International Journal of Research Publication and Reviews, Vol 5, no 5, pp 5040-5043 May 2024

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Research Paper of Analysis of Static Behavior of Rubberized Concrete.

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ABSTRACT:

The construction industry is one of the major industries in the world and concrete is an important part of the construction industry. Tire waste is a major threat to the environment and dumping in landfills can lead to various problems such as fire, breeding ground, land waste, etc. Therefore, if tire waste can be used in the construction industry, it will help reduce pollution. This can help reduce construction costs. For M60 grades of concrete, rubber fibers is added in different percentages [0%, 5%, 10%, 15%, 20%] of fine aggregates. Features like, Compressive Strength was found and compare with control mix of M60 concrete.

1. Introduction

Hazardous waste is generated and accumulated in large quantities nowadays. Tyre rubber is one of the wastes which is continuously increasing all over the world. It is difficult for municipal authorities to store and dispose the waste tyres generated from vehicles. In many countries municipal authorities have banned dumping of waste tyres into the landfills due to its non-decaying nature as it causes serious environmental problems. Over last two decades it has been seen that there is an exponential rise in number of motor vehicles. According to the report of World Health Organization 53% of motorized vehicles are in middle-income countries and only 46% are in high income countries. The tire industry is the largest consumer of natural rubber and is estimated to be currently consuming of about 12 billion tones [WHO 2015] or two-thirds of the world's production of natural rubber in the financial year of 2016-17[Tinna Rubbers 2017].About 1.5 billion of waste tire rubber is generated globally and 40% of them in emerging markets such as China, India, South Africa, South Asia, South America and Europe. In India around 0.6 million tons of scrap tire is generated annually. Annually 285 million scrap tires are added to stockpiles, landfills or illegal dumps across the United States. The United States of America is been the largest producers of waste tyre globally, an estimate of about 290 million a year.

2. Methodology:

(1) First collection of material will be done.

(2) Then properties of materials will be studied so that appropriate proportion is taken.

(3) Calculation of mix design will be done for M60 grade.

(4) Two types of treatment will be given to rubber-

(a) NaOH treatment to rubber and mix with silica fume.

(b) HCL treatment to rubber.

(5) Casting of concrete cubes will be done and curing of cubes will be done after that.

(6) Mechanical properties will be found out.

(7) At last results will be compared with conventional concrete.

Probable Solution:

River sand is the universally accepted constituent of concrete as a fine aggregate, but almost every part of world is facing the acute shortage of sand as it is the natural resource. Along with this the cost for fine aggregate is also increasing every day which directly affects the cost of construction. Extraction of sand from river beds also affects the environment and the aquatic life of that specific river. In concern to problem of availability of fine aggregate, concrete industry is in need to invent an alternative in partial or as complete replacement of sand. On the other hand, the disposal/ landfilling of End-of-

Life Tyres [ELT] is also a major problem for developed and developing countries. Utilization of rubber as partial replacement of fine/ coarse aggregate can be the viable solution for both the above-mentioned problems. Previous experimental work was carried out on rubber fibers treated with NaOH for mini project. Now, the rubber fiber is used as partial replacement of fine aggregate with pre-treatment of rubber fibers by NaOH and HCL separately.

3. Experimental Details:

1. Fineness Test on cement:

Cement hydrates when cement is mixed with the water and a thin layer are formed around the particle. This thin layer grows bigger and makes cement particles to separate. Because of this, the cement hydration process slows down. On other hands, cement smaller particle react much quicker than the larger particle. A cement particle with diameter 1μm will react entirely in 1 day, whereas the particle with diameter 10μm takes about 1 month but, there is a side effect of having too much of smaller particles in cement results in quick setting, leaving no time for mixing, handling and placing, therefore to increase the setting time of cement, cement is must be manufactured in a different range of particle sizes.

2. Consistency Test and Initial setting time Test on cement :

To know the quantity of water required to form uniform paste. If it's exceeds means bleeding will happen, less quantity means, dry mix will happen.

3. Soundness Test on cement:

The test is designed to accelerate the expansion in cement paste by application of heat expansion beyond certain limit indicates unsound cement. It is performed to ascertain the soundness or unsoundness of cement, which affect's durability of the structure in which cement is used.

4. Flakiness Index Test o coarse aggregates:

Particle shape and surface texture influence the properties of freshly mixed concrete more than the properties of hardened concrete. Rough-textured, angular, and elongated particles require more water to produce workable concrete than smooth, rounded compact aggregate. Consequently, the cement content must also be increased to maintain the water-cement ratio. Generally, flat and elongated particles are avoided or are limited to about 15 % by weight of the total aggregate.

5. Crushing strength of coarse aggregate:

The strength of coarse aggregates is assessed by aggregates crushing test. The aggregate crushing value provides a relative measure of resistance to crushing under a gradually applied compressive load. To achieve a high quality of pavement, aggregate possessing low aggregate crushing value should be preferred.

6. Abrasion Test on Aggregate:

Abrasion Test is the measure of aggregate toughness and abrasion resistance such as crushing, degradation and disintegration.

7. Impact Test on coarse aggregates:

Determine the relative measure of the resistance of aggregate to sudden shock or impact in which in some aggregate differs from its resistance to a slowly applies compressive load.

8. Water absorption Test on coarse aggregates:

Water absorption gives an idea on the internal structure of aggregate. Aggregates having more absorption are more porous in nature and are generally considered unsuitable, unless found to be acceptable based on strength, impact and hardness tests.

9. Specific gravity on coarse aggregates:

Specific Gravity of an aggregate and rubber is considered as a measure of the quantity of strength of the material Stones having less specific gravity values generally are weaker than those having higher values. This test helps in identifying the stone specimen.

10. Specific gravity test on fine aggregates:

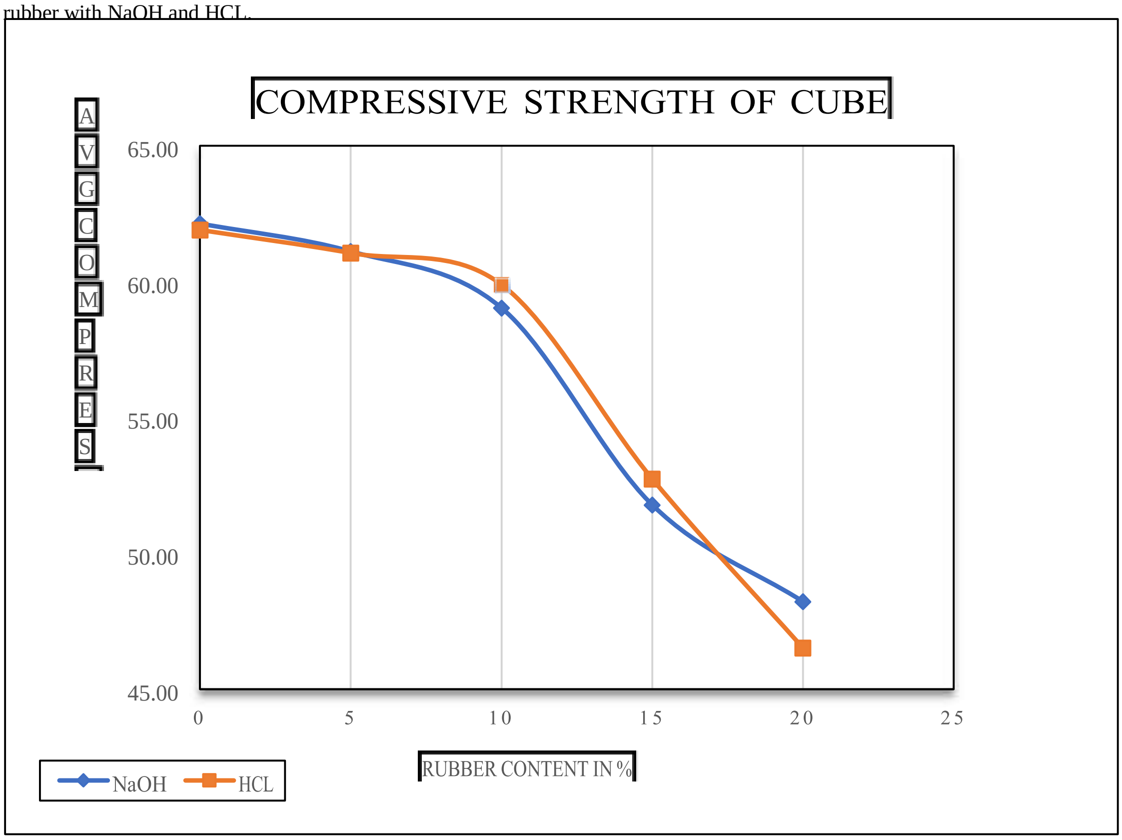
Specific Gravity of an aggregate and rubber is considered as a measure of the quantity of strength of the material Stones having less specific gravity values generally are weaker than those having higher values. This test helps in identifying the stone specimen.

11. Specific gravity test on rubber:

Specific Gravity of an aggregate and rubber is considered as a measure of the quantity of strength of the material Stones having less specific gravity values generally are weaker than those having higher values. This test helps in identifying the stone specimen.

3. RESULTS:

- Comparison of values of compressive strength for cube specimens at 28 days for various % replacement of sand with rubber after treating rubber with NaOH and HCL.



- From Graph it is seen that , the maximum value of Compressive Strength is obtained at 0 % replacement for NaOH & HCL Pretreated Rubberized Concrete.
- The value of Compressive Strength for NaOH Pretreated Rubberized Concrete is slightly higher than HCL Pretreated Rubberized Concrete at 0 % replacement.
- Comparison of values of compressive strength for cube specimens at 28 days for various % replacement of sand with rubber without treating.

Replacement	**No of Sample**	**Load Applied (KN)**	**Area of Cube (mm)²**	**Compressive Strength (MPA)**	**Avg Compressive Strength (MPA)**
0%	3	1398	22500	58.09	57.91
		1400	22500	58.00	
		1380	22500	57.65	
5%	3	1386	22500	51.50	51.64
		1370	22500	51.44	
		1365	22500	52.00	
10%	3	1352	22500	50.22	49.72
		1350	22500	49.95	
		1340	22500	49.00	
15%	3	1170	22500	46.24	46.58

		1180	22500	46.50	
		1210	22500	47.00	
20%	3	1040	22500	43.34	44.24
		1035	22500	44.50	
		1065	22500	44.90	

4. CONCLUSION

- The workability of the concrete decreases with the addition of rubber fibres.
- The result obtained from pre-treatment of rubber fibres with NaOH Solution & HCL Solution gives approximately same values.
- The value of compressive strength for 10% replacement of HCL pretreated rubberized concrete was slightly higher than that of NaOH pretreated rubberized concrete.
- Compressive strength of concrete with the addition of rubber fibres up to 5% to 10% gives equivalent strength as compare to conventional concrete while further addition will decrease the strength.

Acknowledgement

We would like to express our sincere gratitude to all those who have supported us throughout the process of analysing the static behaviour of rubberized concrete.

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