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AN EXPERIMENTAL STUDY TO DEVELOP FIBRE REINFORCED CONCRETE BY ADDING INORGANIC WASTES AS FIBRES

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Abstract - *The advancement in construction sector is mainly associated with improving the efficiency of the structures under seismic effect and making them economical, maximized use of waste materials in construction and to minimize its drawbacks. Consumption of concrete is standing next to consumption of water in the world. To make it more effective in exhibiting its properties, it is best to design it as fibre reinforced concrete. Fibre reinforced concrete is a special type of concrete in which fibres are added to general concrete. Generally glass fibres or steel fibres are added as fibres to concrete. But in order to make it cost effective and to improve its strength properties waste materials like beverage tin pieces, nails and steel powder is added to concrete as fibres at a dosage of 1% to total weight of concrete. This use of dispersed fibres as reinforcement in concrete matrix attains new strength characteristics and eliminates some drawbacks.*

Key Words: fibres, fibre reinforced concrete, compressive strength, split tensile strength, flexural strength

1. INTRODUCTION

The concept of Fibre reinforced concrete was proposed in 1950 in which mostly glass and steel fibres are used. Concrete is such a material which is good in compressive strength and weak at tensile strength. Different waste fibres are added are incorporated into concrete to improve their strength characteristics like compressive strength, tensile strength and flexural strength and also overcome serious defects like shrinkage and creep in concrete. But wastes generated from different industries are highly complicated to degrade .Waste materials like beverage tins are made into pieces of size 10mm in length and 3mm in width, steel powder produced from steel industries and scrap iron nails from nail industries are added as fibres in concrete. In general nails are highly reactive to atmosphere and chemicals and they will corrode easily. Hence, nails coated with zinc are used as fibres in concrete which are of size 25mm in length and 1mm in diameter. Steel powder is a metallic powder obtained from iron and metal industries which is generated during trimming process. This steel powder is added to concrete as fibres.

FIG-1 different wastes as fibres

2. LITERATURE REVIEW

G.MURALI, C.M.VIVEK VARDHAN [1] stated that specimen with steel powder as waste material was found to be good in compression which had the compressive strength of 41.25% more than the conventional concrete. Better split tensile strength was achieved with the addition of the steel powder waste in concrete. The strength has increased up to 40.87% when compared to that of the conventional concrete specimen. In flexure the specimen with soft drink bottle caps as waste material was found to be good. While adding the soft drink bottle caps the flexural strength increased by 25.88% that of the conventional concrete with 1% addition of fibre.

J.RAJPRASAD, V.ANURADHA, P.GRIDHARAN [2] stated that addition of fibres @ 1% to weight of concrete showed good results. It is observed that those specimens which are fibre reinforced shows good characteristic strengths and Better split tensile strength was achieved with the addition of the steel powder waste in concrete.

R.H.MOHANKAR, M.D.PIDURKAR, P.VTHAKRE, S.S.PAKHARE [3] Fibres have been used to reinforce materials that are weaker in tension than in compression. Steel fibre and polypropylene fibre are used as Hybrid fibres. They are used in different proportions as 0.25%, 0.5%, 0.75%, and 1% in this study. Experiments were conducted to study the effect of steel fibre and polypropylene fibre in different proportions in hardened concrete. Compressive strength tests on cube and Flexural strength test on beam were carried out to study the properties of hardened concrete.

JAIS JOY, RAJESH RAJEEV [4] stated that using waste materials we came to know that, the optimum value was obtained by adding scrap by 1% weight of concrete for turn fibre & binding wire in compression, tension and flexure. This steel scrap fibre reinforced concrete showed

excellent performance in compression and in tension but no significant effects was observed in flexure.

SAIYED FARAZ ABBAS ZAIDI1, MOHD. AFAQUE. KHAN, ABHISHEK KUMAR [5] it is observed that addition of waste materials like waste steel powder & soft drink bottle caps, empty waste tin from workshop at a dosage of 1% of total weight of concrete as fibres results which showed that there is increase in strength properties when compared with nominal concrete. It is shown that Increases the cube compressive strength of concrete in 28 days to an extent of 5.12%, Increases the cylinder compressive strength of concrete in 28 days to an extent of 3.84%.Increases the split tensile strength to an extent of 1.63%. The increase in the various mechanical properties of the concrete mixes with polythene fibres is not in same league as that of the steel fibres.

3. SCOPE AND OBJECTIVES

Scope:

- To provide most effective and durable concrete.
- It should be easily adopted in fields.
- To make maximum usage of locally available waste materials as fibers.
- To promote FRC with affordable fibers.
- To find optimum strength of concrete with waste materials as fibers in FRC.

Objectives:

- The main objective is to assess the strength characteristics of Fiber reinforced concrete with conventional concrete.
- To determine the properties of waste materials which are used as fibers in Fiber rein forced concrete.
- To determine the workability and strength properties of the proposed fiber reinforced concrete.

4. TEST ANALYSIS

Fibre reinforced concrete is made by adding different wastes stated above to the nominal mix of M_{20} with mix ratio 1:1.5:3 and water-cement ratio of 0.45 is adopted and the slump values are as follows.

Table-1: Different slump values

Different slump values		
Sl.no	Notation	Slump(mm)
1	Conventional	70
2	Beverage tin pieces	60
3	Nails	60
4	Steel powder	70

By using standard test methodologies compressive strength, split tensile strength and flexural strength values are determined and they are as follows.

Table-2: compressive strength values

Compressive strength values after 28 days of curing			
Sl.no	Notation	Compressive strength (N/MM^2)	No. of cubes
1	Conventional	29.6	3
2	Beverage tins	32.87	3
3	Nails	39.4	3
4	Steel powder	36.57	3

Table-3: split tensile strength values

Split tensile strength values after 28 days of curing			
Sl.no	Notation	Split tensile strength (N/MM^2)	No. of cylinders
1	Conventional	2.09	3
2	Beverage tins	2.48	3
3	Nails	3.96	3
4	Steel powder	3.41	3

Table-4: flexural strength values

Flexural strength values after 28 days of curing			
Sl.no	Notation	Flexural strength (N/MM^2)	No. Of cylinders
1	Conventional	6.48	3
2	Beverage tins	7.57	3
3	Nails	8.98	3
4	Steel powder	8.4	3

5. CONCLUSIONS

Based on limited experimental study the compressive strength, split tensile strength and flexural strength draws the following conclusions:

- By adding steel powder as fibers high slump value is achieved, which can be adoptable on site. Other fibers also showed significant slump values.
- Concrete with beverage tin pieces, nails and steel powder has shown 11.05%, 33.10% and 23.55% higher compressive strength respectively when compared with conventional concrete.

- Concrete with beverage tin pieces, nails and steel powder has shown, 18.66%, 89.48 % and 63.16% higher split tensile strength respectively when compared with conventional concrete.

- Concrete with beverage tin pieces, nails and steel powder has shown 16.82%, 38.58 % and 29.63% higher flexural strength respectively when compared with conventional concrete.

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