iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 8 **Issue:** III **Month of publication:** March 2020

DOI:

www.ijraset.com

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue III Mar 2020- Available at www.ijraset.com

Partial Replacement of Coarse Aggregate with Waste Fiber Body of Vehicle

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Abstract: Concrete is widely used for various purposes such as constructions of roads, buildings, dams, etc… The present trend in concrete is towards increasing strength and durability of concrete to meet the demand of modern constructions. For that we replace waste fiber body of vehicles partially with coarse aggregates due to its property such as durability, light weight and its ability to mould into any desire shape.

This paper deals with the reuse of plastic fiber body of vehicles as a partially replacement of coarse aggregates in M15 concrete as well as on the method of reducing fibers of vehicles as a safe guarding natural aggregate include in concrete. It aims that, finding the replacement of natural coarse aggregate with plastic fibers of vehicles. If we add plastic fibers content of 0%, 10%, 20% and 30% it is observed that the strength after seven days is 10.81N/mm^2, 8.62N/mm^2, 9.89N/mm^2 and 7.61N/mm^2 and 28 days is 17.33N/mm^2, 13.44N/mm^2, 15.86N/mm^2 and 12.58N/mm^2 respectively. Hence we compared the property of waste plastic fibers with aggregate.

Keywords: Compressive strength, Waste plastic fiber.

I. INTRODUCTION

In today's scenario, the disposal and management of plastic waste is the most serious issue. It is one of the major environmental, economical and social issue. Typically, plastic can't recycled into the same type of plastic product.

Looking towards concrete, it is widely used as a construction material. It is composed of cement, sand, aggregate and water according to equivalent proportion. Ingredients used in the concrete has different properties. Aggregate is a broad category of coarse particulate material used in concrete including sand, gravel, crushed stone, slag, recycled concrete and geosynthetic aggregates. The aggregate serves as reinforcement to add strength to the overall composite material. However aggregate makes concrete heavy as it has much weight. To reduce this requirement some alternatives had done.

The purpose of this project is to evaluate the possibility of using waste fiber body materials to partially substitute for the coarse aggregate in concrete composites. The important property of this fiber body is, it is lighter in weight than the aggregates. Addition of this fibers gives compressive strength and it reduces waste as well.

II. MATERIAL

A. Vehicle Fiber Body

Vehicle fiber body is composed of carbon atoms bonded together to form a long chain. The fibers are extremely stiff, strong, and light and are used in many processes to create excellent building material. The strength of weight ratio of a Vehicle fiber body part is much higher than either steel or plastic.

Properties of Carbon Fiber:

1) *Vehicle Fiber Body Has High Strength To Weight Ratio:* Strength of material is the force per unit area at failure, divided by its density. Any material that is strong and light has a favorable strength/weight ratio.
2) *Vehicle fiber body is very Rigid:* Rigidity or stiffness of a material is measured by Young Modulus. Vehicle fiber body is 4 times stiffer than glass plastic, 2.5 times greater than aluminum.
3) *Vehicle fiber body is Corrosion Resistance and Chemical Stable:* Although carbon fiber themselves do not deteriorate, Epoxy is sensitivity to sunlight and needs to be protected.
4) *Vehicle fiber body has good Tensile Strength:* Tensile strength or ultimate strength, is the maximum stress that a material can withstand while being stretched or pulled before necking, or failing. If you take a strip of plastic bag, it will stretch and at one point will start getting narrow. This is Necking.
5) *Fire Resistance /Non Flammable:* Depending up to the manufacturing process and the precursor material, Vehicle fiber body

can be quite soft and can be made into or more often integrated into protective clothing for firefighting. Nickel coated fiber is an example. Because carbon fiber is also chemically very inert, it can be used where there is fire combined with corrosive agent.

6) *Vehicle fiber body are Brittle:* The layers in the fibers are formed by strong covalent bonds. The sheet like aggregations readily allow the propagation of cracks. When the fibers bend they fails at very low strain.

7) *Fatigue Resistance is Good:* Resistance to Fatigue is carbon is fiber composites is good. However when carbon fiber fails it usually fails catastrophically without much to announce its imminent break. Damage in tensile fatigue is seen as reduction in stiffness with larger numbers of stress cycle.

Fig. 1 Waste Vehicle fiber body

III. EXPERIMENTAL PROCIDURE

1) *Washing of Aggregates:* The primary step is by applying water to clean the coarse aggregate to remove fine particles such as dust, silts, clay, etc. It is sun - dried after washing the aggregate so that the proper aggregate weight is used for mixing.

2) *Oiling of the Cube Moulds:* The 150x150mm size cube is properly oiled to prevent the concrete mixture from sticking the cube plate after 24 hours while removing the concrete cube from it.

3) *Mixing of all the materials in mixture:*

a) Taking the materials in the proper proportion of 1:2:4 and mixing all the material until the whole material gets properly mixed.

b) First, the materials are taken properly, then the drum is cleaned, then the coarse and fine aggregate is added to the drum.

c) Then the drum is rotated for 2 - 3 min to properly mix the coarse aggregate and fine aggregate. Then cement is added and drum is rotate until the coarse aggregate, fine aggregate and cement is mixed properly.

d) Then carbon fiber is added to the total mixture and drum is rotate for 2-3 min. Whole mixture should be mix about 5 to 7 min. In mixture drum which revolves at 6 to 7 rpm. Filling of the concrete in cube and compaction concrete by tamping rod so that the concrete settle down to give the constant layer.

e) Next day at same time, remove the cube from moulds and put them in Curing tank for 7 to 28 days and after the curing the cubes are carried for the testing.

IV. RESULT

A. *Impact test of Specimen*

1) Aggregate impact value = 5.5

2) Waste plastic fiber body impact value = 0.529

B. *Weight of each cube of size 150X150X150 mm*

% replacement in course aggregate	0%	10%	20%	30%
Weight in grams	847	750	709	690

Table no. 1

C. Compressive strength of cubes in N/mm^2.

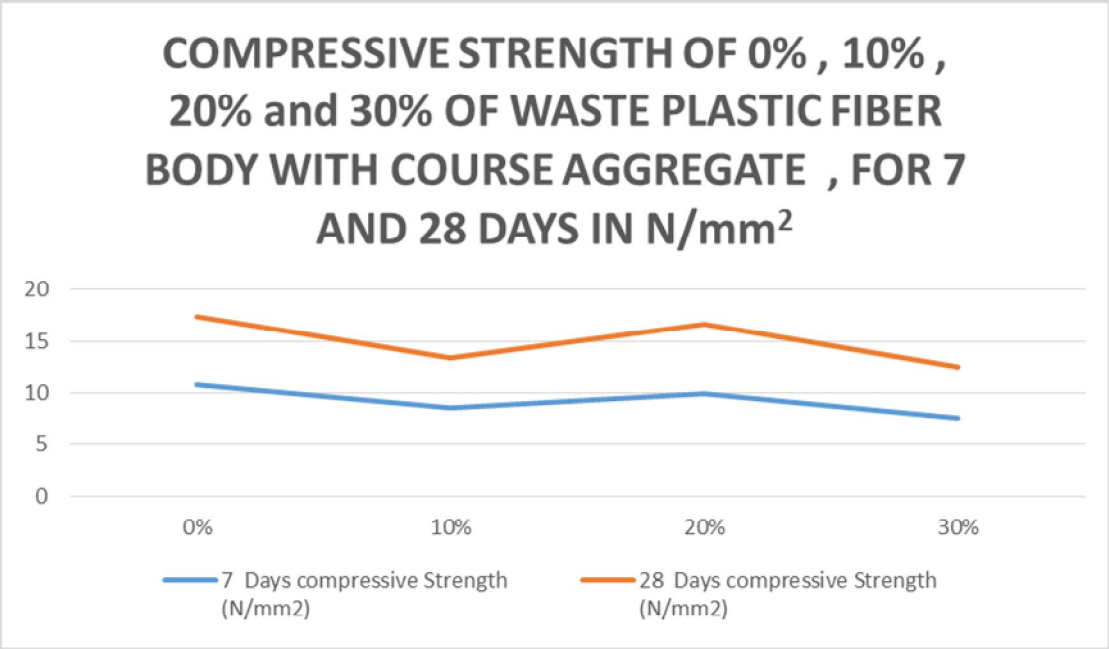

Fig 2 : - Graphical representation of compressive strength in N/mm^2

The following table shows 7 and 28 days results of compressive strength of cubes.

% replacement in course aggregate	0 %	10%	20%	30%
7 days compressive strength in N/mm^2	10.81	8.62	9.89	7.61
28 days compressive strength N/mm^2	17.33	13.44	15.86	12.58

Table no. 2

V. CONCLUSIONS

A. The experimental result have shown the use of automotive plastic waste material in making concrete can provide an alternative solution to minimize the environmental impact of waste plastic.

B. The properties of concrete containing various percentage of plastic {0%, 10%, 20%, and 30%} were tested for its physical properties and compressive strength.

C. The compressive strength of concrete is decrease in 10% then increase in 20% and then decrees in 30%.

D. The weight of cubes is decries when the proportion of waste plastic fiber is increase.

E. Overall the waste plastic fiber concrete more light weight than the plane cement concrete.

VI. ACKNOWLEDGMENT

We have taken efforts in this paper. However, it would have not been possible without the kind support and help of many individuals. We would like to extend our sincere thanks to all of them.

We express our profound gratitude and deep regard to our guide Ms. Neha Arukia for her exemplary guidance, monitoring and constant encouragement throughout this project.

We would also like to thank Dr. V. H. Tatwawadi, Principal and Dr. M. S.Bhagat, Head Civil Engineering Department for helping us to allow all facilities required for this paper work in this college.

We are also thankful to our Family members and Friends for their valuable cooperation and standing with us in all difficult conditions.

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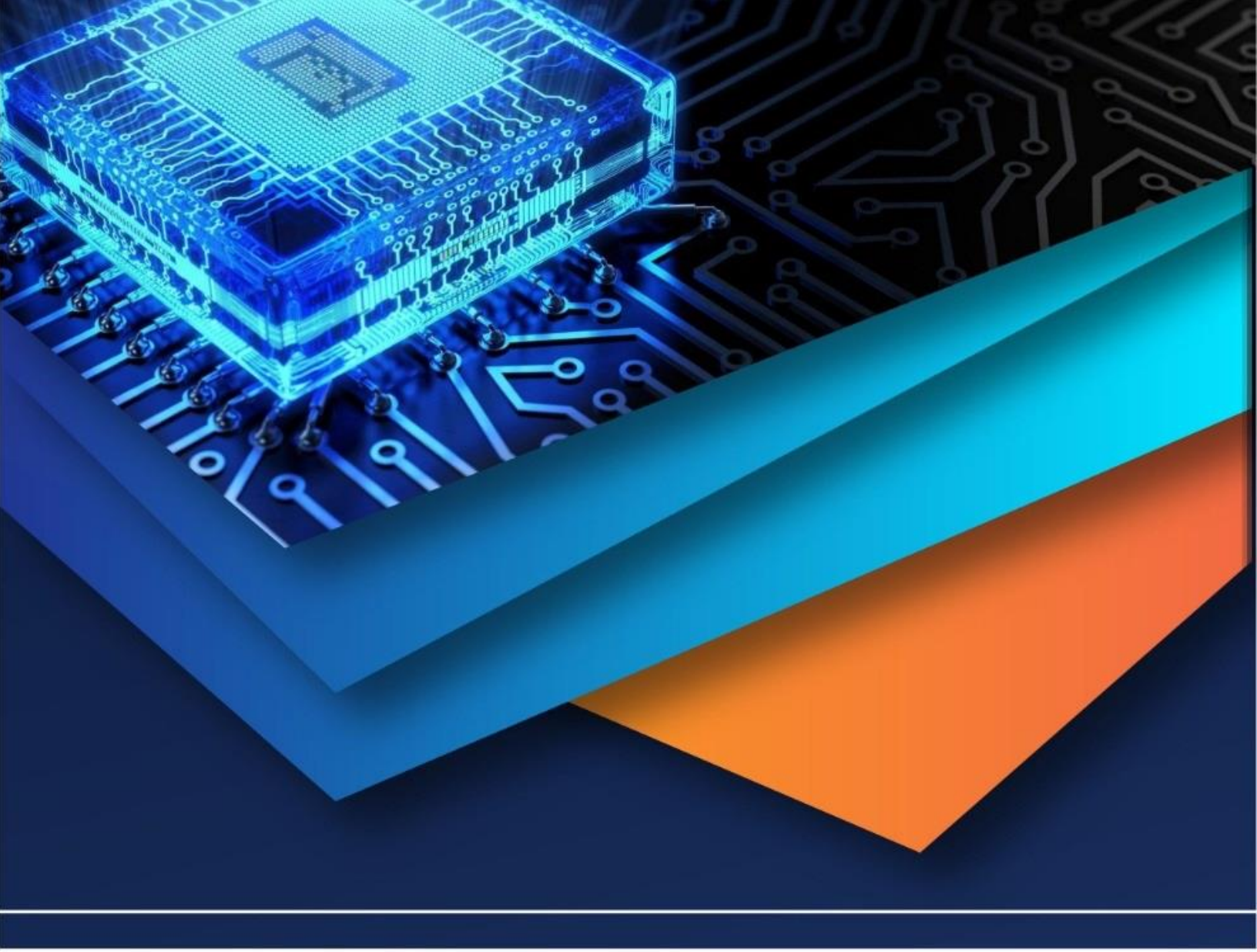

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