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ANALYZING THE TREATED TEXTILE WASTE WATER TO REUSE IN CONSTRUCTION INDUSTRY

[1] R.Chavan,[2] S.Mulla,[3] A.Rathod,[4]R.Jadhav,[5]B.Yalgonde
[1]M.Tech. Assistant Prof,[2] Student,[3] Student,[4] Student, [5]Student
[1]Structural Engineering Civil Engineering, [2]Civil Engineering, [3]Civil Engineering, [4]Civil Engineering, [5]Civil Engineering
[1]Solapur University, Solapur, India, [2]V.V.P. Institute of engineering, Solapur, India
[3]V.V.P. Institute of engineering, Solapur, India
[4]V.V.P. Institute of engineering, Solapur, India
[5]V.V.P. Institute of engineering, Solapur, India

Abstract: The wastewater generated from textile industries of Solapur city is studied for its characterization. Wastewater of textile industry was found to contain a high degree of pollutants with high TDS and suspended solids. The wastewater is highly colored and viscous due to dyestuff and suspended solids respectively. Chloride, sulphate, nitrate, Sodium salts of these anions are most commonly used in the process. In heavy metal chromium is in higher concentration while other heavy metals iron, zinc, lead, copper and manganese are also present. The waste water also has high BOD and COD indication its polluting nature. This review collects the general information relating to textile wastewater constituents and organizes it to help researchers who are required to prepare useable water in construction industry. These ingredients are also evaluated based on the typical characteristics of textile wastewater, and special constituents to simulate these characteristics are recommended. The processes carried out during textile manufacturing and the chemicals corresponding to each process are also discussed.

***Index Terms* -** Textile effluent, wastewater, treatment.

I. Introduction

Nowadays due to global warming the possibility of sufficient rainfall is not sure and hence surface water as well as ground water is reducing day by day. The world's ever increasing population and it progressive adoption of an industrial lifestyle also for industries, agriculture and domestic purpose the ground water mostly used by human beings. For this lot of money is required so the waste water from industry can be recycled and used for construction industries.

The major industries contributing to water pollution are textile mills, pulp and paper mills, tannery industry etc. The textile industries in India require huge amount of pure water. The waste water available from textile industry in and around erode can be used for construction purpose after suitable treatment. Discharges highly colored dye effluent and textile bleaching constitutes one of the most important problems of surface water as well as sub surface water in nature.

The construction industry is one of the major water consuming industry and it attains rapid growth which leads to abundant utilization of pure water. The objective of this research work will be to evaluate the feasibility of using treated textile effluent as mixing water for concrete and the mechanical properties like compressive strength, tensile strength and flexural strength will be tested not only for short term but also for long term.(2 to 3 years) and compared with normal reinforced concrete.

Steel corrosion in reinforced concrete is worldwide problem which affects stability and durability of civil structures. Thus it limits the life of concrete structures. Textile waste contains large amount of organic matter which leads to corrosion in concrete.

Different materials and technique will be used for tackle this problem of corrosion in reinforced concrete.

The production of a textile requires several stages of mechanical processing such as spinning, knitting, weaving, and garment production, which seem to be insulated from the wet treatment processes like sizing, desizing, scouring, bleaching, mercerizing, dyeing, printing and finishing operations, but there is a strong interrelation between dry processes and consecutive wet treatments.

The textile industry emits a wide variety of pollutants from all stages in the processing of fibers, fabrics and garment production.

The main environmental concern in the textile industry is about the amount of water discharged and the chemical load it carries. The textile industry is very water intensive. Water is used for cleaning the raw material and for many flushing steps during the whole process of production.

The amount of water consumed by various types of fabrics varies from industry to industry depending on the dyeing process and the type of fabrics produced. In fact, it has been found that 38 % of water is used during process of bleaching, 16 % in dyeing, 8% in printing, 14 % in boiler and 24 % for other uses. As a result of various processes, considerable amounts of polluted water are released.

In this study, a method is proposed to determine the viability of the reuse of effluent water obtained from the different textile finishing processes of cotton fabrics after some basic treatments including; filtering, airing, pH regulating, and ion exchange in a textile plant. The layout of the plant machinery was also considered as a criterion. The aim of this study is to minimize water consumption and purification costs.

II. OBJECTIVE OF STUDY

A. To know the manufacturing process of textile industry

B. To collect textile treated waste water and study, analyze the impurities present in treated textile waste water.

III. MATERIAL AND METHOD

Effluent waters generated in the textile plant were first collected and then that all collected effluent were analyzed in terms of pH value, COD (Chemical Oxygen Demand), SS (Suspended Solids), colour, in accordance with the related standards.

The method designed for analyzing the treated as well as effluent of every process i.e. bleaching, dying, printing, boiler and other to reuse the water. This method was used to find out which effluent water was suitable to be reused. The first step was to know the manufacturing process of textile industry. The second step was to collect effluent from every process and analyze and check the effluent was reusable with standard or not. For checking the effluent some methods was adopted.

IV. MANUFACTURING PROCESS

MANUFACTURING PROCESS

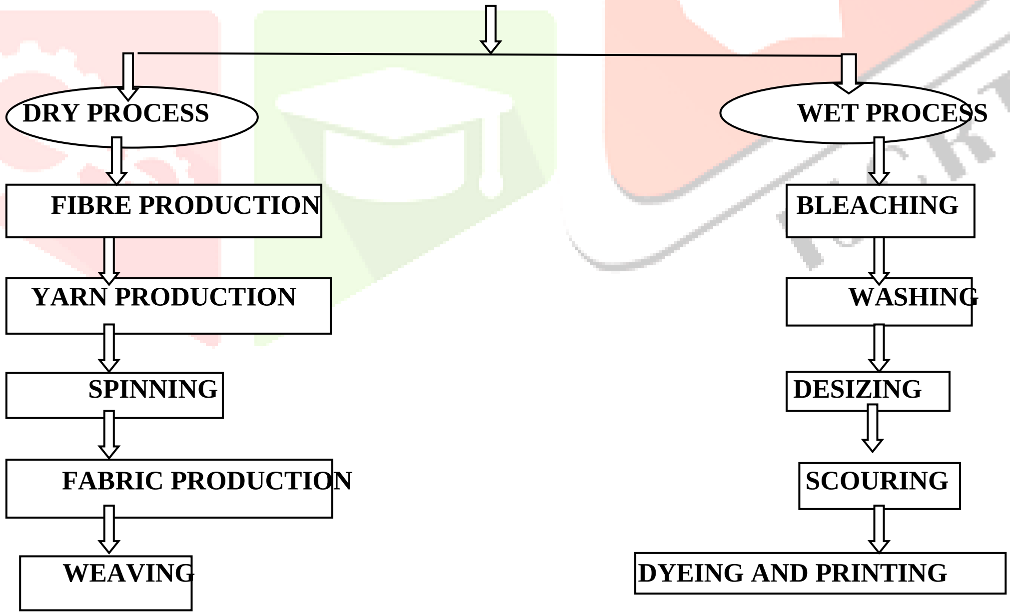


Fig.no.1

Fig no.1 shows the tree diagram of process of textile industry in which the process is distributed in two process i.e. Dry process & Wet process.

V. Consumption of water in textile industry

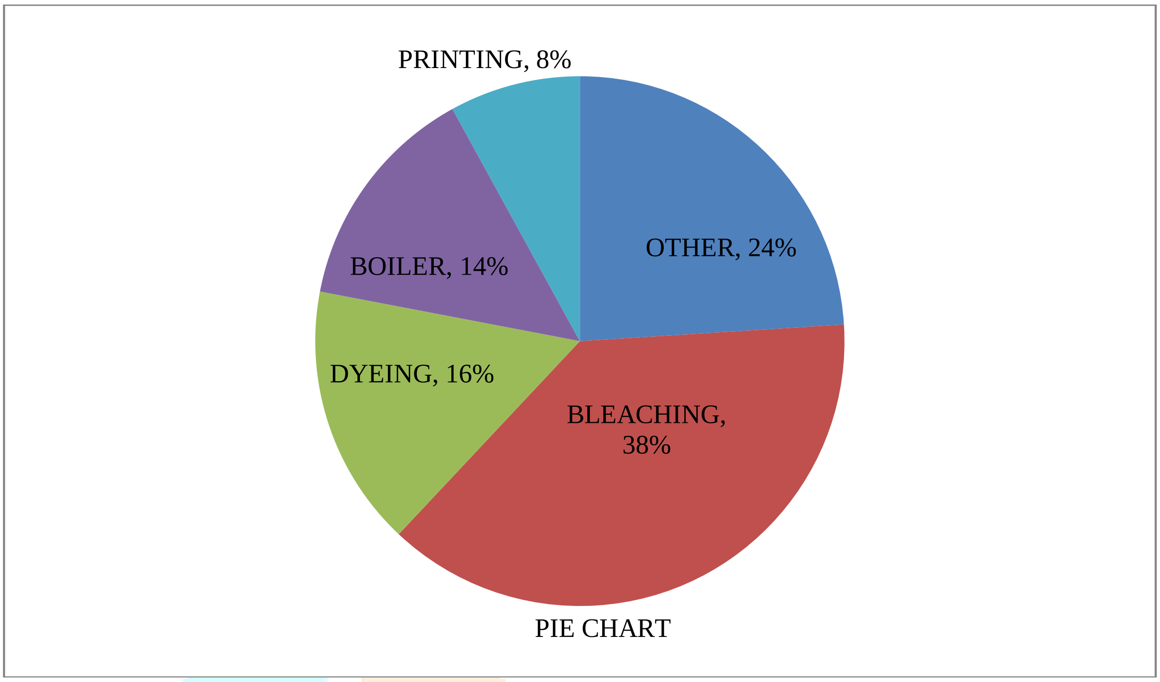


Fig.no.2 Consumption of water in textile industry

The amount of water consumed by various types of fabrics varies from industry to industry depending on the dyeing process and the type of fabrics produced. In fact, it has been found that 38 % of water is used during process of bleaching, 16 % in dyeing, 8% in printing, 14 % in boiler and 24 % for other uses. As a result of various processes, considerable amounts of polluted water are released. And the effect of impurities on concrete is shown in Table no.1.

Table 1.EFFECT OF ORGANIC IMPURITIES ON CONCRETE

IMPURITIES	REMARK
$NaNO_3$ and KNO_3	Sodium and potassium nitrates give strength little inferior to those obtained with sodium chloride.
$CaSO_4$	Water saturated with calcium sulfate is satisfactory for the liquid phase in cement paste which is normally saturated or even super-saturated with this compound.
$Ca(NO_3)_2$	Calcium nitrate added 1.7% weight of cement accelerates setting time and strength reduction.
Na_2SO_4,$MgCl_2$,$MgSO_4$	1% concentration of these common ions, exclusive of carbonate and bicarbonate, could be present without much effect on strength.
$FeSO_4$	In mix water, if 0.5, 1, 2 and 4% weight by water shows 28 days and 3 years tensile strengths which is exceeding 10 and 15 % of control specimens.
Zinc oxide	No significant effect but 0.1% strongly retarded setting time and lowered strength.
Ammonium ion	Ammonium chloride increased strength 0.4, 0.8 and higher percentage by weight of water of ammonium nitrate give same strength as with similar percentage of NaCl in water for making concrete.
Tannic acid	No effect on strength but may have a considerable effect on setting time of concrete.

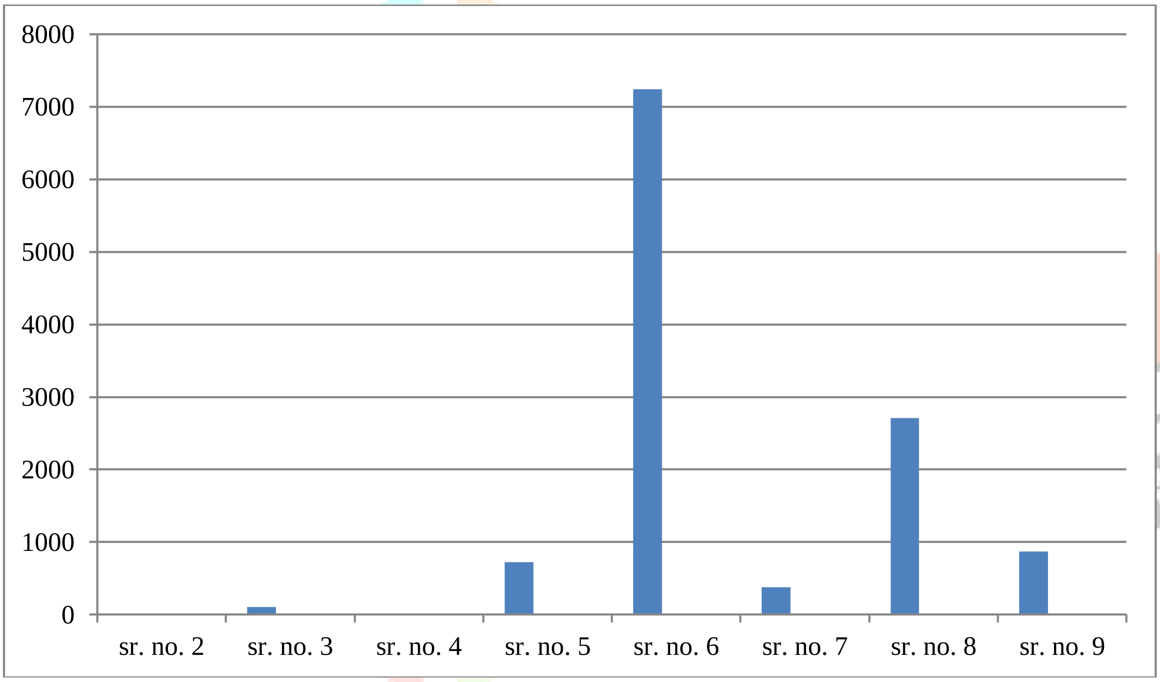
VI. RESULTS:

The results of the analysis of the water fed into the processes, and given from Table 2 to Table 7.

Table no.2 Result Analysis of bleaching

Sr. No.	Parameters	Results	Limits as per IS-456 For Construction
1.	Appearance	Turbid*	Clear
2.	Neutralization Test using Phenolphthalein indicator	0	Not more than 5 ml of 0.02N NaOH
3.	Neutralization test using Mixed indicator	105*	Not more than 25 ml of 0.02N H2SO4
4.	pH	7.75	Not less than 6
5.	Organic	723*	Max 200 mg/l
6.	Inorganic	7244*	Max 3000 mg/l
7.	Sulphates	376	Max 400 mg/l
8.	Chlorides	2710*	1) Max. 2000 mg/l for concrete not containing embedded steel 2) Max. 500 mg/l for reinforced concrete work
9.	Suspended Matter	870	Max. 2000 mg/l

Remarks: The given water sample does not confirm to the standards.
*- IT INDICATES THAT THE PARAMETER IS NOT AS PER LIMITS AS PER IS-456 FOR CONSTRUCTION

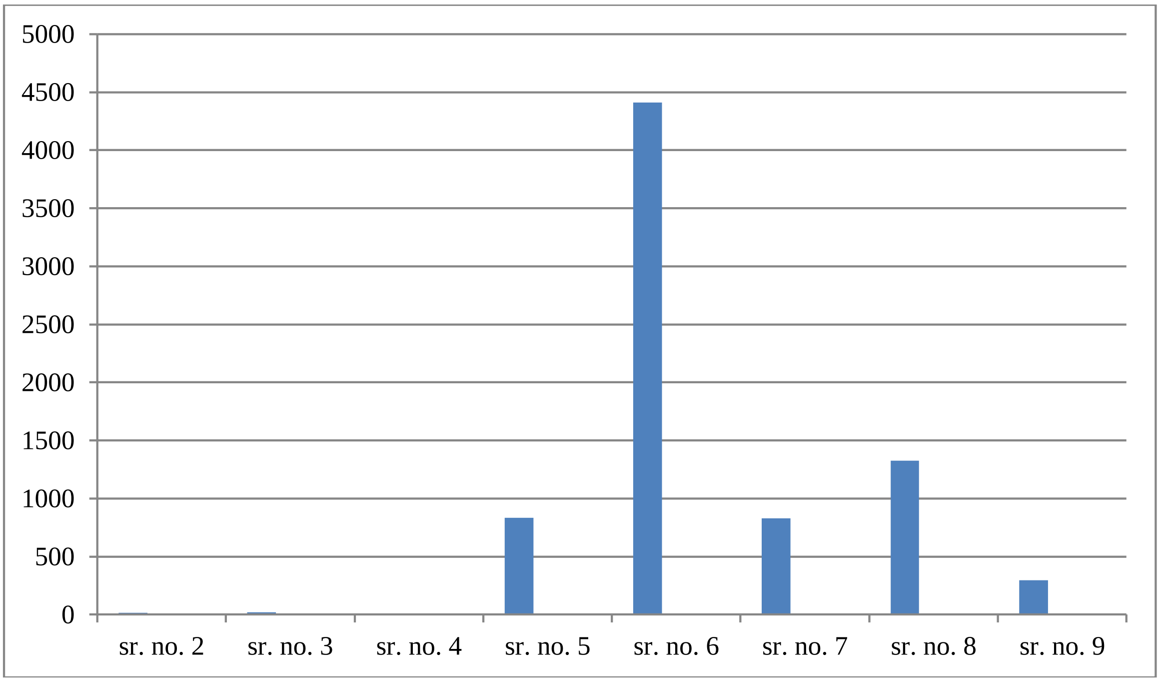


Bar chart1: On X-axis parameters & on Y-axis parameters range

Table no.3 Result Analysis of powder

Sr. No.	Parameters	Results	Limits as per IS-456 For Construction
1.	Appearance	Turbid*	Clear
2.	Neutralization Test using Phenolphthalein indicator	15.7*	Not more than 5 ml of 0.02N NaOH
3.	Neutralization test using Mixed indicator	20*	Not more than 25 ml of 0.02N H2SO4
4.	pH	6.41	Not less than 6
5.	Organic	835*	Max 200 mg/l
6.	Inorganic	4412*	Max 3000 mg/l
7.	Sulphates	829*	Max 400 mg/l
8.	Chlorides	1325*	1) Max. 2000 mg/l for concrete not containing embedded steel 2) Max. 500 mg/l for reinforced concrete work
9.	Suspended Matter	296	Max. 2000 mg/l

Remarks: The given water sample does not confirm to the standards.
*- IT INDICATES THAT THE PARAMETER IS NOT AS PER LIMITS AS PER IS-456 FOR CONSTRUCTION

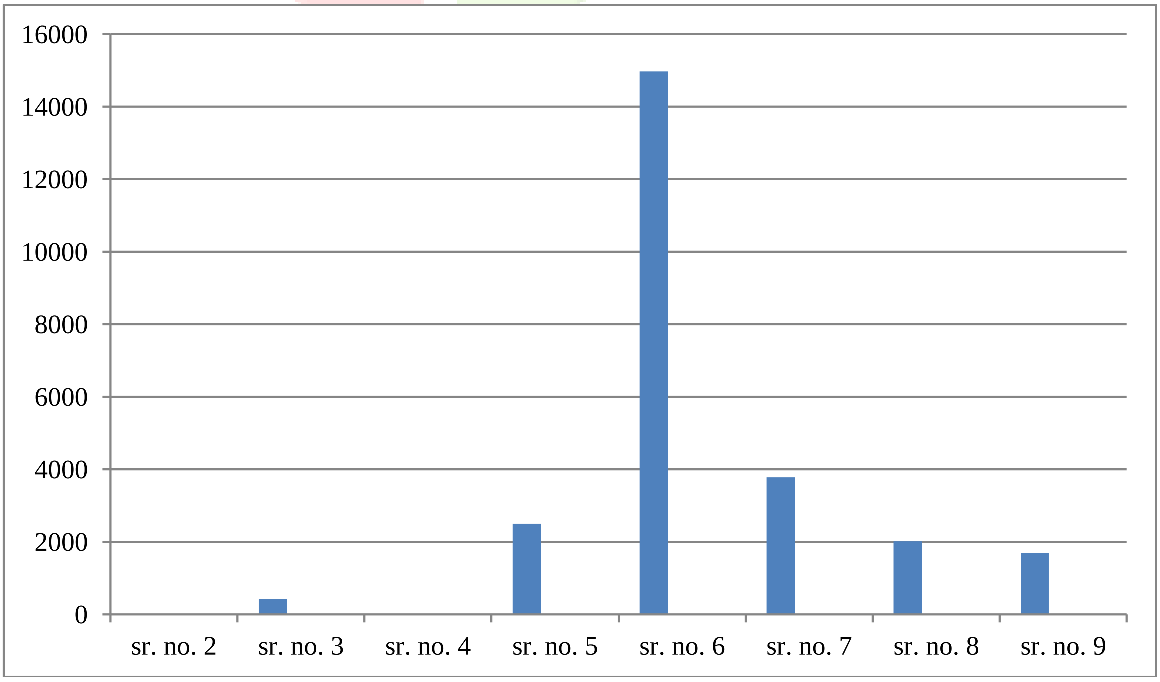


Bar chart 2: On X-axis parameters & on Y-axis parameters range

Table no.4 Result Analysis of dying dark

Sr. No.	Parameters	Results	Limits as per IS-456 For Construction
1.	Appearance	Dark blue Turbid*	Clear
2.	Neutralization Test using Phenolphthalein indicator	0	Not more than 5 ml of 0.02N NaOH
3.	Neutralization test using Mixed indicator	417*	Not more than 25 ml of 0.02N H2SO4
4.	pH	9.29*	Not less than 6
5.	Organic	2500*	Max 200 mg/l
6.	Inorganic	14976*	Max 3000 mg/l
7.	Sulphates	3780*	Max 400 mg/l
8.	Chlorides	2020*	1) Max. 2000 mg/l for concrete not containing embedded steel 2) Max. 500 mg/l for reinforced concrete work
9.	Suspended Matter	1691	Max. 2000 mg/l

Remarks: The given water sample does not confirm to the standards.
*- IT INDICATES THAT THE PARAMETER IS NOT AS PER LIMITS AS PER IS-456 FOR CONSTRUCTION

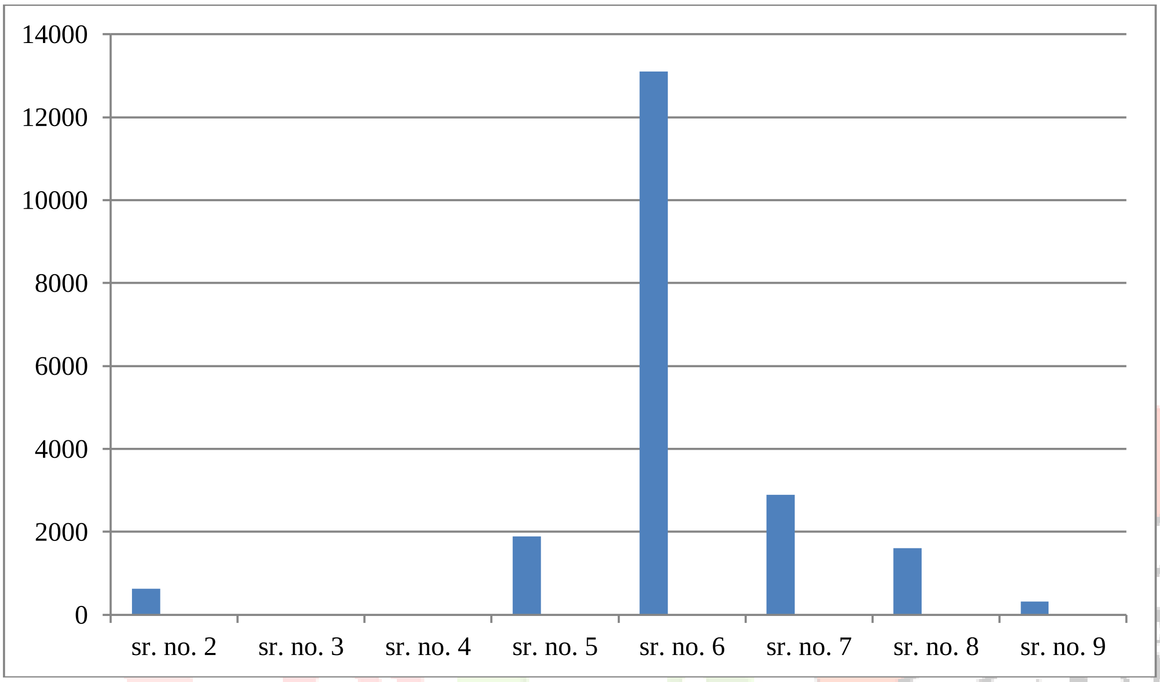


Bar chart3: On X-axis parameters & on Y-axis parameters range

Table no.5 Result Analysis of outlet of textile industry

Sr. No.	Parameters	Results	Limits as per IS-456 For Construction
1.	Appearance	Orange, Turbid *	Clear
2.	Neutralization Test using Phenolphthalein indicator	630*	Not more than 5 ml of 0.02N NaOH
3.	Neutralization test using Mixed indicator	0	Not more than 25 ml of 0.02N H2SO4
4.	pH	2.78*	Not less than 6
5.	Organic	1896*	Max 200 mg/l
6.	Inorganic	13110*	Max 3000 mg/l
7.	Sulphates	2900*	Max 400 mg/l
8.	Chlorides	1605*	1) Max. 2000 mg/l for concrete not containing embedded steel 2) Max. 500 mg/l for reinforced concrete work
9.	Suspended Matter	324	Max. 2000 mg/l

Remarks: The given water sample does not confirm to the standards.
*- IT INDICATES THAT THE PARAMETER IS NOT AS PER LIMITS AS PER IS-456 FOR CONSTRUCTION

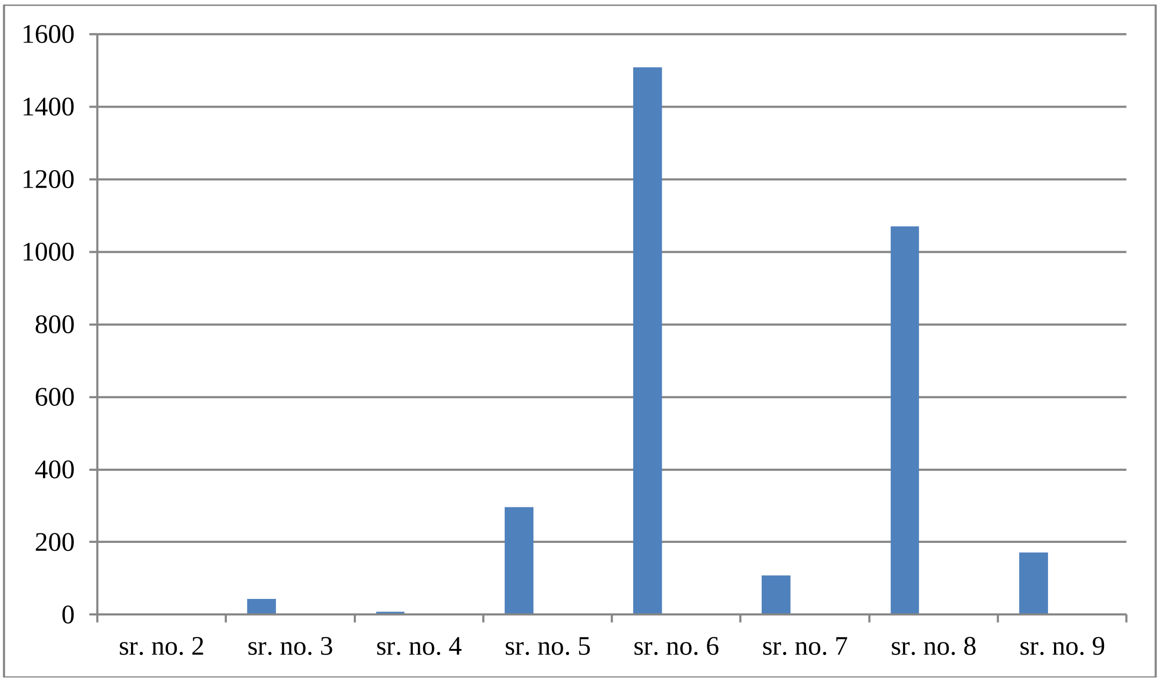


Bar chart 4: On X-axis parameters & on Y-axis parameters range

Table no.6 Result Analysis of pink maska chemical which is used for softening

Sr. No.	Parameters	Results	Limits as per IS-456 For Construction
1.	Appearance	Pink, Turbid *	Clear
2.	Neutralization Test using Phenolphthalein indicator	2	Not more than 5 ml of 0.02N NaOH
3.	Neutralization test using Mixed indicator	44*	Not more than 25 ml of 0.02N H2SO4
4.	pH	7.42	Not less than 6
5.	Organic	297*	Max 200 mg/l
6.	Inorganic	1509	Max 3000 mg/l
7.	Sulphates	108	Max 400 mg/l
8.	Chlorides	1070*	1) Max. 2000 mg/l for concrete not containing embedded steel 2) Max. 500 mg/l for reinforced concrete work
9.	Suspended Matter	172	Max. 2000 mg/l

Remarks: The given water sample does not confirm to the standards.
*- IT INDICATES THAT THE PARAMETER IS NOT AS PER LIMITS AS PER IS-456 FOR CONSTRUCTION



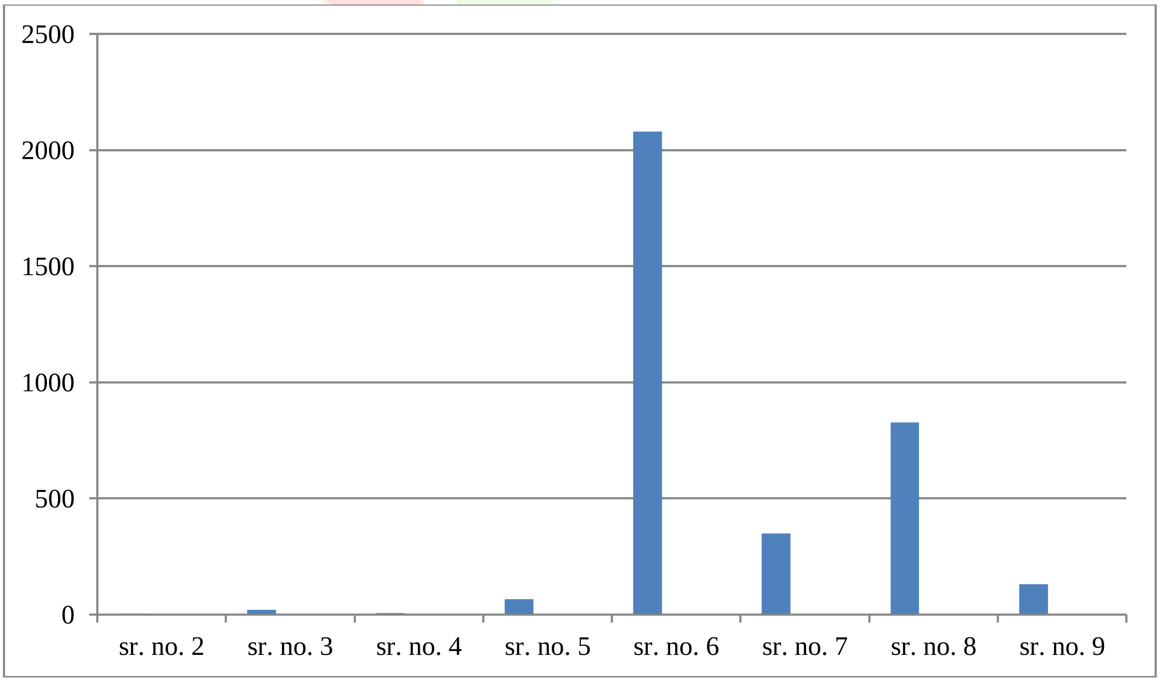
Bar chart 5: On X-axis parameters & on Y-axis parameters range

Table no.7 Result Analysis of treated textile water

Sr. No.	Parameters	Results	Limits as per IS-456 For Construction
1.	Appearance	Grayish Turbid*	Clear
2.	Neutralization Test using Phenolphthalein indicator	3.20	Not more than 5 ml of 0.02N NaOH
3.	Neutralization test using Mixed indicator	19.5	Not more than 25 ml of 0.02N H2SO4
4.	pH	5.95*	Not less than 6
5.	Organic	67	Max 200 mg/l
6.	Inorganic	2081	Max 3000 mg/l
7.	Sulphates	350	Max 400 mg/l
8.	Chlorides	827*	1) Max. 2000 mg/l for concrete not containing embedded steel 2) Max. 500 mg/l for reinforced concrete work
9.	Suspended Matter	130	Max. 2000 mg/l

Remarks: The given water sample does not confirm to the standards.

*- IT INDICATES THAT THE PARAMETER IS NOT AS PER LIMITS AS PER IS-456 FOR CONSTRUCTION



Bar chart 6: On X-axis parameters & on Y-axis parameters range

VII. CONCLUSION

This research, investigating the reuse of effluent water obtained in different textile finishing processes shows that it is quite possible to reuse some of the effluents after some simple and low cost treatment process.

1. The result of the PINK MASKA (Chemical) shows that about 5 parameters are confirmed with standard as compare to other untreated water sample.
2. The result of treated textile water also confirm with 5 parameters with standard.
3. Treated waste water results are positive as compared to potable water but it is not economical.

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