# waste water Treatment Using Different Methods: A Review

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***Abstract-*** *Waste water is the consequence of municipal, domestic, agricultural and industrial activity.Water covers 71% of the Earth's surface, but only 2.5% of the Earth's water is freshwater. Due to industrialization and Urbanization it is becoming more polluted this polluted water utilization and its purity problem is increasing day to day. For solving this problem various methods are used for treatment of waste water. Different types waste water samples were collected and analyzed for the various parameters like pH, DO, BOD, COD, chloride, sulphate, total dissolved solids (T.D.S.)Ammonia, Nitrogen and Phosphate. The current review summarizes research carried out on waste water treatment.*

***Keywords***- waste water, Reed bed, Root Zone, Algae, Banana Peels, Fish Scales.

## I. INTRODUCTION

Water containing unwanted substances which badly affect its quality and thus making it unsuitable for use is termed as waste water. Waste water treatment is gaining much significance in recent years with the intension of reusing it. For the treatment of waste water large amount of materials are to be supplemented. The consumption of resources and energy based on human activities followed by huge amount of wastes has being one of the most serious problems all over the world. Water is our most valuable resource. The purity of our lakes, rivers and oceans is one of the serious goals for environmental protection. The balance of nature depends therefore on the comprehensiveness of our approach to solve the problem of waste water disposal.Reed bed is natural and cheap methods of treating domestic, industrial and agricultural liquid wastes. The use of pesticides waste water helps in reduces the crop defeat, provides financial profit to farmers, reduces soil erosion and helps in ensuring food safety and protection for the nation.The current review summarizes studies and investigations carried out for the treatment of waste water.

## II. waste water TREATMENT

Sanjeev Kumar Sinha et.al.carried out A Study on the Waste Water Treatment Technology for Steel Industry: Recycle and Reuse. [1]In the present study, the research work will be undertaken for characteristics of waste water of steel industry, innovations in technology for waste water treatment of steel industries and recycling and reuse of water and sludge of steel industries. A proper design of Industrial Effluent Treatment Plant (ETP) for treatment of waste water from steel industry is very useful and innovative research work.The standard methodology is followed for analysis of different water quality parameters, pH of sample is measured by pH - meter, temperature is measured by thermometer, turbidity by nephalometer, conductivity is measured by conductivity meter. Other parameters like DO, BOD, COD, chloride, sulphate, total dissolved solids (T.D.S.) are measured by water sampling kit. Treated waste water may be used for agriculture, recreational activities and other purposes.

Thakur et.al. Study on waste water Treatment through Root Zone Technology with Special Reference to Shahpura Lake of Bhopal (M. P.), India.[2]The present Root Zone System is situated above sea level at Guru Govind Singh Park (Ekant Park)in southern area of Bhopal (M. P.), central India. The present Root Zone System is designed to treat 70,000 litres/ day of waste water of nalla passing through the Park. This system is consists of pre-treatment (Settling tank-35 $m^3$)followed by Root zone bed (700 Sq. m) with gravels, Reed Plants (Phragmitiskarka) and Inlet – Outlet arrangement for flow of water The waste water analysis of Inlet and Outlet of Root Zone System has been carried out physiochemical parameters like, DO,BOD, COD, nitrate and phosphate were analysedIn present study, the DO value varied from 0.0mg/L to 2.0 mg/L in Inlet and 3.6 mg/L to 6.8 mg/L in Outlet of Root Zone System. In present study, the BOD value varied from 16.0 mg/L to 80.0 mg/L in Inlet and8.0 mg/L to 44.0 mg/L in Outlet of Root Zone System.In present study, the COD value varied from 64.0 mg/L to120.0 mg/L in Inlet and 48.0mg/L to 110.0 mg/L in Outlet of Root Zone System.In present study,nitrate concentration varied from 2.5 mg/L to 18.4 mg/L in Inlet and 2.0 mg/L to 12.2 mg/L in Outlet of Root Zone System.In present study,phosphate concentration varied from 2.4 mg/L to 9.0 mg/L in Inlet and 1.6 mg/L to 5.8 mg/Lin Outlet of Root Zone System. After conclusion Root Zone System at Ekant Park, Bhopal is working effectively to treat the waste water and the treated water can be reused for secondary purposes like fishing, swimming, irrigation etc.

Ribadiya and Mehta discussed Treatment of municipal and industrial waste water by reed bed technology: A low cost treatment approach.[3] Reed bed system for waste water treatment has been proven to be effective and sustainable alternative for conventional waste water treatment technologies. Reeds are coarse grasses growing in wet places. Reed bed is one of the natural and cheap methods of treating domestic, industrial and agricultural liquid wastes.Generally reed bed is made in shallow pits, installed with a drain pipe in a bed of pieces of lime stones and filled up with pebbles and graded sand.The three types of macrophytes are emergent, free- floating and submerged Macrophytes play a major role in reed beds, influencing biological, chemical and physical treatment processes.A constructed reed bed is an option for the treatment of on-site waste water. The term is used to describe different categories as follows:

- Horizontal free surface flow constructed reed bed (with soil).
- Horizontal subsurface flow reed beds (with gravel).
- Vertical subsurface flow reed beds (with gravel or sand).

The most common type of reed bed is the subsurface horizontal flow reed bed with gravel. Such reed beds are generally regarded as effective in terms of organics, suspended solids and pathogenic organism removal but will not nitrify any ammonia to nitrate due to oxygen limitations.

Vertical flow reed bed systems are more effective than horizontal flow reed beds in not only reducing organics and suspended solid levels, but also in nitrifying ammonia nitrogen to nitrate.It has been observed that reed beds system for treatment of waste water using the floating plant system is a biggest method which is economic to construct requires little maintenance and increase the biodiversity.

Krishnan and Neera carried out Waste Water Treatment by Algae.[4] In the present study freshwater algae such as Oedogonium and Chara was taken. Algae of suitable amount was collected in cans and washed thoroughly with tap water and placed in the respective set up for the experimental study. waste water chosen was rice mill waste water which contains N and P. The synthetic waste water of about 5 litres was fed into the feed tank and by gravity it was fedino the rectangular reactor. The synthetic waste water was fed to the reactor containing 60 g of each algae. Then at each day samples were collected and analysed for the various parameters like pH, TDS, Turbidity, BOD, COD, Ammonia Nitrogen and Phosphate. waste water treatment with the optimized conditions of retention time 7 days, pH 7,combination of algae with aeration, 40 g algal dosages was carried out and removal of 54.12% TDS, 93.07% Turbidity, 78.64% BOD, 53.97% COD, 47.12% Ammonia Nitrogen, 77.33% Phosphate were obtained.

Kadu et. al. carried out Treatment of Municipal waste water by using Rotating Biological Contractors (Rbc's).[5] The Rotating biological contactors (RBCs) is an efficient method of treating waste water because of its simplicity to maintain and operate, low energy consumption and good sludge settling properties. The rotating disks support the growth of bacteria and micro-organisms present in the sewage. RBC consist of parallel, deformed discs mounted perpendicularly on a shaft that is slowly rotated in a tank through which the waste water to be treated is passed. The most important physical factors affecting the overall removal efficiency of the system are oxygen mass transfer rate and temperature.the treatment of waste water using biofilm technologies has been established to be an efficient and proven technology. Biofilm systems may be broadly divided into two categories: fixed-medium systems and moving-medium systems. During the treatment process, microbes that remove the organic material in the waste water.The samples collected before and after treatment were analyzed for pH, TSS, BODand COD by using standards methods like the dissolved oxygen content of liquid was determined by the Azide modification of the Winkler's method ,Five-Day Biochemical Oxygen Demand by The Dilution Method,Chemical Oxygen Demand (COD) Using the Open Reflux Method and Total suspended Solids (TSS) Using the Gravimetric after filtration. RBC energy consumption is equivalent to or less than extended aeration activated sludge plants, and it requires less maintenance and operational skill.therefore, RBC can result in more savings for small communities.

Selvarani et.al. Studied Performance of Duckweed (Lemna minor) on different types of waste water treatment. [6] they analyze the nutrient removal efficiency of duckweed (Lemna minor) on the different waste waters such as municipal waste water, sewage water and seafood processing plant waste water.experiment was carried out in 50 l plastic containers. The different waste waters such as municipal waste water, sewage water and seafood processing plant waste water were introduced in different plastic containers at four different dilutions such as raw waste water (D0), 25% dilution (D1), 50% dilution (D2) and 75% dilution (D3). The initial water quality parameters (pH, dissolved oxygen, alkalinity, hardness, TDS, turbidity, ammonia, nitrite, nitrate, phosphate, BOD and COD) were analyzed. The duckweed (L.minor) was inoculated in each experimental tub at a rate of 0.6kg wet wt. /m2 to study the nutrient removal efficiency in different waste waters. After one month period of experiment, the final water quality parameters were analyzed. Among the three different waste

waters, Lemna minor achieved the maximum removal efficiency of $NH_3$, $NO_2$, $NO_3$, $PO_4$, BOD and COD in municipal waste waters at the rate of 96%, 98%, 98%, 96%, 79% and 79% respectively. The present research work concludes that Lemna minor can perform well in municipal waste water when compared to sewage and sea food processing plant waste water treatment systems. The treated waste water can be used for agriculture and aquaculture activities.

Darge and Mane discussed on Treatment of Industrial waste water by using Banana Peels and Fish Scales. [7] The present work explores a new approach of development in the field of purification of water through minimal energy input, less labour and low investment.In his investigation Fresh banana peels were collected from domestic wastes then this peels were washed with tap water and followed by distilled water. The washed material then cut in to small pieces and allowed to dry in a hot air oven at 80˚C for 24 hours. The moisture content was lost from it and the colour change was observed from yellow to brownish black. The dried material was finely ground and screened through the sieves of cut size of 150-212μm.In a similar manner, fish scales were collected from the local fish market of city. Mature fish scales were washed repeatedly with water to remove adhering dust and soluble impurities from their surface. The fish scales were allowed to dry in sunlight for 2 days. The scales were kept in an oven at 70˚C till the fish scales become crispy. The dried scales were then converted into size of 150-212 μm by grinding in mechanical grinder. The experiments were carried out in the Waste water sample 500ml each was kept with 1.0gm of fish scale and banana peel, powdered as an adsorbent, in orbital shaker at 150 to 180 rpm at 25˚C. Then the separation of bioadsorbent and solution was carried out by filtration with Whatman Filter Paper No.42 and the filtrate stored in sample cans for determine the metal ion concentration using Atomic Absorption Spectrophotometer (AAS). An experiment is carried out by different concentration of dosage for incubation time 24 hours. Heavy metal ions were estimated before and after addition of powdered adsorbents.The effect of adsorbent doses on the equilibrium adsorption of heavy metal ions were investigated with banana peel and fish scale of 1, 2, 5 g in three set of 500 ml waste water.Thus it can be concluded that Banana peels and Fish Scales, which are discarded waste materials and are in abundance in the local market, can be used for the removal of heavy metal from waste water. Mixture of both the adsorbents gives more efficiency.

Gaekwad and Patel et.al. Used Pesticide waste water Treatment by Hydrodynamic Cavitation Process.[8] Cavitation can simply be defined as a physicochemical process employing oxidation mechanism coupled with physical breakage/ thermal decomposition using cavitating device for degradation of chemical species. On the basis of cavity creation mechanism, fourtypes of cavitation can be defined.1) Acoustic cavitationuseof sound waves, 2) Hydrodynamic cavitation hydrodynamic devices producing pressure drop 3) pticcavitation- use of laser 4) Particle cavitation-through bombardment of particles. Hydrodynamic cavitation has great potential in water disinfection due to its capability to generate highly reactive free radicals and turbulence. Cavitation to bore well water and found this technique much more effective in water disinfection compared to other individual physical-chemical techniques including ozonation, hydrodynamic Cavitation and acoustic Cavitation.The untreated waste water sample of pesticide industry was collect from the inlet of the effluent treatment plant of the industry located near Vadodara, Gujarat. For hydrodynamic Cavitation, experiments were performed in reactor of capacity 50 litres in which effluent was lifted and circulate by the pump of capacity 1 H.P. for different intervals of time and chlorine was used an oxidizing agent. Sample was kept for quiescent condition for 2 hours for the settlement of the precipitates. All the Experiments were carried out in normal atmospheric temperature at 28°C.In this study, the effect of Cavitation was examined for the different time intervals from 0 to 150mins. hydrodynamic Cavitation, maximum COD removal achieved was 90.55% and TSS reduction by 84.00% in 75 mins. the colour removal on Pt-Co Scale was observed as 83.21%.Cavitation is eco-friendly way to reduce the pollution load of waste water.

Kshirsagar carried out Bioremediation of waste water by Using Microalgae: An Experimental Study.[9] Bioremediation uses naturally occurring microorganisms and other aspects of the natural environment to treat waste water of its nutrients. The domestic waste water samples used in this study were collected from sewage waste water treatment plant Bopodi from Pune city. Firstly most dominant algal strain selected which survival inthe highly polluted water of river Mula (pune) such as Chlorella vulgaris Beijerinck and Scene desmusquadricauda (Turpin) Breb were used as test organisms for the treatment of domestic waste water.To study the role of microalgae in waste water treatment, the following method was employed(i) waste water treated with culture of C. vulgaris and S. quadricauda; and (ii) waste water treated without culture of C. vulgaris and S. quadricauda(Control). Experiments were conducted intriplicates.2 ml of uniform suspension of C. vulgaris and S. quadricaudaas initial inoculums (9 days old culture) in each flask containing 200 ml waste water sample. The initial total count of the C. vulgaris

and S. quadricauda were $7.32\times10^4$cell/ml and $3.46\times10^4$ cell/ml respectively. The experiment was conducted under controlled conditions (Temp 27 ± 2º C) for a total duration of20 days. Samples were periodically (every 5th day)analyzed for physico-chemical parameters such as pH, phosphate, nitrate, BOD and COD using standard methods (American Public Health Association(APHA), 1998).All physico-chemical parameters were quantified for 0th, 5th, 10th, 15th and 20th days, respectively.initial pH of waste water was 7.41 ± 0.10 When the waste water treated with C.vulgaris and S. quadricaudathen the pH was increased as compared to control.The results showed that the removal efficiencies of COD, BOD, nitrate and phosphate of waste water were 80.64%, 70.91%, 78.08% and 62.73%, respectively using C. vulgaris up to 15$^{th}$days. While using S. Quadricauda the removal efficiencies of COD, BOD, nitrate and phosphate of waste water were 70.97%, 89.21%, 70.32% and81.34%, respectively up to 15th days. These experiments confirm that Chlorella vulgaris and Scene desmusquadricauda may be considered efficient nutrient removers. Therefore, it was found that the remediation using Chlorella vulgaris and Scene desmusquadricauda of waste water provides an effective and environmentally acceptable option for waste water remediation.

## III. CONCLUSION

The overall review has concluded that waste water treatment using different methods should be applied in all developing and developed countries for waste water treatment so as to protect the environmental pollution causing due to waste water from industrial and domestic wastes. Many researchers have carried out study on various aspects of waste water treatment. waste water treatment is important from environmental point of view and treated waste water can be used for agriculture and aquaculture activities.

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