MINI REVIEW ON TEXTILE EFFLUENT TREATMENT

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***ABSTRACT*:** *Textile industries specially in Pakistan continuously increased their production due to increased population of the world so the more attention required on the waste water treatment. Textile sector have many types of dye and auxiliaries which cause many dangerous substance present in their effluents. Many of the textile industries not properly treat the waste water effluent for saving cost which cause environmental pollution increased. Many of the big companies have their own WWT (Waste Water Treatment) system but most of the small industries which have small units like dying, bleaching, only have no WWT system, Now Government t of Pakistan restricted as well as buying houses also not allow to business with without WWT of dye effluent. In this solution we are trying to review of the new technique involve for treatments.*

Key words: Dye effluent ,Textile waste, pollution control, waste water treatment (WWT)

1. INTRODUCTION

According ot the surey 2012 Pakistan Textile is the 4th largest producer in thw world which have 471 spininng units and 50 composite units , it is the main revenue gerated engine it is towel and hisery industry which have grade potential for export. Part of total export having 50% contribution of textile export. Cotton cultivation in subcontinent by Dr Mohammad Afzal Biologically, In 1947 sepration of India And Pakistan, Pakistan have Gul Ahmed Textile Mills, Star Textile Millsin Karachi, kohinoor Textile at Rawalpindi, Nishat and Cresent textile in Fasialabad. In 1970 established central cotton research institute in Multan , Pakistan started your export in late 70 to Africa nad mid 80s to Europe. According to 1999 survey In Pakistan 670 inudtries in which 300 in Karachi while other located in Punjab, A well known Pakistan industrial estate are gadoon amazai, Faisalabad nooriabad,sheikhupura,.G.T road. Etc all these area unfortunately have no planning of waste water system even planned area Islamabad all waste drawn in river , these waste water usually used in the forming of vegetable which have As, Cr, Ni, Cd, and Pb in high quantity

Textile Indusrties produced different kind of fabric like Nylon , wool, Silk, cotton, Rayan and polyester. for all these of production industries used dyes and chemicals with huge amount of water . for coloring and finishing of the material. Chemicals used in the process of sizing, desizing, scouring, Bleaching, Mercerization dying and printing.The process of fabric manufacturing chemicals involve in wetting agent ,caustic soda, peroxide ,lubricants, stabilizers, peroxide killer , Acetic acid, soda ash, sequesting agent , fixing agent , softeners, sodium chloride and dye stuff. In sizing PVA, starch ,glucose ,resin and fats involve so the desizing process all of them should be remove which case pollution in the waste water having high BOD after desizing took bleaching step in which hypochlorite ,caustic soda ,hydrogen peroxide and acid were used which cause dark color of the waste water having low BOD values then taken mercerization step in which caustic soda used which cause highly alkaline waste water produced then dyeing which is cause drastic change in waste water in which reducing agent sulphides , acetic acid and soap the main pollution of this dye waste water have dyes and chemicals then printing and finishing which involve some pollutant like dyes, starch ,gum oil, acid and metallic salt, tallow and special finishing agents, The main involvement in the waste water treatment is the dyes as well as chemicals. All most all over the world many work has been done for the effluent treatment in which Primary treatment by screening and sedimentation process involve in secondary treatment in which reduce the BOD , phenolic and oily substance this step taken after primary step which required big storage tank for aerobic and anaerobically by bacteria and tertiary treatment involve by Ion exchange or by reverse osmosis or by electrolysis. Dye removal technology involved Biological method, Chemical method , Adsorption Now a days AOP involve in which photo oxidation by Hydrogen Peroxide with Ozone like Fenton's reagent, Ozonation, Photochemical, Titanium dioxide and UV

Abbreviations: AOP (advance oxidation process), BOD(Biological oxygen demand), PVA (poly vinyl alcohol)TSS: Total Suspended solid ,TS Total Soild ,TDS Total Dissolved solid COD (Chemical Oxygen Demand)

1.2. Reason of waste water effluent

The effluent of textile have high COD approximately 21-377 m^3 of the water per ton of production of textile fabric [1]Main problem is the removal of color from dye effluent which cause the environmental pollution that sway sun light not reach the undersea lives [2]. Many of the conventional treatment involve for dye effluent like primary ,secondary and tertiary treatment different dyes used for different fabric material for cellulose fabric reactive dyes (which are homofuntional & hetrofuntional) Like ProcionMX,cold water reactive cibacronF, Sabracron F ,DrimareneK, Remazol, direct dyes, indogo dyes, napthol dyes [3] for protein Fabric (such as wool and silk) Azo dyes, triarylmethane dyes, anthraquinone dyes [4] and for synthetic fibers Mono azo, Diazo , Triazo and tetrakis [5]. All types of dyes not consumed 100 % so main cause of dye effluent are unfixed dyes, Fiber which are made by Wool and Cotton used acid and reactive dyes in which 7-20 % dyes unfixed and premettalized dyes 2-7 % unfixed while fibbers which are made by cotton and viscose used Azoic, reactive, direct, vat, sulphur having unfixed dye portion5-10, 20-50 ,5-20, 5-20 and 30-40 % respectively. Polyester fibre used disperse dyes having unfixed dye portion 8-20 and a fibre which is made by acrylic used modified basic dyes unfixed of this dye is 2-3 % [6]. Naturally effluent in dye effluent are colour, persistent organics, toxicant, surfactants adsorable organic halogen

1.3. Chemical Properties of waste water

Textile effluent have following characteristic:

COD, BOD, TSS, TDS, alkalinity, pH chlorides colour sodium and temperature having ranges of 150-10000, 100-

4000, 100-500, 1800-6000, 500-800, 6-10, 1000-6000, 50-200(Pt-CO), 610-2170 and 35-45 C respectively.[7, 50, 51, 16 ,17, 21]. In Pakistan according to the National environmental quality standard COD, BOD, TDS, TSS, TS, chloride, iron, zinc, copper, should be in the range of 150 mg/l, 80 mg/l, 3500 mg/l, 150 mg/l, 3650 mg/l, 1000 mg/l, 2 mg/l, 5 mg/l and 1 mg/l respectively [8].

2. Treantment system

There are three types of treatment in which primary secondary or intermediate and tertiary or full scale treatment system [9].

2.1. Primary system

In this system only suspended, oily, greasy and gritty material were removed [10] first step screen of the waste in which yarn, fibres and raga the fine screening in which floating material has been removed by mechanical means and settling process also involved, settling is done by coagulation and flocculation in which ferrous sulphate , lime, alum, ferric sulphate and ferric chloride were used.in this process high sludge formation and the flock formation is much difficult to control [11].

2.2. Secondary system

This type of system involve after primary treatment complete in which BOD reduced by means of biological treatment, there are two types of condition involve aerobic and anaerobic. Aerobic condition in the presence of air convert sludge in to water ,carbon dioxide and biomass while in anaerobic condition occur in the absence of air to formation of methane, carbon dioxide and Biomass [12].

2.3. Tertiary system or full treatment system

in this system primary and secondary system involve initially and then further treatment done by using reverse osmosis system or by ion exchange method and costly method electrolysis [22].

3. Removal of colour Technology

More than 100,000 types of dyes available and approximately 700.000 [13,49]ton of dyes produced now a day as earlier we discussed that colour of dye removal is the main issue of waste water treatment some special dyes like synthetic dyes colour is very difficult to removed, many experimental method attempt in which some of special experiment success full, for removal of dye colour some technique involve in which biological technique, chemical technique and physicochemical technique.

3.1. Biodegradation

This technique involve Fungi and bacterial growth of anaerobic and aerobic system,many yeast bacteria and algaes has ability to degrade textile effluent easily. azo and anthraquinone dyes decolorized it is feasible for large scale while the Fungi decolour the indigo and antharqunion with good rate but the disadvantage of this process external sources required for energy and decolouration rate is very low ,some toxic substance also produced.

3.2. White-Rot Fungi

Another biological method for waste water treatment by white –rot Fungi(under developing method) The white-rot fungi named shows their appearance of lignin removal of wood and the fungi attacked on them , Biological name of this fungus is *Clitocybula dusenii* 87 % of the waste water decolorized after 20 days 4-fold dilution while by *Trametes versicolor* 40 % decolour in the 7-fold dilution the percentage can be reach 92 % but 42-fold dilution required.

4. Chemical system

In this system chemical used as coagulant and flocculent in which most comment are iron sulphate , iron chloride ,lime, polyelectrolyte sodium hydroxide but its produced very high sludge formation which is big challenge for the entire world. Some of the new technique develop for low sludge or zero sludge formation but it is expansive and small industries not bear the cost of the installation as well as its running finance.

4.1. Latest oxidation technique

Basically this technique is the photo oxidation. In which 79% of COD removed [27, 32] while the other biological means only 39-42% only. This system not generate any other component and can occur any temperature and pressure. In this system hydrogen peroxide , UV and Ozone is the key substance.

4.2.Ozonation

This is gaseous phase reaction and no extra sludge formation took placed. Dyes have chromophore which have double bond in ozonation process it become broken down and convert into small molecule which have carcinogenic properties.[19,34],oxidation produced organic compound in the breaking of carbon-carbon bond [31]. This process is depand upon the concentration of the die in waste water[34,37,39]Biological treatment system 99 % color removal effeciecy on 40-60 min [42]. This treatment reduced COD from 200-400mg/L to 50mg/L in 30 minute [45]. Almost 11-66 time waste water have azo dyes and 80times reactive dye present [40]. In this technique pH is paly a special role like when pH between 2-12 32 % reduction occur for reactive yellow 84 pH required 6.1-3.2 [46]. The disadvantage of that its half life is too short and in alkaline phase it decomposed readily so check and balance is required more attention of pH. It is considered as very costly technique.

4.3. Fenton'sRreagent

This is another technique of hydrogen peroxide with iron II salt, this reagent decolorized dyes very sharply. Issue of this technique is production of sludge due to settling by flocculation [31, 55]. This is the process of oxidation of organic compound in water solution, this process is powerful for green cationic dye by iron sulphate it is effective for Remazol Blue, Red, Yellow and Black 5 [25, 55, 53, 47].

4.4. Titanium dioxide with UV system

The main reaction in this technique to provide hydroxyl ion which reached the dyes to colour less position.TiO_2 under the UV react with water to from Hydroxyl ion they react with dye to product end.Its is more feasible process than H_2O_2/UV [21].

4.5. Peroxide using UV system.

This technique used for broken the chromophore of azo dyes, Hydrogen peroxide under UV is more powerful oxidizing than alone, H_2O_2 is converted into two hydroxyl ion and chain system build-up. Efficiency of the process increase by the increasing concentration of hydrogen peroxide [14, 52]. Total organic carbon (TOC) play as inhibitor of this sytem color can be 100 % decolorized if TOC is low 4.34 mg/dm^3 from 60 mg/dm^3[48].

4.6. Physiochemical system

In this technique activated carbon, non-conventional adsorbent like husk, maize cobs, wheat straw, neam leaf powered ,perlite, coconut husk, natural adsorbent banana pith and chitin, industrial waste residue of sulphuric acid and aluminium sulphate etc. [15, 22, 38, 41, 24] membrane filtration, ion exchange coagulation/flocculation

4.7. Adsorption

The adsorption process are two types chemsorption and physical adsorption , chemical adsorption on monolayer and it is difficult to remove from adsorbete it is also very selective process , while on the physical adsorption is multilayer phenomenon , chemical adsorption increase with increase temperature.In phiscal adsorption rate of adsorption decrese in increase pressure chemicsorption have bond formation while in physical adsorption have very weak intermolecular forces. This is the process of gas and solid absorb on solid bed , it is feasible for operation and installation, adsorbed depend upon surface area , nature , pH and temperature activated charcoal having good result of dyes removal but this charcoal not work for disperse and vat dye and it is very costly [16]. The adsorbent should have following characteristic, pore accessible, hydrophobicity, no catalytic properties, regenerate easilyActivated carbon is the most economical adsorbent but its regeneration is the problem and recently wood by product introduced as source of activated carbon this carbon can be made by usin chitosan /oil-palm, maize rope fly ash, sawdust *etc*. [20, 28, 35].

4.8. Electrochemical

This is another technique for waste water dye effluent but its need to work further for low cost and energy efficient, initially this technique used for metal recovery nowadays scientist work on the same style on waste water, this technique also used in the bleaching process of cotton and denim fabric [19, 33, 36] another advantage is that there no requirement of sodium di thionite in vat dyeing process, Reactive dyes which is not biodegradable easily and required physicochemical method required by means of membrane system , another advantage is that it is not produced sludge or solid residue, The main feature are indirect reduction occur ,hydrogenation by means of electrically decomposition of water , Reduction on graphite electrode Roessler and Jin [29] electrolysis by using graphite granules is the most economical and best method. Most of the work by this technique on reactive dyes which have chromophour group that is the mother of color in the reactive dye which is Azo group worldwide production of this constitute 65 % [43, 26, 54]. Electro chemical method are : electrocoagulation method, electro reduction method, electro oxidation method, indirect oxidation method and photo assisted method indirect advantages are no extra bath required for degaradation ,no need to change the pH, no residue form, 70 % water nad 60 % slat formation decrese[

5. CONCLUSION

Textile waste water treatment is very necessary for environment and natural life specially under sea-life. Different processes have different chemical were used which cause water deviate with their real properties. Using some technique either by primary secondary or full scale but it should be treated before enter into the sea water, many technique were employed but it is necessary to work on new technique development having low cost , easy to installation, quick removal of dyes effluent or may be re production of new items by sludge which is environment friendly. On waste water treatment specially in dye effluent treatment working going on in the development process. Further work required on textile chemicals development in which low hazardous material used.Further required replacement of those dyes by organic one which have low bio-degradability or not easy to remove from sludge .the work should be environmental impact not only for new development.

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