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RESEARCH ARTICLE OPEN ACCESS

Comparative Study of Strength in Concrete Using Potable Water and Waste Water

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ABSTRACT
In construction industry there is no substitution for concrete and concrete needs potable water. Concrete is 2nd industry to consume more water. In concrete industry, approximately 150 Lt of water is required per cubic meter of concrete mixture. The mixing, water which is fit for drinking purpose is use, but about 97 percent of water is held in the oceans, while only 3% is fresh water. So, the waste water can be used in the construction industry where the large amount of water is used and the freshwater is used for drinking purposes.
Waste water collected from car wash center is used as 100 percent substitution while making concrete. Cubes are supposed to be tested against compression, tensile and water absorption test on 7, 14 and 28 days by curing it with water. Three concrete cubes are supposed to be tested during each and every test. So,24 cubes are prepared by using waste water substitution which are willing to be compared with 6 cubes which are prepared by using potable water.

Keywords - Potable water, Construction industry, Waste water, Compression test, tensile test.

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I. INTRODUCTION

Water scarcity is an ongoing water crisis and it is affecting nearly 1 million people each year. The way water scarcity affects huge rural and urban population, it also affects the ecosystem and agriculture too. Large amount of water is needed in construction industry for various purposes. In the beginning, water is needed to mix cement, sand and other raw ingredients that are needed in the concrete mix. Wastewater is generated after use of fresh water in a variety of applications, and usually involves leaching, flushing, or washing away waste products and nutrients added to the water during this application. Waste water reuse reclaims water from a variety of sources then treats and reuses it for beneficial purposes such as agriculture irrigation, & Construction purpose. Water reuse can provide alternatives to existing water supplies and be used to enhance water security, sustainability, and resilience.

Generally, car wash stations are common in India. Therefore, car wash wastewater can be easily collected. Wastewater is normally generated by the process of washing private or public vehicles. However, not much attention is being paid on reusing wastewater from the car wash Centre

The present scope of the project is to minimize the use of potable water used for making concrete and to use waste water as an alternative source in proportion to the conventional method, and to check the strength characteristics of cement concrete.

II. MATERIALS AND METHODOLOGY

2.1 MATERIALS

2.1.1 CEMENT

Cement is very important building material among other in construction industry. A cement is a binder material which is used in concrete to bind other materials together. It has an ability to hold the structure together Cement has different grades. Grade of Cement shows strength of cement. Three grades of cement in which cement gets available are 33, 43 and 53. In our project we used 33 grade of ordinary Portland cement.

2.1.2 AGGREGATE

The term concrete aggregate covers coarse as well as fine grade. Coarse aggregates have size greater than 4.75 mm. Fine aggregates are any material which can pass through a 4.75mm sieve. Aggregates make up 60% to 80% of volume of concrete and 70% to 85% of mass of concrete.

Aggregate is very important constituent for strength, thermal and elastic properties of concrete. For this experiment, Coarse Aggregates of maximum size 20 mm and fine aggregates of zone II are used. The fine aggregate assists in producing workability and uniformly in mixture. It assists the cement paste to hard the coarse aggregate particles. Fine aggregates reduce the shrinkage of binding material.

2.1.3 WATER

Water is one of the most important elements in construction but people still ignore quality aspect of this element. The quality and quantity of water has much effect on the strength of mortar and cement concrete in construction work. Potable and car wash waste water is used for this experiment.

2.2 METHEDOLOGY

2.2.1 TESTS ON WASTE WATER

1. pH TEST

Determination of pH using Universal Indicator Solution

Take a small quantity of the given sample in a test tube using a dropper. Using a dropper pour a few drops of the universal indicator solution into the test tube containing the sample. Shake the test tube well and note the colour developed in the test tube. Now compare the colour produced in the test tube with the different colour shades of the standard colour pH chart and note down the pH value. Similarly, find the pH of the remaining samples.

2. HARDNESS TEST

The burette is filled with standard EDTA solution to the zero level. Take 50ml sample water in flask. If sample having high Calcium content, then take smaller volume and dilute to 50ml.

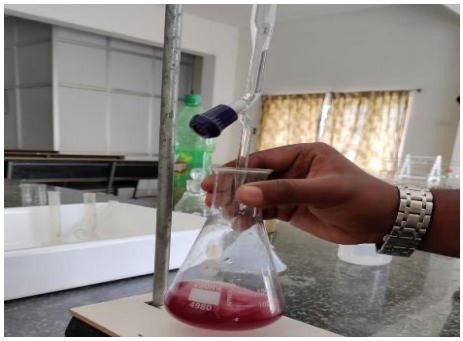

Fig.1 hardness test

Add 1ml Ammonia buffer Add 5 to 6 drop of Erichrome black – T indicator. The solution turns into wine red colour. Note the initial reading Titrate the content against EDTA solution. At the end point colour changes from wine red to blue colour. Note the final reading and record it. Repeat the process till we get concordant value. Take 50ml sample in another flask and boiled it. (Add distilled water to get final volume of water.) Repeat step 3-7.

3. BOD TEST

Collect the water sample from a pond. Carefully fill a BOD bottle with sample water without making air bubbles. Add 2ml of manganese sulphate to the BOD bottle carefully by inserting the pipette just below the surface of water. So that you can avoid the formation of air bubbles. Add 2 ml of alkali-iodide-azide reagent in the same manner. Close the bottle and mix the sample by inverting many times. A brownish cloud will appear in the solution as an indicator of the presence of Oxygen.

Fig .2 BOD test

Allow the brown precipitate to settle out to the bottom. Add 2ml of Conc.H2SO4 carefully without forming air bubbles. Close the bottle and mix the solution well to dissolve the precipitate. Keep the bottle in BOD incubator for 5days of incubation. After incubation, titrate 50 ml of sample water with 0.025N Sodium thiosulphate to a pale-yellow colour. Then add 2ml of starch solution. So, the sample turns blue in colour. Continue the titration till the sample gets clear and note the readings.

2.2.2 COMPRESSION TEST

Fig. 3 prepared moulds

The compression testing machine used for testing the cube specimens is of standard make. After the required period of curing, the cube specimens are removed from the curing tubs and cleaned to wipe off the surface water. It is placed on the machine such that the load is applied centrally. The smooth surfaces of the specimen are placed on the bearing surfaces. The top plate is bought in contact with the specimen by rotating the handle. The oil pressure valve is closed and the machine is switched on. A uniform rate of loading 140 kg/sq.cm/min is maintained. Tabulate Compressive strength for each cube and calculate average value for each mix.

Fig.4 compression test

2.2.3. TENSILE TEST

Tensile testing machine, two packing strips of plywood 30 cm long and 12 mm wide, mould, tamping bar (steel bar of 16 mm diameter, 60 cm long), trowel, glass or metal plate. After curing, wipe out water from the surface of specimen Using a marker, draw diametrical lines on the two ends of the specimen to verify that they are on the same axial place. Measure the dimensions of the specimen. Keep the plywood strip on the lower plate and place the specimen. Align the specimen so that the lines marked on the ends are vertical and cantered over the bottom plate.

Fig.5 Tensile test

III. RESULTS

3.1 COMPRESSION TEST RESULTS

Water ratio in %		mould		
Potable water	**Car wash waste water**	**7**	**14**	**28**
100	0	13	18	22.3
75	25	12.3	17.1	21.8
50	50	12.14	16.8	21.2
25	75	11.6	16.3	20.9
0	100	11.1	15.9	20.4

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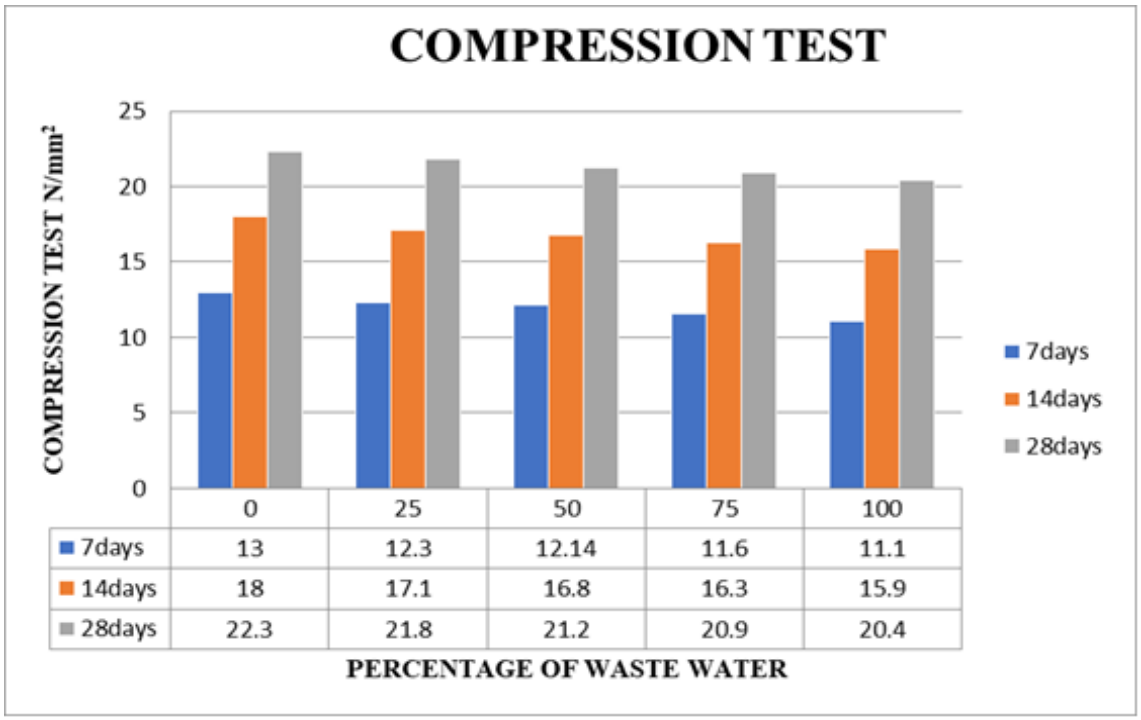
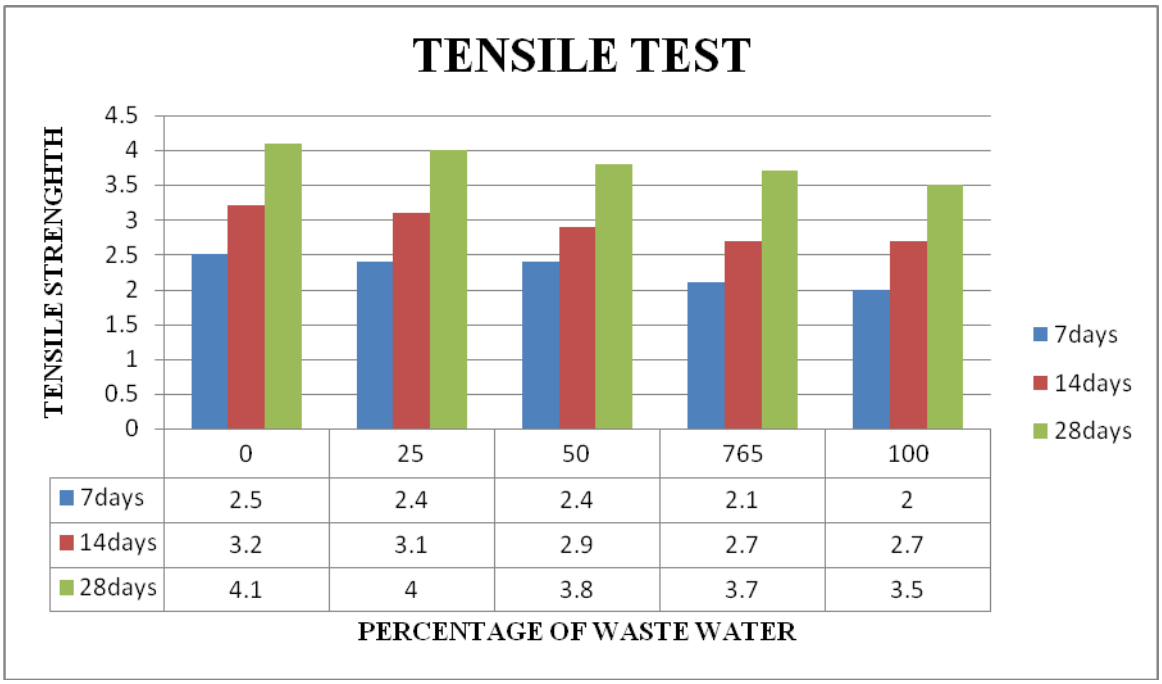


3.2 TENSILE STRENGHTH RESULTS

Water ratio in %		Mould		
Potable water	**Car wash waste water**	**7**	**14**	**28**
100	0	2.5	3.2	4.1
75	25	2.4	3.1	4
50	50	2.4	2.9	3.8
25	75	2.1	2.7	3.7
0	100	2	2.7	3.5



IV. CONCLUSION

This is the conclusion pf regarding the effect of waste water usage on the strength of concrete. The high concentration of some substances could raise concern above the potential for corrosion surface & attack in reinforced concrete structure & the curing period is increases the compressive strength of the concrete & also increased the inspective of the waste water % used.

There was no significant difference in the Compressive & Tensile Strength of concrete among different mixes after 28 days of curing. All concrete mixture with waste water replacement showed similar results.

It concluded from this study that the use of waste water produced from car wash has negligible effect on the strength of concrete.

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