



Replacement of Sand with PET In Concrete

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Abstract:

The manufacture of concrete using a thermosetting polymer instead of a fine aggregate(sand) known as modified concrete. Polyethylene terephthalate (PET) is the polymer used, recycling plastic bottles. PET is a material commonly used as a structural element, not as an aggregate. The research work find out that PET in the concrete produces good flexural strength, higher tenacity, light weight, good resistance. And it is found out that it is even economic than sand because sometimes availability of the sand is scarce.

I. INTRODUCTION

PET (Polyethylene terephthalate) is the most common thermoplastic polymer which is used to manufacture the plastic bottles. These plastic bottles are non-biodegradable which cannot be decomposed by burning and dumping so their quantity is increasing rapidly in urban areas. Plastic waste having 12.3 % constitute in the total waste mostly belongs to the plastic bottles. They are unhealthy for the environment but they have high strength, low density, low weight, more durable etc. because of all these factors we can use it into the concrete mixture (M25) by replacing sand (fine aggregate) as they can be crushed into the finer size particles of aggregate matching the same size.

Plastic is one of the materials showing immense potential in our daily lives as it possess low density, high strength, user friendly designs, fabrication capabilities, long life, light weight and low cost are the factors behind such extraordinary growth. Although, plastics have been used in very huge and useful applications, it bestows to an ever increasing amount in the solid waste stream. Polyethylene forms the largest fraction, which is followed by PET that represents one of the most common plastics in solid urban waste.

Concrete is the most widely used construction material due to its high compressive strength, long service life, and low cost. In field of concrete technology, India as well as other countries now is seeking for an alternative for conventional aggregate that may be recognized as use plastic waste, for it might be realized as PET phase capacities.

II. METHODOLOGY

Cement is the basic raw material which is used for making concrete thus, the type and quality of the cement is of utmost importance. Therefore we have conducted various laboratory tests for the cement which includes various tests like

- 1) FINENESS OF CEMENT
- 2) CONSISTENCY OF CEMENT
- 3) SPECIFIC GRAVITY OF CEMENT
- 4) LE CHATTLIER APPPARATUS
- 5) IST AND FST OF CEMENT
- 6) COMPRESSIVE STRENGTH OF CEMENT

The quality of the sand is also very important while preparing the mix of concrete. Therefore in order to select good sand we have selected sand on the basis of the laboratory tests performed in the lab. The various laboratory tests performed are

- 1) FINENESS MODULUS OF SAND
- 2) SPECIFIC GRAVITY OF SAND
- 3) WATER ABSORPTION OF AGGREGATE

We tested cement in its compressive strength with concrete mix of M-20 and obtained result. After that test we mix PET in different proportions and tested mix after 28 days. PET generally found in plastic bottles and by crushing bottles fine some sand proportions replaced. All tests are performed similar to ordinary concrete mix and compare the obtained result.

III. RESULT

Fineness of Cement (Sieve Analysis):

$$\text{Fineness} = (W1-W2)*100/W1 = (100-4.5)/100 = 95.5 \%$$

Results- Average fineness of cement is 95.5 %.

Limits- Percentage residue should not exceed 10 % by weight.

Normal Consistency of Cement:

Result: The consistency of the given cement sample is 29 %.

Soundness of Cement:

Observation:

Initial distance between the indicator points in mm = 15 mm

Final distance between the indicator points in mm = 19 mm

Expansion in mm = final distance- initial distance = 19 – 15 = 4 mm

Result: Expansion in mm = 4 mm

Initial and final setting time:

Result:

Initial setting time = 29 min.

Final setting time = 9 hrs and 47 min.

Specific gravity of cement

Result: SP. Gravity of the sample = 3.005

Compressive strength of cement:

Average compressive strength in 7 days is 36 N/mm²

Average compressive strength in 28 days is 54 N/mm²

IV. CONCLUSION

- The enhancement of existing knowledge and comparative studies will help them utilized in an efficient way. Since a huge amount of PET Bottle wastes are being generated every year around the globe thus creating landfill problems, utilization of PET Bottle waste.
- As workability is continuously decreasing gradually from the starting to the end.
- As compressive strength is more than the normal compressive strength till 6 percent.
- As flexural strength is increased up to 2 percent so it should be check according to the required.

Future Scope of Work:

- As workability decreases, sometimes it affects the required strength so it can be minimizing in the future.
- Durability of PET bottle concrete structures can be determined as per the added percentage of plastic shredded pieces in the future.
- Split tensile strength test can be performed and its observation can be noted in the future.
- Testing of this project can be done by taking various grade of concrete other than M30.

V. REFERENCE

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