Physico-Chemical Analysis of Textile Effluent

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Abstract: **Sample of textile industry effluent was collected from south Gujarat Region. The results of this analysis were comparedwith the water quality standards of BIS (Bureau of Indian Standard). In this analysis the various physicochemical parameters such as colour, odour, temperature, alkalinity, acidity, chloride, hardness, total dissolved solids(TDS), total suspended solid, pH,DO, COD, BOD, were determined using standard procedures. The study revealed that Due directly discharge of untreated Textile effluents poses a health risk to several rural communities which rely on the receiving water bodies primarily as their source of domestic water.**

Key words: Physico-chemical parameters, textile industry effluents, Water quality BIS

I. INTRODUCTION

The textile industry actually represents a range of industries with operations and processes as diverse as its products. It is almost impossible to describe a "typical" textile effluent because of such diversity. Fabrics, after its manufacturing, are subjected to several wet processes collectively known as "finishing" and it is in these finishing operations that the major waste effluents are produced (Abo-Elela *et al.*, 1988).

In South Gujarat more than 100 textile units are working at present. Almost all of them have no proper discharge system. The effluents come through open channels in the city and it is common to find stagnant pools of colored and foul water in the industrial areas deteriorating water and soil, Keeping in view the significance of water pollution (sofia nosheen,et al 2000).

There are more than 8,000 chemical products associated with the dyeing process and over 100,000 commercially available dyes exist with over 7×105 metric tons of dyestuff produced annually (Zollinger Het al,1987). 10-25% of textile dyes are lost during the dyeing process, and 2-20% is discharged as aqueous effluents indifferent environmental components. In particular, the discharge of dye-containing effluents into the water environment is undesirable because of their colour, released directly and breakdown products are toxic, carcinogenic or mutagenic to life forms mainly because of carcinogenic, such as benzidine, naphthalene and other aromatic compounds (Suteu D,et al 2008, Zaharia C, et al 2011). The recycling of treated wastewater has been recommended due to the high levels of contamination in dyeing and finishing processes (i.e. dyes and their breakdown products, pigments, dye, intermediate, auxiliary chemicals and heavy metals (Bertea A,et al 2008. Bisschops I.A.E,et al 2003. Correia V.M,et al 1994. Orhon D,et al 2001)

The present study deals with the collection of textile mill effluent contaminated or irrigated samples and characterization of these samples in order to find out the physicochemical load put in by the effluent generated from these industries, on the wastewater stream. The study also helps in finding the impact of the textile effluents on corresponding soil and water ecology

II. MATERIALS AND METHODS

A. collection of sample

The samples of untreated effluent were collected from Textile industrial area near south Gujarat .collected sample processed with in 24 hr of collection.

B. physicochemical analysis of effluent sample

Determination of Samples Colour and odour

Method: Visual Observation The colour of each sample and odour were Noted at the point of sampling and recorded.

a) Determination of the Samples temperature

Apparatus: thermometer meter,temperature measured by using Procedure was as described by Ademoroti (1996).

b) Determination of the Samples pH

Method: Potentiometric

Apparatus: pH meter , with temperature compensating device, accurate and reproducible to 0.1 pH unit with a range of 0 to 14. Procedure was as described by Ademoroti (1996).

c) *Determination of Total Acidity*

Method: titrimetric *Apparatus*: Standard laboratory glassware such as pipettes, burettes, volumetric flasks, conical flasks and beakers.The procedure was as described by Ademoroti (1996).

Calculation:

$$\text{Acidity (mg/l)} = \frac{M \times V \times 50 \times 100}{\text{Sample volume (ml)}}$$

Where, M = molarity of NaOH solution
V = volume of NaOH solution used in titration

d) *Determination of Total Alkalinity*

Method: titrimetric *Apparatus*:Standard laboratory glassware such as pipettes, burettes, volumetric flasks, conical flasks and beakers. *Reagents*: Tetraoxosulphate VI acid solution, 0.1N: 2.8 ml of conc. H_2SO_4 was added into 500 ml distilled water and it was diluted to one litre to get approximately 0.1N H_2SO_4. Phenolphthalein indicator: 1 g of phenolphthalein powder dissolved in 100 ml of 75 ml of ethanol and 25 ml of distilled water. Standardization of0.1N Tetraoxosulphate VI acid solution was done by the procedure described by Ademoroti (1996).

e) *Determination of dissolved oxygen*

Method: iodometric Titration
Procedure: as described by Ademoroti (1996)

f) *.Determination of biological oxygen demand*

Method: iodometric Titration
Procedure: as described by Ademoroti (1996)

g) *Determination of Chemical Oxygen Demand (Cod)*

Method: open reflux method as described by Ademoroti (1996).

h) *Determination of chloride*

Method: Argentometric Titration
Procedure: as described by Ademoroti (1996).

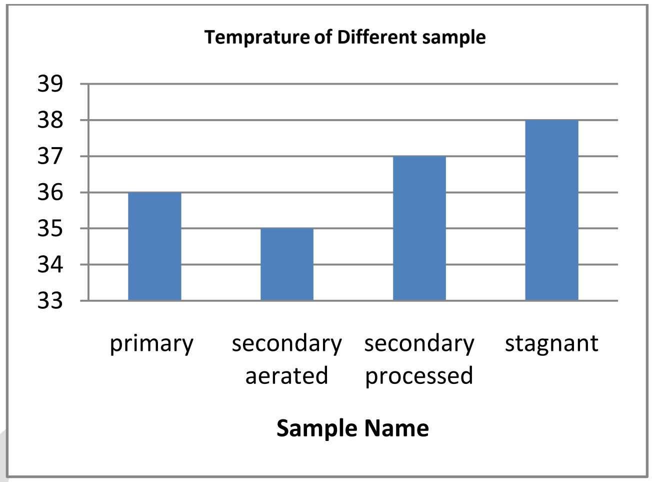
III. RESULT AND DISCUSSION

Colour and odour

The colour of the effluent sample typically depends upon the different industrial processes. The measurement and removal of colour is essential part as it is unfit for recycling without proper treatment.different colour of some effluent may due to presence of presence of dissolved salts .In present investigation primary treated same has black as well as secondary aerated has light yellow ,secondary processed has milky white ,and stagnat sample has dark black colour.Disagreeable odor and taste in water maybe because of presence of decaying vegetation, Inorganic constituents / organic substances,discharge of wastewater in water bodies. (BIS limit: unobjectionable / agreeable due to aesthetic consideration)(. N.P. MOHABANSI et al,2011)primary sample has fishy,secondary aerated and processed has rotten Egg as well as stangnant sample has Fortified odour.

Temperature

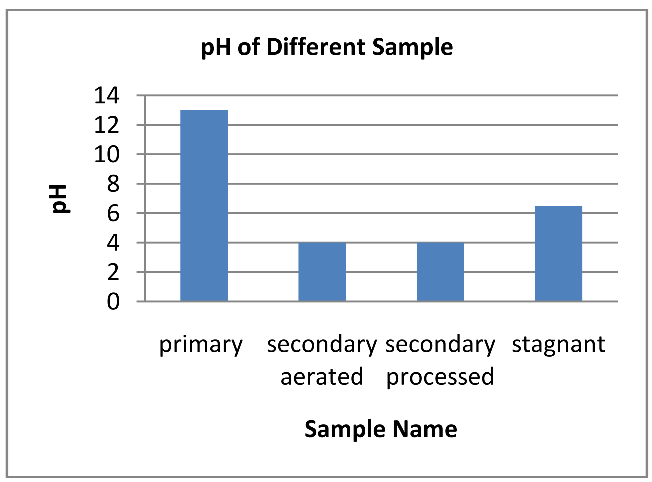
Temperature of all sample ranging between 35-39 ◦c . (Graph- 1).



Graph-1 Temprature of samples

pH

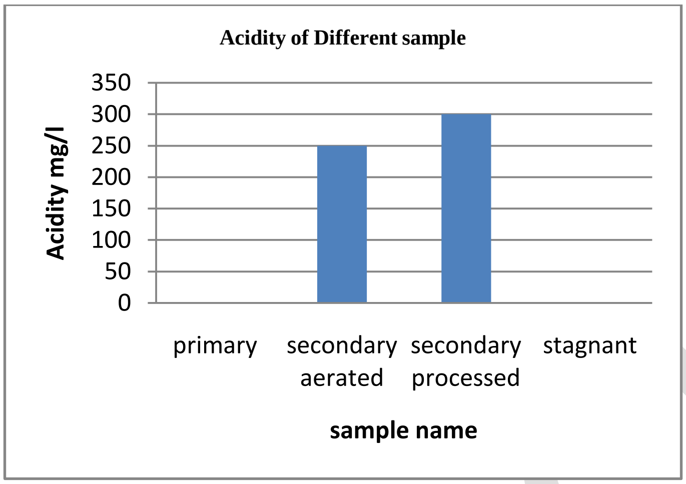
pH is the value expressed as the negative logarithm of the hydrogen ion concentration .pH of a effluent is very important in determination of water quality since it affects other chemical reactions such as solubility and metal toxicity (Fakayode, 2005)..In the present investigation the pH value of. effluents was ranging between 4-13 (graph-2)that is very differ than (BIS limit: 6.5 to 8.5;). It determines the equilibrium between free CO_2, HCO_3^- and CO_3^- (Sekar P,et al 2008).



Graph-2 pH of Different sample

Acidity

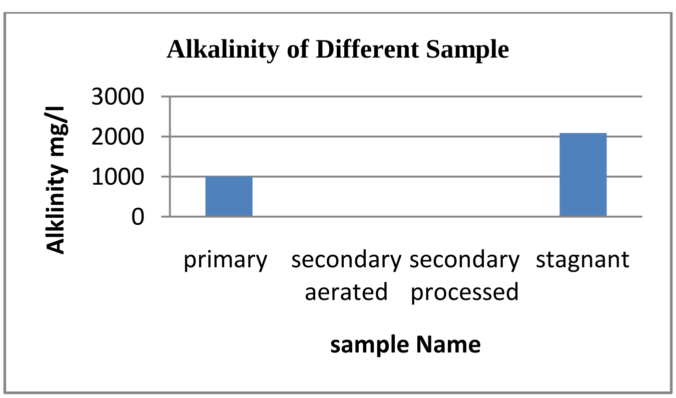
Acidity is a measure of the effects of combination of compounds and conditions in water. It is the power of water to neutralize hydroxyl ions and is expressed in terms of calcium carbonate. Water attain acidity from industrial effluents, acid mine drainage, pickling liquors and from humic acid.In present study in secondary aerated and processed sample acidity found 250 and 300 mg/l (Graph-3). No phenolphthalein acidity and methyl orangeacidity was found in primary and stagnant water sample.



Graph-3 Acidity of Different sample

Alkalinity

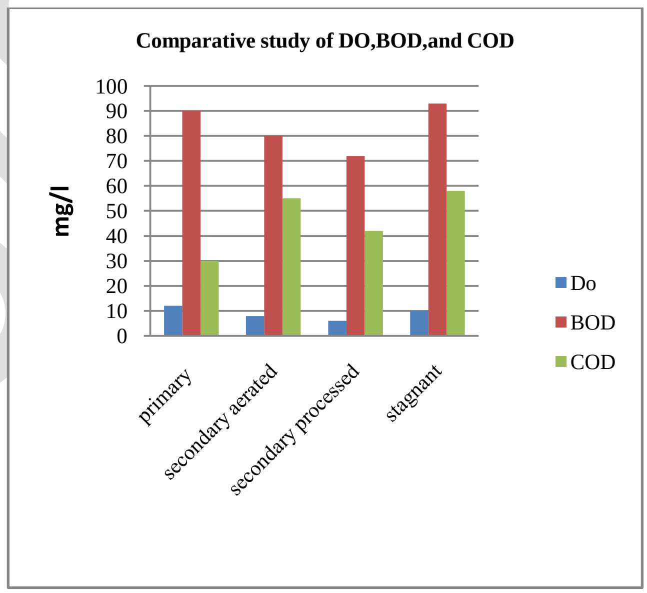
Alkalinity of water is acid-neutralizing capacity of the water to pre-designated pH .Alkalinity is the sum of all the titratable bases .Alkalinity in water is mainly due to carbonate, bicarbonate and hydroxide content.Borates, phosphates, silicates or other bases if present also contribute for alkalinity.(BIS limit : 200 to 600 mg/L; taste become unpleasant**)** In the present study, total methyl orange alkalinity of primary and stagnant water were found 1000 and 2090 mg/lit, that is lower than BIS Standard (Graph-4).



Graph-4 Alkilinity of Different Sample

Dissolved oxygen,Biological oxygen demand ,chemical oxygen Demand

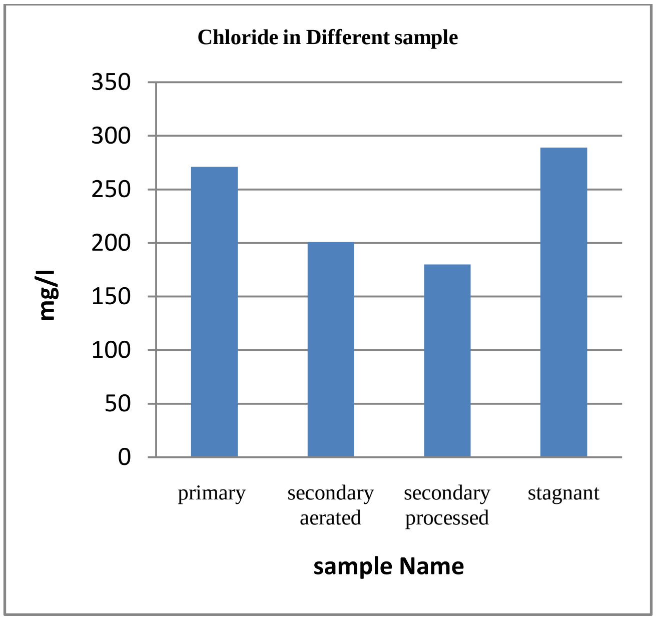
Dissolved oxygen levels are found to be very low and hence a lot of oxygen has been used up. It shows the increased concentration of organic matter. In present study Dissolved oxygen of sample ranging between 6-12 mg/l. (Graph-5) ,BIS standard limit-4-6 mg/l. In present investigation except Secondary processed sample all have higher Value.The presence of free oxygen in water is an indication of the ability of that water to support biological life (Ogunfowokan, A. O,et al 2005). BOD measure the amount of oxygen requires by bacteria for breaking down to simpler substances from the decomposable organic matter present in any water and COD test is useful in pinpointing toxic condition and presence of biological resistant substances (Chaurasia N.K.et al 2011).In present study Value of BOD and COD were between &7 2-93 mg/l and 32-58 mg/l, that is lower than permisable limit(Graph-5).



Graph-5 comparative graph of DO,BOD,COD

Chlorides

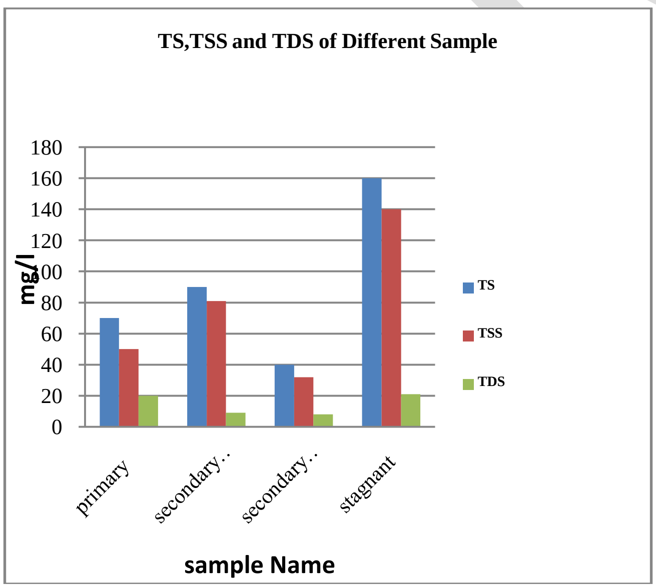
In present investigation concentration of chloride varied from 180-289 mg/l(Graph-6), slightly higher than who limit 250 mg/l and BIS limit. Highcontration of Chloride may due to use Chlorine compounds, like Hydrochloric acid, Hypochloric acid, chlorine gas are used as a raw materials in various process11,. The fear of high level of chloride causing threat to all forms of biotic life. its availability in small amount is beneficial to both plants and animals (Hodgson and Manus, 2006).



Graph-7 Chloride in different Sample

TS, TSS And TDS

Total solid,Total suspended solid and Total dissolved solid is the measure of total inorganic salts and other substances that are dissolved in water**.** The effluents with high TDS value may cause salinity problem if discharged to irrigation water (A.S. Kolhe et al,2011).In present study value of Total solid ranging between 40-160 mg/l ,Total suspended solid ranging between 32-140 mg/l and Total dissolved solid ranging between 8-20 mg/l ,that is lower than permissible limit of BIS and WHO(Graph-7).



IV. CONCLUSIONS

The Textile effluent taken from South gujarat region were analyzed and the analysis reports that the water qualityparameters like temperature,Acidity,Biological oxygen Demand, Chemical oxygen Demand ,Total solid.Total Suspended Solid and Total Dissolved Solid lies within the maximum permissible limit prescribed by BIS and WHO.But few parameter like pH ,Alkilinity, Chloride ,Dissolved Oxygen,and colour were reported with higher value than the permissible level,So proper Effluent treatment needed before Discharge. The high level pollution of the industrial effluents cause's environmental problems which will affect plant, animal and human life(Sagar T. Sankpal et al 2012),(A.S. Kolhe,et al 2011) (Avasan Maruti,et al,2001),(Chaurasia N.K,et al 2011).

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