

# A study on density by using plastic waste in Concrete Mix

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Abstract -- This study is illustrate the consumption of plastic wastes which is easily available. It compress crushed graded in organic particles are processed from the materials that are employed in construction. The scope of current investigation is to determines and compares the fresh density and dry density mix by using different percentage of plastic waste .The investigation of carried out using fresh density and dry density test for total of four batches of mix prepared in which 0% 5% 10% 13% replacement of fine aggregate by plastic waste at water ratio is 0.48 .The fresh density and dry density of recycle plastic waste up to 13% replacement level is about less than referral mix (0%) at 28 days for water cement ratio is 0.48 .this reduction in density may be done to less bonding between plastic and concrete mix. If increase the plastic waste then density is dcreases.so axpected out come at 5% is beneficial for density.

Keywords — HDPE, Sieve machine, Sound test equipment, Compression testing machine, vicat apparatus.

## I. INTRODUCTION

Plastic has become the foremost common and necessary material since the beginning of the twentieth century and fashionable life is impossible without it. Humans have continuously made garbage and disposed of it in how thus solid waste management /isn't a replacement drawback. Unluckily, it's important for unattributable to its sturdiness, light-weight and low price. . Despite the quality of plastic for a large style of applications, organizations square measure baby-faced with the growing drawback of finding substitute strategies for disposing an outsized volumes of waste packaging. Disposal of plastic waste in atmosphere is taken into account to be a challenging drawback as a result of its terribly low biodegradability and presence in large quantities. Dozens of many tones of plastic trash find yourself floating in world oceans broken into micro plastic, the questionable plastic soup. Micro plastic square measure terribly dangerous, ocean mammals and birds that die from consumption plastic trash. one in all the most environmental problems within the most region of any country is that the sizable amount of package made up of synthetic resin materials like carry-bags, shampoo sachets, milk and water pouches nitro packs, and vegetable packages etc., that square measure deposited in domestic waste and landfills. the biggest part of the plastic waste is plastic, synthetic resin terephthalate, and vinyl benzene. The utilise of wastes is vital from totally different purpose of read. It helps to save lots of and sustain natural resources that don't seem to be replenished, it decreases the pollution of the atmosphere and it conjointly helps to save lots of and

recycle energy production method. In present times, plastic waste is one a part of municipal solid waste that is turning into a main analysis drawback to review the likelihood of disposal the waste in mass concrete particularly in self compacting concrete, light-weight weight concrete, and in pavements. It will be used as a part of a composite construction material, as AN inorganic filling material, and combination of concrete. usage of plastic waste in concrete has several profit and benefits since it's loosely used and features a long service life, which implies that the waste is being off from the waste stream for an extended amount. Further, mistreatment of plastic waste in concrete combine won't exclusively be its safe disposal and more technique however might get improved the concrete properties like durability, chemical resistance, drying shrinkage and creep on short and future basis. The soul has been discovered new forms of engineering that embrace property engineering and inexperienced engineering to scale back energy and natural resources consumptions. The aim of inexperienced engineering is to reduce adverse conditions whereas at constant time maximising advantages to the economy, society, and also the atmosphere. it's specializing in the increasing the potency of a method to scale back the number of pollution generated to be as eco-efficiency. man et al, was found that the workability and compressive strength were reduced as a result of part replacement of sand by waste plastic flakes in varied percentages by volume to supply waste plastic combine concrete with plasticiser. Pezzi et al, found that the addition of compound material in fraction but ten all through volume within cement matrix doesn't imply a major variation of the



concrete mechanical options. However, Marzouk et al, found that density and compressive strength of concrete slashed once the synthetic resin terephthalate combination exceeded five hundredth by volume of sand. Binici H. et al, has been with success used synthetic resin bottles wastes in cement less concrete production and located that the plasticity of concrete was improved. Plastic has totally different properties like sturdy and corrosion resistant, smart isolation for cold, heat, and sound, saving energy, economical, features a longer life, and lightweight weight. As a result, during this analysis, solid-state usage method is projected to understand the direct usage of synthetic resin because the inexperienced engineering forming technology. Moreover, it'll be accustomed turn out plastic cement directly from solid state to boost the mechanical properties and workability of product.

## **II. LITRATURE REVIEW**

Lakshmipathy(2003), have done experimental investigations to check the suitability of the employment of Re-engineered plastics as fibers for road pavements. The properties studied embody compressive strength, durability, flexural strength underneath inverted cyclic loading, impact conflict, plastic shrinkage and abrasion resistance etc., hard work are created to check it steel fibers. The results have shown that the improvement of concrete properties at lower value is obtained with Re-engineered plastic shred reinforced concrete.

**Prabir Das (2004)** has instructed that plastics will be utilized in construction industry at numerous places. correct choice of material / grade and appropriate design concerns will facilitate to replace more applications. Lighter weight, design flexibility, half integration, low system price, terribly high productivity and improved product look are the most features to be used of engineering plastics. The engineering thermoplastics and introduction of application specific grades has thrown challenges to standard materials within the industries. This paper provides all the supports in choosing appropriate engineering plastics, method and design for conversion of typical material to engineering plastics for performance and system cost advantages.

**Vasudevan (2004)** in his report, he has given most helpful ways in which of disposing waste plastics and birth roads have come to lightweight in a very research applied by the department of chemistry of Thiyagarajar college of Engineering. they need reported that the waste plastics could also be utilized in block creating changed lightweight roofing, mastic flooring and compound ferroconcrete. The novel composition of waste polymer-aggregate mix has been proprietary. they need suggested that utilization of waste plastics to reinforce the binding property is better possibility than disposing or imposing a blanket ban on the use of plastics. it's been reported that the per capita use of plastics in Asian country is three.5 kg, with virgin plastics

accounting for three.1 million tonnes and recycled plastics, a meg. the employment in Tamilnadu, with over 7000 units producing material is place at 2.4 lakh tonnes per annum. The 'Garbage Culture' has created disposal of waste plastic a significant drawback for civic bodies.

## **III. MATERIAL USED**

Plastic-Polyethylene terephthalate 3.1 normally abbreviated PET . is one in each of the chief common thermoplastic mix resin of the polyester family unit and it's working in fibers for wear, containers for liquids and foods, thermoforming for produce, and together with fibre for engineering resins. within the perspective of fabric applications, PET is named by its ordinary name, polyester, whereas the descriptor PET. is mostly employed in consider to packaging. Polyester makes up concerning eighteen of world polymer production and is that the fourth-mostproduced polymer; polyethylene (PE), polypropylene (PP) and polyvinyl chloride (PVC) are initial, 2nd and 3rd, severally. While plastic waste is cut into little pieces and mixed among sand, aggregate, cement and water.



Fig 1- Polyethene waste after cutting

#### 3.2 Cement

53 grade OPC (ordinary portland cement) water cement ratio equal to 0.48 in this work.For preparing this mix M30 water cement ratio is taken 0.48.The cement used OPC 53 grade

## 3.3 Aggregate

#### Coarse Aggregate-

For Sieve analysis is completed to check the gradation of aggregate. The test is done as follow.the coarse aggregate size is 20mm not but hour of use

•Take needed quantity of mixture sample (for coarse aggregates take approximate. 2.5 kg and for fine mixture take 0.5 kilogramg).

•aggregate on organize the desired no of sieves as per the contract or job demand in AN down manner. (i.e. keep the sieve having major size gap at the highest and also the smallest variety of size opening at the bottom)

•Shake smartly the sieve set for a minimum of 2 minute.

•After that calculate the burden of all sieve and categorical it because the share of passing.



## Fine Aggregate-

#### (a). Fineness Modulus

Fineness modulus is usually comfortable get a concept of however coarse or fine the aggregate is. a lot of fineness modulus worth indicates that the aggregate is coarser and little worth of fineness modulus indicates that the aggregate is finer

#### (b).Bulking Of Sand

while sand is damp, the water covering on the surface of every sand particle causes severance of particles from each other attributable to physical phenomenon. This causes sand to bulk. Bulked sand occupies a lot of volume and thus if volumetrical measurement is completed whereas proportioning it, bulking correction is important.

3.4 Water. Water used conforms IS 3025 (part 22, 23).

#### **IV. EXPERIMENTAL WORK**

4.1 Test on cement

(a) Fineness
(b) Soundness Test
(c) Consistency Test

4.2 Test on aggregate

(a) Sieve Analysis

(b) Surface Moisture Content & Absorption
(c) Frying Pan Method

4.3 Test on sand

(a) Fineness Modulus
(b) Bulking Of Sand

4.4 Concrete mix design

Concrete mix is ready as M30 nominal combine. that water cement retio up to 0.48. The concrete combine style as advised by IS: 10262-1982 was wont to prepare check samples. forty eight cube specimen for M30 grade of concrete with four fully different level percentages of plastic pallets replace by cement (0%, 5%, 10%, and 13%) were forged. half-dozen cubes be forged for every proportion of plastic pallets while not excellent plasticiser, and half-dozen cubes for every changeable percentages of plastic pallets are casted with excellent plasticiser CONPLAST SP320. Sizes of cube specimens area unit 150 mm  $\times$  150 mm  $\times$  150 mm

#### 4.5 Cube casting

After the sample has been remixed, in real time fill the cube moulds and compact the concrete, as well by hand or by vibration. Any air on unfree within the concrete can scale back the strength of the cube. Hence, the cubes should be absolutely compacted. However, care should even be taken to not over compact the concrete as this may cause segregation of the aggregates and cement paste within the mix. this may additionally reduce the final compressive strength.



**Fig.2** Casting of Cubes

#### 4.6 Curing Test Cubes

This cubes necessity be cured before they are tested. Unless needed for check at twenty four hours, the cube should be placed immediately after demoulding within the curing tank or mist space. The curing temperature of the water within the curing tank be need to maintained at 27-30°C. If solidifying is during a mist space, the ratio ought to be maintained at no lower than 95th. curing should be continuing as long as potential up to the time of testing.



.Fig.3 curing of concrete cubes.

## gineen V. RESULTS AND DISCUSSION

A comparative study of concrete mix is disseminated to find the impact of replacement fine sand by plastic pallets, while not super plasticiser and with super plasticiser. property of waste plastic mix concrete, that is, fresh density, dry density workability are studied and besides the results are as follows

Table.1 Fine	eness Mo	aulus	

Type of Sand	Fineness Modulus Value	
Very fine sand	Below 2.2	
Fine sand	2.2 to 2.6	
Medium sand	2.6 to 2.9	



Coarse sand	2.9 to 3.2
Very coarse sand	Above 3.2

#### Table.2 Bulking Of Sand

Moisture contents %age by wt.	Bulking % by volume
2	15
3	20
4	25
5	30

#### 5.1 Fresh Density

Figure indicates that the contemporary density tends to decrease by 5%, 8%, and 10.25% for 5%, 10%, and 13%, severally, below the reference mixture, that is, 0%. This tendency could also be recognized to the density of the waste plastic being below the sand by 70%, that results in a reduction within the fresh density.



Fig.5.1Graph for fresh density.

## 5.2 Dry Density

The dry density values for waste plastic combine concrete are shown in Figure Dry densities at every solidification age tend to decrease with increasing waste plastic quantitative relation in every concrete mixture. it's clear that, at twenty eight days solidification age, the lowest dry density (2248 kg/cu-m) exceeds the vary of the dry density for structural light weight concrete. the utilization of waste plastic for every solidification age reduced the dry densities of all mixtures with increasing the waste plastic quantitative relation, as a result of the density of plastic is lower than that of sand by 70%



## Fig.5.2 Dry density after 28 days.

**Table.3** density in (kg/cu-m) plastic mix concrete after 28 days

Experiment No.	HDPE %	Fresh density	Dry density after 28days
1	0	2600	2422
2	5	2476	2321
3	10	2400	2254
4	13 to a	2352	2248

## vi<mark>. Conclusion</mark>

According to our work it's possible to turn out plastic cement from waste of polythene materials that generated by human activities like food packages or crates. As compare to traditional mix the density of the specimen using plastic waste is low. But as per environmental need it is necessary to replace it at satisfactory level. At 5% replacement by fine aggregate gives the Fresh density is 2476(kg/cu-m) and at the same percentage at 28 days the Dry density 2321(kg/cu-m) .which satisfactory as per strength criteria. but as we see the percentage replacement after 5% will consecutively reduce the density level so recommendation for use of 5% is beneficial .At the replacement of fine aggregates by 10% the Fresh density is decrease 2400(kg/cu-m) and at 28 days by Dry density 2254(kg/cum) from traditional mix .And further decrease density at 13%.

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