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COMPARATIVE STUDY ON EFFECT OF CONCRETE MADE WITH TEXTILE EFFLUENT AND ORDINARY WATER

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Abstract *— **This paper deals with study of possible utilization of textile water in concrete by analyzing their durability properties .An attempt was made to use the waste water from textile dyeing industry for construction purpose, so that the shortage in water can be greatly reduced and the waste water can be suitably disposed for safe guarding the environment. The basic properties of different stages of effluent such as raw effluent, anaerobic process outlet, and tertiary treated outlet, reverse osmosis feed effluent from the textile industry were tested and the results were found to be satisfactory such that it can be used for construction purposes. By using the four stages of treated effluent, concrete specimens were casted and tested for its mechanical properties (compressive strength and tensile strength) and the results were found to be optimum for anaerobic and tertiary treated outlet. Hence the study was planned to continue for durability properties (Acid attack-sulphuric acid, hydrochloric acid and carbonation) of specimens using anaerobic and tertiary effluent.***

Keywords- Concrete, raw effluent, anaerobic effluent, tertiary treated outlet.

1. INTRODUCTION

Due to urbanization and expanding economic activities, about 13% of the world's population do not have access to safe drinking water. With current trend of water demand, water shortage will become even more intense and approximately, half of the world's population will suffer from major water scarcity by the year 2030 said by UNESCO. Industrial sector, contributes about 20% of the national income. Textile industry contributes nearly14% of the total industrial production in India. There are about 10,000 garment manufactures and 2100 bleaching and dyeing industries in India. Textile waste water includes a large variety of dyes and chemical additions that pose an environmental challenge for textile industry not only as liquid waste but also due to its chemical composition. The shifting of irrigation water to fulfil the need of industrial use as well as water quality and lowering of water table around. The surface as well as ground water quality induces environmental degradation over long period of time because of discharge of highly contaminated effluent accelerated by over exploitation of existing water resources. The world bank estimates that 17 to 20 percent of industrial water pollution comes from textile dyeing and finishing treatment given to fabric majority are concentrated at Tirupur and Karur in Tamil Nadu, Ludiyana in Punjab and Surat in Gujarat. In recent decades, major research project are undergone to develop the utilisation of industrial waste into useful one. An attempt was made to the use the waste water from textile dyeing industry for construction purpose, so that the shortage in water can be greatly reduced and the waste water can be suitably disposed for safe guarding the environment and on the other hand the use of alternatives pozzolonic material like flyash in concrete production may greatly reduce the disposal and minimises the usage of cement.

ASTM C 1602/C 1602M-06 (2006) outlined the requirements of non potable water to be used as mixing water in concrete. The compressive strength of concrete made with non potable water should not be less than 90% of the compressive strength of control mix and the deviation in the time of set of concrete should be 1.00 hours to 1.30 hours. The objective of this study is to finding out the feasibility of using textile water in concrete. This paper describe about the mechanical properties of concrete made with anaerobic and tertiary treated water and methodology for durability tests.

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2. MATERIALS

2.1 Cement

Cement is a water-based binder used to bind other building materials together. The ordinary Portland cement (OPC) of 53 grade was used for the study. The properties of cement are given in Table 1

Table 1: Properties of cement

Properties	Observed values
Specific gravity	3.15
Consistency	35%
Initial setting time	90 mins
Final setting time	225 mins

2.2 Fly Ash

Fly ash, also known as flue-ash, is one of the residues generated in combustion, and comprises the fine particles that rise with the flue gases Class F fly ash was used for 30% replacement of cement The properties of fly ash are given in table 2

Table 2: Properties of fly ash

Properties	Observed values
Consistency	33%
Initial setting time	40 mins
Final setting time	235 mins

2.3 Fine Aggregate

Good quality river sand was used as a fine aggregate. The properties are conducted as per BIS 2386-1963 and are presented in Table 3.

Table 3: Properties of fine aggregate

Properties	Observed values
Specific gravity	2.69
Zone	III
Fineness Modulus	3.2
Moisture content	0.02%

2.4 Coarse Aggregate

Good quality crushed aggregate of 20mm was used in the experimental study. The properties are given in table 4.

Table 4: Properties of fine aggregate

Properties	Observed values
Specfic gravity	2.62
Impact value	21%
]Moisture content	Nil

2.5 Water

Effluent samples such as two stages Anaerobic and Tertiary treated outlet were taken from textile dyeing industry in karur. And also potable water from tap was used for experimental study.

3. EXPERIMENTAL STUDY

3.1 Cement paste

Cement pastes were made to study the consistency, setting time for the various water samples taken. Consistency and setting time is essential for proper concrete. Setting time was followed after the consistency tests with 3 sample of water including potable water. The test were conducted in the accordance with the IS codes 12269-1987(clause 4) 4031(Part 4)-1988, 4031 (Part5) -1988.

3.2 Formulation of concrete

Concrete specimens were prepared to study the mechanical properties of concrete such as compressive strength. To the mix design arrived, the quantities per m^3 of concrete were given below in Table 4.

Table 5: Mix proportion

Cement Kg/m^3	Fine aggregate kg/m^3	Coarse aggregate kg/m^3	Water kg/m^3
425	630	1139	191

Table 6: Mix proportion (30% fly ash replacement)

Cement kg/m^3	Fly Ash kg/m^3	Fine aggregate kg/m^3	Coarse aggregate kg/m^3	Water kg/m^3
298	127	616	1115	191

Concrete cubes were casted for three water samples (Anaerobic, tertiary and potable water) Nine specimens for fly ash and nine specimen for conventional were casted to conduct the compressive strength for 28 days. Further, 108 concrete cubes were prepared for testing durability properties such as Sulfuric acid and Hydrochloric acid for 30, 60 and 90 days.

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4. RESULT AND DISCUSSION

4.1 Compressive Strength

Table 6 and 7 shows about the compressive strength of concrete made with two stages of textile water and potable water. Compressive strength was tested after 28 days of curing in water. AOW shows good strength compared to potable water both with flyash and without flyash concrete.

Table 7 Compressive strength of concrete cubes without fly ash

Water	28 days strength in N/mm^2
PW	43.6
AOW	45
TCW	36.4

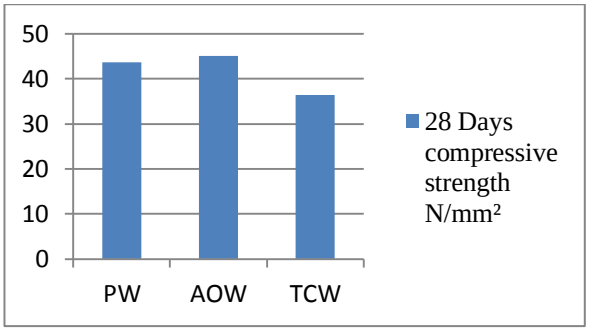

Chart 1- Compressive strength of concrete cubes

Table 8 Compressive strength of concrete cubes with fly ash

Water	28 days strength in N/mm^2
PW	32.8
AOW	38.8
TCW	31.5

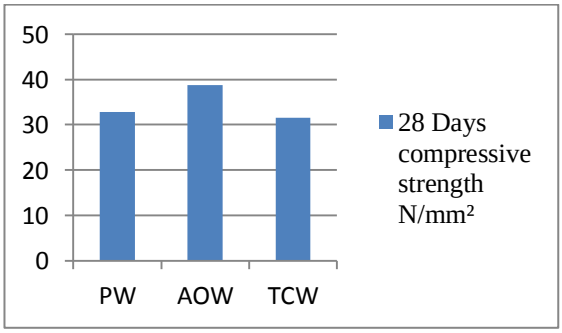

Chart2- Compressive strength of concrete cubes

4.2 Behavior of concrete in acid medium

4.2.1 Sulfuric Acid

Table 8 and 9 shows about the weight loss and compressive strength of concrete cubes with and without fly ash after 28 days of normal curing followed by 1% sulfuric acid curing with pH of 1.7 for 28 days.

Table 9 Loss of weight and compressive strength of concrete cubes without fly ash

Water	% Weight loss	% compressive strength loss
PW	1.2	5
AOW	3.2	6.5
TCW	1.3	4.55

Table 10 Loss of weight and compressive strength of concrete cubes with fly ash

Water	% Weight loss	% compressive strength loss
PW	4.6	3.9
AOW	1.5	5.9
TCW	1	3.8

4.2.2 Hydrochloric acid

Table 10 and 11 shows about the weight loss and compressive strength of concrete cubes with and without fly ash after 28 days of normal curing followed by 1% Hydrochloric acid curing with 1.11pH for 28 days.

Table 11 Loss of weight and compressive strength of concrete cubes without fly ash

Water	% Weight loss	% compressive strength loss
PW	1.7	8.25
AOW	1.72	6.5
TCW	4.7	5.55

Table 12 Loss of weight and compressive strength of concrete cubes with fly ash

Water	% Weight loss	% compressive strength loss
PW	2.9	3.9
AOW	3	5.9
TCW	3.6	4.76

4.2.3 Carbonation

To find out the carbonation depth on various sample phenolphthalein test was conducted by spraying 1% of solution on the broken surface. If pH greater than 9 means then the surface where it turns to magenta and changes in to pink when pH values of 8-9. If the surface is colorless means it represents carbonation affect. All the samples are tested after 28 days of normal curing followed by 30 days atmospheric exposure condition and its pH values are 8-9.

5. CONCLUSION

This study shows the possible utilization of textile water in making concrete cubes with good and equivalent strength of concrete cubes made with potable water.

Compressive strength of concrete cubes made with AOW and TCW was good and equivalent to potable water.

The behavior of acid attack on concrete cubes made with TCW was less compare to the potable water.

A fly ash concrete cube shows better results than the normal cubes in compressive strength after acid curing.

Further durability studies are needed and planned to know the durability properties in detail.

REFERENCES

1. Kanitha.M, Ramya.P et al (2014) 'Potential utilisation of untreated/treated textile effluent in concrete' International Journal of Research in Engineering &Technology eISSN: 2319-1163

2.Aathira G Krishna, Jerry Anna Mathew et al (2013) 'Modelling of Chemical Durability Parameter of Fly ash Blended Concrete' International Journal of Scientific & Engineering Research Volume 4, Issue 8

3.Atul Kumar, Pratibha Chaudhary(2013) **'**Adsorption of reactive red 194 dye from textile effluent by using class F fly ash' . Sci.1(2):111-116

4. Bahador Sabet Divsholi, Tze Yang Darren Lim et al(2014) 'Durability Properties and Microstructure of Ground Granulated Blast Furnace Slag Cement Concrete.'International Journal of Concrete Structures and Materials Vol.8 , No.2,pp.157-164

5. Deotale.S, Sathawane et al (2012) 'Effect of Partial Replacement of Cement by Fly Ash, Rice Husk Ash with Using Steel Fiber in Concrete' International Journal of Scientific & Engineering Research, Volume 3, Issue 6, June-2012

6. IS 10262-2009 'Recommended guideline for concrete mix design', BIS, New Delhi, India, 2009

7. IS 383-1970, 'Specification for fine and coarse aggregate from natural source of concrete' (second revision).

8. IS 456-2000 'Specification for plain and reinforced concrete, New Delhi, India, 2000.

9. Marimuthu, Rajendran et al (2013) 'Pollution In Karur DistricT'Asian Journal of Science and Technology Vol. 4, Issue 07, pp.042-044

10.Muthuswamy K.R and Thirugnanam G.S (2014)**'**Strength and durability characteristics of steel fiber reinforced concrete'CE &CR

11. Ravi Kant Singh, Deepak Kumar Gupta et al (2013) 'Utilization of fly ash as biologically activated carbon on microbial consortium for the removal of pollutants from waste water' . International Journal of Advanced Biotechnology Vol 4, pp 20-28.

12. Santhosh G. Cheriyan, B.S Dhanya., et al., (2014) 'Durability indices for concrete with different dosages of mineral admixtures' Indian concrete journal.

13.Sumanth Reddy, Ratna Sai et al (2013) 'Mechanical and Durability properties of Self Compacting Concrete with recycled concrete aggregates' International Journal of Scientific & Engineering Research Volume 4