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# Experimental Approach to Assess the Viability of Aluminium Matrix Composites in Concrete

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**ABSTRACT** : During the past decades the construction field has experienced a growing interest in the advantages of fibre reinforcement in concrete. Between the different fibbers' available e.g. steel, glass and natural fibre ,steel, aluminium fibre is probably most investigated and most commonly used. In this project aluminium fibres are used. Aluminium fibres are light in weight. It has been used to study the effect on compressive strength , split tensile and flexural strength on M25 grades of concrete with varying percentage of pcc.

**KEYWORDS**: Aluminium fibres, compressive strength, split tensile strength, flexural strength

## I. INTRODUCTION

Aluminium is most widely used metal in the world. The properties of aluminium include: low density and therefore low weight, high strength, superior malleability, easy machining, excellent corrosion resistance and good thermal and electrical conductivity are amongst aluminium's most important properties. Aluminium is also very easy to recycle.

So it has been thought to initiate toward the use of aluminium matrix or aluminium composites or aluminium fibre in concrete & to check the different properties of that. Because basically aluminium having above mentioned properties so primary view is indicating towards that & this properties giving push to do something new in concrete related areas. In this whole project work, generally the viability of aluminum matrix in concrete such like whether this approach is right or wrong according to compressive as well as tensile & flexure test is discuss. The setting time of concrete is influenced by many factors, in particular temperature and water/cement ratio. With AMC, the setting time will be reduced slightly, perhaps. The effect will be more pronounced at high levels of AMC and/or low temperatures. This is particularly useful in cold weather. The rate and quantity of bleeding in concrete containing AM fibre is usually less than that in concrete containing no AM fibre because of the relatively higher fineness of fiber. It is observed that AMC is slightly more water absorptive than Portland cement concrete or normal concrete and thus AM concrete is equally workable to Portland cement concrete.

## II. MATERIALS AND METHODS

### Materials

Cement : OPC 53 grade available in local market is used in investigation. The cement used has been tested for various proportions and found to be conforming to various specifications IS:12269-1987. The specific gravity was 3.15

Coarse aggregate-crushed angular stone aggregate from a local source was used as coarse aggregate

Fine Aggregate:River sand is used as fine aggregate. Fineness modulus and specific gravity of fine aggregate is 3.42 and 2.6 respectively.

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## Aluminium Fibre Properties

- Density: 2.70 g/cm<sup>3</sup>
- Relative atomic mass 26.98
- Oxidation number: 3
- Length of fiber- 25 mm
- Dia. of fibre-0.06 mm
- Aspect ratio- 4166.1

TEST SPECIMENS: The specimens used were cubes, beam specimens and cylinders. Dimensions of each test specimen are as under:

Cube: 150 mmx150 mm x150 mm for compressive strength,

Beam: 100 mm x 100 mm x 500 mm were used to determine flexural strength.

Cylinder: 150 dia. x 300 height were used for split tensile strength. The test were perform by using different percentage of aluminium fibre for M25 grade concrete.

Table 1 Compressive strength for M25 grade of concrete mix with different % of aluminium fibre

| Grade of Concrete | No of Days | Compressive strength N/mm <sup>2</sup> |             |               |              |
|-------------------|------------|--|-------------|---------------|--------------|
|                   |            | with 0% AMC                            | with 5% AMC | with 7.5 %AMC | with 10% AMC |
| M25               | 7          | 21.5                                   | 21.8        | 22.2          | 21.7         |
|                   | 28         | 26.33                                  | 26.53       | 27.11         | 26.46        |

Table 2 Split tensile strength of M25 concrete over different percentage of AMC

| Grade of Concrete | No of Days | Split tensile strength N/mm <sup>2</sup> |             |               |              |
|-------------------|------------|--|-------------|---------------|--------------|
|                   |            | with 0% AMC                              | with 5% AMC | with 7.5 %AMC | with 10% AMC |
| M25               | 7          | 2.44                                     | 2.73        | 2.90          | 2.57         |
|                   | 28         | 3.52                                     | 3.84        | 4.07          | 3.60         |

Table 3 Flexural strength of M25 concrete over different percentage AMC

| Grade of Concrete | No of Days | Flexural strength N/mm <sup>2</sup> |             |               |              |
|-------------------|------------|-------------------------------------|-------------|---------------|--------------|
|                   |            | with 0% AMC                         | with 5% AMC | with 7.5 %AMC | with 10% AMC |
| M25               | 7          | 2.60                                | 2.72        | 2.87          | 2.70         |
|                   | 28         | 3.92                                | 4.21        | 4.51          | 4.16         |

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## III.RESULTS

Compressive strength of different grades of ordinary concrete and varying percentage of aluminium fibre concrete mixes Table 1 gives 28 days compressive strength with different % of AMC and their values are observed to be varied to 26.53 N/mm<sup>2</sup> to 27.11 N/mm<sup>2</sup> for M25

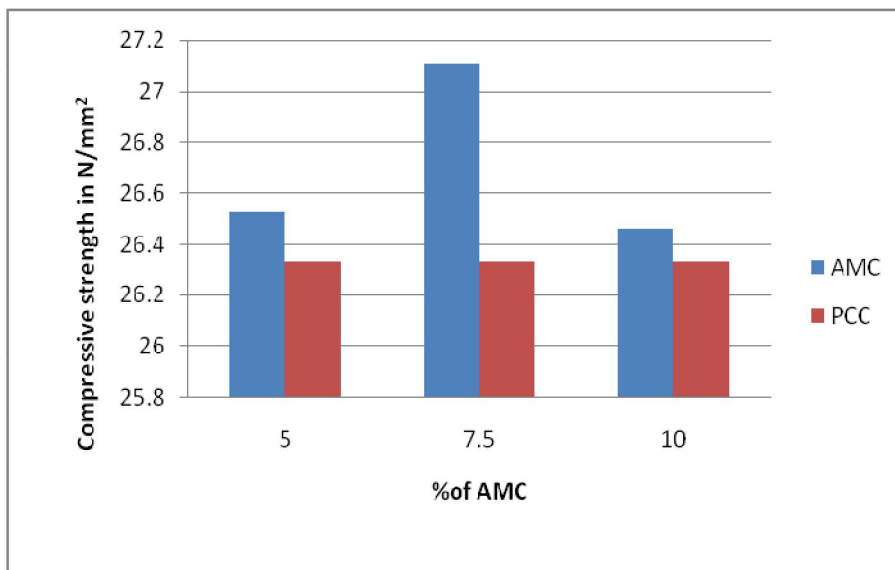


Fig-1-Compressive strength of Aluminium fiber (AMC) with PCC

Split tensile strength of different grades of ordinary concrete and varying percentage of aluminium fibre concrete mixes Table 2 gives 28 days split tensile strength with different % of AMC and their values are observed to be varied to 3.60 N/mm<sup>2</sup> to 4.07 N/mm<sup>2</sup> for M25

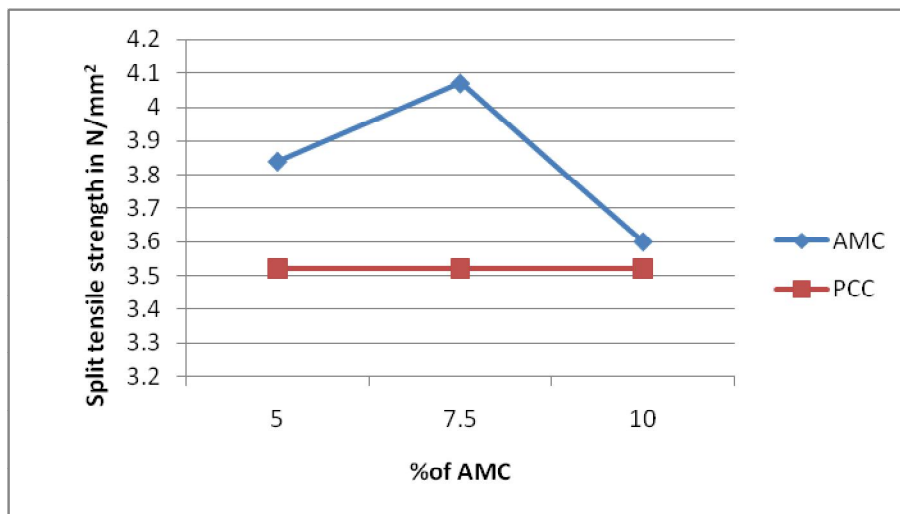


Fig-1-Split tensile strength of Aluminium fiber (AMC) with PCC

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Flexural strength of different grades of ordinary concrete and varying percentage of aluminium fibre concrete mixes Table 3 gives 28 days flexural strength with different % of AMC and their values are observed to be varied to 4.16 N/mm<sup>2</sup> to 4.51 N/mm<sup>2</sup> for M25

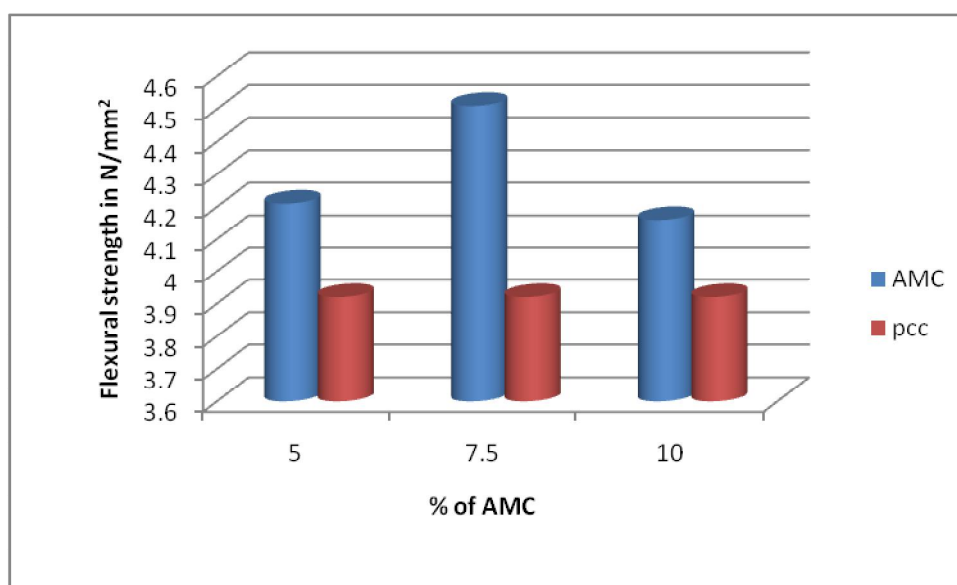


Fig-3-Flexural strength of Aluminium fiber (AMC) with PCC

### IV.CONCLUSION

The significant improvement in various strengths is observed with the inclusion of 7.5% of AMC in the plain concrete. 7.5 % AMC concrete is good in compressive strength as well as in flexural strength as compare to other combinations.

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