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Potential Utilization of Raw Textile Effluent in Concrete

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Abstract: Cement, sand and aggregate are basic needs for any construction industry. Water is a prime material used for preparation of mortar and concrete and which plays a major role in mix design. 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 raw 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 treated effluent, concrete specimens were casted and tested for its mechanical properties (compressive strength and tensile strength). Hence the study was planned to continue for durability properties (acid attack-sulphuric acid, hydrochloric acid and carbonation) of specimens using raw effluent.
Keywords: Textile effluent, Cement, sand, concrete.

I. Introduction

Concrete is the most widely used construction material in civil engineering industry because of its high structural strength, stability.Concrete is composed of cement paste, aggregates and water. Concrete resists compressive force than tensile force. In order to compliment this reduced resistance to tension, concrete is provided with the reinforcement regarding the structural elements.

Concrete is a very strong and versatile moldable construction material. It consists of cement, sand and aggregate (e.g., gravel or crushed rock) mixed with water. The cement and water form a paste or gel which coats the sand and aggregate. When the cement has chemically reacted with the water (hydrated), it hardens and binds the whole mix together. The initial hardening reaction usually occurs within a few hours. It takes some weeks for concrete to reach full hardness and strength.

Concrete can continue to harden and gain strength over many years. The utilization of industrial waste or secondary materials has encouraged the Production of cement and concrete in construction field. New by-products and waste materials are being generated by various industries. Dumping or disposal of waste materials causes environmental and health problems. Therefore, recycling of waste materials is a great potential in concrete industry.Over recent decades, intensive research studies have been carried out to explore all possible reuse methods.

II. Significance of the Project

Using textile effluent to improve the materials bulk properties, Reducing the waste water by using a concrete binding material, To lower the level of environmental contaminations.

III. Materials and Methods

3.1 Cement

Cement is the most important constituent of concrete, in that it forms the binding medium for the discrete ingredients made out of naturally occurring raw materials and sometimes blended with Industrial wastes used for experimental study. It serves as a binder to aggregate. Portland cement is the most common type of cement in general usage.

3.2 Aggregates

Aggregate is a collective term for the mineral materials such as sand, gravel and crushed stone that are used with a binding medium (such as water, bitumen, Portland cement, lime etc.) to form compound materials. Aggregate is also used for base and sub base courses for both flexible and rigid pavement. It is chemically inert material. It occupies 70-80 percent of the volume of concrete.

Aggregates can either be natural or manufactured. Natural aggregates are generally extracted from larger rock formation through an open excavation.Extracted rock is typically reduced to usable sizes by mechanical crushing. Manufactured aggregates is often the byproducts of other manufacturing industries.

3.3 Water

The water reacts with the cement, which bonds the other components together, creating a robust stone-like material. Water is then mixed with this dry composite, which produces a semi-liquid that workers can shape a chemical process called hydration. The cement paste glues the aggregate together, fills voids within it, and makes it flow more freely.A lower water-to-cement ratio yields a stronger, more durable concrete, while more water gives a free-flowing concrete with a higher slump. Impure water used to make concrete can cause problems when setting are in causing premature failure of the structure.

3.4 Mixing Proportions

The mixing proportions is developed has per IS code method for characteristics strength of 25 Mpa. The process of selecting suitable ingredients of concrete are determining their relative amount with the objective of producing a concrete of the required strength, durability and workability as economically as possible, termed the concrete mix design.

3.5 Casting of Test Specimen

Concrete is mixed by hand .oil is applied inside cube and cylinder. Materials should be mixed in various proportions. Care should be taken to see that the concrete is properly placed beneath and also along the sites of the mould with the help of trowel and the tamping rod conventional concrete and coconut shell concrete.

3.6 Preparation of Concrete by Using Raw Textile Effluent Water

The textile effluent is added to the concrete by various proportions in M25grade of concrete.

3.7 Curing

Curing is the process of controlling the rate of moisture of loss from concrete cement hydration. It may be either after it has been placed in position (or during the manufacture of concrete products), thereby providing time for the hydration of the cement of occur. since the hydration of cement does take time-days ,and even weeks rather than hours curing must be under taken for a reasonable period of time if concrete is achieved its potential strength and durability curing may also encompass the control of temperature since this affects the rate at which at cement hydration.

3.8 Testing of Specimens

3.8.1 Compression Test

Compression test is the most common test on hardened concrete. Concrete is strong in compression and weak in tension. Partly because it is an easy test to perform, and partly because most of the desirable characteristic properties of concrete are qualitatively related to its compressive strength.The compression test is carried out on specimens cubical or cylindrical in shape. Prism is also sometimes used. The cube specimen is of the size is 150x150x150mm.

3.8.2 Split Tensile Strength Test of Concrete

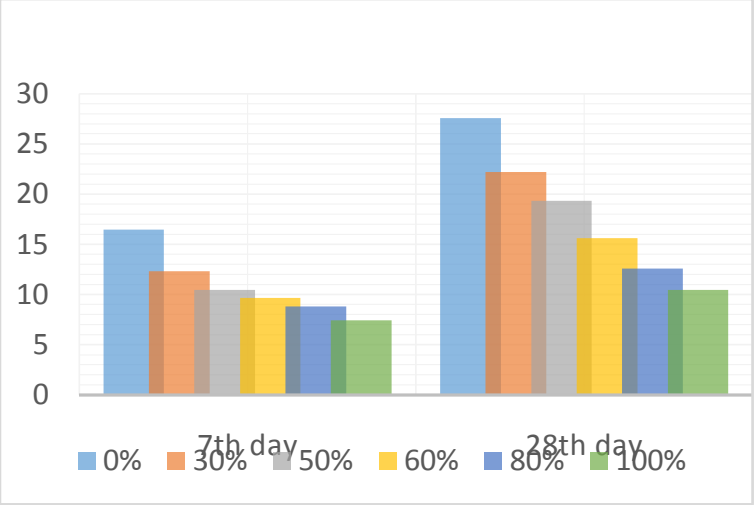
The tensile strength is one of the basic and important properties of the concrete. The concrete are not usually expected to resist the direct tension because of its low tensile strength and brittle nature. However, the determination of tensile strength of concrete is necessary to determine the load at which the concrete members may crack. The cracking is a form of tension failure.

As there are many difficulties associated with the direct tension test. A number of indirect methods have been developed to determine the tensile strength. In these tests in general a compressive force is applied to a concrete specimen in such a way that the specimen fails due to tensile stresses developed in the specimen. The tensile stress at which the failure occurs is termed the tensile strength of concrete.

IV. Results and Discussion

4.1 Compressive Strength Test

A cube compression test is performed on standard cubes of conventional concrete and raw textile effluent water concrete with partial replacement of 0%,30%,50%80%, and 100% of size 150mmx150mm after 7 days and 28 days of immersion in water for curing.

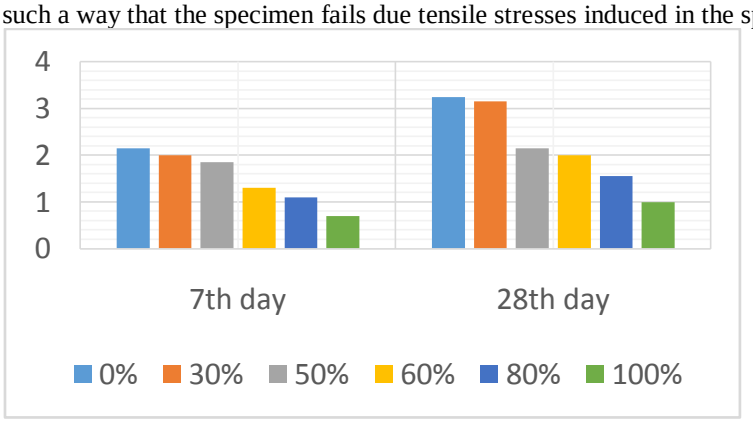


Comparison of compressive strength of concrete

The compressive strength of concrete increases with increase in raw textile water content. The increase in compressive strength of concrete at the age of 28 days was found to be 60.35%, 24.26% and 17.95% for 30%, 50% ,80%and 100% replacement of sand with coconut shell ash by comparing with normal concrete.

4.2 Split Tensile Strength

The split tensile test is well known indirect test used to determine the tensile strength of concrete. Due to difficulties involved in conducting the direct tension test, a number of indirect methods have been developed to determine the tensile strength of the concrete. In these tests, in general a compressive force is applied to a concrete specimen in such a way that the specimen fails due tensile stresses induced in the specimen.



Comparison of Split tensile strength of concrete

The Split Tensile strength of concrete increases with increase in raw textile water content. The increase in Split Tensile strength of concrete at the age of 28 days was found to be 59.17%, 31.04% and 27.95% for 30%, 50%,80%and 100% replacement of cement with rawtextile water by comparing with normal concrete.

V. Conclusion

The following points are concluded from the study on Raw textile water in Concrete:

a. 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.
b. Raw textile effluent can be successfully used by adding it in m25 grade of concete up to 32% ultimate comprising on compressive strength.
c. Workability of concrete goes on reducing as percentage of raw textle effluent increases.
d. For all percentages considered that 7 days , 28 days average compressive strength fall down with raw textle effluent percentage beyond 32%.
e. The behavior of acid attack on concrete cubes made was less compare to the potable water.
f. Further research is needed because there is a strong need to manufacture concrete in a more sustainable manner. Some of the possible outcomes and contributions of this research are to minimize the need for the use of potable water eliminate the need to expand potable water supply for use in the concrete

industry minimize the need to construct more water treatment facilities due to population growth save potable water for drinking purposes.

g. Other researchers around the world have been investigating the use of reclaimed water in concrete. However, not many have studied the use of textile effluent water in concrete. This research topic is also a challenge in terms of public health, when human contact with sewage treatment water is considered.

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