



Review Paper on Addition of carbon fiber and lathe scrap to improve the mechanical properties of concrete

KEYWORDS

carbon fiber, lathe scrap compressive strength, flexural strength, tensile strength

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ABSTRACT

Concrete is most widely used construction material in the world. Nowadays the world is witnessing the construction of more and more challenging and difficult Engineering structures. So, the concrete need to possess very high strength and sufficient workability. Various fibers like glass, carbon, Poly propylene fibers provide improvement in concrete properties like tensile strength, fatigue characteristic, durability, shrinkage, impact, erosion resistance and serviceability of concrete. The aim of the work is to study the properties of the effect of carbon fibers and lathe scrap in the concrete for different proportions.

1.0 INTRODUCTION

Crack formation is very common phenomenon in concrete structure which allows the water and different type of chemical into the concrete through the cracks and decreases durability and strength. This leads to damage to reinforcement when it comes in contact with water. Concrete has some deficiencies such as low tensile strength, flexural strength, low post cracking capacity, and brittleness, highly porous, susceptible to chemical and environmental attack.

Concrete is very good material to resist the compressive load to a limit but if the load applied on the concrete is more than their limit of resisting load, it causes the strength reduction of concrete by producing the cracks in the concrete and the treatment of the cracks in very expensive. Addition of carbon fiber scrap and lathe scrap has chances to avoid cracks and increase the mechanical properties of concrete.

Addition of these fibers in concrete is one of the most suitable and relatively a new composite material in which concrete is reinforced with short discrete carbon fibers and lathe scrap. They are uniformly distributed so that it will improve many Engineering properties. Fiber length up to 8mm to 10mm is used.

The actual role of the fibers is to enhance the toughness under different type of loading. Addition of these fibers in various proportions proves to have a clear idea about the increase in the mechanical properties of concrete. Thus a comparative study is done based on the previous implementation of these fibers by various researches.

2.0 LITERATURE REVIEW-

"Improving concrete properties with fibers addition", E. Mello, C.Ribelloato, E. Mohamdelhassan has studied the concrete properties with the addition of fibers. Keeping in view all the mechanical and engineering properties of concrete, the respected authors concluded that the concrete properties incredibly increase on the addition of fibers.

"Strengthening of beams using carbon fiber reinforced polymer" , Ratan Kharatmol, Pankaj Sananse, Rohit Tambe has studied the measures to strengthening the beams with the use of carbon fiber reinforced polymer. Their valuable study represents the use of reinforced polymer by wrapping the polymer around the beam.

"The effect of addition of carbon fibers on mechanical properties of high strength concrete" S.M.Kinayekar, Kishor Kulkarni, respected authors had a practical exposure of the mechanical properties of high strength concrete with the addition of fibers.

"Reuse of steel scrap from lathe machine as reinforcement material to enhance properties of concrete", Shirule Pravin, Swami Suman, Nilesh Chincholkar, had a very economical study and put forth the option of reusing steel scrap from lathe machine.

"Effect of different types of steel fiber at aspect ratio on mechanical properties of self compacting concrete" Kishor S Sable, Madhuri K Rathi, the respected authors had a very keen study on the effects of mechanical properties of concrete by addition of steel fibers in varying proportions.

"Experimental study on steel fiber reinforced concrete for M40 Grade", A.M Pande, M. Gulfam Pathan, made an experimental study after the addition on steel fibers on concrete of grade M40.

"Cement reinforced with short carbon fibers with multifunctional materials", December, 1999, characteristics of lathe scrap reinforced concrete", D.D. L. Chung. The respected author had a study on concrete which is added with short carbon fiber and multifunctional materials.

3.0 THE PROPERTIES OF MATERIAL

3.1 HARDENED CONCRETE:-

- 1) Strength
- 2) Permeability
- 3) Durability
- 4) Shrinkage and creep deformation
- 5) Response to temperature variation

3.2 CARBON FIBERS:-

- 1) Post peak ductility
- 2) Durability
- 3) Pre-crack tensile strength
- 4) Fatigue strength
- 5) Impact strength
- 6) Eradicating temperature and shrinkage cracks
- 7) Stiffer
- 8) Have sufficient length.
- 9) have high aspect ratio
- 10) Good bonding with concrete matrix.

3.3 LATHE SCRAP

- 1) Shape of its cross-section is irregular.
- 2) Bright and can be twisted.
- 3) Good strength.
- 4) Easily mix with other concrete ingredients.
- 5) Post peak ductility
- 6) Durability
- 7) Pre -crack tensile strength
- 8) Fatigue strength
- 9) Impact strength
- 10) Eradicate temperature and shrinkage cracks

4.0 MATERIALS AND TESTING WITH CODAL PROVISION:

4.1 Cement-

Codal Provision: IS 12269: 1987

Tests

- 1) Test for initial and final setting time.
- 2) Consistency test

4.2 Aggregates-

Codal Provision (both for fine and coarse aggregate): IS 383:1970

Tests

- 1) Specific gravity test
- 2) Fine aggregate: Pycnometer test
- 3) Coarse aggregate: Density Basket test
- 4) Fineness modulus
- 5) Bulk Density
- 6) Water absorption

4.3 Fibers-

- 1) Carbon fiber (8mm to 10 mm)
- 2) Lathe scrap

4.4 Curing-

Curing carried out for 14 days, 28 days and 90 days

4.5 Test on concrete cubes -

1) Compression test

As per IS-516:1959

2) Flexural test

As per IS-516:1959

3) Tensile test

As per IS-5816:1999

4) Split tensile strength

As per IS- 5816:1999

5.0 CONCLUSION:-

As the expected outcome, increase in compressive strength of concrete due to lathe scrap is 10-20% and due to carbon fiber scrap is 5-10%.

Increase in tensile strength of concrete due to lathe scrap is 30-45% and due to Carbon Fiber scrap is 40-50%

Increase in flexural strength of concrete due to lathe scrap is 30-40% due to Carbon Fiber scrap is 20-30%

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