International Journal For Technological Research In Engineering
Volume 7, Issue 4, December-2019 *ISSN (Online): 2347 - 4718*

REVIEW ON WASTEWATER TREATMENT TECHNOLOGIES

Samik Sharma[1], Mayank Singh[2], Akash Khandelwal[3]
[1]Assistant professor of Mahavir Swami Institute of Technology
[2,3]Student of Mahavir Swami Institute of Technology pursuing Civil Engineering

ABSTRACT: ***Nowadays several water resources area unit impure by phylogeny sources together with home and agricultural waste and industrial processes. Public concern over the environmental impact of waste pollution has inflated. many typical waste treatment techniques, i.e. chemical clotting, adsorption, activated sludge, are applied to get rid of thepollution, but there area unit still some limitations, particularly that of high operation prices. The utilization of aerobicb wastewater treatmentas a subtractive medium is receiving inflated interest thanks to its lowoperation and maintenance prices. additionally, it's easy-to-obtain, with sensible effectiveness and talent for degrading contaminants. This paper reviews the utilization of waste water treatment technologies to get rid of contaminants from waste like halogenated organic compound compounds, significant metals, dyes, pesticides, and herbicides, that represent the most pollutants in waste.***
Key Words: Sewage, Aerobic, Treatment, Technologies.

I. INTRODUCTION

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 (UN, 1997). 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, presents major challenges to engineers, planners and politicians (Black, 1994; Giles and Brown, 1997).

As human numbers increase, bigger strains are going to be placed on accessible resources and cause even larger threat to environmental sources. A report by the Secretary-General of the UN Commission on property Development (UNCSD, 1997) complete that there's no property within the current uses of water by either developing or developed nations, which worldwide, water usage has been growing at quite thrice the world's population increase, consequently resulting in widespread public health issues, limiting economic and agricultural development and adversely poignant a good vary of ecosystems.

Although Asian nation occupies solely three.29 million km2 geographical region, that forms two.4% of the world's expanse, it supports over 15 August 1945 of world's population. The population of Asian nation as of March one, 2001 was 1,027,015,247 persons (Census, 2001). Asian nation conjointly incorporates a eutherian mammal population of five hundred million, that is regarding 2 hundredth of world's total eutherian mammal. However, total annual utile water resources of the country area unit 1086 km3 that is merely four-dimensional of world's water resources (Kumar et al., 2005).Total annual utile resources of surface water and spring water area unit 690 and 396 km3, severally (Ministry of Water Resources, 1999). subsequent to rapid climb in population and increasing water demand, stress on water resources in Asian nation is increasing and per capita water accessibility is reducing day by day. In Asian nation per capita surface water accessibility within the years 1991 and 2001 were 2300 money supply (6.3 money supply/day) and 1980 m3 (5.7 money supply/day) severally and these area unit projected to scale back to 1401 and 1191 m3 by the years 2025 and 2050, severally (Kumar et al., 2005). Total water demand of the country in 2050 is calculable to be 1450 km3 that is on top of the present accessibility of 1086 km3. Much of the wastes of civilization enter water bodies through the discharge of waterborne waste from domestic, industrial and non-point sources carrying unwanted and unrecovered substances (Welch, 1992). though the gathering of waste product dates back to times of yore, its treatment may be a comparatively recent development chemical analysis from the late 1800s and early decennary (Chow et al., 1972). trendy information of the necessity for sanitation and treatment of impure waters but, started with the often cited case of John Snow in 1855, during which he proven that a infectious disease natural event in London was thanks to waste product contaminated water obtained from the River Thames (Cooper, 2001). In developed nations, treatment and discharge systems will sharply take issue between countries and between rural and concrete users, with relevance urban high financial gain and concrete low-income users (Doorn et al., 2006). the foremost common waste product treatment strategies in developed countries area unit centralized aerobic waste product treatment plants and lagoons for each domestic and industrial waste product.

Modern civilization, armed with speedily advancing technology and quick growing financial set-up is below increasing threat from its own activities inflicting pollution,

(Singh et al. (1989). Asian country is that the seventh largest country within the world with a complete land of three.29 million sq. km, population over one billion, twenty ninth of that sleep in urban areas cover 5162 cities. With monumental natural resources and growing economy Asian country is that the second largest pool of technical and scientific personnel within the world. Pollution from tiny size industries (SSIs) puts the Indian regulators ahead of a tough arbitrage between economic development and environmental property. The uncontrolled growth in urban areas has created coming up with and enlargement of water and waste material systems terribly tough and high-priced (Looker, 1998). Aerobic activated sludge reactors are used on a restricted scale as bio-scrubbers for the treatment of odorous air (Bowker, 2000). Despite varied positive reports from full scale applications in North America, very little information square measure accessible on the particular performance of those systems with wide travel considerations on reduction of sinking potency because of changes in thready organisms and microorganism flocks (Burgess et al. 2001). These considerations square measure mitigated in MBRs wherever attraction sinking of the microbic resolution is replaced by physical filtration. Also, the diffusion and bioconversion of odorous gases square measure a perform of contact time, bubble size, and reactor configuration (Burgess et al. 2001). Submerged MBRs incorporate the membrane unit inside the bioreactor and admit gas and liquid scouring to wash the membrane surface. Since trendy eutherian operations square measure equipped with blowers and ventilation systems, booster fans may well be superimposed to extend outflow pressure. this idea was explored in past analysis efforts once biofilter beds (compost and wood chips) were tested for odour removal (Mann et al. 2002).

Status of wastewater in India The total waste product generated by 299 class-1 cities is sixteen,652.5 MLD. Out of this, regarding fifty nine is generated by twenty three railway cities. The state of geographical area alone contributes regarding twenty third, whereas the Ganga geographical area contributes regarding thirty first of the whole waste product generated in class-1 cities. solely seventy two of the whole treated waste product generated is collected. Out of 299 class-1 cities, one hundred sixty cities have sewerage system for quite seventy five p.c of population and ninety two cities have quite fifty p.c of population coverage. On the full seventieth of total population of class-1 cities is supplied with sewerage facility, compared to forty eighth in 1988. the sort of sewerage system is either open or closed or piped. the most objective of this study was to perform a review of the treatment of domestic waste material victimization the aerobic sludge to make sure effective discharge and/or re-use/recycling.

Wastewater treatment in India
Out of 16,662.5 MLD of waste product generated, only 4037.2 mld (24 %) is treated before unharness, the remainder (i.e. 12,626.30 MLD) is disposed of untreated. Twenty-seven cities have solely primary treatment facilities and solely cardinal have primary and secondary treatment facilities. Wastewater treatment involves breakdown of complicated organic compounds within the waste product into less complicated compounds that ar stable and nuisance-free, either physico-chemically and/or by victimisation micro-organisms (biological treatment). The adverse environmental impact of permitting untreated waste product to be discharged in groundwater or surface water bodies and or lands ar as follows:
The decomposition of the organic materials contained in waste product will result in the assembly of huge quantities of miasmic gases.

Need of sewage treatment:
Out of 16,662.5 MLD of waste product generated, only 4037.2 mld (24 %) is treated before unharness, the remainder (i.e. 12,626.30 MLD) is disposed of untreated. Twenty-seven cities have solely primary treatment facilities and solely cardinal have primary and secondary treatment facilities.
Wastewater treatment involves breakdown of complicated organic compounds within the waste product into less complicated compounds that ar stable and nuisance-free, either physico-chemically and/or by victimisation micro-organisms (biological treatment). The adverse environmental impact of permitting untreated waste product to be discharged in groundwater or surface water bodies and or lands ar as follows:
The decomposition of the organic materials contained in waste product will result in the assembly of huge quantities of miasmic gases.
Untreated wastewater (sewage) containing a large amount of organic matter, if discharged into a river / stream, will consume the dissolved oxygen for satisfying the Biochemical Oxygen Demand (BOD) of wastewater and thus deplete the dissolved oxygen of the stream, thereby causing fish kills and other undesirable effects.
Wastewater may also contain nutrients, which can stimulate the growth of aquatic plants and algal blooms, thus leading to eutrophication of the lakes and streams.
Untreated wastewater usually contains numerous pathogenic, or disease causing microorganisms and toxic compounds, that dwell in the human intestinal tract or may be present in certain industrial waste. These may contaminate the land or the water body, where such sewage is disposed.
For the above-mentioned reasons the treatment and disposal of wastewater, is not only desirable but also necessary.
Industrial, Municipal and Domestic Reuse of Wastewater
Municipal uses of treated waste matter embrace the irrigation of road plantings, parks, playgrounds, golf courses and bathroom flushing etc. (Bouwer, 1993). Industrial reuses of waste matter embrace cooling systems, agricultural uses (irrigation and aquaculture), the food process trade and different high- rate water uses (Bouwer, 1993b; Khouri et al. 1994; Asano and Levine, 1996). In Middle Eastern countries, wherever water is scarce, twin istribution systems can, within the close to future, give prime quality, treated effluents for lavatory flushing to hotels, workplace buildings, etc. (Shelef and Azov, 1996).
In India, waste matter is presently being employed for irrigation, gardening, flushing, cooling of air-con systems, as

a feed for boilers, and as method water for industries (Chawathe and Kantawala, 1987). In China, national policy has been developed that promotes the event of water-efficient technologies, and encourages the employ of rescued municipal waste matter in agriculture 1st, so for industrial and municipal uses (Zhongxiang and Yi, 1991). In Japan, reclaimed wastewater is used for toilet flushing, industry, stream restoration and flow augmentation to create "urban amenities" such as green space (Asano, Maeda, Takaki, 1996).

Planning and Implementing Wastewater Reuse Appropriate Technology

A useful and property waste material management theme begins at the menage level and is essentially enthusiastic about the "software" or the human element (Khouri et al., 1994). only perception of want and maybe, anticipation for a waste material reprocess system has been internalized at the neighborhood/user level, can coming up with and implementation be with success dead (Khouri et al., 1994). native level support of a treatment and recovery theme will, in turn, catalyze pro-active establishments and vertical support from governments. Once the package element has been integrated into project development, the "hardware" or technological element will act to market a comprehensive, integrated, and property waste material treatment and recovery strategy for the community - if it's well chosen and "appropriate". many options characterise Associate in Nursing acceptable waste material treatment technology that may be a property sweetness to a community. Denny, (1997) has expressed that waste material treatment technologies within the developing world should have one dominant criterion: the technology should be cost-efficient and acceptable. the subsequent concerns ought to be created concerning the appropriateness of technologies:

The theme or technology ought to be a felt priority publicly or environmental health, and each centralised and de-centralised technologies ought to be thought-about (Veenstra and Alaerts, 1996).

The technology ought to be inexpensive and need low energy input and mechanisation, that reduces the danger of malfunction (Frijns and theologiser, 1996; Boller, 1997).

The technology ought to be straightforward to work, be "local" labour intensive, maintained by the community not believe dearly-won chemical inputs, like halogen, for tertiary microorganism reductions to fulfill quality pointers, and may be able to recover resources (Mara and Cairncross, 1989; Frijns and Jansen; 1996; Boller, 1997).

The technology ought to be capable of being incrementally upgraded as user demand or quality standards and treatment pointers increase (Boller, 1997).

Public acceptance of reprocess comes is important to the way forward for waste material reprocess and also the consequences of poor public perception might menace future waste material reprocess comes (Asano and Levine, 1996). the choice of any treatment technology should be accompanied before by a close examination of the independence and technological capability of the community. The treatment alternatives should be manageable by the area people. (Boller 1997) suggests that ball-hawking operation andmaintenance ar essential toachieve satisfactory performance which technologies should need all-time low level of maintenance and management. The dominant criterion is that the system should be capable of achieving acceptable levels of microorganism reductions to facilitate the recovery of effluent for irrigation and organic soil modification (Yu et al., 1997).

Table 1: Overview of the wastewater treatment technology types in the selected countries

Country	Treatment type
Jordan	Activated sludge Biofiltrataion Stabilization ponds Extended aeration
Turkey	Activated sludge/extended aerated Trickling filter Stabilization ponds
Lebanon	Grit and scum removal
Palestine	Extended aeration Stabilization ponds Oxidation ditches Anaerobic Rock filter Imhoff tank and trickling filter Anaerobic sludge stabilization

A number of standard treatment technologies are thought-about for treatment of waste product contaminated with organic substances. business activated charcoal is considered the foremost effective material for dominant the organic load. but because of its high price and regarding 10-15 loss throughout regeneration, unconventional adsorbents like ash, peat, lignite, wood, saw mud etc. are used for the removal of refractory materials, (Pandey et al., 1985) for varied degree of success. Ionic liquids holds promise to supply higher various to the toxicant solvents, (Sheldon et al., 2001)

The removal of organic material by sorption has recently become the topic of interest of many employees, Admiral Nelson et al. (1969); Eye et al. (1970); Johnson et al.(1965); debutante et al.(1966); Gupta et al.(1978,1990); feminist et al. (1992); Viraraghavan et al.(1994). they need explored the utilization of ash as AN adsorbent for treatment of waste product to get rid of toxicant compounds and color. Pandey et al. (1985) has projected a way for removal of copper from waste product by taking ash as AN adsorbent. the utilization of active filtration through alkalescent media for the removal of phosphorus from domestic waste product has been projected by Johansson et al. (1998); and Drizo et al. (2006). gas could be a superb oxidiser because of its high instability (reduction potential two.07 V) when put next to element

(1.36 V) and (1.78V). it's potential to degrade sizable amount of pollutants like phenols, pesticides and aromatic hydrocarbons and is employed since the first Nineteen Seventies in waste product treatment (Robinson et al. 2001, Özbelge et al. 2002, Pera-Titus et al. 2004) . the most important disadvantage of the utilization of this methodology is, gas has short half-life, it decomposes in twenty minutes thus need continuous ozonation and creating this methodology big-ticket to use,(Slokar et al., 1998, Robinson et al., 2001).

Anaerobic wastewater treatment is a biological wastewater treatment without the use of air or elemental oxygen. Applications are directed towards the removal of organic pollutants in waste water, slurries and sludge. Complete replacement of aerobic with anaerobic technology is not yet possible as the effluent quality of anaerobic treatment systems is not up to par. The anaerobic treatment is considered as a pre-treatment technique and has been applied in Colombia, Brazil, and India, replacing the more costly activated sludge processes. There are different types of digesters available, some have been proven effective over time, and others are still being tested. One of the most suitable digesters for tropical conditions is the UASB (Up flow Anaerobic Sludge Blanket). Harada et al. (2007, 2006, 2005, associate degreed 2002) has projected a self-sustainable biodegradable pollution treatment system with the mix of UASB as pretreatment unit and an aerobic reactor Down flow Hanging Sponge (DHS) reactor as a post treatment unit. The projected anaerobic-aerobic bio conenoses of UASB and DHS fulfill the necessity for a simplified treatment system for developing countries thanks to its low price, and operational simplicity, beside property of the system as an entire.

II. CONCLUSION

This report may be a review of sort of choices which will be used within the treatment, recovery and employ of waste. it's apparent that a range of choices area unit possible to be used within the developing world and even a lot of apparent that several low-technology choices is mixed and matched for terribly high efficiencies. Natural treatment technologies area unit attracting a major level of interest by environmental managers. Natural treatment technologies area unit thought of viable thanks to their low capital prices, their simple maintenance, their probably longer life-cycles and their ability to recover a range of resources including: treated effluent for irrigation, organic humus for soil change and energy within the style of biogas.

This report examined aborning problems and technological choices associated with the size of assortment and treatment systems. there's increasing momentum developing behind the notion that usage loops, from purpose of generation (e.g., the household) to purpose of treatment and employ should 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, New 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: 125-135.

[20] Frijns, J. and M. Jansen (1996). Institutional requirements for appropriate wastewater treatment systems. In A. Balkema, H. Aalbers and E. Heijndermans (Eds.), Workshop on sustainable municipal waste water treatment systems, Leusdan, the Netherlands. ETC in cooperation with WASTE. 12-14 November, 1996. pp: 54-66.

[21] Giles, H. and B. Brown (1997). And not a drop to drink. Water and sanitation services in the developing world. Geography, 82: 97-109.

[22] Gupta, G.S., G. Prasad, and V.N. Singh (1990). Removal of chrome dye from aqueous solutions by mixed adsorbents: fly ash and coal. Water Research, 24: 45–50.

[23] Harada, H., A. Tawfic and A. Ohashi (2006). Sewage treatment in a combined up-flow sludge blanket (UASB)-down flow hanging sponge (DHS) system. Biochemical Engineering Journal, 29: 210-219.

[24] Harada, H., M. Tandulkar and A. Ohashi, (2007). Performance comparison of a pilot-scale UASB and DHS system and activated sludge process for the treatment of municipal wastewater. Water Research, 132: 166-172.

[25] Harada, H., M. Tandulkar, S. Uemura and A. Ohashi (2005). A low-cost municipal sewage treatment system with a combination of UASB and the Fourth Generation Down flow Hanging Sponge (DHS) reactors. Water Science and Technology, 52: 323-329.

[26] Johansson, L. and L. Hylander (1998). Phosphorus removal from waste water by filter media: retention and estimated plant availability of sorbed phosphorus. Journal of polish Academy of Science, 458: 397-410.

[27] Johnson, G.E., L.M. Hunka and J.H. Field (1965). Use of coal and fly ash as adsorbents for removing organic contaminants from secondary. Industrial and Engineering Chemistry Process Design and Development, 4: 323-327.

[28] Khouri, N., J.M. Kalbermatten and C. Bartone (1994). The reuse of wastewater in agriculture: A guide for planners. UNDP - World Bank Water and Sanitation Program. Washington, DC: The World Bank.

[29] Kumar, R., R.D. Singh and K.D. Sharma (2005). Water resources of India. Current Science, 89: 794-811.

[30] Looker, N. (1998). Municipal Wastewater Management in Latin America and the Caribbean, R.J. Burnside International Limited, Published for Roundtable on Municipal Water for the Canadian Environment Industry Association.

