International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 04 | Apr 2020 www.irjet.net p-ISSN: 2395-0072

TO CHECK THE VARIATION IN PROPERTIES OF CONCRETE AFTER ADDITION OF RECYCLE PET FIBRE

Divyani Harpal[1] Vaibhav Pant[2] Apurva Powale[3] Tushar Khadgi[4] Prajakta Dhopekar[5] Yash Gharde[6]

[1]ASISTANT PROFESSOR DR. BABASAHEB AMBEDKAR COLLEGE OF ENGINEERING AND RESEARCH, NAGPUR.
[2-6]GRADUATE STUDENT DR. BABASAHEB AMBEDKAR COLLEGE OF ENGINEERING AND RESEARCH, NAGPUR .

ABSTRACT- *A PET fibre concrete is a mixture having the ingredient cement, sand, aggregate with PET Fibre. PET bottle waste was used because it is thrown after single use and cause environmental problem. And As we know that the fibre cannot be decomposed. One way to recycle wasted PET bottles are cut into desired shape. Then, it was added with the concrete and test the performance of the concrete. The study was conducted using square mould and beam mould of concrete to investigate the performance of the concrete in term of mechanical properties. A total off our batches of concrete were produced namely, normal concrete and concrete containing PET fibre of 0%, 0.3%, 0.5%, fraction volume. In this research, the mechanical properties that were measured are compressive strength, ultimate flexural strength splitting. The results give that the presence of PET fibre in concrete will increase the Concrete strength.*

Key Words: PET Fibres, workability, compressive strength, flexural strength, bond strength.

1. INTRODUCTION

Plastics consumption now days have become an integral part of our lives. The amounts of plastic consumed annually have been increasing day by day. There are several factors that contribute to the rapidly growth of plastics consumption such as low density, fabrication capabilities, long life, light weight, and low cost of production. Plastic has been used widely in packaging, medical delivery systems, artificial implants, water desalination, housing, and other uses. Extra ordinary applications of plastics in all part of daily activities increase the volume of plastic waste.

PET is one of the most significant and vital products which issued extremely in the domestic life, as per the estimates India produces around 500000 tons of PET waste per year. The concrete has a unique property that it is good at compression and at the same time weak intension. The limitation is the limitation is circumvented by using the steel reinforcement in the concrete which allow the concrete to tolerate the tensile forces and prevents cracking due to load as well as contraction and expansion. Fibres can be effective in arresting cracks.

1.1 PET FIBRE CONCRETE

PET fibre is a thermoplastic polymer resin of the polyester. It is mostly used in synthetic fibre, like bottles and food container. Essentially, it is most useful raw material in manmade fibre. PET fibre concrete is a concrete which containing fibrous material which is increase its strength. It contains fibres of various types of fibres, glass fibres PET fibres, synthetic fibres and natural fibre. Each of these fibres has varying properties to the concrete.

The concept of use of fibres in concrete is not new. Fibres have been used since ancient times. Historically horse hair was used in concrete. In 1900s, Asbestos fibre were used in concrete. In1950s, the concept using fibres in concrete and it was one of the topics of interest. By the 1960s, steel, glass and synthetic fibres were used in concrete. And the research into new fibre concrete continues today.

PET fibre is usually used in concrete to control cracking. It also reduces the permeability of concrete and also reduce bleeding of water. Generally, fibres do not increase tensile strength of concrete.

PET fibre is a mixture of cement, sand, aggregates, and PET fibre. It is commonly use to increase the strength of concrete. The amount of fibre added to concrete is expressed as a percent of total volume of composition, termed as volume fraction (Vf). Vf ranges from 0.1 to 3%. The ratio is calculated by dividing fibre length by its diameter. Increase in ratio of fibre usually segments the flexural strength. some research in the 2000s indicated that the use of fibre in concrete has limited effect on the impact resistance of material. The use of micro fibre gives the results of better impact resistance than the longer fibre

2. METHODOLOGY

MATERIAL PROPERTIES

Cement

Cement is a fine, greyish green powder. It is used as binding material with aggregate sand to make hard

concrete. In arenaceous materials clay predominates and in calcareous materials calcium carbonate predominates. Grade 43 Ultra Tech cement to IS 1489 (Part 1) – 1991 was used for casting specimen for all concrete mixing purpose. The cement was of uniform colour i.e. grey with a slight greenish shade and was free from any hard lumps. We have casted in the properties of Ultra Tech cement in laboratory testing are as given below.

Table 1- Physical properties of cement.

1	Normal Consistency	33 %
2	Initial Setting time	95 min
3	Final Setting time	240 min
4	Fineness	2.7%
5	Specific gravity	3.12

Polyethylene Terephthalate

Polyethylene Terephthalate (PET) is the most commonly used thermoplastic polyester. Its chemical formula is (C10H8O4) n . its generally used for packaging of soft drinks and carbonated water. Due to addition of PET fibre we improve the quality and age of concrete as its non-biodegradable material. we have cut it desired design by us of dimension of 4mm x 10mm (as per figure). It is tough enough to be stable dimensionally as well as flexible for use in concrete. it is truly amazing sustain material with less value as scrap therefore affordable to be used recycled material in concrete as construction material.

Figure1.1

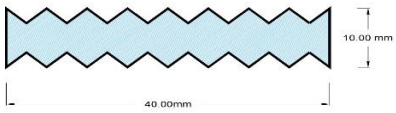


Figure 1.2

Table 2 – Addition of PET Fibre**.**

PET fibre (%)	For single cube (gm)	for single beam (gm)
0	0	0
0.3	26	35
0.5	43	57

Fine Aggregates

The sand is used for the testing purpose was locally used procured and conformed to Indian Standard Specifications IS: 383-1970. The sand was sieved through 4.75 mm sieve to remove bigger particles greater than 4.75 mm and then was washed to remove the dust. This sieved particle are used for further process.

Table 3: Physical Properties

Sr. No.	Property	Results
1	Specific gravity	2.55%
2	Water absorption (%)	2
3	Bulk density (Kg/cu.m)	1722.5f
4	Fineness modulus	2.65
5	Silt Content (%)	0.61

Properties of fine aggregate used in work are as follows-

Coarse aggregates

The naturally broken stone is generally used as a coarse aggregate. The kind of work decides the maximum size of the coarse aggregate. Generally available two sizes of coarse aggregate having the maximum size of 20 mm and 12.5 mm were used in our work. We have used sieved aggregates from 20mm to 10 mm the aggregates were tested as per Indian Standard Specifications IS: 383-1970. The results of various tests performed on coarse aggregate are given below.

Table 4: Physical Properties

Sr.No.	Property	Results
1	Specific gravity	2.85
2	Water absorption	3.7%
3	Impact test	10.11

3. CONCRETE MIXING

Concrete mix grade M25 has been design on base of IS 10262- 2009. The addition of quantities is in ratio of 1:1:2. the specimen used for moulding cubes and beam we used 150mm x150mm x150mm and 100mm x 100mm x 500mm prepared using the standard moulds. Mould are oiled prior to casting and kept for 24 hours and then dismantle as to keep it for curing for duration of 7, 14 and 28 days. Total 27 cubes and 12 beams were casted as specimen.

Test Results

We conducted slump cone test for a regular check on workability of fresh concrete as important aspect property.

COMPRESSIVE STRENGTH

Table 5- Compressive strength for 7days

Sr no	PET fibre (%)	Load (KN)	Compressive strength(N/mm²)
1	0	276.502	12.289
2	0.3	326.25	14.50
3	0.5	348.975	15.51

Table 6 - Compressive strength for 14 days

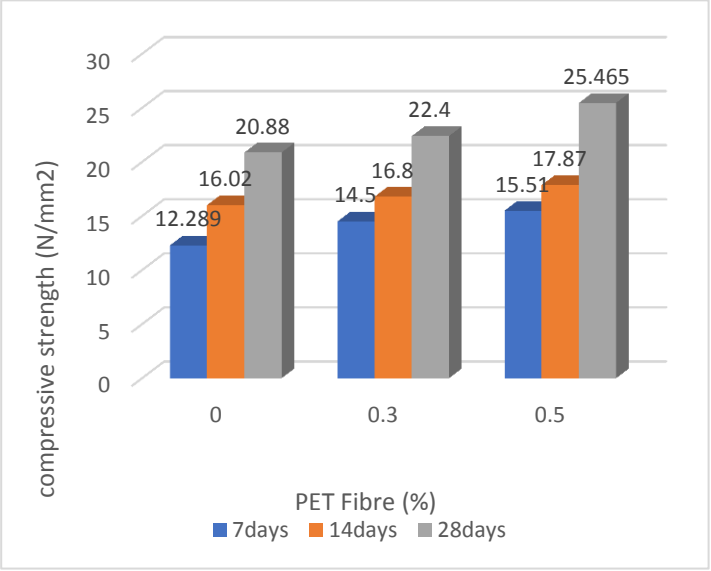
Sr no	PET fibre (%)	Load (KN)	Compressive strength(N/mm²)
1	0	360.45	16.02
2	0.3	378	16.8
3	0.5	402.075	17.87

Table 7 - Compressive strength for 28 days

Sr no	PET fibre (%)	Load (KN)	Compressive strength(N/mm²)
1	0	469.8	20.88
2	0.3	504	22.40
3	0.5	572.962	25.465

Table 8 -FLEXURAL STRENGTH

Sr no	PET fibre (%)	Load (KN)	Compressive strength(N/mm²)
1	0	1700	3.4
2	0.3	18750	3.75
3	0.5	19600	3.92



CONCLUSION

The PET fibre concrete is beneficial to environment. The main benefit of the PET fibre concrete in the presence of fibre is improving the strength. The use of fibre decreases the pollution and improves the strength of concrete. It is also beneficial economically. The material were used from the scrap or purchased by the shops at low cost.

- The compressive strength of PET fibre concrete is found to be increased almost for all variation of the PET fibre as compared to the normal concrete.
- The flexural strength of PET fibre concrete is also found to be increased as compared to the normal concrete.
- The compressive and flexural strength of PET fibre concrete of 0.5 % was found to be highly increased.
- These conclude that the precise result of fibre addition can be successfully used to increase strength of PET fibre concrete.

Future work of PET fibre concrete

The use of PET fibre concrete always save the environment and decreases the pollution level. In future work strength could be improved using the properties of fibre in the PET fibre concrete. Due to enhancing the strength of PET fibre concrete development is growing increasingly and it is friendly to the environment. PET fibre concrete will prepare as standard concrete with increase its durability.

- As results shows variation in strength for different shapes and amount of fibre.
- and for some addition increase in strength should be 25%, hence different results can be examined by using more different addition.

- In this experiment, concrete grade use were 1:1:2 which is M25. The strength can be checked for different grades of concrete.
- In this polyethylene terephthalate fibre were used. Other fibres can also be used.
- The fibre was used in desired shape, can also used with the different shapes
- Different water cement ratio can be used as it also imparts strength.

REFERENCE

1. R. N. Nibudey, P. B. Nagarnaik, D. K. Parbat, A. M. Pande "A model for compressive strength of PET fiber reinforced concrete". American Journal of Engineering Research (AJER) 2013 e-ISSN: 2320-0847 p-ISSN: 2320-0936 Volume-02, Issue-12, pp-367-372
2. J.M. Irwan, R.M. Asyraf, N. Othman H.B. Koh, M.M.K. Annas and Faisal S.K. "The Mechanical Properties of PET Fiber Reinforced Concrete from Recycled Bottle Wastes". Advanced Materials Research Vol. 795 (2013) pp 347-351 © (2013) Trans Tech Publications, Switzerland doi: 10.4028/www.scientific.net/AMR.795.347
3. D. Maruthachalam , J. Muthukumar "mechanical performance of recycled PET fibre reinforced concrete with low volume fraction" International Jounal of Structural and Civil Engineering Research ISSN2319-6009 www.ijscer.com vol. 2,no. 2,may 2013 © 2013 IJSCER. All right reserved
4. P. Ganesh Prabhu, C. Arun Kumar, R pandiyaraj, p. rajesh and sasi kumar "study on utilization of waste PET bottle Fibre in concrete." IMPACT: International Journal of Research in Engineering & Technology (IMPACT: IJRET) ISSN(E): 2321-8843; ISSN(P): 2347-4599 Vol. 2, Issue 5, May 2014, 233-240 © Impact Journals
5. F.J. Baldenebro-Lopez, J.H. Castorena-Gonzalez, J.I. Velazquez-Dimas, J.E. Ledezma-Sillas, C.D. Gómez-Esparza, R. Martinez-Sanchez, J.M. Herrera-Ramirez "Influence of continuous plastic fibers reinforcement arrangement in concrete strengthened". IOSR Journal of Engineering (IOSRJEN) www.iosrjen.org ISSN (e): 2250-3021, ISSN (p): 2278-8719 Vol. 04, Issue 04 (April. 2014), ||V1|| PP 15-23
6. R. Kandasamy R. Murugesan "Study on fibre reinforced concrete using manufactured sand as fine aggregate and domestic waste plastics as fibre". Journal of Structural Engineering Vol. 40, no. 6, february - March 2014 pp. 521-531
7. C. Selin Ravikumar, V. Ramasamy, T.S. Thandavamoorthy "Effect of Fibers In Concrete Composites". International Journal of Applied Engineering Research ISSN 0973-4562 Volume 10, Number 1 (2015) pp. 419-430 © Research India Publications http://www.ripublication.com
8. Milind V. Mohod (2015) in study of Performance of Polypropylene Fibre Reinforced Concrete." IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684, p-ISSN: 2320-334X, Volume 12, Issue 1 Ver. I (Jan- Feb. 2015), PP 28-36 www.iosrjournals.org DOI: 10.9790/1684-12112836 www.iosrjournals.org
9. Showkat Maqbool, Hemant Sood "Effect of PET fibers on the performance of concrete", volume-3, issue 12, December2016
10. Vinod L. Patil, Vivek Shukla "Use of PET Fibre as Constituent of Concrete" MAT Journals 2016 Journal of Structural Technology Volume1 Issue 3
11. Y. Dinesh, Ch. Hanumantha Rao "strength characteristics of fibre reinforced concrete using recycle PET". International Journal of Civil Engineering and Technology (IJCIET) Volume 8, Issue 4, April 2017, pp.092-099 Article ID : IJCIET_08_04_013ISSN Print: 0976-6308 and ISSN Online: 0976-6316
12. Vinod L.Patil , Vivek Shukla "Use of PET Fibre as Constituent of Concrete" Vol-3 Issue-2 2017 IJARIIE-ISSN(O)-2395-4396 www.ijariie.com