

Investigation on Waste Plastic Fibre Reinforced Concrete using Manufactured Sand as Fine Aggregate

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Abstract— Concrete is the main construction material in the world. It consist of cement, fine aggregate, coarse aggregate and water as main ingredients. Now days due to high global consumption of natural sand, sand deposit are being depleted and causing serious threat to environment as well as society. River sand is becoming a scarce commodity and hence an exploration alternative to it has become imminent. Manufactured sand is the good alternative to river sand and it is purposely made, fine crushed aggregate produced under controlled conditions from a suitable sand source rock. Plastics are non biodegradable common environmental polluting materials. Which are going to affect the fertility of soil. In present study the detailed experimental investigation is carried out on plastic fibre reinforced concrete by partial replacement of normal sand by manufactured sand with different percentages(0%, 20%, 40%, 60%,80%,100%) and adding fixed percentage (0.5% of weight cement)) of plastic fibres.The mechanical properties of concrete like compressive strength, tensile strength and flexural strength are studied here.

Keywords: Fibre reinforced concrete, manufactured sand, compressive strength, split tensile strength, flexural strength.

I. INTRODUCTION

Concrete is mostly wide construction material in world. It is manmade building material it can be mould and shape. Concrete is composite material having properties of high compressive strength , low tensile strength , low post cracking capacity, brittleness and low impact strength . These properties can be improved by addition of fibre in the concrete. The fibres are dispersed and distributed randomly in the concrete during mixing and this improves certain properties like tensile strength, flexural strength etc. Fibre reinforced concrete can be defined as composite materials consist of cement based matrix containing an ordered or random distributed of fibres. The common fibres used in the concrete are steel, glass, asbestos, jute, coir, polypropylene, nylon.,[1] The technical term for sand as fine aggregate require in bulk state for various civil engineering works but availability of construction sand allows environmental pressure to reduce extraction of sand from rivers the use of manufactured sand as a replacement is increasing with the ban of sand mining implemented by different states, with the increasing demand for river sand for construction works, many civil engineers have expressed the need to promote use of manufactured sand in the construction industry, as per reports manufacture sand widely used as around the world and technicians of major projects around the world insist on the compulsory use of manufactured sand because of its consistent gradation and zero impurity.

II. LITERATURE REVIEW

The uses of plastic fibres in the concrete are going to improve the mechanical properties of concrete. R.Kandasamy[1] reported that with addition of domestic plastic fibres in the concrete there is appreciable increase in compressive strength.Mahendra and R.Chitalang [4] reported that using manufactured sand and steel fibres in concrete going to produce improve mental results compared to conventional concrete. Balasubramanianm.M [5] reported that by using 1% of E-plastic in concrete produces 2.5% of incremental strength compared to conventional concrete.

III. MATERIALS AND METHODOLOGY

Cement

In this experimental investigation Portland pozzolona cement (PPC) was used for all concrete mixes, the cement used was fresh and without lumps. The testing of cement was done as per IS 8112-1989.The specific gravity of cement was found to be 3.15.

Water

Portable tap water was used for the preparation of specimens and for the curing of specimens.

Fine aggregate

As per IS 383-1970, table 4 sand used for experimental program was locally produced and was conforming zone-II. The specific gravity of fine aggregate was found to be 2.6.

Manufactured sand

As per IS 383-1970R2007 manufactured sand used for experimental program is obtained from local resources SB Hukkeri crushers (P) Ltd. It was conforming zone-II. The specific gravity of manufactured sand is 2.8.

Coarse aggregate

Locally available coarse aggregate having maximum size of 20mm were used.The specific gravity was found to be 2.9 and water absorption is 0.5%.Fineness modulus of coarse aggregate was found to be 6.86.

Plastic fibres

Low density polyethylene is used as fibres. Generally these made by cutting the water bottles in to laminar shaped fibres are used and thicknesses of fibres are varying from 0.125 to 0.150mm. By mix results 0.5% (by weight of cement) is added in the concrete of present experimental work.

Admixture

Commercially available conplast SP-430 super plasticizer is used to enhance the workability of fresh concrete.

Mix design

The mix was designed as per IS 10262:2009 for M40 grade. Concrete mixes are prepared by partial replacement of normal sand by manufactured sand with different percentages (0%, 20%, 40%, 60%, 80%, 100%) respectively and adding fixed percentage of plastic fibres (0.5% of weight of cement) for every mix.

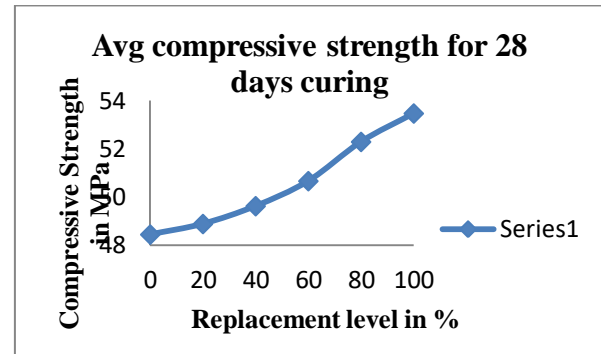
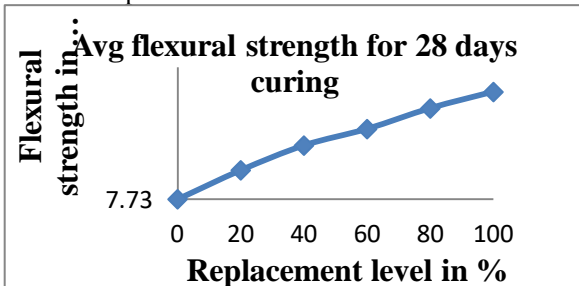
Test specimens and test procedure

Cement, sand and aggregate were taken in mix proportion 1:2.05:2.89 which correspond to M40 grade of concrete respectively. The 150mm size concrete cubes, concrete beams of size 100mm×100mm×500mm and cylinder of size 150mm diameter and 300mm height were used as test specimens to determine the compressive strength, split tensile strength and flexural strength respectively.

IV. RESSERCH SIGNIFICANCE

Based on the above discussions, following conclusions are drawn:

1. Concrete produced by replacing normal sand by manufacture sand with addition of 0.5% of plastic fibres imparts higher compressive, flexural and split tensile strengths.
2. The compressive strength of 100% replaced manufactured sand concrete with 0.5% of plastic fibres is 10.38% more than reference mix (0% replaced mix).
3. The split tensile strength of 100% replaced manufactured sand concrete is 17.52% more than the split tensile strength of reference mix.
4. The results of experimental work proves that the river sand can be completely replaced with manufactured sand and the addition of plastic waste does not have any adverse impact on mechanical characteristics of concrete



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TABLE 1CONCRETE MIX DETAILS

S. No	Cement (kg)	Fine aggregates		coarse aggregate 20mm down (Kg)	Water (litres)	Super plasticizer (conplast SP 430 in Kg)	Plastic fibres (Kg)
		Normal sand (Kg)	M-sand (Kg)				
Mix A (0% M –sand, Ref mix)	400	823	----	1159.53	157.60	4	2
Mix B(20%M-sand)	400	658.47	175.92	1159.53	157.60	4	2
Mix C(40% M - sand)	400	493.80	351.85	1159.53	157.60	4	2
Mix D (60% M-sand)	400	329.20	527.78	1159.53	157.60	4	2
Mix E (80% M-sand)	400	164.60	703.71	1159.53	157.60	4	2
Mix F (100% M-sand)	400	----	879.65	1159.53	157.60	4	2