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Study on various technologies in wastewater treatment

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ABSTRACT

Water is the most valuable resource in the world, and is now under threat due to human population and technical development. Since water is under demand to the human race, it has to be used efficiently. This has to be done by recycle and reuse of waste water. Since, the human population and environmental safety are the issues for the need of water treatment, water has to be done primarily atleast for the domestic wastewater for the basic needs. This review article discusses the various methods of treatment processes. This recycling and reusing of wastewater can meet the needs of human in their technical and industrial processes. Domestic wastewater reuse can also help the community to achieve a better living, and less dependent on ground water, hence ecosystem can also be balanced. The paper concludes that the wastewater treatment has to be done effectively based on the content and type of wastewater and reuse in the most efficient way to save our most valuable resource for the future.

KEY WORDS: Wastewater, Technologies, Treatment

1. INTRODUCTION

Waste Water treatment is a process of making water suitable for its application or returning its natural state. Thus, water treatment required before and after its application. The required treatment depends on the application. Wastewater treatment involves science, engineering, business, and art. The treatment may include mechanical, physical, biological, and chemical methods. As with any technology, science is the foundation, and engineering makes sure that the technology works as designed. The appearance and application of water is an art. Water is a renewable resource.

All Wastewater treatments involve the removal of solids, bacteria, algae, plants, inorganic compounds, and organic compounds. Removal of solids is usually done by filtration and sediment. Bacteria digestion is an important process to remove harmful pollutants. Converting used water into environmentally acceptable water or even drinking water is wastewater treatment. Although the sewage water may be discharged back to the ecological system after aerated digestion and percolating filtration. Biological is one of the promising technologies. Since most of the waste water contains biodegradable particles biological treatment attains a special place in the process. Both BOD/COD ratio of or greater (0.5) can be done with the biological process. Aerobic process consume the free or dissolved oxygen and convert the organic matter into the biomass and carbon-di-oxide, while the anaerobic process degrades the complex particles into methane, water and carbon-di-oxide. Anaerobic treatment undergoes three steps in the absence of oxygen. The process has hydrolysis, acidogenesis including acetogenesis and methanogenesis which helps to digest the complex matter. Reverse osmosis is the other effective technology for waste water treatment mostly to obtain standard for domestic puposes. From the literature review it is seen that RO technology is used to remove organic matter, solids, colour and nitrate from the feed stream. Hence RO can be used for the treatment for wastewater from food processing units.

Methods involved in waste water treatment: The various methods are available for the treatment of hazardous waste.

Aerobic treatment: Aerobic water treatment encourages the growth of naturally occurring micro-organisms to renovate the wastewater. These micro-organisms are considered as the engines of the treatment plant. These engines that are the micro-organisms are powered by the high energy carbon content in the organic compounds and convert them in to low-energy organic compounds such as carbon-di-oxide. This aerobic treatment considers temperature, moisture content, food to microorganism ratio (F/M), acid concentration and also the type of reactor used. Suspended Growth Bioreactors, Attached-Growth Bioreactors, Rotating Biological Contactor (RBC), Sequencing Batch Reactor Systems (SBR) or Periodic Processes are the various types of bioreactors used for this process. The process description in the SBR: A single cycle of SBR undergoes 1) Fill: raw waste water if fed with or without dissolved oxygen. This occupies 25% of the cycle. 2) React: Aeration is provide for rapid biodegradation and nitrogenous that occupies the 35% of the total cycle.3) Settle : Aeration is shut off and clarification is done that occupies 20% of the cycle. 4) Draw: Supernatant is removed from the clarified reactor that takes 15% of the cycle 5) switch floe to the next reactor.

Anaerobic treatment: Anaerobic process is the digestion of complex compound in the absence of oxygen. The digestion process starts with bacterial hydrolysis. The carbohydrates that are the insoluble organic polymers are broken as soluble substance that can be consumed by other bacteria. Acidogenic bacteria help to convert the amino acids and sugars into organic acids, ammonia, carbon-di-oxide and hydrogen. This organic acid is converted to acetic acid by these bacteria. Methanogens help to convert all these products into methane and carbon-di-oxide. The main methanogens that play vital roles are the methanogen archaea.

Sedimentation: Allow the vessels to settle the particles without any disturbances for a period of time. Recover the supernatant water carefully. This helps the turbidity of the water to get reduced. But this process does not reduce the microbial concentration. Hence chlorination and solar treatment is helpful for this purpose. The coagulation enhances the settling process using iron or aluminium salts as aluminium sulphate, ferric sulphate, ferric chloride or polymers. These are called as the coagulants. These are positively charged that combine with the negatively charged suspended particles and neutralizes to bind together and form larger particles to settle as flocculants called as flocculation.

Seed extract coagulation-flocculation: This type is practiced widely using natural and renewable vegetation. *Moringa* species are widely used that are available in Africa and coastal regions. *Nirmali* plant or *Strychnos potatorum* help in clearing the water from microbes and turbidity. *Moringa oleifera, Strychnos potatorum, Strychnos potatorum* are the types of plant species that has the capability to coagulation –flocculation process. These function as particulate, colloidal and coagulant aid.

Filtration: Filtration is an ancient process to remove the floating and suspended particles. This reduces turbidity, microbial growth depending on its type and filtration method. Granular porous media, filtration membrane, Bucket filters, Drum or barrel filters, Roughing filters, Filter-cisterns, Biomass and fossil fuel granular media filters, Slow sand filters, Fiber, fabric and membrane filters, Porous ceramic filters, Diatomaceous earth filters are the various types of filters that can be used for the filtration process depending on the type of waste water and concentration of the waste particles.

Adsorption Process: Adsorbents such as clay, charcoal and other types of organic matter have been used for the treatment of wastewater. They are impregnated in the filter media and enhance the filtration process. It can also be combined with coagulants, therefore can also be carried out with filtration and coagulation.

Clay adsorption: Clay adsorption is one of the ancient processes used for the filtration process. Clay with the chemical coagulants give better results. Clay can be used alone so that it can reduce the turbidity and microbes in the waste water and can be reused. Clay adsorption is not much used for the domestic wastewater treatment.

Charcoal and activated carbon adsorption: Adsorbents such as charcoal and activated carbon are widely used for the treatment all over the world. It can mainly reduce the toxic organic compounds. Extensively it can also reduce taste and odor. It is either used in the powdered or pressed carbon block form. Both fresh charcoal and activated carbon can absorb micro-organisms, pathogens, dissolved matter and rapidly develop biofilm. When activated charcoal is impregnated in the filtration membrane they give better results. Carbon particles are usually prone to shed heterotrophic plate count bacteria and colonizing microbes in the treated water hence reduces the microbial quality. There impregnation to the filters help to reduce the proliferation of microbial colonizing. Silver nitrate used as a bacteriostatic agent and be bind with charcoal that will reduce the microbial colonizing in the treated water.

Softening, deionizing and scavenging resins: Hardness of water is the carbonate content present. There are types of carbonates present in the wastewater. Removal of hardness is otherwise known as water softening. Water softening resins can remove hardness but they cannot remove microbes. These resins result in clogging of colonized bacteria, resulting in high bacterial levels in the treated water. Softening resins are also expensive due to their maintenance, monitoring and frequent replacement and recharging. Thus it is not cost effective for domestic purposes.

2. CONCLUSION

Wastewater has to be treated according to their affected condition and reused since the scarcity of water is an issue all over the globe. Waste water treatment has to be given special attention since the major volume of water is used in industries. Since large volume of water is used, fresh water cannot be used every time, hence the used water has to be treated for the washing, cooling purposes, etc. More new methods has to adopt for reuse of water.

REFERENCES

Anbazhagan R, Prabhakar S, Vanangamudi S, Thamotharan C, Electromagnetic engine, Middle - East Journal of Scientific Research, 20 (3), 2014, 385-387.

Anbazhagan R, Satheesh B, Gopalakrishnan K, Mathematical modeling and simulation of modern cars in the role of stability analysis, Indian Journal of Science and Technology, 6 (5), 2013, 4633-4641.

BIS, Specification for drinking water IS, 10500, 1991, Bureaa of Indian standard, 1991,

Boari G, Manchi I.M, Truli E, Technology for water and wastewater treatment, 1997, 261-287.

Brindha G, Krishnakumar T, Vijayalatha S, Emerging trends in tele-medicine in rural healthcare, International Journal of Pharmacy and Technology, 7 (2), 2015, 8986-8991.

Brintha Rajakumari S, Nalini C, An efficient cost model for data storage with horizontal layout in the cloud, Indian Journal of Science and Technology, 7, 2014, 45-46.

Carrieri C, Balice V, Boari G, Rozzi A and Santori M, Anaerobic treatment of olive mill effluents and sewage sludge in conventional digesters. In Proceedings of International Symposium on Olive By-products Valorization, Sevilla, 8 (2), 2002, 167-170

Ecological engineering for wastewater treatment, Bok Skogen, Gothenberg, 227-238

Gopalakrishnan K, Prem Jeya Kumar M, Sundeep Aanand J, Udayakumar R, Analysis of static and dynamic load on hydrostatic bearing with variable viscosity and pressure, Indian Journal of Science and Technology, 6 (6), 2013, 4783-4788.

Jessen P.D, Krohstad T and Maelhulm T, Wastewater treatment by constructed wetland in the Norwegian climate, Pretreatment and optimal design. In Etnier C and Guterstam, 1991.

Jeyanthi Rebecca L, Susithra G, Sharmila S, Das M.P, Isolation and screening of chitinase producing Serratia marcescens from soil, Journal of Chemical and Pharmaceutical Research, 5 (2), 2013, 192-195.

Kerana Hanirex D, Kaliyamurthie K.P, An adaptive transaction reduction approach for mining frequent itemsets, A comparative study on dengue virus type1, International Journal of Pharma and Bio Sciences, 6 (2), B336-B340, 2015.

Ollis D.F, Al-Ekabi H, (Eds.), Photocatalytic Purification and Treatment of Water and Air, Elsevier, Amsterdam.Engineering Chemistry (15th Edition) by Jain & Jain, 1993.

Sachithanantham P, Sa Nkaran S, Elavenil S, Experimental study on the effect of rise on shallow funicular concrete shells over square ground plan, International Journal of Applied Engineering Research, 10 (20), 2015, 41340-41345.

Sharmila S, Jeyanthi Rebecca L, Das M.P, Production of Biodiesel from Chaetomorpha antennina and Gracilaria corticata, Journal of Chemical and Pharmaceutical Research, 4 (11), 2012, 4870-4874.

Sharmila S, Jeyanthi Rebecca L, Naveen Chandran P, Kowsalya E, Dutta H, Ray S, Kripanand N.R, Extraction of biofuel from seaweed and analyse its engine performance, International Journal of Pharmacy and Technology, 7 (2), 2015, 8870-8875.

Thamotharan C, Prabhakar S, Vanangamudi S, Anbazhagan R, Coomarasamy C, Hydraulic rear drum brake system in two wheeler, Middle - East Journal of Scientific Research, 20 (12), 2014, 1826-1833.

Turkar SS, Bharti DB and Gaikwad GS, Various methods involved in waste water treatment to control water pollution, J. Chem. Pharm. Res, 3 (2), 2011, 58-65.
Canziani R, Biological nitrification and denitrification – Configurations plant. In Water Treatment Rguto, Institute for the Environment, 1990.

Vanangamudi S, Prabhakar S, Thamotharan C, Anbazhagan R, Dual fuel hybrid bike, Middle - East Journal of Scientific Research, 20 (12), 2014, 1819-1822.

Vanangamudi S, Prabhakar S, Thamotharan C, Anbazhagan R, Turbo charger in two wheeler engine, Middle - East Journal of Scientific Research, 20 (12), 2014, 1841-1847.

Vanangamudi S, Prabhakar S, Thamotharan C, Anbazhagan,R, Drive shaft mechanism in motor cycle, Middle - East Journal of Scientific Research, 20 (12), 2014, 1810-1815.

Vanangamudi S, Prabhakar S, Thamotharan C, Anbazhagan R, Collision control system in cars, Middle - East Journal of Scientific Research, 20 (12), 2014, 1799-1809.