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WASTE PET BOTTLE FIBRE USED IN CONCREATE FOR INCREASING THE STRENGTH

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ABSTRACT

Waste plastic bottle are major cause of solid waste disposal. Polyethylene Tetra phthalate (PET) is commonly used for carbonated beverage and water bottles. This is an environmental issue as waste plastic bottles are difficult to biodegrade and involve processes either to recycle or reuse. Today the construction industry is in need of finding cast effective materials for increasing the strength of concrete structure. This project deals with the possibility of using the waste PET bottles mixing with concrete. Concrete with 1% PET bottles fibre mix and compared with normal concrete and steel fibre concrete.

Keywords: Polyethylene Terephthalate, Waste Plastics Bottles, PET Bottle Fibre, Compressive Strength.

I. INTRODUCTION

Concrete is a basic material for civil engineering construction. All basic ingredient of concrete are natural. But the property of concrete can be change by adding some plastic fibers. The concrete has many advantages property such as good compressive strength, durability, specific gravity and fire resistance but tensile strength of the concrete is very much low means it can be neglected. But tensile property of the concrete can be increase by addition of plastic fiber. Research conducted for this to utilization plastic bottle of various brands like Coca-cola, Bislery etc.

And mix them in the concrete by taking some aspect ratio. The use of plastic has increses substantially all over the world it leads to create large quantities of plastic-based waste. Plastic waste one of the challenge to dispose and manage as it is non-biodegradable material which harm to our beautiful environment. The Polyethylene Teraphthelene (PET) bottles are recycled and used in concrete Over thepast few years, it is estimated that roughly 25 billion tones of concrete manufactured each year globally. The current concrete construction industries consumed vast amount of natural aggregate and approximately 2billion tonnes of Portland cement. The excessive raw material consumption potentially release greenhouse gases leading to global warming. Therefore, they need to incorporate recycled material as a substitution to construction materials are essential to reduce landfill space as well as a shortage of natural resources. Waste material increase with increasing population most of these materials are non-degradable. The excessive disposal of non-degradable material can lead to environmental pollution. To overcome this serious issue, they recycle of non-degradable material is very. Normally, 60-80% of the aggregates used in concrete and it shows significant function in concrete performance such as strength, workability, durability, stability.

Concrete is the most common material used in the construction of building, bridges, dams etc. all over the world both in developed and developing countries. This is due to the ease, availabilty and tendency of producing concrete in any desired shape, making it an important material in the construction. Polyethylene terephthalate (PET) bottles are commonly used as a medium of packaging liquid product like water, carbonated soft drinks, and they constitute best material, which contribute to environmental pollution causing considerable damage to the environment. It is imperative to find substainable and innovative way of utilizing waste plastic PET bottle in a way that it will not in endanger the environment. Concrete reinforced with plastic PET bottle can improve concrete properties such as tensile strength.

Objectives

Increase the compression strength of concrete block when plastic bottle can be used as core part of concrete block. As partial substitute for the fine aggregate in concrete composites. To investigate the mechanical behaviour of the components by using fibres. To determine the percentage of plastic fibre which gives more strength when compared to concrete. It is counted as one of the foundation for green project through reduce

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land and air pollution

II. REVIEW LITERATURE

1. Foti (2013) investigated use of different forms of reinforcements with pet bottle viz circular fibres, half bottles and rectangular strips. The tests resulted in high concrete PET adherence. Further, more ductile behaviour was observed when subjected to bending load.
2. Sanjay kumar and Daule (2017) studied effect of 0.5% to 2% with increment of 0.5% replacement of fine aggregates on properties of concrete. The water cement ratio was 0.40 for the test. They reported optimal strength at 1.5% replacement. There was increase of 4%, 8% and 59% in compressive strength, split tensile strength and flexural strength respectively.
3. Ramadevi and Manju (2012) examined the impact of 0.5%, 1%, 2%, 4% and 6% replacement of fine aggregates with ground pet fibres. Pet bottles were first shredded into flakes and subsequently ground. Optimal compressive strength, split tensile strength and flexural strength was recorded on 2% replacement.
4. Patil et al. (2016) tested concrete specimens with plastic waste fibres 1%, 2% and 3% of cement for compressive strength, split tensile strength and flexural strength. There was increase of 13% in compressive strength while split tensile and flexural strength increased by 38% and 65% respectively.
5. Safinia and Alkalbani (2016) compared the compressive strength of concrete blocks with empty 500ml PET bottles placed in between to that of hollow concrete blocks procured from a local market. Concrete specimen with bottles resulted in an increase of 57% as compared to hollow concrete block from market.
6. Rinu Isah and shruthi (2017) compared non reinforced concrete beam with beams reinforced with hollow bars made of PET bottles and steel bars. The hollow bars where prepared by cutting PET bottles longitudinally then folding and pinning to form 48 cm long bars. Although steel reinforcement gave maximum flexural strength, for hollow PET bar reinforced beams the flexural strength almost doubled as compared to control beam with no reinforcement.

III. METHODOLOGY

1) Manufacture of concrete was carried out of following steps.
2) Collect and arrangement the require materials.eg. Portland cement, sand, coarse aggregate, fine aggregate, PET bottles and steel fiber.
3) The PET bottles fibers is a waste material which is obtained from industries, we collect the PET bottles from the restraurants. And the steel are easily available in the market.
4) The PET bottle cut after removing the top and bottom of the bottles will cut that PET bottles and steel into a short strips.
5) PET fibers and steel fiber had been used in the concrete mix in the shape of short strips. The length breadth of PET fiber 30mm and steel fiber length 30mm used irregular shape .
6) Mix design carried out for M20 grade of concrete for casting prepare moulds of size of 150x150x150mm and fill the cement concrete paste in it.
7) Then the final casting has been done as per the above mix design by using 1% of PET bottle and steel fibers for 28 days testing and each sample there are three block.
8) Make sure to note down the percentage of PET bottle and steel fibers and normal concrete size of mould with the width of mould in the observation table properly and carefully.
9) Cure the concrete block properly 28 day make it ready for testing it for testing it for water absorption test compressive strength.
10) Note down the result of the various tests in the observation to compare with PET fibers, steel fibers and normal concrete.

Calculation for M20 grade of concrete (1:1.5:3)

Size of cube = 150*150*150 mm Volume of cube = 150*150*150 mm

=0.15*0.15*0.15 m

=0.003375 m3

Wet volume =1.54*dry volume

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=1.54*0.003375 m3

=0.0051975 m3

For M20 grade of concrete M20 = 1:1.5:3

∑of ration =1+1.5+3=5.5

For cement = 1/5.5*0.005197

=0.00094490 m3

W= volume *density

W (in kg)=0.00094490*1440 (density of cement)

=1.360 kg

- For sand =1.5/5.5*(0.0051975) =1.4175*10-3

=0.0014175 m3

=0.0014175*1700 (density of sand)

=2.409 kg

- For aggregate =3/5.5 (0.0051975) = 2.835*10-3 m3

=0.002835 m3

=0.002835*1500 (density of aggregate)

=4.25 kg

Steel Fibre **Plastic Fibre**

Cube Casting in concrete lab

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IV. RESULT

Steel Fibre concrete	Normal concrete	Plastic Fibre concrete
S1 = 520KN	N1 = 490KN	P1 = 680KN
S2 = 510KN	N2 = 430KN	P2 = 660KN
S3 = 530KN	N3 = 500KN	P3 = 700KN

Result of compressive test after 28 days of curing :

Replacement	Specimen sample	Load (KN)	C/S area(mm2)	Compressive strength=Max. load carried by specimen / Top surface area of specimen (N/mm2)	Average
	N1	490	22500	21.77	
Normal	N2	430	22500	19.11	21.03N/mm2
	N3	500	22500	22.22	
	S1	520	22500	23.11	
1% of steel fibre	S2	510	22500	22.67	23.11N/mm2
	S3	530	22500	23.56	
	P1	680	22500	30.22	
1% of plastic fibre	P2	660	22500	29.33	30.22N/mm2
	P3	700	22500	31.11	

V. CONCLUSION

1) The fibres obtained from waste PET bottles help to increase the strength of concrete
2) Which is one of the innovative material having low cost that can be used in construction field
3) Also use of such material solve the problem of solid waste disposal and prevent environmental pollution also.

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