# A Survey On Durability Of Fiber Reinforced Concrete With Artificial Sand

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***Abstract-*** *Concrete is the combination of cement, natural sand or artificial sand and aggregate which are used in civil engineering works such as township project and infrastructure work . The present research work shows the study of cement concrete with varying percentage of fibers which are namely 0.10%, 0.20%, 0.30%, 0.40% & 0.50%. M20 grade concrete was adopted. Sizes of cube (15*15*15 cm) were used for testing. Compressive test of cubes was carried out with various types of fibers namely AFRC and NFRC with N.S and A.S. The aim of this experiment is to use of different fiber as reinforcement in concrete for a greater durability, workability and reduction in crack. The present work is concerned with the compressive strength of FRC specimens (132 cubes) with 90 days of normal W.C and 90 days curing in sulphate & chloride.*

## I. INTRODUCTION

Conventionally concrete is construction materials which are used in different types of construction work and in which the properties of aggregate change the durability and workability of concrete, so fine aggregate play a significant role in concrete mix design. The generally used fine aggregate is N.S and artificial sand.

N.S and coarse aggregate are near about 75% of total quantity of concrete. Therefore, we have to select right type and good quality aggregate for concrete, as the aggregate is the major ingredient of the concrete or mortar and provide strength to the concrete mix. Concrete is a construction material made-up of cement, sand (i.e. N.S or A.S), aggregate, water and admixtures.

Concrete shows distinct properties like extensive Compressive strength, stiffness and durability. Concrete is extreme in compression and poor in tension and has brittle behavior and it is used in building work, road work etc. Apart from its properties, concrete shows a low performance when subjected to tensile stress, low post cracking capacity. These drawbacks are generally overcome by reinforcing concrete with fiber because fiber reinforcement helps in improving the strength of concrete. Nowadays the main principle of concern is the non renewable N.S and the corresponding increasing need of natural sand in construction field. So we have to see the other replacement to natural sand. The economic and easiest alternative to N.S is artificial sand by crushing stones in required size and grade by suitable method which give good quality of sand and such sand form by stone is termed as artificial sand.

## II. LITRATURE REVIEW

**P. N. Balaguru et. al. 1992 [1]** observed that concrete is most widely used construction material in the world. Different fiber materials used in FRC can be G.I., carbon, glass, asbestos, polypropylene, jute etc. The fibers adding to the concrete which improves the compressive strength, tensile strength of concrete, flexural strength and also impact strength of concrete. He concluded that the addition of steel fibers at 0.5 % by volume of concrete reduced the cracks under loading. The brittleness of concrete was improved by addition of steel fibers & also by glass fibers.

**D. Ludirdj et. al. 1992 [2]** noticed that synthetic fibers were added to concrete for crack control in concrete slab construction. Polypropylene and polyester were most widely available and used as plastic fibers in construction. The use of artificial fibers overcome the plastic shrinkage cracking in concrete during placement & adding the same amount of synthetic fiber may not be able to control drying shrinkage cracking in the hardened slab. They concluded that the use of synthetic polymers as reinforcement in concrete slab-on grade construction it overcome the plastic shrinkage cracking & also the addition of fibers to concrete that have silica fume Improved the abrasion resistance & flexural strength of the concrete.

**Pavan Kumar et. al. 2015 [3]** observed that when cubes are casted with cement mortar and placed in different concentration of sulphate for different time duration maximum 90 days .If the concentration of sulphate increases, due to which it increase the compressive strength of cement mortar upto the limit of 2500 mg/l and then after it start decreases.

**Vipul kumar 2015 [4]** observed, that the workability of concrete improves with increase the percentage of fiber-

cement ratio and the slump value decrease and The of FRC give the extreme compressive strength and The difference in Initial setting and final setting time of concrete will expanded when the percentage of fiber increase and while addition of fiber to the concrete then there will be no requirement of increase of percentage of steel reinforcement in RCC structure as we get sufficient compressive strength and durability of concrete. Durability of cement composites increases with Reduction in Cracks propagation occur.

**Amit Rai et. al. 2014 [5]** observed that when the fibers are properly mix with concrete which control or reduce the micro crack develop in the concrete and if we use natural fiber in a concrete it improve compressive strength about 10 % as compared with conventional concrete and also Improved permeability by inclusion of fibers and while using polymer fiber which improve the compressive strength about 16% as compared with conventional concrete. And finally they gives the over all view while using fiber in a concrete which helps to improve its properties such a compressive strength and important is that it reduce the void from concrete due to which concrete make more dense and reduce or control micro crack as compared to conventional concrete.

**Er. Lakhan Nagpal et. al. 2013 [6]** stated that use of artificial sand in a concrete when the physical and chemical properties of artificial sand is satisfied the requirements of IS code provision in properties studies in Natural sand, if natural sand replaced hundred percent by artificial sand, then sometimes it gives equal or better results in term of compressive strength and flexural strength than the concrete made with Natural Sand and they also observed that the water absorption of artificial sand concrete is slightly higher than Conventional Concrete and the durability of artificial sand concrete under sulphate and acid action is greater inferior to the concrete.

**A. V. Patil et. al. 2013 [7]** observed that fiber uses Up to 0.5% adding of concrete with polypropylene fiber there is optimum percentage to increase in all mechanical properties. Compressive strength of concrete improve with increasing fiber content. Strength enhancement up to 24% for PFRC and the durability of concrete improves and addition of polypropylene fibers greatly improves the fracture parameters of concrete. joints are less form along with this fiber and overcome damages or repair work. The compressive strength, increase with the addition of fiber near about 0.5% content as compared with normal concrete. The workability of fiber concrete has been found to decrease with increase in fiber content to the concrete.


Fig. 1: Concrete Cube (150*150*150 mm)

Fig. 2: Jute (Natural Fibre) with aspect ratio And Plastic Pipe Chip (Artificial Fibre)

On the basis of the experimental study it was observed that in case of Artificial fiber (plastic pipe chips) with natural sand the Compressive strength of M20 grade concrete using varying percentage of Artificial fibers are observed to be increasing from **41.1** to **43.8** N/mm$^2$ and after that it decreases up to **42.9** N/mm$^2$ in 90 days potable water curing and **41.9** to **44.1** N/mm$^2$ and after that decreases up to **43.4** N/mm$^2$ in 90 days chloride & sulphate mixed water.

## III. CONCLUSION

The present work is concerned with the compressive strength of FRC specimens (132 cubes) with 90 days of

normal water curing and 90 days curing of age for sulphate & Chloride attack. The following observations are made:

- Chemical effect in the concrete can be minimized by adding/ increasing the volume of artificial fiber to the mix composition.
- Enhancement in compressive strength, durability, shrinkage properties, and impact strength of concrete by adding/ increasing the volume of natural (jute) fiber to the mix composition.

FRC controls the micro cracking, shrinkage and deformation under load much better than plain concrete. About 43.8 $N/mm^2$ compressive strength found with natural sand at 0.4% fiber concentration when cubes samples were cured in plain water (AFRC) & about 44.1 $N/mm^2$ compressive strength found with natural sand at 0.4% fiber concentration when cube samples were cured in NaCl & $MgSO_4$ mixed water AFRC and On the other hand 35.8 $N/mm^2$ compressive strength found with artificial sand at 0.4% fiber concentration when cubes samples were cured in plain water (AFRC) & about 39.9 $N/mm^2$ compressive strength found with artificial sand at 0.4% fiber concentration when cube samples were cured in NaCl & $MgSO_4$ mixed water.

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