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SMALL SCALE WASTE WATER TREATMENT BY ANAEROBIC PROCESS AT COMMON EFFLUENT TREATMENT PLANT

Aakriti Jain*, Ashok Sharma, Sarita Sharma and Sanjay Verma
* M. Tech Scholar in Chemical Engineering Department
Associate Professor in Chemical Engineering Department
Associate Professor in Chemical Engineering Department
Associate Professor in chemical Engineering Department

ABSTRACT

During the past 30 years the industrial sector in India has quadrupled in size, thus it increases the pressure on wastewater treatment industries to produce higher quality treated water at a lower cost. It is a proved useful device to surmount a few of the limitations of usual mathematical models for wastewater treatment plants for the reason that of their complex mechanisms, changing aspects-dynamics and inconsistency. The efficiency of a treatment process closely relates to the operation of the plant. Sets of historical plant data of COD and BOD were collected from common effluent treatment plant at Govindpura, Bhopal (India). Data were collected over a period of 3 years from the influent and effluent streams of the station.

KEYWORDS: effluent treatment plant, small-scale projects, wastewater treatment.

INTRODUCTION

Globally, billions of people lack access to safe water and adequate sanitation (WHO, 2002; Ho, 2003). About 40 percent of the world's population lacks basic sanitation and sanitation coverage is commonly much lower in rural areas than in urban areas (WHO, 2002) Even though it appears to be in plentiful supply on the earth's surface, water is a rare and precious commodity, and only an infinitesimal part of the earth's water reserves (approximately 0.03%) constitutes the water resource which is available for human activities.(Awaleh and Soubaneh,2014) Thus far,Organic Wastes and Waste Waters have been treated mostly due to pollution control, While in the future, They may act as valuable resources(Angenent et. al,2004) Water is the basic need of all life, human, well-being and also for economic development. Because of increasing industrialization, urbanization and other anthropogenic activities, and the water quality is getting degraded day by day. Common Effluent Treatment Plant is the concept of treating effluents by means of a collective effort mainly for a cluster of small scale industrial units.(Monika Vyas *et. al*,2011) Anaerobic treatment converts the wastewater organic pollutants into small amount of sludge and large amount of biogas as source of energy (Ayati, and Ganjidoust, 2006). The Upflow Anaerobic Sludge Blanket (UASB) process is one of the recent developments in field of anaerobic treatment. In this process the use of primary treatment and the filter bed is completely eliminated. Up-flow Anaerobic Sludge Blanket (UASB) reactor is one of the anaerobic process. In this anaerobic treatment complex organic matter is get converted into methane gas through the stages like hydrolysis,acidogenesis and methanogenesis.(Mrunalini M. Powar et. al,2013) The UASB process is seen as one of the most cost effective & efficient anaerobic treatment. The anaerobic treatment results in formation of methane (CH4) which can be used as an energy source. Therefore anaerobic process followed by aerobic process has proved to be economical in waste treatment. (Prof. P. A. Shirule,2013) In recent years, the chemical industry are required either improving the existing waste water treatment processes or developing combinations various processes. This enables one to emerge with feasible treatment schemes targeting treatment of high strength wastewater.

MATERIALS AND METHODS

CETP Govindpura (BHOPAL):

For treatment of combined industrial wastewater from Govindpura Industrial Area an agency known as Govindpura Audhyogik Kshetra Pradushan Nivaran Pvt. Ltd. (GAKPNPL), had installed a Common Effluent Treatment Plant (CETP). Designed capacity of CETP was 900 m^3/day. The designed removal efficiency of COD and BOD was 89%

and 95% respectively. The treatment system consists of equalization tank, holding tanks, buffer tank, anaerobic treatment unit (Up flow Anaerobic Sludge Blanket, UASB) and flash aeration tank. For evaluating the performance of CETP Composite sampling was done for 24 hours. Grab samples were also collected. V-notch was provided for measuring the flow. During monitoring, 492 m^3/day flows was observed as against the designed flow of 900 m^3/day. At present, eight industries are participating in the Govindpura treatment plant for the wastewater treatment. Lilasons Breweries and Ramani Icecream industries are major contributors whereas the other industries which include EEI capsules, Rajsons dairy, Bhopal incinerators, Saviour caps, Specialty organics and Anik organic are the minor ones. After entering the treatment plant, wastewater is allowed to homogenize in equalization tank. This sets up the standard for treating the waste from variety of industries simultaneously. Waste from the equalization tank moves to the holding tank where it is held for about 1 hour. This facilitates settling and separation of heavy particles in the wastewater.

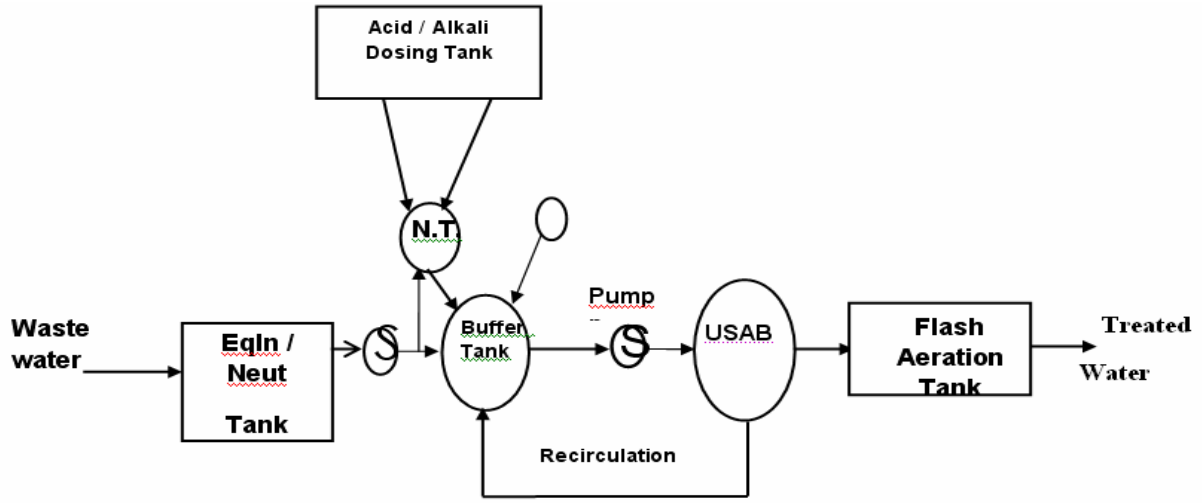

Figure1. Flow Diagram of Common Effluent Treatment Plant at industrial area, Govindpura, Bhopal, (M.P.)

RESULTS AND DISCUSSIONS

Waste water is transferred to the neutralization tank where the pH of the wastewater is maintained by suitable alkali and acid dosing whichever is required. The effluent from the equalization tank is transferred to buffer tank where it is retained for a small period of one hour. The buffer tank accepts re-circulation flow from the UASB reactor along with raw wastewater. The buffer tank is provided to trigger the acitogenesis phase in the anaerobic treatment & preconditioning of the effluent before entering into the UASB.

The upflow anaerobic sludge blanket reactor (UASB)

Industrial wastewater or blackwater flows into the bottom of an anaerobic up flow tank. Accumulated sludge forms granules. Microorganisms living in the granules degrade organic pollutants by anaerobic digestion. The sludge blanket is kept in suspension by the flow regime and formed gas bubbles. A separator at the top of the reactor allows to recover biogas for energy production, nutrient effluent for agriculture and to retain the sludge in the reactor. Sludge accumulation is low (emptying is only required every few years) and the sludge is stabilized and can be used as soil fertilizer.

For an optimal growth of these bacteria and thus a optimal anaerobic digestion, the temperature should lie between 35 to 38°C. The pH-value needs to be between 6.3 and 7.85 to allow bacteria responsible for anaerobic digestion to grow. The pH-value is also important because at high pH-values, ammoniac (NH4+) dissociates to NH3 which inhibits the growth of the methane producing bacteria.

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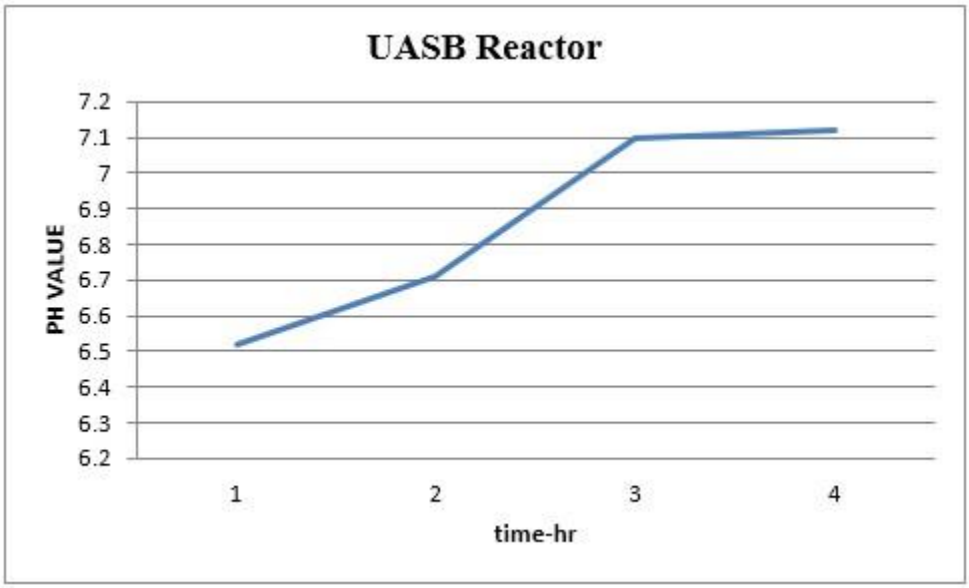

Fig. 1- shows the pH variation in the UASB reactor.

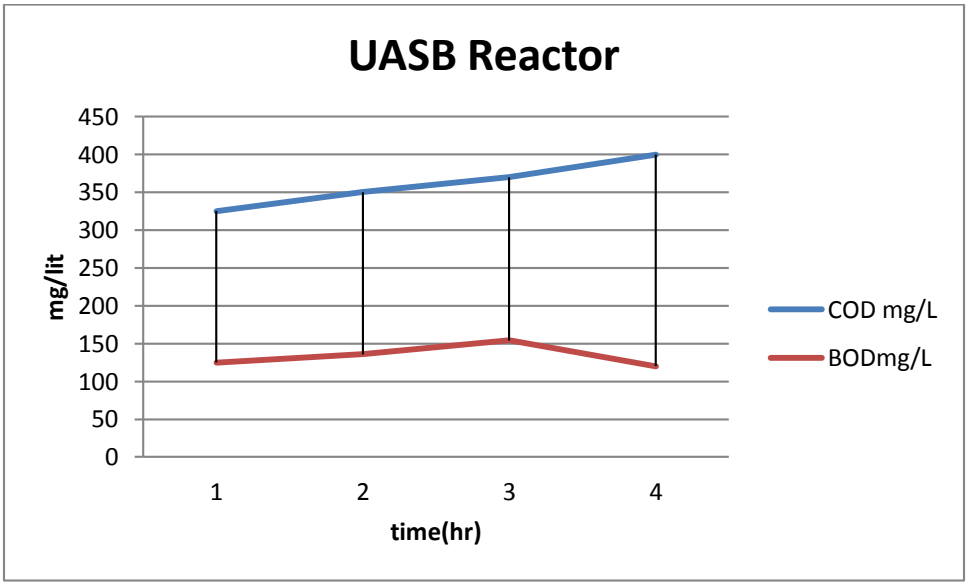

Fig.2- Shows the COD & BOD concentration variation in the UASB Reactor.

Aeration Tank

The graph shows the outlet water variation of COD and BOD in the aeration tank. The graphical data collected from CETP Govindpura Bhopal (MP) COD and BOD is maintained by continuously agitating water through the mechanical agitator in the aeration tank, in this process natural oxygen is directly contact aeration tank water and decrease the COD value, this process used in various chemical industries, pharmaceutical industries, paint industries etc. This treated water used in garden, vegetable growing, agricultural irrigation etc.

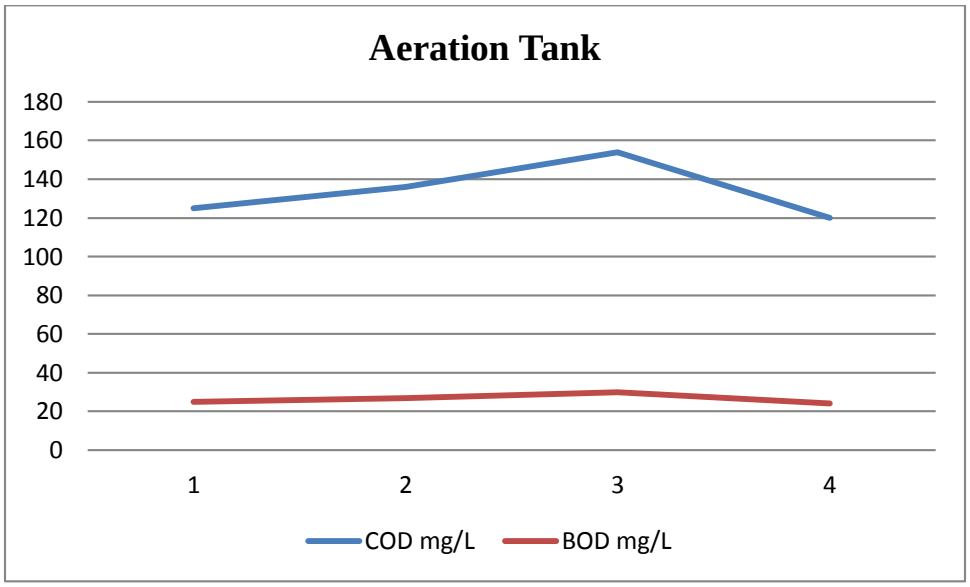

Fig.3- Shows the final discharge water COD & BOD concentration.

CONCLUSION

Wastewater treatment technology changes according to social and economic conditions, and must take the most suitable form for a society that uses that technology, apart from its basic elements. Therefore, when the technology is Transferred to another society, it is necessary to examine its adaptability from various aspects. The difficulty in transferring advanced technology to developing countries without modification is widely known. However, in recent years, there has been an urgent need to provide wastewater treatment facilities in regional areas without so much population. Processes requiring low construction and maintenance costs, that were used 25 to 30 years ago, can be considered leading-edge technology that takes into account the current social conditions because of financial difficulties. Therefore, in order to consider future technological transfer, it is necessary to not only consider current technology but also to look into previously developed or adopted technology, and to evaluate it from current technological or economic standpoint of view. In addition, because technology is not stationary, but constantly transforms, it is possible to select technology more suited to each individual site, and develop new technology through additional examination of technological development cases. Therefore, "locally suitable technology" should be selected according to the current situation of each region where the technology is adopted, which also must ensure future sustainability. As this project still in preparation phase, the field experience and assessment will be published in subsequent papers.

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REFERENCES

[1] Awaleh,M.O. and Soubaneh,Y.D.(2014) "Waste Water Treatment in Chemical Industries: The Concept and Current Technologies" Hydrology Current Research ISSN: (2157-7587) HYCR, an open access journal Volume 5 , Issue 1 , 1000164

[2] Shirule,P.A., Mulik,N.M. and Sangore,V.P.(2013) "Treatment of Dairy waste water using UASB Reactor and generation of energy" International Journal of Science, Spirituality Business and Tecnology(IJSSBT), Vol. 2, No.1, ISSN (Print)(2277—7261)

[3] Powar M.M., Kore S.V., Kore V.S. and Kulkarni S.G.(2013) "Review on Applications of UASB Technology For Wastewater Treatment" International Journal of Advanced Science, Engineering and Technology, ISSN 2319-5924 Vol 2, Issue 2, 2013, pp 125-133

[4] Vyas,M., Modhera,B., Vyas,V. and Sharma,A.K.(2011) "Performance Forecasting of Common Effluent Treatment Plant Parameters By Artificial Neural Network" ARPN Journal of Engineering and Applied Sciences ISSN (1819-6608) VOL. 6, NO. 1,
[5] Vyas,M., Modherab,B.,and Sharma,A.K. (2011) "Artificial Neural Network Based Model In Effluent Treatment Process" International Journal of Advanced Engineering Technology, E-ISSN (0976-3945), IJAET/Vol.II/ Issue II/271-275
[6] Hampannavar, U.S. ,and Shivayogimath, C.B. (2010) "Anaerobic treatment of sugar industry wastewater by Upflow anaerobic sludge blanket reactor at ambient temperature" International Journal Of Environmental Science Volume 1, No 4, ISSN (0976 – 4402)
[7] Ghali, A.M.F.(2009) "Photovoltaic Small-Scale Wastewater Treatment Project for Rural and New-Cultivated Areas in Egypt" International Journal of Environmental, Earth Science and Engineering Vol:3 No:5,
[8] Massoud,A.M., Tarhini,A., Nasr,A.J. (2008) "Decentralized approaches to wastewater treatment and management: Applicability in developing countries" Journal of Environmental Management (652–659)
[9] Luostarinen,S.(2005) "Anaerobic Onsite Wastewater Treatment at Low Temperatures"Jyvaskyla Studies in Biological and Environmental Science,ISSN (1456-9701)