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# EFFECT OF METALLIC BOTTLE CAP FIBRE ADDITION ON STRENGTH PROPERTIES OF CONCRETE

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**Abstract**
Concrete the most popular construction material is string in compression but has limited properties namely low tensile strength, low ductility, low energy absorption and shrinkage. Out of all these draw backs, low tensile strength is the most important one and this problem can be corrected by adding some fibre like materials. In the present work, the influence of addition of soft drink bottle cap in varying dosages on the properties of concrete is investigated. The results indicate that mechanical properties namely compressive strength, split tensile strength and flexural strength were found to increase with the increase in bottle cap fibre addition.
**Keywords:** Bottle cap fibre, Compressive Strength, Split tensile strength, Flexural strength.

## 1. Introduction

Concrete being a brittle material has low tensile strength and low strain capacity. As a result, mechanical behavior of concrete is critically influenced by crack propagation. Concrete in service may exhibit failure through cracks which are developed due to brittleness. To improve properties of concrete like low tensile and low strain capacity, fibre reinforced concrete (FRC) has been developed which is defined as concrete containing dispersed randomly oriented fibres. Use of fibres in concrete was initially experimented in 1910 and research on steel Fibre addition in concrete started in early 1960 s. Use of admixtures to concrete has long been practiced since 1900. In the early 1900's, asbestos fibres were used in concrete. There was a need to find replacement for the asbestos used in concrete. By the 1960's steel, glass GFRC and synthetic fibres such as poly propelene fibres were used in concrete. The main objective of this investigation is to improve tensile strength of concrete. To overcome this defect, partial incorporation of fibres is practiced.

## 2.Objective

• To study the effect of addition of metallic bottle cap fibers in varying percentages (0.25,0.5, 1, 1.5, 2) to concrete
• To understand the effect of bottle cap fiber addition on concrete by comparing it with control concrete.

## 3.Methodology

The following figure shows the methodology involved in this study. For conducting the study, bottle caps were cut into strips of size 3mm width and 10 mm length. They were added at a dosage of 0.25 %, 0.5 %, 1%,1.5% and 2% of total weight of concrete. M25 concrete was considered for the study and mix design was carried out as per IS-10262:2009. Variation in strength of the fibre added concrete was compared with the control concrete (0 % fibre content )

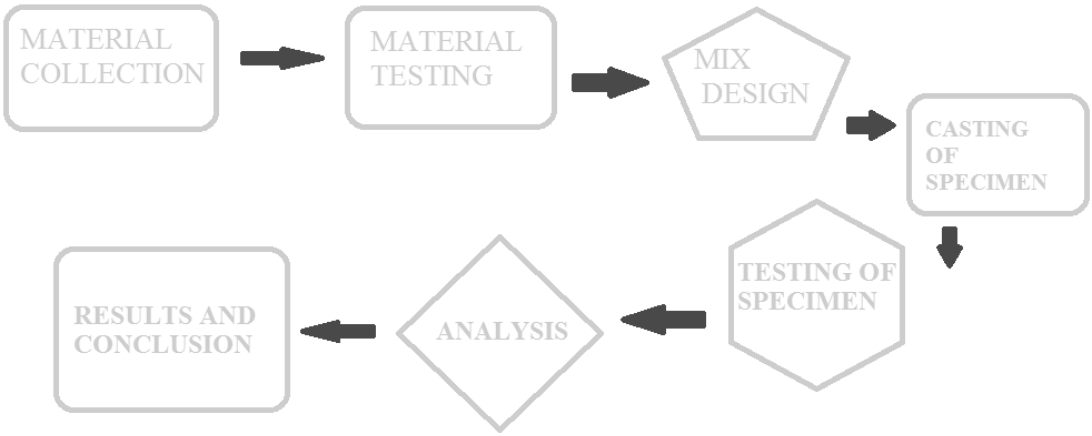


Figure 1: Algorithm chart for methodology

### *4.Properties of Materials used in concrete construction*

***Table 1. Properties of Cement***

| | |
|---|---|
| Fineness of Cement | 2 % |
| Standard Consistency | 36% |
| Initial Setting Time | 48 min |
| Final Setting Time | 210 min |

***Table 2. Properties of Fine Aggregate***

| | |
|---|---|
| Specific Gravity | 2.625 |
| Fineness Modulus | 2.90 |
| Zone | II |

***Table 3. Properties of Coarse Aggregate***

| | |
|---|---|
| Specific Gravity | 2.64 |
| Fineness Modulus | 7.20 |
| Angularity Number | 9 |
| Aggregate Impact Value | 36.66 % |

***Table 4. Properties of Fresh Concrete***

| | |
|---|---|
| Compaction Factor | 0.94 |
| Slump Value | 30 cm |

***Table4. Mix Proportion for 1 $m^3$ of Concrete***

| | |
|---|---|
| Mass of cement in $Kg/m^3$ | 452 |
| Mass of fine aggregate in $Kg/m^3$ | 532.65 |
| Mass of coarse aggregate in $Kg/m^3$ | 1152.95 |
| Water cement ratio | 0.43 |
| Mix design proportion | 1:1.18:2.5 |

## 5.Testing of concrete results

1. Compressive Strength
2. Split tensile Strength
3. Flexural Strength

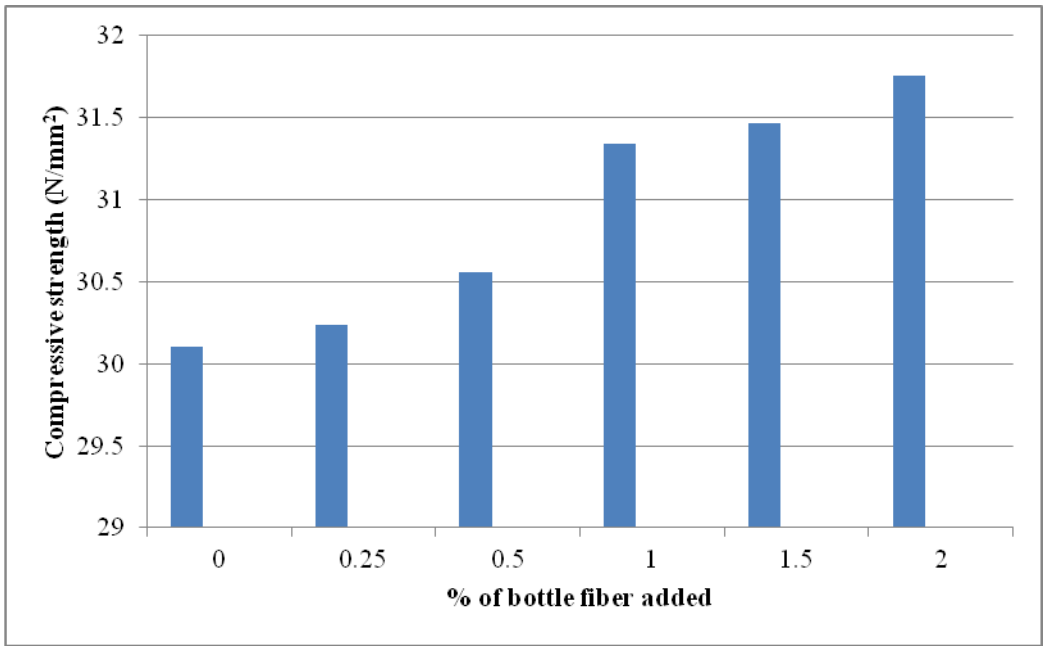


Figure 2: Compressive Strength variation (28 days)

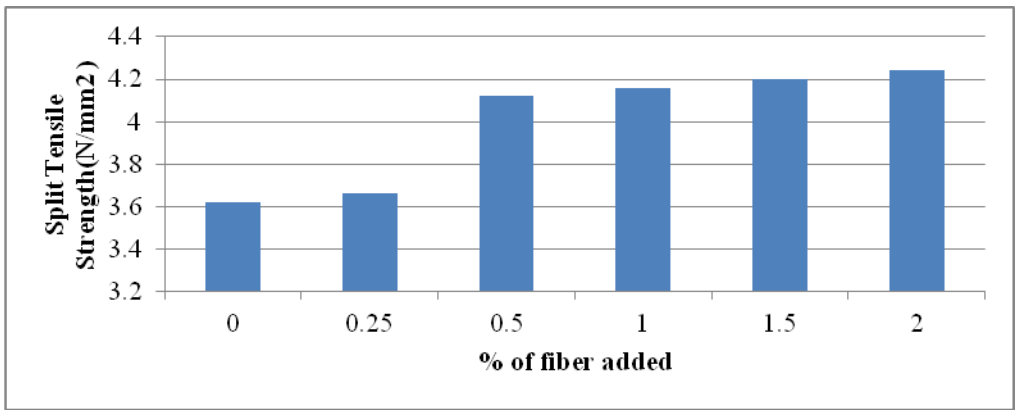


Figure 3: Split Tensile Strength variation

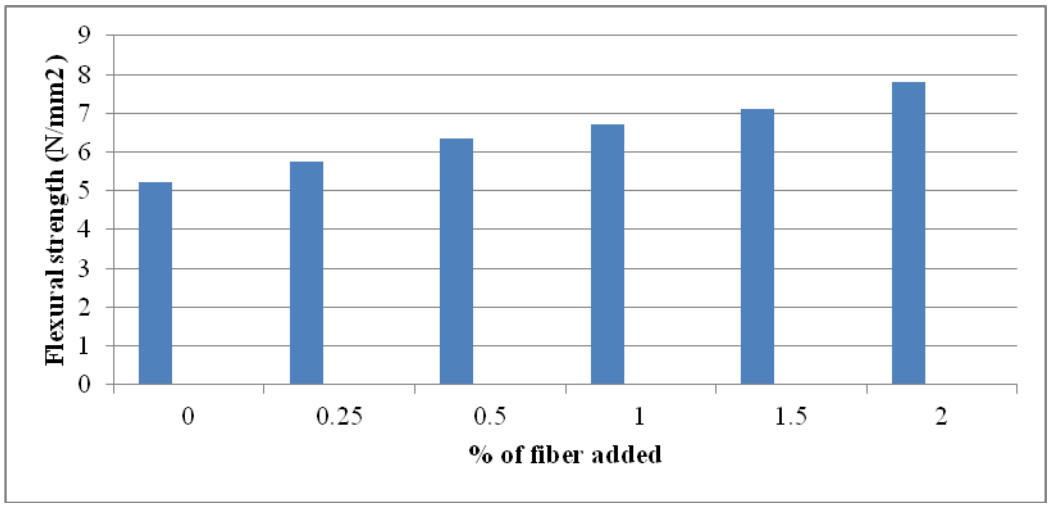


Figure 4: Flexural strength variation

### *6. Results and Discussions*

Test results shows that when fibers are added compressive strength is found to be increasing. Increase in strength maybe due to the strong bond between fiber and mortar in fiber reinforced concrete. The Flexural strength was found to be increasing with increasing percentage of fiber. The split tensile strength also shows a tremendous increase.

### 7. Conclusions

Concrete is good in compression and weak in tension. To improve the tensile strength of concrete various fibers such as carbon, glass etc are added to concrete. In the present study metallic bottle caps were used as fiber in varying percentage such as 0, 0.25, 0.5, 1 and 2 percentages. To determine the mechanical properties compression test, flexural strength test and split tensile strength test were carried out. The experimental values of compressive strength, split tensile strength and flexural strength were found to be increasing with bottle cap fiber addition. Compressive strength, split tensile strength and flexural strength of concrete increased upto 5.23%,14.62% & 49.21 % for bottle fibre addition upto 2 %.The compressive strength shows a slight increase when compared to control concrete. The split tensile strength and flexural strength shows a tremendous increase.

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