

Utilization of Plastic Waste Replacing by Aggregate

Ghansham Bhaskar Fegade¹, Devashish Manasaram Sonawane²,
Shubham Namdev Jadhav³.

^{1,2,3}Student, Department of Civil Engineering Alard College of Engineering and Management, Savitribai Phule
Pune University, Pune, Maharashtra.

Guide-Prof. Rachana Vaidya¹

¹Department of Civil Engineering, Alard College of Engineering and Management, Savitribai Phule Pune
University, Pune, Maharashtra

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ABSTRACT: This research paper is about the Utilization of Plastic Waste Replacing by Aggregate. Disposal of waste plastic has become a serious problem and waste plastic is thrown out which causes environmental pollution. Utilization of waste obtained in production recycle plastic pipe may be used as coarse aggregate in the construction of bituminous pavement. In the proposed work we have done an experimental study on waste plastic aggregates, obtained from recycled pipe waste generated at pipe manufacturing plant at M.I.D.C area, Jalgaon. The plastic waste named as Gullah waste is cut in cutting machine into small pieces passing through 25mm standard sieve. These plastic aggregates are thought to be used in place of natural aggregate in construction of flexible pavement. The specified test results are positive and hence hopeful. The use of innovative techniques will not only strengthen the road construction but also increase the road life and eco-friendly construction industry as well as will help to improve the environment. These roads would be a boon for India's hot and extremely humid climate, when temperature frequently crosses 50 ° and torrential rains create havoc leaving most of the road with big potholes.

KEYWORDS: Gullah waste, cement, compressive strength, partial replacement, aggregate, etc.

I. INTRODUCTION

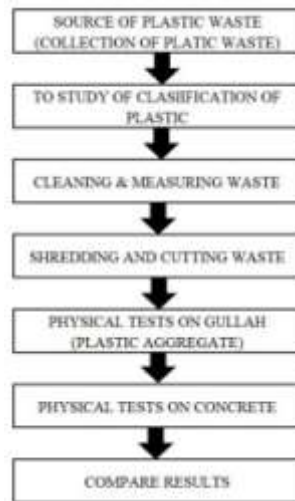
In this paper Utilization of Plastic Waste Replacing by Aggregate, the basic intention is to efficiently utilize the industrial waste plastic obtained in the process of manufacturing of recycled plastic pipes in a constructive way so that it can be beneficial to society. However, the main objectives of the current project work can be summarized as follows:

1. To check the suitability of waste plastic as aggregate.
2. To determine the physical properties like specific gravity, sieve analysis, water absorption, impact value, crushing value, stripping value, etc. of plastic aggregate.
3. To search for an eco-friendly procedure of utilizing plastic waste, which will help reduce environmental burden.
4. To make the aggregate with the waste of plastic pipe.
5. To compare the standard specification for natural aggregates and plastic aggregates.

II. PLAN OF EXPERIMENTATION

It is necessary to work out a project proposal to carry out further studies on various aspects such as collection, processing and effective utilization of this industrial plastic waste material. To start with, such a study could be initiated with the following components:

1. Estimation of the types, quantity and useful components present in the waste plastic materials in the industrial and surrounding areas.
2. Methodology for collection and sorting out the useful components of the plastic pipe waste.
3. Methodology for processing the plastic pipe waste as required for use in the preparation of modified aggregate, including cleaning, crushing and further processing of the plastic pipe waste material.
4. It is hoped that on completion of this project, the plastic waste materials will be put to effective use in road construction.



Flow chart No.2.1: Plan of Experimentation

1. Collection of plastic waste: The waste obtained from recycled plastic pipe plant at M.I.D.C. Jalgaon. The waste is known as

Gullah material which is obtained in process of production of recycled pipes. This material generally obtains in cylindrical shape.



Figure No.2.1: Plastic waste collected from Factory

2. Study Of classification of plastic waste: Plastic can be classified in many ways, but most commonly by their physical properties. Plastic may be classified also according to their chemical sources. The 20 or more known basic types fall in to 4 general groups, cellulose plastic, synthetic resin plastics, protein plastics, natural resins, elastomers and fibers. But depending on their physical

properties may be classified as thermoplastic and thermosetting material Thermoplastic material can be form into desired shapes under heat and pressure and become solids on cooling. If they are subjected to same conditions of heat and pressure, they can be remoulded. Thermosetting material which once shaped cannot be softened/remoulded by the application of heat.

Thermoplastic	Thermosetting
Polyethylene terephthalate (PET)	Bakelite
Polypropylene (PP)	Epoxy
Poly vinyl acetate (PVA)	Melamine
Poly vinyl chloride (PVC)	Polyester
Polystyrene (PS)	Polyurethane
Low-density polyethylene (LDP)	Urea-formaldehyde

High-density polyethylene (HDPE)	Alkyd
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TableNo.2.1: Typical thermoplastic and thermosetting resins

- Cleaning and Measuring waste:** The waste obtained from plastic pipe plant was dirty. Waste is cleaned and measured the weight after cleaning.
- Shredding and cutting of plastic waste:** Plastic waste Shredder which are manufacture using high quality materials These when

thrown are collected and resold in a new packaging, giving impression of being fresh, resulting in the spread of deadly diseases. The shredder shreds all kinds of waste like syringes, needles, glucose bottles, mineral water bottle, plastic lumps, pellets, wood paper, cardboard etc.



Figure No.2.2: Plastic waste after Shredding and cutting

- Physical Testsof aggregate:**With consideration of above points, the study of engineering properties i.e., strength of, specific gravity, sieve analysis, water absorption tests, aggregate impact value test, aggregate crushing value etc as per IS standards.
- Physical Tests on concrete using plastic aggregate:**This clause deals with the procedure for determining the compressive strength of concrete specimens. We have

performed this test on Universal Testing Machine for specimen aging at 28 days. Three specimen blocks were taken to laboratory for testing and tested one by one. In this test, a specimen block is put on Universal testing machine and applied pressure till it breaks. The ultimate pressure at which block is crushed is recorded. All Three specimen blocks are tested one by one and the load at crushing was recorded.



Figure No.2.3: Block in Curing Tank



Figure No.2.4: Weight Measurement on weighing machine



Figure No.2.5: Block Testing on UTM

- Compare results:** Comparison of results between plastic aggregate and standard specifications of stone aggregate. The result obtained indicates that plastic aggregate obtains from industrial waste plastic from M.I.D.C. area, Jalgaon. Are giving satisfactory results may be hopefully used as coarse

aggregates for construction of flexible pavement.

III. RESULT AND DISCUSSION

We have conducted to all the test according to concerned IS specifications and the result are mentioned as given in the table below.

Comparison of results between plastic aggregate and standard specifications of stone aggregate

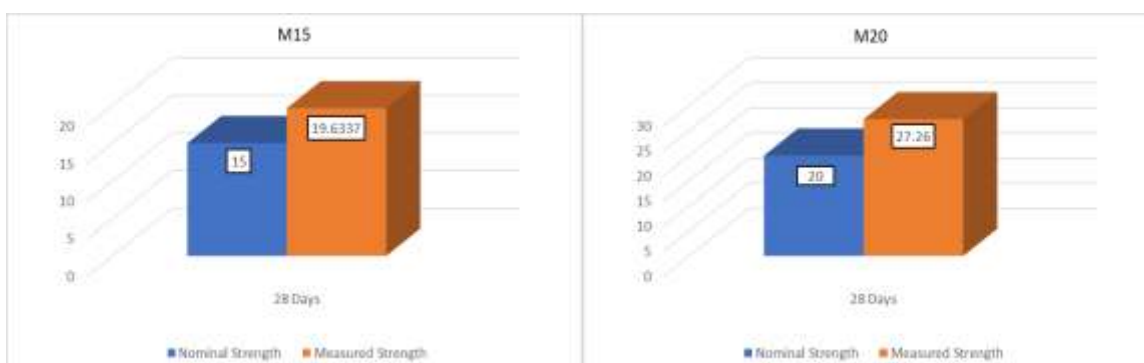
Sr. No.	Name of test	Results (Stone Agg.)	Results (Plastic Agg.)	I.S. Specification
1.	Specific Gravity	2.30	1.50	IS: 2720 (Part 3) 1980
2.	Sieve analysis	Conducted As Per IS	Conducted As Per IS	IS: 2386 (Part 1) 1963
3.	Water absorption	1.61%	1.65%	Almost Similar
4.	Aggregate Impact value	6.97%	7.86%	Almost Similar
5.	Aggregate Crushing value	1.185%	1.725%	27% max (Almost Similar)

Table No.3.1: Test Results of Aggregates with Comparison

We have conducted to all the test according to concerned IS specifications and the Compressive Test result are mentioned as given in the table below.

Sr.no.	Grade	Weight of Specimens	Nominal Strength (N/mm ²)	Load Reading (KN)	Strength (A) (N/mm ²)	Percentage of Strength (%)
1	M15	8.1	15	450.45	20.02	130.89%
		8.21		400	17.77	
		8.2		475.8	21.11	
2	M20	8.73	20	601	26.67	136.3%
		8.95		590	26.22	
		8.59		650	28.89	

Table No.3.2: Test Results of Compressive Strength of Specimens



Graph No.3.1: Comparison of Nominal VS Measured Strength

IV. ADVANTAGES

1. Plastics have various chemical and physical properties, so that roads can be designed to meet specific weather and wear resistance requirements.
2. Existing Plastic waste usually put into landfill, burned, or polluted into the open-air

environment but Plastic waste can be reused productively in construction of road.

3. Road constructed using plastic have good wear resistance that standard bitumen road they do not absorb water, have better flexibility so that maintenance cost of such a road will be less as compare to standard bitumen road.
4. Plastic gives higher strength, higher resistance to water ultimately it can be provide better performance over the period of time.
5. Plastic aggregate can be used to fill up existing pot holes on the roads.

V. DISADVANTAGES

1. Plastic comes in different types so while using in road construction compatible plastics need to mix together if it mixes with non-compatible plastic then it can cause structural weakness.
2. Plastic has lower resistance to the temperature so that it can't use in high temperature zone.

VI. CONCLUSION

The conclusion for the proposed study can be summarized in the following points:

1. The specific gravity of plastic aggregate is within normal range.
2. The shape and size of the plastic aggregate is similar to that of stone aggregate.
3. The surface texture of plastic aggregate is rough like stones aggregate which can be developed good bond with binder material like bitumen and building construction.
4. The impact value and crushing value obtain for plastic aggregate shows that they satisfy strength criteria for coarse aggregate.
5. The plastic aggregate obtain from industrial plastic waste may positively be used as aggregates as a constituent in the construction of flexible pavement.
6. The use of innovative technology not only strengthen the road construction but will also increase the road life as well as will help to improve the environment and also solve the problem of pollution.
7. Plastic aggregate road would be boon for India's extremely humid climate where torrential rains create havoc, leaving most of the road with big potholes.
8. It can hopefully be said that in near future we will have strong, durable, and eco- friendly

roads which will relieve the earth from all type of plastic waste.

9. Plastic waste can be effectively used in the concrete and thus provide a solution for the disposal problem of the plastic wastes.

VII. FUTURE SCOPE

Experimental study has to be conducted for other varieties of plastics so that same can be used in Civil engineering projects.

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