (fig 5-6) increasing time

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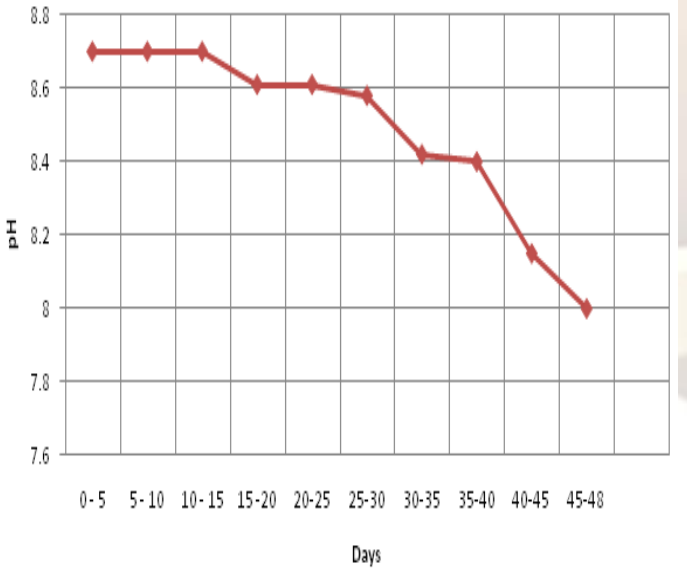


**Fig-2 pH of effluent changes with time**

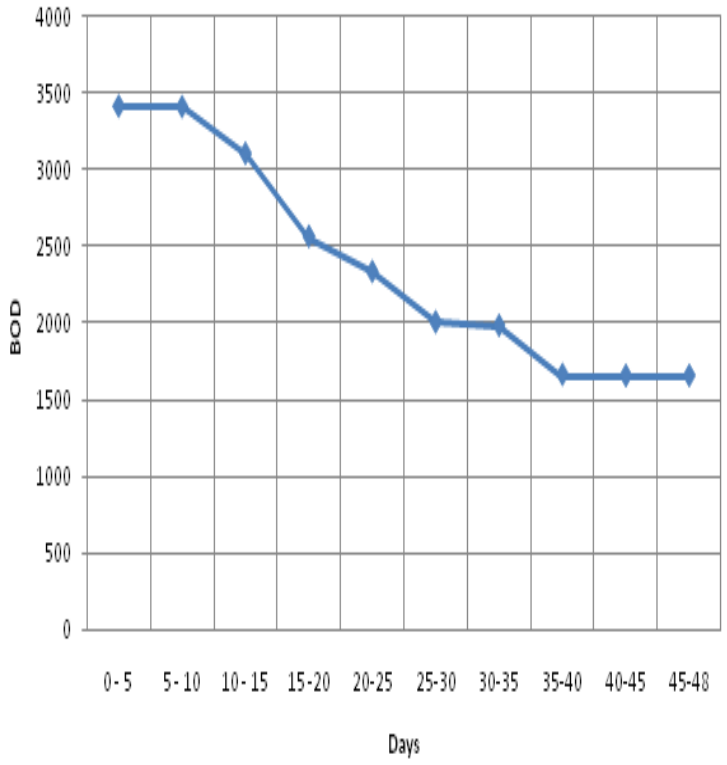


**Fig-4 BOD of effluent changes with time**

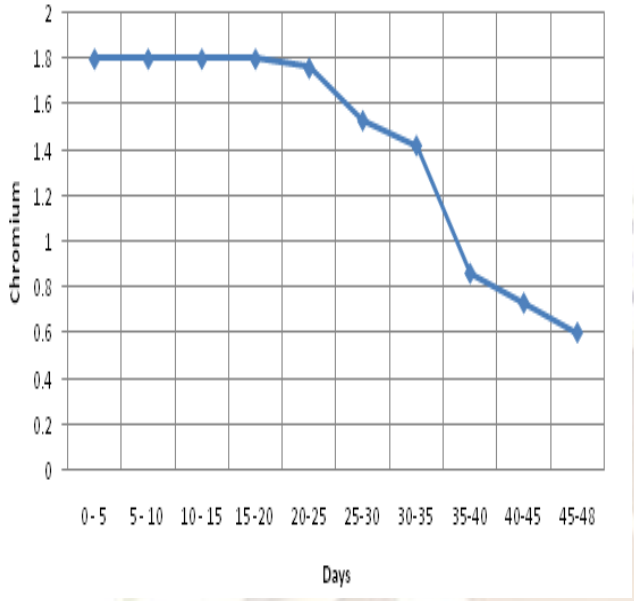


**Fig-4 Cr of effluent changes with time**

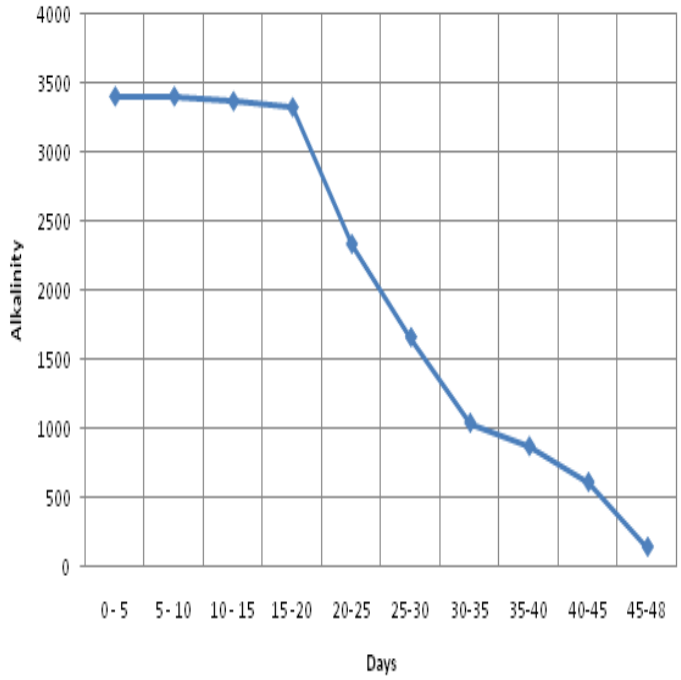


**Fig-4 Alkalinity of effluent changes with time**

## 4. CONCLUSION

Based on the performance evolution of acedogenic reactor and UASB reactor the following collusion has been drawn UASB reactor can be started successfully in 48 days tannery effluent is treated. The performance of UASB reactor indicates that the tannery wastewater has better anaerobic biodegradability at the suitable COD. Conditions of digestion in UASB are as follows: At the bottom of UASB reactor, the macromolecular organic matter has been biodegraded into smaller molecular organic acid by acid-producing bacteria, and among which. The highest proportion is acetic acid. Along the whole length of reactor. Methanogen gradually converts the organic A considerable rate of decrease has been found out in the values of COD, BOD, Chromium, pH, Acidity and Acidity. As a result of the treatment of tannery effluent using USAB reactor. Bio-Gas production has been seen, which is a useful by-product.

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