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Experimental Study on Compressive Strength Polypropylene Fiber High Strength Concrete

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ABSTRACT: The Requirements of the countries are rapidly increasing and with it, there is an increase in the growth of industries and housing. Construction is the backbone of all industries and concrete has emerged as one of the most important materials in the construction industry. The most commonly used fine aggregate is river sand. Due to Polypropylene fiber and high quality additives like high range of water reducer are used for the production of high strength of concrete. the rapid increase in the consumption of concrete the demand for sand is also increasing in countries where infrastructure growth is high. In some parts of the world, there is a shortage of natural sand because there is a restriction imposed on mining of sand from rivers due to environmental problems this cause an adverse effect on the construction industry. Now in the era of scientific experiments, there is much research going on using the environmental wastes as the replacement of the materials in concrete. Polypropylene fiber can be used as an alternate material for increasing the strength of concrete.

KEYWORDS: M60 Grate of concrete Slum test, Compressive strength test , 24 cubes 7days and 28days 0%,5%,10%,15% coarse aggregate to polypropylene fiber replacement.

I. INTRODUCTION

Concrete is the most widely used construction material with the ever increasing industrialization and urbanization huge amount of natural resources are required to make concrete. It is the mixture of the cement, sand, water and aggregate. The hardening of concrete is caused by chemical action between the water and cement and continues for long time period. It is the quality that makes the concrete different from other binding materials. High strength of concrete has the characteristics strength is Grate of Concrete M60 N/mm2 high strength of concrete also having higher resistance capacity against chloride and abrasion of

[1]. Polypropylene fiber is the most recent supplementary cementations materials to be commercially introduced to the concrete construction Industry. Unlike other supplementary cementations materials, Polypropylene fiber is not an industrial by product; it is produced by High purity kaolin clay at temperatures of 700 to 800°C. It has been shown that the inclusion of Polypropylene fiber could improve the properties and durability performance of concrete. Polypropylene fiber is the very reactive clay and it has focused on many of investigations. High reactivity Polypropylene fiber is recently developed material for achieving the high strength of concrete.

[2].This research reports the experimental investigation, capturing the effect of engineered fiber on fresh and mechanical properties of M50 grade concrete blended with poly-vinyl chloride (PVC) waste powder with one mineral admixture and one chemical admixture as super plasticizer. The experimental investigation fourteen mixes (seven mixes with fibers and seven mixes without fibers) are prepared using ground granulated blast furnace slag (GGBS) mineral Admixture and PVC waste powder. In these mixes PVC waste powder content is varied in 0% (treated as reference mix), 5%, 10%, 15%, 20%, 25% and 30% by weight of cement whereas, 30% of GGBS is kept constant except reference mix. 0.6% of sulphonaphtha lene formaldehyde (SNF) as super plasticizer, by weight of cement are kept constant in all the mixes. Similarly, to study the effect of fiber on fresh and mechanical properties of concrete, 0.5% of engineered fiber are used along with 0.6% of super plasticizer.

[3].Polypropylene fiber is the very reactive clay and it has focused on many of investigations. High reactivity Polypropylene fiber is recently

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developed material for achieving the high strength of concrete. It simply converts the material to PP phase, which is an amorphous alum silicate Polypropylene fiber has been refined carefully such that to remove its impurities, its particle size Controlled and lightened color like the other industrial is product like Silica fume that blast furnace slag and fly ash.

[4]. Polypropylene fiber can be used as an alternate material for increasing`g the strength of concrete. The physical and chemical properties of Polypropylene fiber make it suitable to substitute for fine aggregates because of the amount of calcium carbonate present they are considered a good option. The Polypropylene fiber benefits the construction industry and the waste industry at the same time. Today's construction industry requires making a better quality of concrete with less cost and higher strength than normal concrete.

[5].Concrete is the most widely used construction material, because of the several well-known advantages it offers, such as low cost, general availability, and wide applicability. However, concrete is a quasi-brittle material and its Brittleness increases with its strength. Relatively low tensile strength and poor resistance to crack is opening and propagation are the main disadvantages of conventional concrete. The development of modern civil engineering construction has generated an essential demand for new types of concretes which should possess improved quality and strenth such as high-strength, toughness, and durability.

II. MATHODOLOGY

The experiments are` performed by Yang et.al, after replacing saturated surface dry sand (SSD) with dry Polypropylene fiber. The fine aggregates are replaced by Polypropylene fiber and the substitution rate are 10% and 20%. The tests are performed at an interval of 7 days, 14 days,28 days, 2 months, 3 months, 6 months, and 1 year. . Long term mechanical and durability of Polypropylene fiber concrete are evaluated. It was found at a substitution rate of 10% of Polypropylene fiber in concrete the compressive strength goes on increasing as the curing period increases but in the case of elastic modulus, the value increases till it reaches 6 months of curing period after that it decreases gradually. In the case when the substitution rate is 20% then the compressive strength increases with the curing period but the elastic modulus increases till 6 months then it starts decreasing. In the other half of the paper, tests are done to find the durability of concrete, Tests are done to find the drying shrinkage value for 8 months and substitution rates of 10% and 20%. It is seen that at 10% replacement the drying shrinkage increases by 7% and at 20% replacement the drying shrinkage increases by 28%. The increase in drying shrinkage after the addition of Polypropylene fiber is because of its properties such as low rigidity of Polypropylene fiber and effects of the size of fine powder of Polypropylene fiber. To find the effects of Polypropylene fiber on concrete the carbonation tests are performed and it has been seen that with the increase in substitution rate the carbonation depth also increases. Chemical tests are done to find good packing properties, consistency, and gradation of aggregates and it is seen that the usage of cement to obtain the desired compressive strength is reduced to 25% To check that when you add the Polypropylene fiber in concrete it affects the packing properties

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III. EXPERIMENTATION

The capability of durable is structure to resist weathering action and chemical attack. The abrasion and other degradation processes during its service life. The minimal maintenance is equally important the capacity of a structure to resist the loads applied on it. It is concrete offers many advantages regarding mechanical characteristics and economic aspects of the construction, the brittle behavior of the material remains a larger handicap for the seismic and other applications where flexible behavior is essentially required. The however development of polypropylene fiber reinforced concrete (PFRC) has provided a technical basis for improving these deficiencies. This paper presents an overview of the effect of polypropylene fiber on various properties of concrete in fresh and hardened state such as compressive strength and tensile strength, workability, bond strength, fracture properties, creep strain, impact and chloride penetration. The role of fiber in crack prevention has also been discussed.

CUBE TEST

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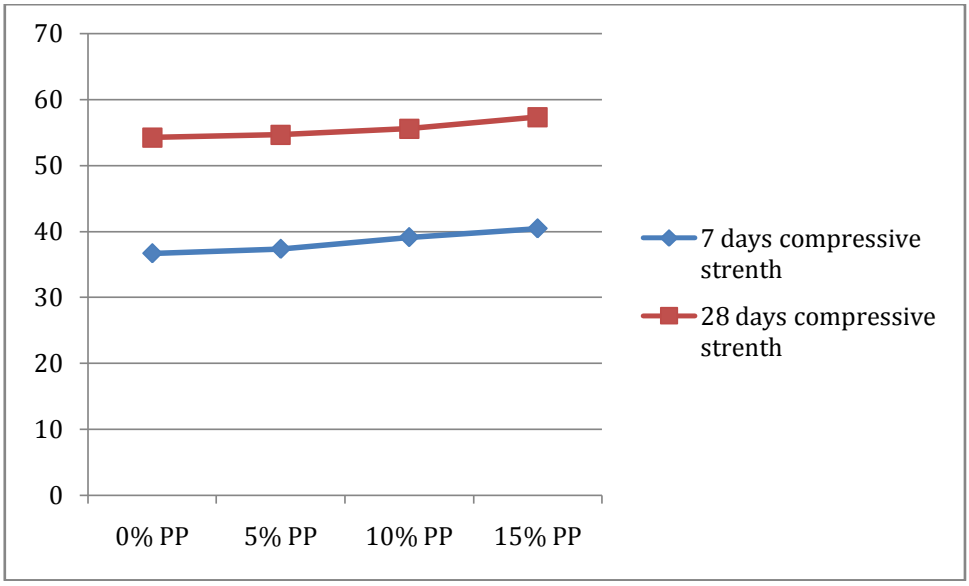
IV. OBESERVATIONS FROM THE TESTS CONDUCTED SOLENOID FORCE

The Polypropylene fiber benefits the construction industry and the waste industry at the same time. Today's construction industry requires making a better quality of concrete with less cost and higher strength After 7 days Result than normal concrete. The main aim of this research is to develop high-performance concrete and find the compressive strength, and workability of Polypropylene fiber concrete. Concrete mixes of M60 grades are prepared with substitution of 5%, 10% and 15% of Polypropylen

7 DAYS	Cube-1	Cube-2	Cube-3	Average	Unit
PP %					
O%	35.7	36.9	38.12	36.9	N/mm^2
5%	36.8	37.12	39.2	37.06	N/mm^2
10%	37.5	38.5	39.5	38.33	N/mm^2
15%	40.4	39.9	42.2	40.83	N/mm^2

After 28 days Result

28 DAYS	Cube-1	Cube-2	Cube-3	Average	Unit
PP %					
O%	55.2	54.6	53.2	54.33	N/mm^2
5%	57.9	54.20	56.4	56.16	N/mm^2
10%	57..2	56.7	57.42	57.1	N/mm^2
15%	59.2	59.5	57.4	58.48	N/mm^2



GRAPH

V. CONCLUSION

The quantities required to replace coarse aggregates are evaluated by designing for 1 m3 and then multiplying with the size in which the cubes and beams are cast. The experiment is performed by replacing coarse aggregates with Polypropylene fiber by 5%,10% to 15% of the weight of aggregates.

In this chapter, the coarse aggregate is replaced with Polypropylene fiber and the tests are done and the results are evaluated. As per the results it can be ssen that the Compessive strength increases between 5% 10% and 15% . M60 Grate of Conccrete.

REFERENCES

[1] OA Ubachukwu and FO Okafor. Towards green concrete: Response of Polypropylene fiber powder-cement concrete to splitting tensile load. Nigerian Journal of Technology, 39 (2):363–368, 2020.

[2] CHEN Hai-Yan, Leo Gu Li, Zhen-Min Lai, Albert Kwok Hung KWAN, Pi-Mao Chen, and Pui Lam NG. Effects of crushed Polypropylene fiber on strength and durability of marine concrete containing fly ash and blastfurnace slag. Materials Science, 25(1):97–107, 2019.

[3] K Aye, K Kenye, E Nainar, A Khing, and C Sangtam. Strengthening of concrete by using Polypropylene fiber and marble powder. International Journal of Recent Technology and Engineering, 8(4):8048–8052, 2019.

[4] Eun-Ik Yang, Seong-Tae Yi, and Young-Moon Leem. Effect of Polypropylene fiber substituted for fine aggregate on concrete characteristics: Part i. fundamental properties. Cement and Concrete Research, 35(11):2175–2182, 2005.

[5] Xinglu Cai, Ruiwen Liu, Junhao Fan, and Yingdi Liao. The effectiveness of waste Polypropylene fiber (wos) as major fine aggregate replacement in concrete. In E3S Web of Conferences, volume 261. EDP Sciences, 2021.

[6] Eun-Ik Yang, Myung-Yu Kim, Hae-Geun Park, and Seong-Tae Yi. Effect of partial replacement of sand with dry Polypropylene fiber on the long-term performance of concrete. Construction and building materials, 24(5):758–765, 2010.

[7] Gil-Lim Yoon, Byung-Tak Kim, Baeck-Oon Kim, and Sang-Hun Han. Chemical–mechanical characteristics of crushed oyster-shell. Waste Management, 23(9):825–834, 2003.

[8] Seok-Hong Eo and Seong-Tae Yi. Effect of Polypropylene fiber as an aggregate replacement on the characteristics of concrete. Magazine of Concrete Research, 67(15):833–842, 2015.

[9] Hanis Nadiah Ruslan, Khairunisa Muthusamy, Sharifah Maszura Syed Mohsin, Rajan Jose, and Roslina Omar. Polypropylene fiber waste as a concrete ingredient: A review. Materials Today: Proceedings, 2021.

[10] Wen-Ten Kuo, Her-Yung Wang, Chun-Ya Shu, and De-Sin Su. Engineering properties of controlled low-strength materials containing waste Polypropylene fiber. Construction and Building Materials, 46:128–133, 2013.