Utilization of bottle caps in concrete

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Abstract— *Advances in technology enhance human comforts and in the same time damages the environment. Plastic used as cap for containers preserve liquids in the bottles very well, but the disposal of caps particularly bottle caps which harmful to environmental. Hence an attempt has been made in the present investigations to study the influence of addition of waste materials like soft drink bottle caps dosage of 0%, 5%, 10%, 15% & 20% of total weight of coarse aggregate as fibers. M25 grade of concrete was produced by replacing coarse aggregate by plastic bottle caps. In this investigation caps were cut into strips. Experimental investigation was carried out adding bottle caps in concrete and tests were carried out as per recommended procedures by relevant codes. Split tensile strength increases with increase of bottle caps. Split tensile and flexural strength of 5.0 % bottle cap fiber concrete increase up to 1.72% and 13.23 % more than plain concrete(without bottle cap plastic) respectively.*

Keywords— plastic bottle caps, compressive strength, course aggregate, split tensile strength , flexural test.

I. INTRODUCTION

Concrete has an extensive role to play in the construction and improvement of our civil engineering and infrastructure development. Its great strength, durability and veracity are the properties that are utilized in construction of Roads, Bridges, Airports, Railways, and Tunnels, Port, Harbors, and many other infrastructural projects. Plastic waste products deserve special attention on account of non-biodegradable property which is creating a lot of problems in the environment today the construction industry is in need of finding effective materials for increasing the strength of concrete structures with low cost, and with less environmental damages. Currently millions of tons of waste bottle caps are produced in the world. This will ultimately cause pollution and harmful to the ecosystem. . Therefore utilizing waste bottle caps in concrete production not only solves the problem of disposing this ultra-light solid waste but also helps preserve natural resources. A project was taken up to use plastic bottle caps in concrete with following objectives.

II. OBJECTIVE

- To assess the fresh properties of concrete when coarse aggregates are partially replaced with Waste Bottle Caps (WBC).
- To produce lighter weight polymer concrete for its multidimensional use.
- Optimize the amount of recycle fiber bottle caps in concrete.
- Test demonstration concrete product.
- Develop suitable mix design.
- Provide knowledge/data that will be used for development of concrete work.

III. METHODOLOGY

The following figure shows the methodology involved in the entire project work.

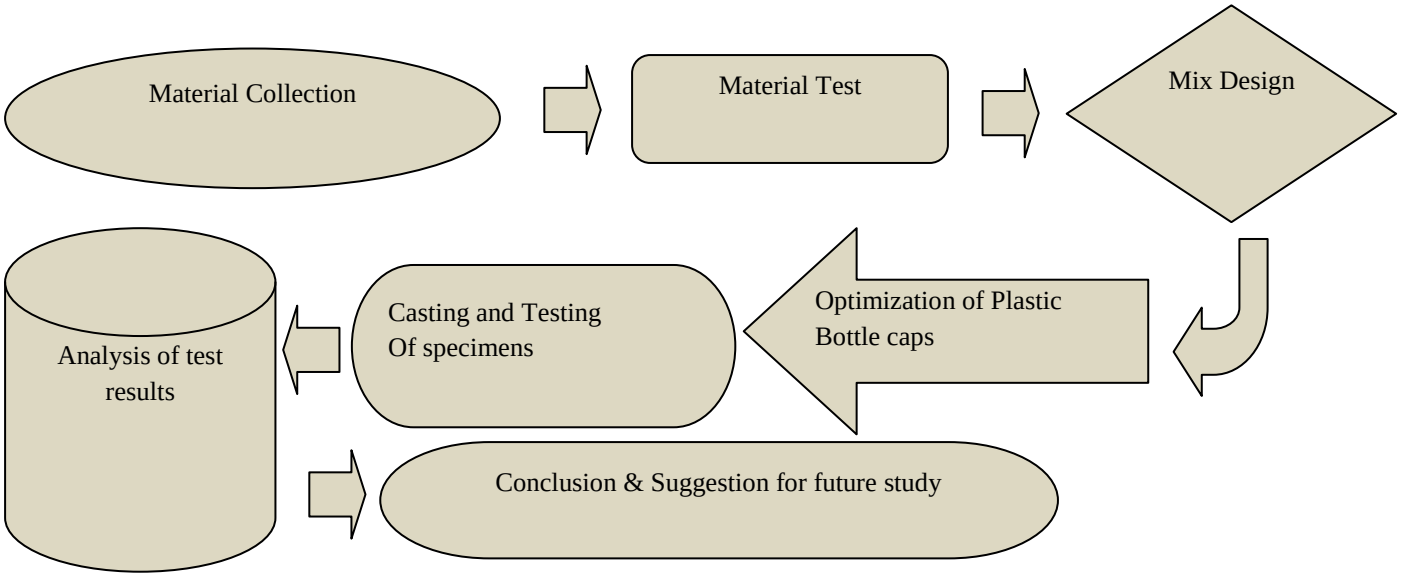

FIG. 1 SHOWS THE ALGORITHM CHART FOR METHODOLOGY

TABLE 1
PHYSICAL PROPERTIES OF FINE AND COARSE AGGREGATE

Sr. No	Property	Fine Aggregate	Coarse Aggregate
		Results	
1.	Particle Shape, Size	Round, Below 4.75mm	Angular, 20mm
2.	Fineness Modulus	4.175	7.424
3.	Silt content	3%	Nil
4.	Specific Gravity	2.652	2.664

IV. M-25CONCRETE MIX DESIGN

The M25 concrete mix is designed As per IS- 10262:2009 which gives a mix proportion of 1:1:2 with water cement ratio of 0.40.The concrete used in this research work was made using Binder, Sand and Gravel.

TABLE 2
MIX PROPORTIONS FOR 1 CUM OF CONCRETE

Sr. No.	Descriptions	Quantity
1	Mass of Cement in kg/m^3	384 kg/m^3.
2	Mass of Water in kg/m^3	191.6 kg /m^3
3	Mass of Fine Aggregate in kg/m^3	752.71 kg/m^3
4	Mass of Coarse Aggregate in kg/m^3	1064.65 kg/m^3
5	Mass of 20 mm in kg/m^3	1064.65 kg/m^3
6	Water Cement Ratio	0.44

TABLE 3
PARTIAL REPLACEMENT OF BOTTLE CAPS

Sr. No.	Materials	Replacement in % (per Block)				
		1	2	3	4	5
1.	Bottle caps	0%	5%	10%	15%	20%
2.	Coarse agg.	100%	95%	90%	85%	80%

V. TESTING OF CONCRETE RESULTS

1. Compressive Strength

2. Split tensile Strength

3. Flexural Strength

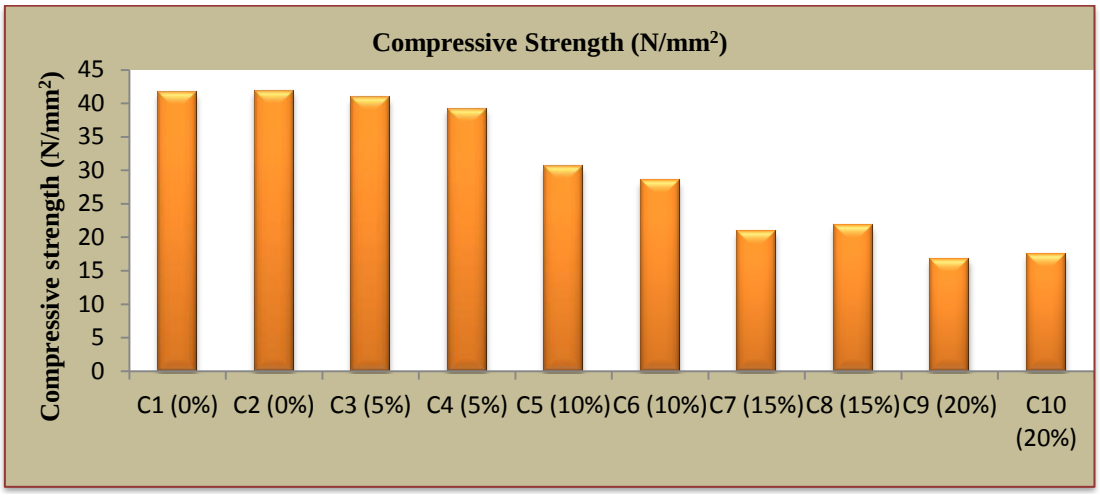

CHART. 1. COMPRESSIVE STRENGTH

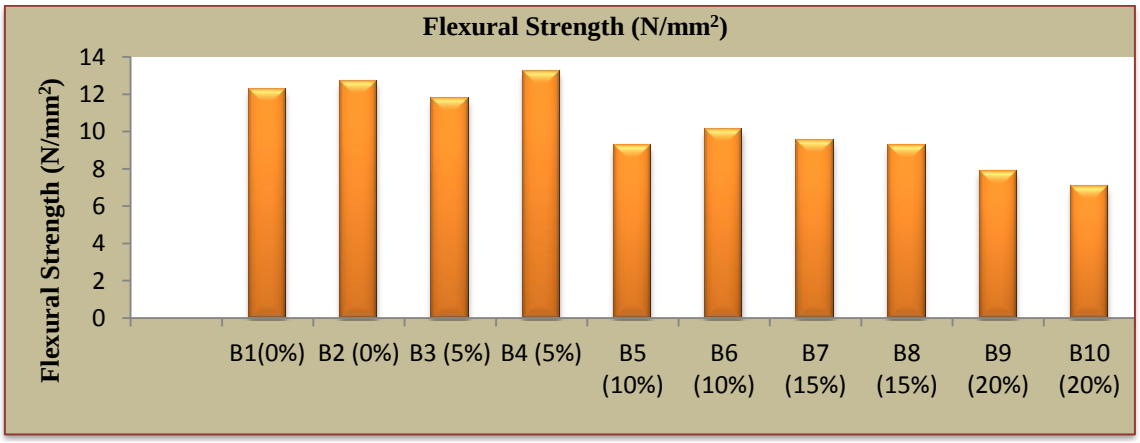

CHART. 2. FLEXURAL STRENGTH

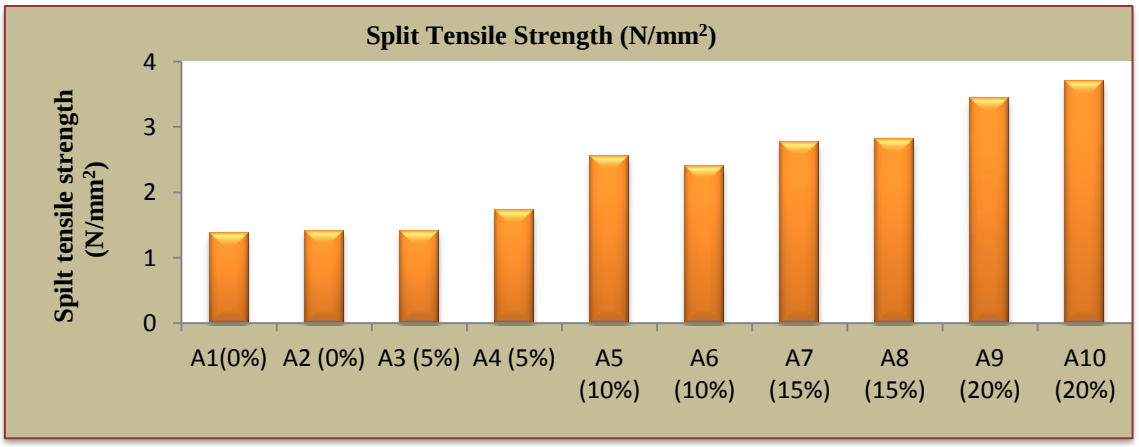

CHART. 3. SPLIT TENSILE STRENGTH

VI. CONCLUSION

Conclusion of our project is as follows:

1. Compressive strength decreases with increase in percentage by 5%, 10%, 15% and 20% of bottle cap fibers.
2. Split tensile strength increases with increase in 5%, 10%, 15% and 20% of fiber.
3. Flexural strength decreases is more prominent with increase in percentage of bottle cap fiber.
4. It is used for the construction of partition walls for multistoried building.
5. It is used for the construction of compound wall & panel.
6. Plastic building material is strong, flexible, water- and heat - resistant.
7. Waste reduction, Conservation of energy.
8. Save money, Generate revenues. Etc.

Hence this concept of mixing is good for strength and workability of concrete. The possibilities of using waste bottle caps (WBC) as partial replacement of coarse aggregate have been explored.

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