

A Study on Waste Nylon Fiber in Concrete

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Abstract— Concrete is a resourceful material for civil engineering construction. It has many properties such as compressive strength, durability and fire resistance. Concrete is made up of aggregates, cement, water and various admixtures. This article is about the study of waste fishing nets. Normally fish nets (made up of plastics) are adding 1%, 2%, 3%, 4% and 5% in concrete and compared the fibre concrete with the conventional concrete with the mechanical properties. By using the fibre in concrete as 10 mm length and the diameter is to fix as per the aspect ratio. This has been done in order to reduce the disposal of plastics and for effective utilization of waste plastics that are hazardous to environment. This study attempts to give a contribution to the effective use of domestic wastes (plastics) in concrete as fibres in order to prevent the environmental strains caused by them, also to limit the consumption of natural resources.

Keywords— Waste fish nets, Fiber concrete, Mechanical Properties, Aspect Ratio, Compressive Strength.

I. INTRODUCTION

Protection of the sea environment is one of the most serious issues of this time. In order to know the causes of environmental degradation such as pollution, overbuilding of the coast, unconscionable fishing and coastal erosion. While in the past fishing nets were made of biodegradable natural materials such as cotton and linen, nowadays the nets are typically made of plastic. Normally fishing net in plastics are generally not biodegradable, and therefore it is extremely important to enhance their reusing in order to dispose of wastes, lower the cost of the resulting products, reduce energy consumption and emissions of CO₂ into the atmosphere. Polypropylene (PP) and polyamide (PA) fibers have been effectively used in cementitious Constituents to control shrinkage cracking, to develop material toughness and impact resistance etc. and such plastic fibers might guarantee better mechanical performance than recycled plastics, but inevitably require larger energy consumption and CO₂ emissions. Among recycled plastics, the reinforcement of cementitious materials through recycled polyethylene terephthalate (R-PET) fibers has received particular attention in the technical literature. Several authors have shown that R-PET fibers can conveniently replace virgin plastic fibers in eco-friendly concretes, providing good mechanical and chemical strengths to the final material. It should be noted, however, that the use of recycled materials in cementitious mortars remains only very partially investigated. The same holds with respect to the use of nylon fibers as mortar reinforcements. The preparation of nylon fiber concrete and the identification of its thermo-mechanical properties, such as compressive and tensile

strengths, toughness, specific heat capacity, thermal conductivity, thermal expansion, and hygrometric shrinkage. Thenylon fibers have more ductile and tougher behavior than the unreinforced material, and suffer minor drying shrinkage. Such advantages are however balanced by slight reductions of the tensile strength, maximum load bearing capacity, and modulus of elasticity.

II. MATERIAL INVESTIGATION

a. Nylon Fiber

A fishing net is a net used for fishing. Nets are devices made from fibers woven in a grid-like structure. Some fishing nets are also called fish traps, for example fyke nets. Fishing nets are usually meshes formed by knotting a relatively thin thread. Early nets were woven from grasses, flaxes and other fibrous plant material. Later cotton was used. Modern nets are usually made of artificial polyamides like nylon, although nets of organic polyamides such as wool or silk thread were common until recently and are still used.

b. Cement

Cement is a binder, a substance used for construction that sets, hardens and adheres to other material to bind them together. Cement is one of the main constituent in concrete. Table I shows that the physical properties of cement as per IS 4031

Table I

PHYSICAL PROPERTIES OF CEMENT

Sl. No	Description	Quantity
1	Specific gravity	3.15
2	Standard Consistency (%)	31
3	Initial Setting Time (minutes)	50
4	Final Setting Time (minutes)	330

c. Fine Aggregate

The aggregate which is passing 4.75 mm sieve is called fine aggregate. Table II shows that the physical properties of Fine aggregate as per IS 2386

Table II
Physical Properties of Fine aggregate

Sl. No	Description	Quantity
1	Specific gravity	2.6
2	Water Absorption (%)	1.5
3	Fineness modulus	2.9
4	Zone	II

d. Coarse Aggregate

The aggregate which is retained 4.75 mm sieve is called coarse aggregate. Table III shows that the physical properties of coarse aggregate as per IS 2386

Table III
Physical Properties of Coarse aggregate

Sl. No	Description	Quantity
1	Specific gravity	2.7
2	Water Absorption (%)	1.2
3	Fineness modulus	5.2

e. Waste Nylon Fibers

Waste nylon fibers which is mainly made up of plastics. Usage of nylon fibers in concrete by 10 mm length and the aspect ratio of about 52.6. Table IV shows the physical properties of nylon fibers.

Table IV
Physical Properties of nylon fibers

Sl. No	Description	Quantity
1	Density (g/cm ³)	1.14
2	Diameter (mm)	0.19

f. Super plasticizer

Admixtures play a vital role in concrete especially super plasticizer is the high range water reducer by the range of 29% in water. Here we are using supaflo as a chemical admixture. Which have specific gravity of about 1.145.

III. CONCLUSION

- By utilizing the waste nylon fiber in concrete it protects the environment with respect to plastics
- By adding waste Nylon Fiber in concrete, it will increase the ductile behavior of concrete. So that tensile strength will increase.
- The compressive strength, split tensile strength, flexural strength of concrete will increase by percentage of nylon fiber i.e. (1%, 2%, 3%.etc.)

- Waste nylon fiber is also used in the bitumen road for better abrasion.

REFERENCES

- [1]. Akaram Ali, Aleem Aijaz, Mohammad Arsalan "A Study On Nylon Fiber Reinforced Concrete By Partial Replacement Of Cement With Metakaolin : A Literature Review" *International Research Journal of Engineering and Technology (IRJET)*, Volume: 05 Issue: 03 | Mar-2018
- [2]. Arjun R Kurup, Dr. Senthil Kumar K "Behaviour of Concrete with E-Waste Fibers under Compression", *International Conference on ACESC 2016*, 197-199.
- [3]. Baboo Rai, S. Tabin Rushad, Bhavesh Kr and S. K. Duggal "Study of Waste Plastic Mix Concrete with Plasticizer", *International Scholarly Research Network*, Volume 2012, Article ID 469272, 5 pages
- [4]. Tirthankar Banerjee, Rajeev Kumar Srivastava, Yung-Tse Hung, "Plastics waste Management in India: An Integrated Solid waste Management Approach", *Handbook of Environmental and Waste Management Vol. 2*.
- [5]. Ananthi, A. Jay Tamil Eniyan, S. Venkatesh "Utilization of Waste Plastics as a Fiber in Concrete", *International Journal of Concrete Technology*, Vol. 3: Issue 1
- [6]. Rai, S. Tabin Rushad, B. Kr, S.K. Duggal. "Study of waste plastic mix concrete with plasticizer", 2012; Article ID 469272.
- [7]. Kandasamy. R, R. Murugesan "Fibre reinforced concrete using waste plastics and steel fibres", 2011; 6(3).
- [8]. Khileshsarwe "Study of strength property of concrete using waste plastics and steel fibre" 2014; 3(5).
- [9]. Nibudey. R.N, P.B. Nagarnaik, D.K. Parbat, A.M. Pande "Cube and cylinder compressive strengths of waste plastic fibre reinforced concrete", 2013; 4(2).
- [10]. Raghatate Atul. M "Use of plastic in a concrete to improve its properties", EISSN2249-8974.
- [11]. Katte. V, A. Gangrude, A. Pawar "Green concrete using plastic waste", 2015; 19(04).
- [12]. Ghernouti. Y, B. Rabehi, B. Safi, R. Chaid "Use of recycled plastic bag waste in the concrete", 2014; 08.