

PERFORMANCE EVALUATION OF TEXTILE REINFORCED CONCRETE

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Abstract - Advancement in technology enhance not only human comfort but also damage the environment. Presently the construction industry is in need to finding economical effective materials for improving the strength of concrete. Hence an attempt has been made in the present investigation to study the influence of addition waste materials. In this research work, Textile industrial waste polyester fiber material at a proportion of 0%, 0.25%, 0.50%, 0.75% and 1% by weight of cement will use. Evaluated and comparison of compressive strength, flexural strength and split tensile strength of concrete using M20 mix, water cement ratio 0.50 and test have been carried out as per recommended in relevant codes.

Key Words : Polyester fiber, workability, Compressive strength, Flexural strength, Split-Tensile strength.

1. INTRODUCTION

Textile-reinforced concrete(TRC) is a type of reinforced concrete in which the usual steel reinforcing bar replaced by textile material. TRC represents an interesting new construction material,additional advantage compare to steel or fiber reinforced concrete. this material is low weight and high bearing capacity. Uses of TRC material are extensively increasing in modern days in combination with materials science and technology. Bridge, Paver blocks, Pillars and Road guards are prepared by Kevlar or jute reinforced concretes to withstand vibrations, sudden.

1.1 Textile Fiber Classification

It can be defined as spun into a yarn or made into a fabric by various methods including weaving, knitting, braiding, twisting.

There are mainly two types : 1) Natural fiber 2) Manmade fiber . Natural fiber included those produced by plants , animals & geological process. they can be classified three groups. (i) Animal fiber; like wool, silk fiber , camel & Goat hair . (ii) Mineral fiber; like asbestos fiber . (iii) Vegetable fibre; like cotton & jute fiber.

Man-made fiber known as manufactures fiber. they can be classified two groups. (i) Manmade fiber; like Viscose rayon, Acetate rayon (ii) Synthetic fiber; like Nylon, Polyester,

Acrylic fiber. Synthetic fibers generally come from synthetic material such as petrochemicals.

1.2 Polyester Fiber(PF)

Polyester is a synthetic fiber. Polyester fiber looks like a smooth, glass rod similar to Nylon. The length, width and shape of the polyester fiber are controlled during manufactured to suit a specific end use. The dia. of PF is determined by (i) the rate of filament from the spinneret and (ii) The number of spinneret holes and therefore the number of filaments.



Fig -1: POLYESTER FIBRE

2. MATERIAL USED

2.1 Properties of polyester fiber

Polyester is a very important manmade fiber. Polyester is produced with a long chain synthetic polyester produced by melt spinning process.

Sr No.	Properties	Units	Polyester Fiber
1	Shape	-	Triangle
2	Color	-	White
3	Cut length	mm	5 to 20
4	Effective diameter	mm	0.08-0.1
5	Specific gravity		1.34 - 1.39

6	Water Absorption		2.84-5.69%
7	Melting point	Deg.c	250 – 265
8	Tensile strength	MPa	300-500
9	Alkaline strength		very good

Table -1: Properties of Polyester fiber



Fig -2: Mixing of concrete

2.2 Materials used

Ordinary Portland cement 53 grade was used for casting of all the specimens and clean dry river sand and natural aggregates will be used. The natural river sand passing through IS 4.75 mm sieve the specific gravity of fine aggregate is 2.638. Then natural coarse aggregate with specific gravity of 2.836 and passing through IS 20 mm sieve. Cubes of 150x150x150 mm and beam of 150x150x700 mm were cast, cured and tested for 7 days and 28 days.

3. MIX DESIGN

Table -2: Mix Proportion ratio

Water (liter/m ³)	Cement (kg/m ³)	Fine aggregate (kg/m ³)	Coarse aggregate (kg/m ³)
186.0 lit.	372	535	1342
0.50	1	1.44	3.61

4. EXPERIMENTAL INVESTIGATION

The mixing of concrete was done mixer machine is efficient and also economical. The process of mixing concrete describe below:

- In first step coarse aggregate and fine aggregate were added in the mixer drum and then the drum is rotated for 1 to 1.5 minutes.
- Ordinary Portland cement and Textile fibres mix of 5 to 20 mm added in to drum of mixer machine and then the drum is rotated for 1 to 1.5 minutes.
- Water is added into drum and then the rotation of drum is started and rotated for 3 to5 minutes.

5. EXPERIMENTAL RESULTS

5.1 Slump test result

Sr No.	PF in percentage (%)	slump
1	0	68
2	0.25	73
3	0.50	77
4	0.75	80
5	1	82

Table -3: Slump test result

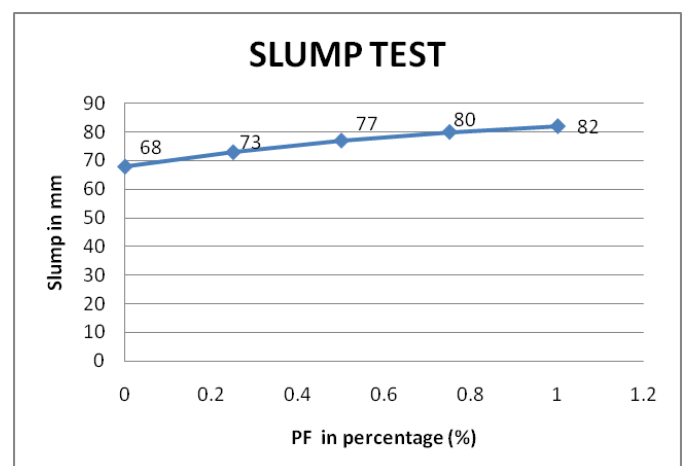


Chart -1: Slump Vs. % of PF

5.2 Compressive strength test result

Sr No.	PF(%)	Compressive strength (N/mm ²)	
		7 Days	28 Days
01	00%	14.64	26.50
02	0.25%	16.01	33.92
03	0.50%	16.41	34.35
04	0.75%	18.88	35.15
05	1%	17.13	34.69

Table -4: Compressive strength test result

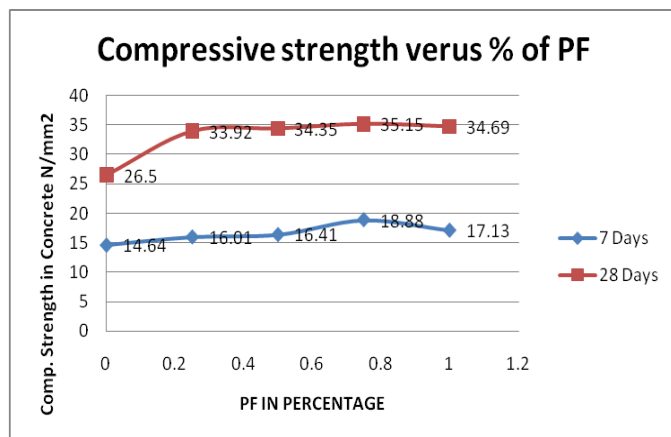


Chart -2: Compressive strength Vs. % of PF

5.3 Flexural strength test result

Sr No.	PF(%)	Compressive strength (N/mm ²)	
		7 Days	28 Days
01	00%	3.01	3.51
02	0.25%	3.42	4.66
03	0.50%	3.91	4.97
04	0.75%	4.98	5.703
05	1%	4.01	4.56

Table -5: Flexural strength test result

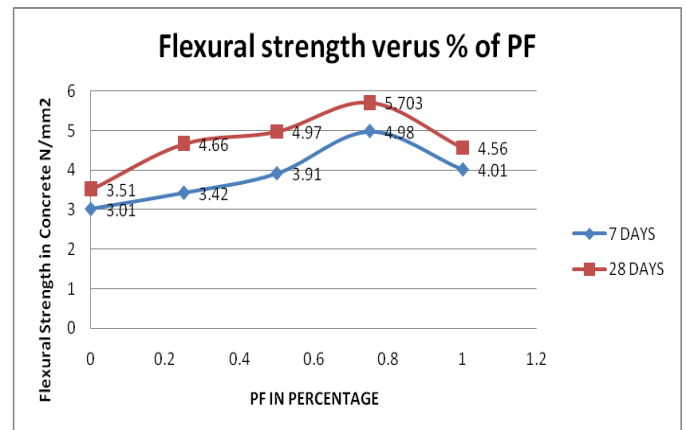


Chart -3: Flexural strength Vs. % of PF

5.4 Tensile strength test result

Sr No.	PF(%)	Tensile strength (N/mm ²)	
		7 Days	28 Days
01	00%	2.01	2.333
02	0.25%	2.42	2.7
03	0.50%	2.6	2.94
04	0.75%	2.88	3.28
05	1%	2.75	3.08

Table -6: Tensile strength test result

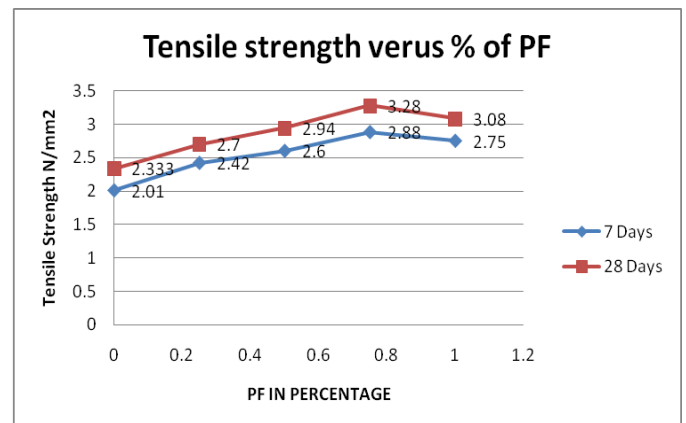


Chart -4: Tensile strength Vs. % of PF

6. CONCLUSIONS AND FUTURE WORK

Based on the Experimental Investigations, the following conclusion were drawn.

- (1) The percentage of addition of polyester fiber was increase 0% to 1% slump is increase from 4.84% to 25.81%.
- (2) The Compressive strength , flexural strength and tensile strength were increased proportionally with the increase in volume of ratio of Polyester fibers with reference to the controlled mix without fibers.

(3)The maximum increase in Compressive strength was 44%, Flexural strength was 40% and split tensile strength was 36% compare to the mix without fibers.

(4) The samples with fibers content of 0.75% showed optimum results in comparison with other samples in this study.

For the future work, the continuation of project research with the change Water cement ratio, change the proportion of polyester fiber and fix length of polyester fiber to find out the better optimum dosage and the effectiveness of concrete.

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