Investigation of Dyeing Wastewater and Optimization using Sawdust as Absorbent

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ABSTRACT

The particular textile effluents that contains dye, printing and processing waste consuming water of tirupur region were gathered to analyze the concentration amounts of different salts and metallic ions in the effluents. Water examples were collected from ten different locations of tirupur region and various guidelines were analyzed viz pH, EC, TDS, COD. The focus of Na and the heavy alloys (Cu, Fe, Crystal reports, Ni, Zn, Pb Cd), which discloses that effluent release from the dyeing and printing fabrics has great impact on the quality of water. The particular results show extreme variation from the typical specifications. The examples were found to contain pH and electrical conductivity in the range seven. 1 to 7. 7 and EC from 2000 to 9000 μmhos/cm, correspondingly. The concentrations of biological oxygen demand (BOD) and chemical substance oxygen demand (COD) were found suddenly high. A higher concentration of heavy metals seemed to be detected. The particular concentration of nitrates and fluorides were high from the limit set by Indian Standards. The particular physical and chemical substance characterization of the effluent was transported out after and before the adsorption studies. The physical and chemical portrayal of the effluent was carried away before and after the adsorption studies. From your results, a maximum adsorption capacity of 98. 5 percent was obtained at the enhanced conditions of one. 5 g, ninety min and 275 rpm for adsorbent dose, contact time and agitation rate respectively. Further evaluation carried out exposed that, in addition to dye elimination, trace metals were also adsorbed in the process.

Keywords waste water, quality index, biological, effluents, pollutants

I. INTRODUCTION

The particular degradation of surface and groundwater quality due to commercial and urban waste materials has been identified for a long time. The streams and stream would be the common recipients of commercial effluent worldwide. The particular deterioration in

drinking water quality comes with an undesirable effect on humans as well as aquatic ecosystem straight or indirectly. The present practice of any commercial unit is to discharge wastewater into local atmosphere with no treatment. The particular untreated or partially treated effluent on entering a water body either will get blended or lie hanging on river mattress, thereby leading to the pollution of drinking water body. Industries are tempted to presume that they are not able to avoid large quantities of wastewater produced during major commercial procedures and therefore, they become lax in pollution avoidance. One essential step in water air pollution is precise evaluation of pollution standing of every person unit and the potential for enhancement. Thus the preliminary step in a pollution prevention strategy for drinking drinking water resource is a comprehensive audit and characterization of wastewater from industrial procedures. The textile industry is classified into three main categories. 1) Cellulose fibers (cotton, rayon, linen, ramie, hemp and lyocell), 2) Protein fibers (wool, angora, mohair, cashmere and silk) 3) Artificial fibers (polyester, nylon, spandex, acetate, acrylic, ingeo and polypropylene). Tirupur town is situated about 100 kilometres to the western of Trichy. The particular town is known for its dyeing and printing process industrial sectors. The effluent out there industries, which consists mainly chemical dyes like Methylene Azure, Malachite Green, Rhodamine Band and various salts, is purged to the Noyal and Kaveri river. Dyeing industries are located around Noyal lake and other drinking water sources and are discharging foul smelling, colored, liquid effluent in the lake. A large amount of which is absorbed by the soil, creating drinking water pollution. The maqui berry farmers use the contaminated water to irrigate their fields. The particular vegetables and vegetation so produced are consumed by the human beings ensuing into a amount of health dangers. The highly alkaline and saline drinking water is also creating harm to surface water. For dyeing cloth, wide range of water is required by the industries, which is supplied by searching wells in the agriculture field. The particular effluent thus produced causes substantial air pollution in term of increase in chemical oxygen demand, Biological Oxygen Demand, TDS, chlorides, sulphates and heavy metals like zinc, lead, copper, metal and so on Textile effluents, when discharged in near by river, serves as major recharge way to obtain fresh water for wells in monsoon causes severe contaminants of ground and underground water. The particular indiscriminate use of too much organic and natural chemical dyes has grown the toxic metal items to unwanted degree in effluents.

Fabric dyestuffs are found to contain a huge quantity of natural substances that are difficult to weaken and are proof to cardio exercise wreckage. They are also found to be

reduced into dangerous agents under anaerobic conditions. Inorganic elements in the fabric effluents make the water unsuitable for use due to the occurrence of excess concentration of soluble salts. These types of substances during a lower quantity are normally found to be poisonous to aquatic life. Some of the inorganic chemicals like hydrochloric acid, salt hypochlorite, sodium hydroxide, sodium sulphide and reactive dyes are poisonous to ocean life. The organic and natural components are found to endure chemical substance and biological changes that bring about the removal of air from water. The particular major environmental results of the fabric industry are the release of high amounts of chemical substance loads resulting from benefit consumption of water and dangerous chemicals utilized in this sector and the associated drinking water pollution high energy consumption in creation processes and related air emissions. The particular textile industry utilizes a lot of gallons of water everyday. Gowns because to produce 1 kg of fabric, typically, two hundred litres of drinking water are consumed: cleaning the fiber, whitening, dyeing and then cleaning the completed product. The problem does not relax in the high usage, though, but in the reality that often waste materials seas are not treated to eliminate contaminants before these are got rid of in the atmosphere. As a outcome, based on some studies 20 per cent of all fresh water pollution is made by textile treatment and dyeing.

II. OBJECTIVE

The particular primary objective of the current research was to determine the status of pollution in Tirupur caused by fabric industries, as it is an important industrial part of Tamilnadu where an amount of textile industries are active. Within order to examine the quality of dye waste drinking water using waste drinking water portrayal method. To make use of textile waste materials as a intensifying component in waste materials drinking water treatment. To determine the bioremediation of waste materials water using low cost technology.

III. SCOPE

Within future, there may be an exceptional water scarcity and thus it is essential to treat the particular waste water. The wastewater may usually be dealt with by using absorbents of low price technology. then dealt with wastewater can be used intended for domestic purpose. Though, wastewater is definitely treated by making use of textile waste this greatly controls the particular environmental air pollution as well since helps in the particular efficient usage of fabric waste.

IV. LITERATURE

Fabric and Clothing (T&C) is one of the most significant and oldest industries present globally (Gereffi, 2002). Nevertheless, the fabric industry is considered to be one of the biggest threats to the environment. The various processes carried out there in the fabric industries produce large amounts of fuel, liquid and strong wastes. The fabric industry utilizes a variety of chemicals and a sizable volume of water for all from the manufacturing steps. Regarding 200 L of water are widely-used to produce 1 kilogram of textile. Inside the year (2012) Paul et 's. selected six fabric industries in Eastern region of Solapur city for examining the pollution signal parameters namely BOD, COD, TDS, sulphide, sulphate, chloride, solidity, alkalinity, calcium and magnesium.

They documented upto 1548 ppm COD, 7072 ppm TDS, 79 ppm sulfide, 2750 ppm chloride and 912 ppm sulphate for different textile products of Solapur. Since per the review by Rathore (2012), around 49 MLD (Million Litres/Day) of combined effluent from more than eight hundred texile dyeing and printing industries with domestic sewage has been discharged in Bandi river at Pali. The physicochemical parameters suspended shades, chemical oxygen demand and biological air demand assessed in the incorporate effluent were higher than the recommended criteria for discharge of professional effluent by BIS. The particular overall pollution insert in Bandi lake in words of chemical oxygen demand, biological oxygen demand, suspended solids and total alkalinity is 57, 520 kg/ day 38, one hundred sixty kg/day, 61, 950 kg/day and 74570 kg/day respectively. Therefore, the pollution insert estimated evidently shows the environmental wreckage in the research area largely.

Duen-Gang et. al (2017) Colored dye wastewater presents a strong task for natural treatment. Depending how it is created, wide pH ranges and high sodium concentrations such as chloride ion often add to the difficulties. Systematic screening process for dye decolorizing and/or degrading bioagents from garden soil and water examples learned fungi which show dramatic color elimination capability (Shen, et al., 1990). One particular example shows that up to 99% reduction of light absorption at feature wavelength of a red dye (200 mg/L) could be obtained within forty eight hours.

This capability does not is very much specific toward chemical dyes targeted for action. It clarifies, often beyond detection by naked eyes, a repertoire of coloured wastewater samples. These types of results appeared to be insensitive to wide variations in pH and sodium concentration and, they may not be limited to one particular fungal types or genus

either after further analysis. This dye adsorption mechanism may be of great importance in uncovering new methods for bio-removal or bio-recovery of dye substances in wastewater.

Akil Ahmad et. al (2019) Dyes are an important class of organic pollutants and are well respected for their harmful effects on marine life in common and human creatures in particular. In order to be able to reduce the negative effects of coloring contaminated wastewater on humans and the environment, the wastewater must be taken care of carefully before release into main avenues. Advances in technology and technology have led to the evolution of several tips for the elimination of dyes from professional and household effluents.

In this review, the more recent techniques for the removal of dyes from drinking water and wastewater have been discussed. Wastewater treatment techniques such as adsorption, oxidation process, flocculation–coagulation, membrane purification and biological treatment have been pointed out. In addition, initiatives were made to review all the available techniques and recently published studies from 2010– 2014. Furthermore, the performance and special features of these technology have been summarised. Advantages and restrictions of each method are also displayed. A thorough literary works survey revealed that chemical oxidation, adsorption, and biological treatments have been the most often researched techniques for coloring removal over the past couple of years. Xu

Shiming et. al (2019) A novel innovative oxidation process technology for organic and natural wastewater treatment was suggested in this document. The working process is the reality that a low-grade heat (LGH) is first changed into a salinity lean energy (SGE), and then the SGE is converted into the wreckage energy of organic and natural pollutions by a invert electrodialysis (RED) reactor. To verify the feasibility of switching a SGE into a degradation energy by a CRIMSON reactor, an fresh investigation of coloring wastewater treatment with a RED reactor powered by SGE have been done.

The results demonstrated that the result current of CRIMSON reactor, operating guidelines of electrode wash solution (ERS) and degradation circulation settings have effects on the decolorization of acid solution orange seven (AO7) dye wastewater. Beneath the present fresh conditions, after 20 min treatment, the decolorization efficiencies of AO7 dye wastewater for the independent wreckage circulation mode achieved 99. 93% and 96. 52% in the anodic and cathodic loops correspondingly, while that for the synergetic wreckage circulation mode achieved 82. 85%.

Sara Yasipourtehrani et. 's (2020) Blast Heater Slag (BFS) is a byproduct of the iron ore digesting industry with possible to be used in different commercial applications. Within this research, BFS was used to look at its capability for dye elimination from wastewater. The particular efficiency of two types of BFS examples for elimination of cationic methylene blue (MB) and acidic methyl orange colored (MO) chemical chemical dyes was investigated and results found that the optimal conditions for treatment of wastewater were eighty g/L of adsorbent dose and one h of treatment time for both dyes.

BFS was found to be more effective for removal of the acidic MO coloring than the cationic MB dye. Below shorter residence times, the final results showed invert trends with BFS samples removing higher concentrations of MEGABYTES than MO. The particular BFS chemistry acquired additional impacts on the efficiency of coloring removal. Increased basicity of BFS had lower coloring removal ability for adsorption of acidic dye when applied at smaller levels, while for cationic coloring when applied at higher levels. The final results showed that BFS has possible role for pre-treatment of professional wastewater contaminated with chemical dyes and might contribute to reduced use of more expensive adsorbents, such as turned on carbons.

A. Kothai et. al (2021) To investigate the effectiveness of innovative treatment methods such as Electro coagulation (EC) and innovative oxidation process process (AOP) so as to minimize the Color, concentration of chemical substance oxygen demand and biochemical oxygen demand for the examples collected from fabric dyeing waste drinking water. Experiments carried out there at lab range model. The EC process was conducted by varying voltages such as 8 V, 10 V, 12 V, 14 V, 16 V as well as for timeframe of 60 minutes each. AOP consists of oxidation process in the wastewater using Fenton's reagent (Fe2+/H2O2). The experiment was conducted at 3 different dosages such as 3 g + 30 ml, 4 g + 40 ml and 5 g + 50 ml of Fe2+ and H2O2. From the results obtained, the reduction efficiency was dependant on comparing the important parameters such as COD, BOD and Colour of taken care of water as well as untreated waste materials water. The obtained comes from the treatments were in accordance with the criteria given by Central Pollution Manage Board (CPCB) of India for fabric wastewater discharge.

V. METHODOLOGY

The particular schematics of drinking water reuse treatment procedures. Pre-treatment and natural treatment techniques have been introduced in. Therefore, the treatment

technology of reused water from fabric wastewater was presented in this research after biochemical treatment.

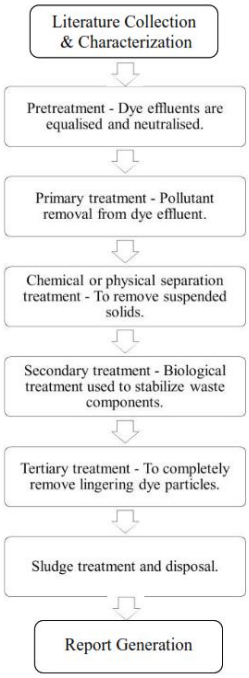

FIGURE 1
METHODOLOGY

V. MATERIAL TEST

Overall dissolved solids, chloride, sulphate were dependant on using the standard methods published with each other by American Community Health Association (APHA), the American Drinking water Works Association (AWWA), and the Drinking water Environment Federation (WEF) 99. The chemical substance oxygen demand (COD) of the examples was determined by using the reagents procured from Merck and the technique followed corresponds to the ISO 15705 and is similar to EPA 410. 4 and APHA 5220 D. In order to find out phenolic compounds, the examples were distilled. The total of five hundred mL sample was taken and the pH was altered to 4. zero with H3PO4 solution. After collecting 400 mL distillate the process of work was stopped until boiling ceased. More, 50 mL of warm water was put into distilling flask and work was continued until a total of 500 mL was collected. The distillate volume must finally be equal to those of the original sample.

Afterwards, 100 mL of distillate was accepted as sample and 100 mL of double distilled drinking water as blank into 250 mL cone-shaped flask. In both the flasks (containing the sample and the blank), 2. 5 mL of 0. 5 In NH4OH solution was added and the pH was altered to 7. nine ± 0. one with phosphate barrier (pH 6. 8). Subsequently, 1) zero mL of 4-aminoantipyrine solution (2 %) was added and mixed well. Afterwards, 1 mL of 8 %

K3Fe(CN)6, was added & mixed properly. This particular solution was held for 15 min for color development finally the absorbance of samples were measured at five hundred nm against reagent blank. Zinc, Pennie and Chromium in Water: Samples were digested in a microwave assisted digestive function system pursuing the ENVIRONMENTAL PROTECTION AGENCY method 3051A and analysed in fire AAS. EPA method 24 is the only method presently accepted by ENVIRONMENTAL PROTECTION AGENCY and U. Ersus. state/local regulatory systems for the dimension of volatile organic and natural substance (VOC) content in paints, ink, and related layer products.

This method however is well known and documented to get large measurement mistakes especially with layer with VOCs below 50g/L. The major options for VOC mistake were found to be in drinking water and non-volatile determinations. This is shown within an article published in the Journal of Films Technology “Sources of Error in VOC Determination via ENVIRONMENTAL PROTECTION AGENCY Method 24”. Because of to this degree of error, different methods for deciding VOC directly by Gas Chromatography (GC) are currently being pursued, such as ASTM D6886 and SCAQMD method 313. Based on forty CFR 51. multitude of, volatile organic and natural substances refer to any compound of co2 which participates in atmospheric photochemical responses.

However, this description excludes carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates and ammonium carbonate. The set of the exempt solvents are found in the CFR, including some popular coating solvents such as acetone, t-butyl acetate, dimethyl carbonate, propylene carbonate, parachlorobenzotrifluoride (Oxol 100), methyl acetate, methylene chloride, and most lately 2-amino-2-methyl-1-propanol (AMP-95). ENVIRONMENTAL PROTECTION AGENCY 24 is employed by many people production industries for confirming emissions of layer and related products to local regulating bodies, which includes of the most common being the CASE industries (coatings, adhesives, sealants, and elastomers). This would include both layer manufacturers and layer operations, such as automotive, appliance, furniture and can liner manufacturers.

The layer functioning industry is susceptible to emission controls which can range from zero. 4 #/gal upward to 5. 5#/gal and are suggested to consult their state or local regulations for details of such limitations. While at times the EPA Technique 24 may show up to be simple, there are many different tests that cover the top array of small sample types. For this reason, it is essential to know your sample type and application to assure the appropriate testing is being performed to meet your requirements.

TABLE 1
DIFFERENT CLASSESS OF SURFACE WATER

Classification	Type of use
Class A	Drinking water source without conventional treatment but after disinfection
Class B	Outdoor bathing
Class C	Drinking water source with conventional treatment followed by disinfection.
Class D	Fish culture and wild life propagation
Class E	Irrigation, industrial cooling or controlled waste disposal

Findings presented in evidently reveal that out there of5 surface water samples, eighty % of the samples i. electronic. 4 (sample program code – X, XI, XIII,XIV) have pH and PERFORM above the restrict of Indian Criteria for surface drinking water(ISI-IS: 2296-1982). Since per for this standard, these examples do not come under anycourse of surface drinking water (i. e. The, B, C, G and E). Nevertheless, sample code I actually (NoyaU/S river) falls under the limit of this standard therefore can be used for every sortof work related to surface water.On discovering the pH of three drinking drinking water samples, it was found thatall the samples are well within the number of Indian criteria i. e. six. 5 – almost eight. 5.Suggesting that on the time frame of pH drinking water is fit for drinking

V. RESULTS ANALYSIS

I. PRIMARY RESULTS

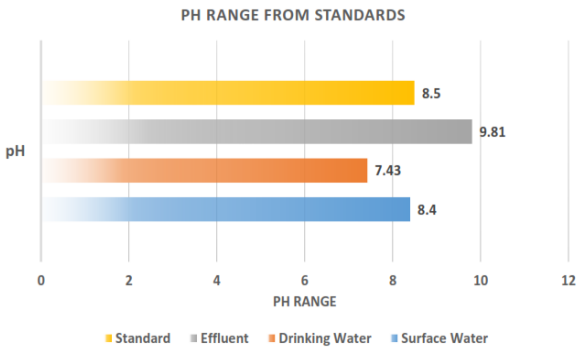

FIGURE 2
PH RANGE FROM STANDARDS

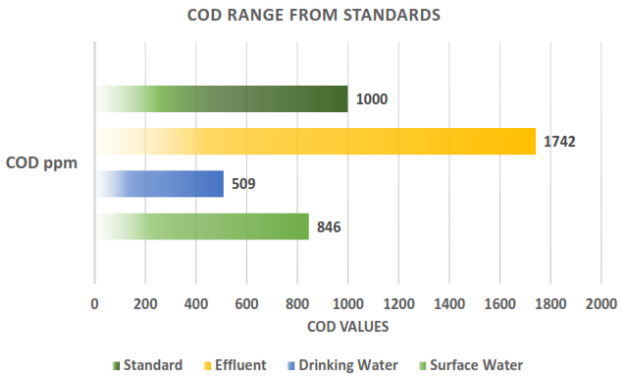

FIGURE 3
COD RANGE FROM STANDARDS

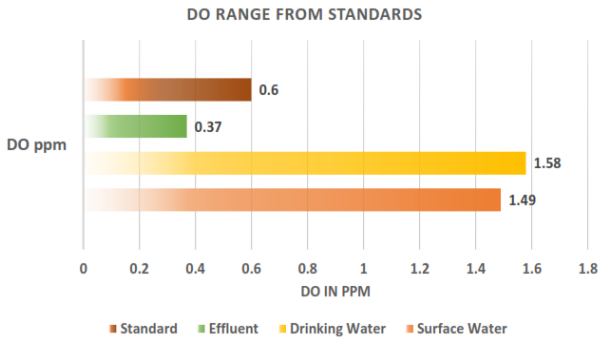

FIGURE 4

DO RANGE FROM STANDARDS

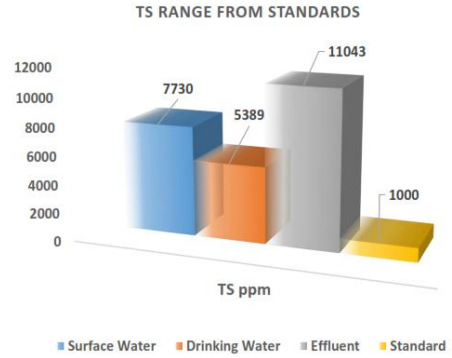

FIGURE 5

TS RANGE FROM STANDARDS

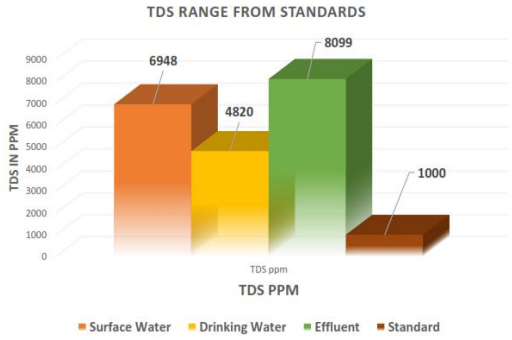

FIGURE 6

TDS RANGE FROM STANDARDS

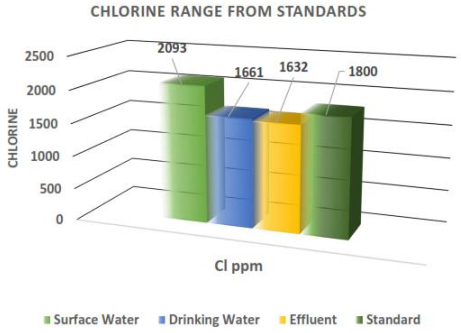

FIGURE 7

CHLORINE RANGE FROM STANDARDS

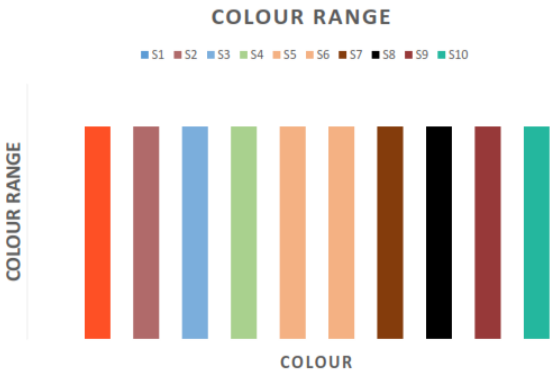

FIGURE 8

COLOUR RANGE

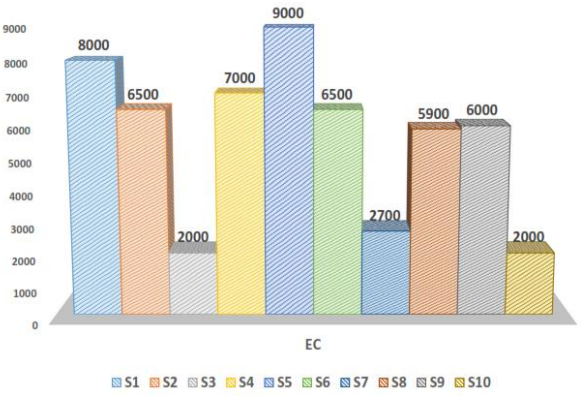

FIGURE 9

EC RANGE

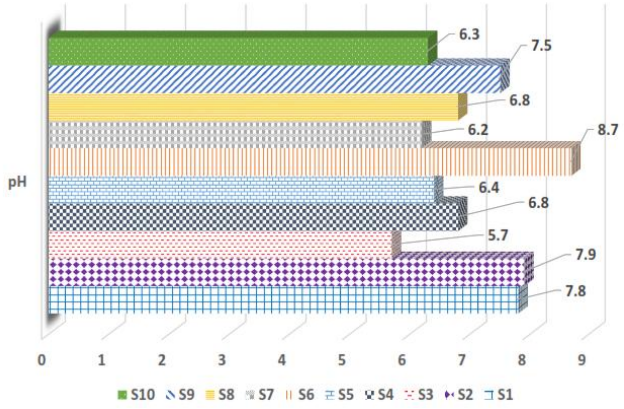

FIGURE 10

pH RANGE

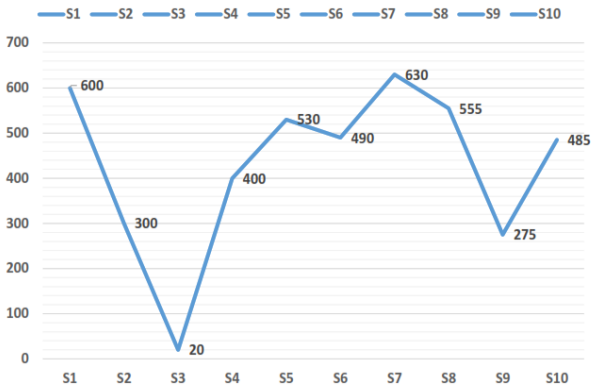

FIGURE 11

ALKALINITY RANGE

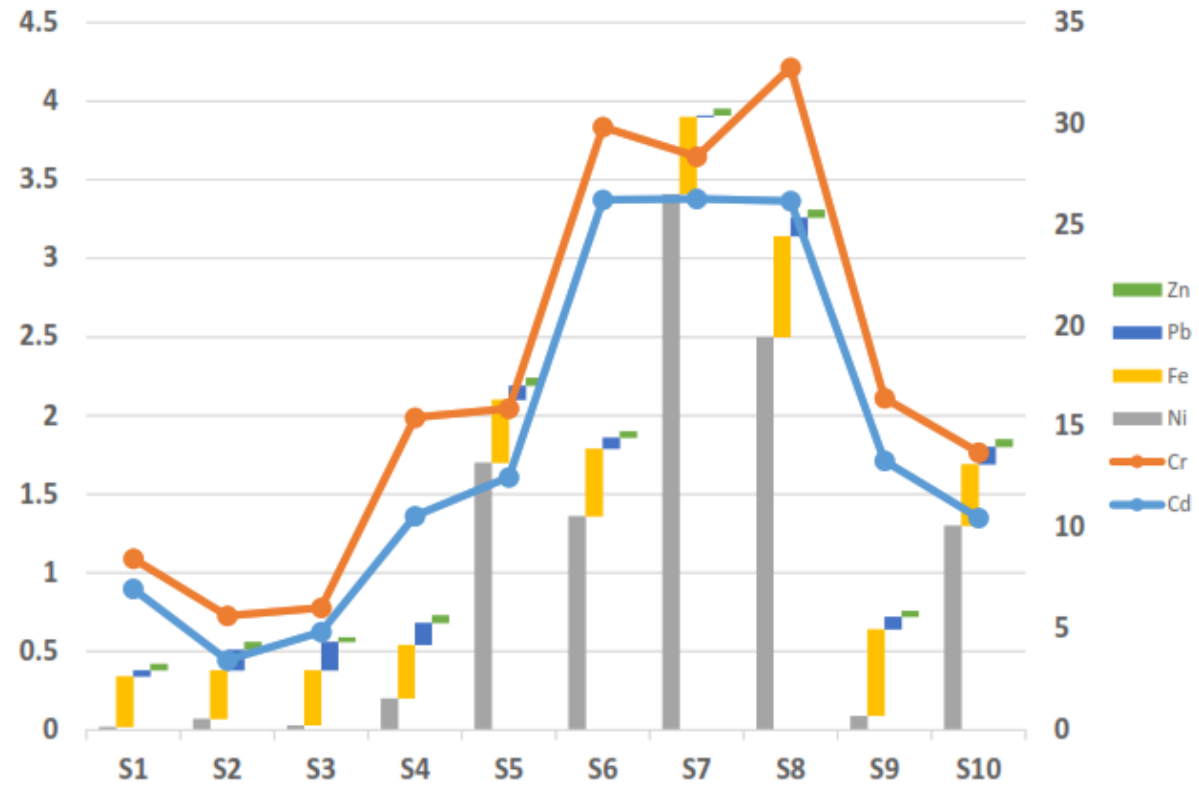

FIGURE 12

CHEMICALS RANGE

II. CHARACTERIZATION

The particular adsorbent (activated sawdust) was characterized using Fourier Transform Infrared (FTIR) Spectroscopy Method to determine surface functional groups present. The FTIR studies after and before dye adsorption were carried out on the samples using Shimadzu FT-IR-8400S Spectrophotometer with a quality of 4 centimeter -1 in the range of -14000 - 500 centimeter. The removal of dye from the textile wastewater was carried out using the batch method at room heat range. The adsorption studies were carried out there

for different contact times, adsorbent doses and agitation rates of speed. The various combos resulting in fifteen batch experimental operates as determined by the design of experiments using design expert software were followed. The set experiments were transported out by adding each dosage of activated sawdust (0. 52. 5 g) to 100 ml of the wastewater sample and infuriated using the container test apparatus for the duration of contact time (30 -120 min) and agitation speed (100 - 300 rpm). The mixture was filtered and the filtrate was examined for the level of dye elimination simply by using a turbid meter. The run with the best dye elimination was then used for the following studies.

FIGURE 13
CHARACTERIZATION BEFORE ADSORPTION

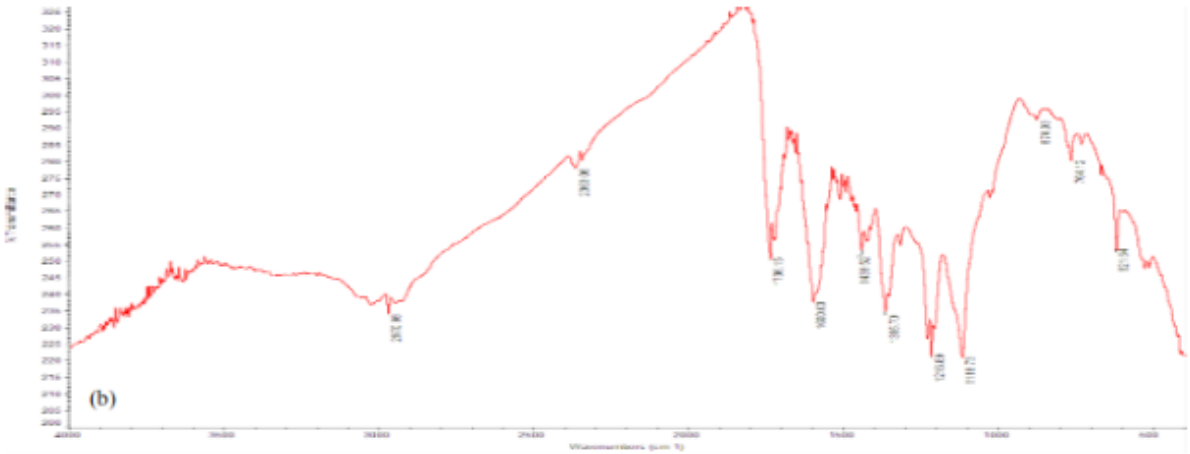

FIGURE 14
CHARACTERIZATION AFTER ADSORPTION

The particular result of contact time on color removal was looked into by performing color removal occurs with a rise in adsorbent dosage until at adsorbent dosage of second. 0 gary the gadget guy where the color removal was maximum (80% removal). This particular

can be related to the increase in area and number of energetic sites and with further increase, there was an noticed fall in the percentage removal of dye due to an embrace adsorbent dosage over and above maximum adsorption capacity which might be because of this of overlapping of the adsorption sites due to overcrowding of adsorbent contaminants beyond the the best dose. The percent of dye elimination as a functionality of your time indicated that, the percentage was found to increase from 32. 7 - 75. 3% since the contact time boosts from 30 - 120 min at 15 min period. The maximum elimination was 75. 3 % corresponding to contact moments of 85 min. Inside the batch type adsorption processes, the monolayer of adsorbate is usually formed on the surface of adsorbent and the pace of removal is handled mostly by the rate of transportation of the adsorbate species from the exterior/outer site to the internal sites of the adsorbent particles.

VI. CONCLUSION

The particular existence of higher toxic concentration associated with lead, chromium, cadmium, nickle and metal within the business effluent of several factories indicates the truth that some associated with the dyeing plus printing industries are usually not treating effluent water before tossing them in empty and then in order to Noyal river. The particular river has already been polluted because associated with higher concentration associated with trace metals considerably. Lead, chromium, cadmium, copper, iron, plus zinc contents are actually found to become significantly above the particular recommended limit associated with 0. 1, three or more. 0, 13. zero, one 0 plus 15. 0 mg/L in most effluent trial except at a single or two websites. Heavy metals, when present beyond permitted limits in drinking water are toxic in order to human beings, marine plants and animals. In the existing study, Pb, National insurance, Cu, Fe plus Cr are going above their permissible limitations. It really is usually quite evident these types of heavy metals might enter the meals chain, and via bioaccumulation can certainly achieve humans through vegetation and may trigger various deadly illnesses. Lead poisoning may cause asthma, neurobehavioral disorders and may cause cancer. Chrome is also extremely toxic. Workers operating in these dyeing industries are primarily affected. The triggered carbon prepared through sawdust shows considerable adsorption capacity regarding removing dyes through textile effluent therapy processes under appropriate fresh conditions. The particular process was enhanced, and the optimum dye removal associated with 98. 5% has been achieved at the best conditions of one. 5 g, ninety min, and 275 rpm regarding adsorbent dose, contact period, and agitation rate respectively.

Normal supervising of the drinking water quality is therefore required to examine the heavy metallic contents within the particular effluent water prior to throwing them in order to the drain therefore that remedial actions can be used to save the particular ground water through heavy metal air pollution.

REFERENCES

[1] Al-Kdasi A, Idris A, Saed K and Guan C (2004) Treatment of TextileWastewaterby Advanced Oxidation Processes-A Review. Global Nest IntJ 6: 222230.

[2]AmericanPublicHealthAssociation(APHA,1998).StandardMethodsfortheExaminationofWaterandWastewater,WEFandAWWA,20th Edition,USA.

[3] Arya D and Kohli P (2009) Environmental Impact of Textile WetProcessing, India. Dyes and Chemicals.

[4]Bhadra BK, Pathak S and Sharma JR (2013) Impact of IndustrialEffluents on Groundwater around Pali City, Rajasthan Using Field andSatellite Data. Journal Geological Society of India. 82: 675-691.

[5] BI (2009) Jodhpur, Pali, Balotra Industrial Waste Management. In:Project Report by Blacksmith Institute, New York. Website:www.blacksmithinstitute.org.

[6]Blomqvist A (1996) Food and Fashion-Water Management andCollective Action among Irrigation Farmers and Textile Industrialists inSouth India. Linkoping University. Studies in Art and Science 02829800:148.

[7] Chinda AC, BraideAS andSibeudu OC (2004) Distribution ofhydrocarbons and heav metals in sediments and a crustacean (shrimps-Penaeusnotialis) from the bonny/new calabar estuary Nigeriadelta. Ajeam-Ragee, 9, pp 1-14.

[8] CPCB (2005) Performance Status of Common Effluent TreatmentPlants in India. In: Report of Central Pollution Control Board, 68p.

[9] CSE (2006) CSE Study on Pollution of Bandi River by TextileIndustries in Pali Town. In: Report of Centre for Science andEnvironment, New Delhi, 13p.

[10] Dutta S and Singh S (2014) Assessment of ground water and surfacewater quality around industrial area affected by textile dyeing andprinting effluents, Pali,Rajasthan, India. Journal of EnvironmentalResearch and Development. 8(3A): 574581.

[11]Emongor V, Kealotswe E, Kooprapetse I, Sankwasa S andKeikanestswe S (2005) Pollution indicators in Gaberone effluent, Journal of Applied Science, 5, pp147-150.

[12]Eswaramoorthi S, Dhanapal K, Chauhan D (2008) Advanced inTextile Waste Water Treatment: The Case for UV-Ozonation andMembrane Bioreactor for Common Effluent Treatment Plants in Tirupur,Tamil Nadu, India. Environment with People's Involvement & CoordinationinIndia.Coimbatore,India.

[13] Mathur N, Bhatnagar P, Bakre P (2005) Assessing Mutagenicity ofTextile Dyes from Pali (Rajasthan) using AMES Bioassay. EnviToxicology Unit, Dept of Zoology, Univ of Rajasthan, Jaipur, India.

[14]Nese T, Sivri N, Toroz I (2007) Pollutants of Textile IndustryWastewater and Assessment of its Discharge Limits by Water QualityStandards. Turkish J Fisheries Aquatic Sciences 7: 97-103.

[15] Olayinka KO (2004) Studies on industrial pollution in Nigeria: Theeffect of textile effluents on the quality of groundwater in some parts ofLagos. Nigerian Journal of Health and Biomedical Sciences, 3, pp 44-50.

[16] Panda UC, Sundaray SK, Rath P, Nayak BB and Bhatta D (2006)Application of factor and cluster analsyis for characterization of river and estuarine water system- A case study: Mahanadi River (India),Journal of Hydrology, 331(3-4), pp 434-445.

[17] Rathore J (2011) Assessment of water quality of River Bandi affected by textile dyeing and printing effluents, Pali, Western Rajasthan,India, International Journal of Environmental Sciences, 2 (2): 560-568.

[18] Ugochukwu, C.N.S. (2004) Effluent monitoring of oil servicingcompany and its impact on the environment, Ajeam-Ragee, 8, pp 27-30.

[19] Wood KN and Bishop AL (1992) Effluent guidelines compliancethrough waste minimization, Water science and technology, 25(1-2), pp301-307.