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A Case on Wastewater Treatment by Adsorption

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ABSTRACT: Nowadays many water resources are polluted by anthropogenic sources including household and agricultural waste and industrial processes. Public concern over the environmental impact of wastewater pollution has increased. Several conventional wastewater treatment techniques, i.e. chemical coagulation, adsorption, activated sludge, have been applied to remove the pollution, however there are still some limitations, especially that of high operation costs. The use of aerobic waste water treatment as a reductive medium is receiving increased interest due to its low operation and maintenance costs. In addition, it is easy-to-obtain, with good effectiveness and ability for degrading contaminants. This paper reviews the use of waste water treatment technologies to remove contaminants from wastewater such as hydrocarbon compounds, heavy metals, dyes, pesticides, and herbicides, which represent the main pollutants in wastewater

KEYWORDS: Sewage, Aerobic, Treatment, Technologies.

I. INTRODUCTION

Adsorption is surface phenomenon for the removal of soluble contaminates and insoluble contaminates from the wastewater. Adsorption is affected by temperature, nature of adsorbate and adsorbent.

Adsorption is fast, inexpensive and widely used for the treatment of wastewater. Adsorption process can be used for limited or large amount of water. Adsorption process is the best technique to reduce the contaminates of water, because it is surface phenomenon which removes the soluble and insoluble contaminates of water also remove the heavy metals. A supply of clean water is an essential requirement for the establishment and maintenance of diverse human activities. Water resources provide valuable food through aquatic life and irrigation for agriculture production. However, liquid and solid wastes produced by human settlements and industrial activities pollute most of the water sources throughout the world.

Due to massive worldwide increases in the human population, water will become one of the scarcest resources in the 21st century (Day D., 1996). In the year 2015 the majority of the global population (over 5 billion) will live in urban environments. By the year 2015, there will be 23 mega-cities with a population of over 10 million each, 18 of which will exist in the developing world (Black, 1994). Central to the urbanization phenomena are the problems associated with providing municipal services and water sector infrastructure, including the provision of both fresh water resources and sanitation services. Currently, providing housing, health care, social services, and access to basic human needs infrastructure, such as clean water and the disposal of effluent. As human numbers increase, greater strains will be placed on available resources and pose even greater threat to environmental sources. A report by the Secretary-General of the United Nations Commission on Sustainable Development (UNCSD, 1997) concluded that there is no sustainability in the current uses of fresh water by either developing or developed nations, and that worldwide, water usage has been growing at more than three times the world's population increase, consequently leading to widespread public health problems, limiting economic and agricultural development and adversely affecting a wide range of ecosystems.

Although India occupies only 3.29 million km² geographical area, which forms 2.4% of the wastewater treatment methods in developed countries are centralized aerobic wastewater treatment plants and lagoons for both domestic and industrial wastewater. Modern civilization, armed with rapidly advancing technology and fast growing economic system is under increasing threat from its own activities causing water pollution, (Singh et al. (1989). India is the seventh largest country in the world with a total landmass of 3.29 million sq. km, population over 1 billion, 29% of which live in urban areas spread over 5162 towns. With enormous natural resources and growing economy India is the

second largest pool of technical and scientific personnel in the world. Pollution from small size industries puts the Indian regulators in front of a difficult arbitrage between economic development and environmental sustainability. The uncontrolled growth in urban areas has made planning and expansion of water and sewage systems very difficult and expensive (Looker, 1998).

Water is an important and essential component of this universe and play as a vital role in the functioning of the ecosystem .like domestic ,industrial purpose .Safe drinking water is not available in some part of the world .Nearly 76 million people in India do not have access of safe drinking water .Aerobic activated sludge reactors have been used on a limited scale as bio-scrubbers for the treatment of odorous air.Despite numerous positive reports from full scale applications in North America, little data are available on the actual performance of these systems with wide ranging concerns on reduction of settling efficiency due to changes in filamentous organisms and bacterial flocks .

1.1 Biofilm technology

Definition of biofilm itself is simply defined as communities or clusters of microorganisms that attached to a surface . Formation of biofilm could be achieved by a single of microorganisms that have the ability to form at biotic and abiotic surfaces.As a general, there are few steps that important for development of biofilm, which starting with the initial attachment and establishment to the surface, followed by maturation, and finally, the detachment of cells from surface.

1.2 Status of wastewater in India

The total wastewater generated by 299 class-1 cities is 16,652.5 MLD. Out of this, about 59% is generated by 23 metro cities. The state of Maharashtra alone contributes about 23%, while Ganga river basin contributes about 31% of the total wastewater generated in class-1 cities. Only 72% of the total treated wastewater generated is collected. Out of 299 class-1 cities, 160 cities have sewerage system for more than 75 percent of population and 92 cities have more than 50 percent of population coverage. On the whole 70% of total population of class-1 cities is provided with sewerage facility, compared to 48% in 1988. The type of sewerage system is either open or closed or piped.

II. LITERATURE REVIEW

Water pollution in the past and in present days the water pollution is increasing due human activities and plants that is very serious issues because it affect our lives .Adsorption process is the best technique to reduce the contaminates from water adsorption process is fast and inexpensive which removes soluble and insoluble contaminates from the waste water.In ancient times (1500 B.C) ,activated carbon has been used for medical purposes. These after the powders of activated carbon were dissolved in 1773 when scheeles conducted experiments with gases.However in 19th century, the industrial production of activated carbon was well established and gradually it replaced bone char in sugar refining processes

Lowitz studied the effectiveness of charcoal in decolorizing various aqueous solutions and this appears to be the first systematic account for application of charcoal in liquid phase.Kehl discovered that carbon prepared from animal tissues could be used for color removal from solutions. Delessert demonstrated the decolonizing power of charcoal for sugar beet liquor. Hunter recognized the gas adsorption properties of activated carbon prepared from coconut shells.

Kubelka interpreted sorption phenomena on active carbon by the mechanism of capillary condensation .

Wunch recognized the decolorizing capacity of eponit was greatly increased by heating with zinc.

III. METHODOLOGY

Adsorption is the adhesion of atoms,ions,or molecules from a gas , liquid or dissolve solid to a surface . This process creates a film of the adsorbate on the surface of the adsorbent. This process differs from adsorption, in which a fluid is dissolved by or permeates a liquid or solid. The wastewater treatment by adsorption is divided into tow types batch operation and fixed bed column operations , adsorption study is conducted for removal of heavy metals such as Pb,Cu,Zn,Ni and Cr using activated charcoal prepared from neem leaf powder.

- 1) Batch operation
- 2) Continuous or fixed bed column operations

Design formulation of the activated carbon

- 1) Freundlich isotherm (1909).

$$X/M = KC^{1/n}$$

Where ,

X - weight of substance adsorbed

M- Weight of adsorbent

C - concentration of substance

K,n – constant

- 2) Langmuir isotherm(1916)

$$X/M = abc/1+ac$$

Where

a- Constant , increase with increasing molecular size

b- - amount adsorbed from a complete monolayer on surface

Langmuir isotherm introduced in 1916 .

Freundlich isotherm introduced in 1909 for constant temperature .

IV. CONCLUSION

This report is a review of variety of options that may be employed in the treatment, recovery and reuse of wastewater. It is apparent that a variety of options are feasible for use in the developing world and even more apparent that many low-technology options can be mixed and matched for very high efficiencies. Natural treatment technologies are attracting a significant level of interest by environmental managers. Natural treatment technologies are considered viable because of their low capital costs, their ease of maintenance, their potentially longer life-cycles and their ability to recover a variety of resources including: treated effluent for irrigation, organic humus for soil amendment and energy in the form of biogas.

This report examined emergent issues and technological options related to the scale of collection and treatment systems. There is increasing momentum developing behind the notion that recycling loops, from point of generation (*e.g.*, the household) to point of treatment and reuse must be shortened.

REFERENCES

1. Asano, T. and A. D. Levine (1996). Wastewater reclamation, recycling, and reuse: Past, present and future. *Water Science and Technology*, 33: 1-14.
2. Black, M. (1994). *Mega - slums: The coming sanitary crisis*. London: WaterAid.
3. Boller, M. (1997). Small wastewater treatment plants - A challenge to wastewater engineers. *Water Science and Technology*, 35: 1-12.
4. Bouwer, H. (1993a). From sewage to zero discharge. *European Water Pollution Control*, 3: 9- 16.
5. Bouwer, H. (1993b). Urban and agricultural competition for water and water reuse. *Water Resources Development*, 9: 13-25.
6. Bowker, R.P.G. (2000). Biological odour control by diffusion into activated sludge basins. *Water Science and Technology*, 41: 127-132.
7. Burgess, J.E., S.A. Parsons and R.M. Stuetz (2001). Developments in odour control and waste gas treatment biotechnology: A review. *Biotechnology Advances*, 19: 35-63.



8. Caribbean Environment Programme Technical Report #40 (1998). Appropriate technology for sewage pollution control in the wider Caribbean Region.
9. Carter, C.R., S.F. Tyrrel and P. Howsam (1999). Impact and sustainability of community water supply and sanitation programmes in developing countries. *Journal of the Chartered Institution of Water and Environmental Management*, 13: 292-296.
10. Census of India (2001): Analysis and Articles on Population and Literacy Rates, Office of the Registrar General, India, Ministry of Home Affairs.
11. Chawathe, S. D. and D. Kantawala (1987). Reuse of water in city planning. *Water Supply*, 15: 17-23.
12. Chow, V.T., R. Eliason and R.K. Linsley (1972). Development and trends in wastewater Engineering. In *Wastewater Engineering*. McGraw-Hill Book Company. New York, St. Louis, Dusseldorf, Johannesburg, Kuala Lumpur, London, Mexico, Montreal, Delhi, Panama, Rio de Janeiro, Singapore, Sydney, Toronto. pp. 1-11
13. Cooper, P.F. (2001). Historical aspects of wastewater treatment. In *Decentralized sanitation and reuse concepts, systems and Implementation*. Eds., Lens P., Zeeman G., and G. Lettinga. IWA Publishing. London. pp. 11-38.
14. Day, D. (1996). How Australian social policy neglects environments. *Australian Journal of Soil and Water Conservation*, 9: 3-9.
15. Deb, P.K., A.J. Rubin, A.W. Launder and K.H. Mancy (1966). Removal of COD from wastewater by fly ash. In *proceeding of the 1966. 21st Indiana Waste conference*. D.E. Bloodygood Ed. Published by Purdue University, W. Lafayette, Indiana. pp: 848 – 860.
16. Denny, P. (1997). Implementation of constructed wetlands in developing countries. *Water Science and Technology*, 35: 27-34.
17. Doorn, M.R.J., S. Towprayoon, S. Maria, M. Vieira, W. Irving, C. Palmer, R. Pipatti and C.Wang, (2006). Wastewater treatment and discharge. In *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. WMO, UNEP. pp. 5: 1-6.
18. Drizo, A., C. Forget, R.P. Chapuis and Y. Comeau (2006). Phosphorus removal by electric arc furnace steel slag and serpentinite. *Water Research*, 40: 1547– 1554.
19. Eye, D.J. and T.K. Basu (1970). The use of fly ash in municipal waste treatment. *Journal of the Water Pollution Control Federation*, 42



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