



EXPIREMENTAL PROJECT ON MANUFACTURING ON PLASTIC SOIL BRICK

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Abstract: This project paper manages utilization of waste plastic bottle containers as brick material. Plastic waste which is expanding step by step moves toward becoming high and also dirties the earth, particularly in high mountain towns and visitor trekking areas where no rubbish accumulation framework exists and furthermore which are disposed of or burned which prompts the pollution of land and air. The transfer of waste plastics is a greatest test, as continued reusing of PET bottles containers represent a potential risk of being changed to a cancer-causing material and just a little measure of PET bottles is being reused. Thus this Poly ethylene terephthalate (PET) bottles are cleaned and included with fine total (soil) at different (%) to acquire high quality brick blocks that have warm and sound protection properties to control contamination and to decrease the general expense of development, this is a standout amongst the most ideal approaches to maintain a strategic distance from the amassing of plastic waste which is an on degradable toxin. The soil that must be obtained from the quarries. The plastic waste is normally accessible in surplus amount and thus the cost factor descends. Since this type of brick blocks have more compressive strength and less water absorption. Thus, this sort of brick blocks is ideally utilized for underground septic tank construction, submerged constructions, and underground construction like passages and furthermore utilized for the sub structure of the buildings so as to oppose the leakage of the water on account of less water absorption limit and furthermore have high compressive quality which oppose the substantial basic burdens. The main drawback of this work is the cost because the soil rate is high due to the demand and also the cost of collection of plastic waste in large amount. But is preferable for government to dispose this waste plastic in the government buildings construction as a waste plastic bricks.

IndexTerms - Soil, Plastic, Water, Percentage (%), Tests.

I. Introduction:

In India the large amount of waste plastics is obtained from the household areas, hotels bus stand, Railway stations and other crowded areas. Especially the large quantity of waste plastic water bottles is obtained. Only few amounts of water bottles are got recycled due to transportation cost and others are get disposed in the forest or nearby lakes, river beds, and sea. This causes land pollution, air pollution and water pollution due to contamination. It also one of the reasons to cause various diseases like dengue, malaria, plague and rat-bite fever due to breeding of mosquitos and rat. Hence in order to reduce the waste plastic contamination in our environment and also to convert them into useful construction material this project work was carried out. In this project, the soil is the one of the main materials used for the manufacturing process of the waste plastic bricks. Since soil gives the great property of this plastic bricks, which gives required hardness, shapes and also gives the required physical properties to this plastic bricks. They also protect the plastic by resisting the thermal insulation up to certain degree Celsius. Hence the soil play vital role in the waste plastic bricks. As most of the local manufactures are producing bricks of size 220x100x75mm and 220x105x75mm, so the same dimensions were adopted for production of waste plastic bricks. The brick mould was prepared according to this dimension with steel and wood at workshop and four sample are (40/60) %, (50/50) %, (60/40) %, (65/35) % were prepared. In this each sample was of different percentage of the waste plastic is taken from the total amount of weight and the soil amount is taken at different amounts. The casting and demoulding of this waste plastic bricks are done manually.

II. LITERATURE SURVEY:

Puttaraj Mallikarjun Hiremath, et.al, (2012) performed a study on "Utilization Of waste plastic in manufacturing of Plastic-soil bricks", have used laterite soil with 75% of plastics and 5% of admixtures by weight of laterite soil as a material to make bricks. The test had been conducted to know the strength of bricks and was found that compressive strength of bricks is 6.80 N/mm² which is greater than the specified minimum strength value i.e., 3.0N/mm². After process of testing been carried out, they concluded that cost comparison of available walling materials showed that the use of bricks made from 75% plastic and 5% bitumen resulted in a saving of 30 - 47% when compared with the use of fired clay bricks resulted in a savings of 19% per square meter of wall. The study therefore recommends the use of laterite bricks because it is more economical and environmentally friendly than fired clay bricks.

Arvind Singhal, et.al, (June 2018) performed study on —Utilization of plastic waste in manufacturing of plastic sand bricks”, performed the study for utilization of waste plastic. Therefore, by combining the proportion of plastic and sand brick was made. The ratio of plastic and stone dust used was 3:7 and the stone dust used in manufacturing of bricks is sieved for a size less than 4. 75mm. After pouring into the mould and drying the weight of brick was 2.5Kg. Compressive strength of Plastic sand brick is 5.6 N/mm. They concluded that waste plastic, which is available everywhere, may be put to an effective use in brick making. Plastic sand bricks can help reduce the environmental pollution, thereby making the environment clean and healthy. Plastic sand bricks reduce the usage of clay in making of bricks. Plastic sand bricks give an alternative option of bricks to the customers on affordable rates. Water absorption of plastic sand brick is zero percent. Compressive strength of plastic sand brick is 5.6 N/mm² at the compressive load of 96 KN. We conclude that the plastic sand bricks are useful for the construction purpose.

Bhushan V. Ghuge, et.al, performed “Manufacturing of Plastic-Sand bricks” in Volume 5, Issue 05, (May-2019), e-ISSN: 2455-2585, study by using plastic, sand as the material. The waste plastic bottles were used and sand was sieved with 1.18 mm sieve. The sand and the plastic bottles were weighed in various proportions among which the plastic was taken for burning process. The mixture is then poured into the brick mould and is compacted by using tamping. Mold removed after 24 hours. Different proportions of Plastic Sand mixes have been finalized and compressive strength is noted down, for 1:2 ratio compressive strength is 8.63 N/mm², for 1:3 ratio compressive strength is 9.09 N/mm², for 1:4 ratio compressive strength is 9.54 N/mm². And also, water absorption test has been conducted, for 1:2 ratio water absorption is 3.69%, For 1:3 ratio water absorption is 3.26%, For 1:4 ratio water absorption is 2.66%. They concluded that with the increase in strength of bricks, the water absorption decreases which improves the quality of bricks. As its strength is good it can be successfully implemented for construction of shear walls and load bearing walls.

III. METHODOLOGY AND MATERIAL USED:

3.1 Collection of Material:

3.1.1 Collection of Laterite Soil:

The laterite soil for our requirement for the purpose of project is collected from Humnabad which is relatively near to kalaburagi 60km, the place has abundant amount of laterite soil distributed over the area the soil has been collected from a quarry.

3.1.2 Collection of Black Soil:

Black soil which is widely available is collected for the requirement of our project from the nearby village about 2km away field of khakhde chowk, kalaburagi.

3.1.3 Collection of Plastic Bottle (pet):

PET bottles were collected from local hotels in the locality which is easily available in huge numbers each bottle weighs around 20 grams. each bottle is separated based on weighs for example half litre bottles weighs around 9 grams. so that 111 such bottles nearly weigh around 1kg, these bottles are well dried by keeping it in room temperature so as to avoid moisture content it is used as binding material when melted.

3.2 Physical Tests on Collected Materials:

3.2.1 Soil:

Soil is a granular material made out of finely separated shake and mineral particles. It is defined by size. soil can likewise allude to a textural class of soil or soil type Hence the soil assume fundamental job in the waste plastic blocks the tests like Specific gravity, Fineness modulus, and soil Replacement test were directed for getting the physical properties of soil and the acquired outcomes are,

Table 1: Properties of Soil.

Sl.no	Content	Values
1	Natural water content (%)	7.14%
2	Specific gravity	2.51
3	Liquid limit (%)	37.5%
4	Plastic limit (%)	28.96%
5	Optimum moisture content (%)	18.14%
6	Optimum dry density(g/cc)	1.80

Table 2: Properties of Plastic (PET) Bottles.

Sl.no	Contents	Values
1	Chemical Formula	$(C_{10}H_8O_4)_n$
2	Density	1.38g/cm ³ (20°C)
3	Melting point	>250°C
4	Boiling point	>350°C
5	Solubility in water	Practically Insoluble

3.3 Preparation Process

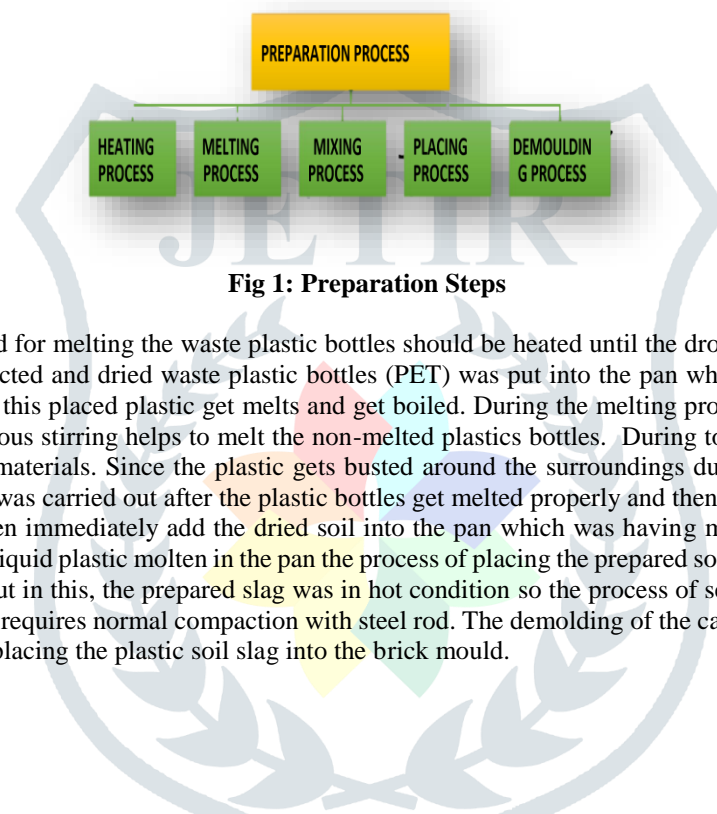


Fig 1: Preparation Steps

The Pan which is used for melting the waste plastic bottles should be heated until the drop of water get evaporated. After the heating was done the collected and dried waste plastic bottles (PET) was put into the pan which get heated due to the heated pan and at certain temperature this placed plastic get melts and get boiled. During the melting process the continuous stirring was required. Because the continuous stirring helps to melt the non-melted plastics bottles. During to the melting there is no form of adding water or other cooled materials. Since the plastic gets busted around the surroundings due to the presence or addition of moisture. The mixing process was carried out after the plastic bottles get melted properly and then in boiling condition. The while the boiling of the plastic molten immediately add the dried soil into the pan which was having molten plastic inside it. After the process of mixing the soil and liquid plastic molten in the pan the process of placing the prepared soil and plastic slag in the prepared brick mould was take place. But in this, the prepared slag was in hot condition so the process of self-compaction takes place up to 3/4th of the mould. So, then it requires normal compaction with steel rod. The demoulding of the casted plastic bricks was done one hour later after the process of placing the plastic soil slag into the brick mould.



Fig 2: Preparation Process of Plastic Soil Brick

3.4 Test on Prepared Bricks

The different sorts of tests on plastic bricks were led to check the characteristics of blocks for developments. This kind of brick tests are led at both in building site and in laboratory center. This brick blocks are most established and imperative development materials in view of their toughness, loading bearing strength, quality and minimum cost. To get the quality structure, the great quality materials are required. To choose the good quality materials a few tests on brick blocks are to be carried out. Hence the tests which are required to discover the reasonableness of the bricks for construction purpose are examined beneath.

3.4.1 Water Absorption Test

3.4.2 Compressive strength test

- 3.4.3 Hardness Test
- 3.4.4 Soundness Test
- 3.4.5 Efflorescence Test

3.4.1 Water Absorption Test



Fig 3: Immersed Bricks in Water For 24hrs

Absorption test is carried on the brick to discover the measure of dampness content consumed by the brick under extreme conditions. In this test, dry bricks are taken and weighted. Then these bricks are put in water with full drenching for a time of 24 hours. After 24 hours the wet brick are cleaned the water at the surface with cloth and weight this wet brick. The distinction among dry and wet brick block weights will give the measure of water assimilation. Normally the brick should have less than 20% of water by its weight.

3.4.2 Compressive Strength Test



Fig 4: Compression Testing Machine

Normally the Compressive strength of bricks is determined by compression testing machine. Hence the prepared bricks are placed in the compression testing machine. After placing this brick in compression testing machine, the load is applied on it until brick breaks. Note down the value which obtained at the breaking point and find out the compressive strength value of brick. Minimum compressive strength of brick is 3.50N/mm^2 . If it is less than 3.50N/mm^2 , then this type of bricks is not useful for construction.

If the brick has less impression, then the brick is a hard brick. This type of test was conducted to check the hardness property of the prepared plastic brick. Hence this test was carried out either in laboratory of our college sharnbasva university kalaburagi. In this test the sharp tool was used to scratch the surface of the bricks and the identifying the hardness by the depth of the scratch which was done by the sharp tool.



Fig 5: Hardness Test

3.4.4 Soundness Test:

From this test, the observed result was that the sound of normal burnt clay brick was less when compared with the plastic soil bricks of different percentage. The plastic bricks do not get any crack or damages during the process of checking the soundness, but the burnt clay bricks get abraded at their surface.



Fig 6: Soundness Test

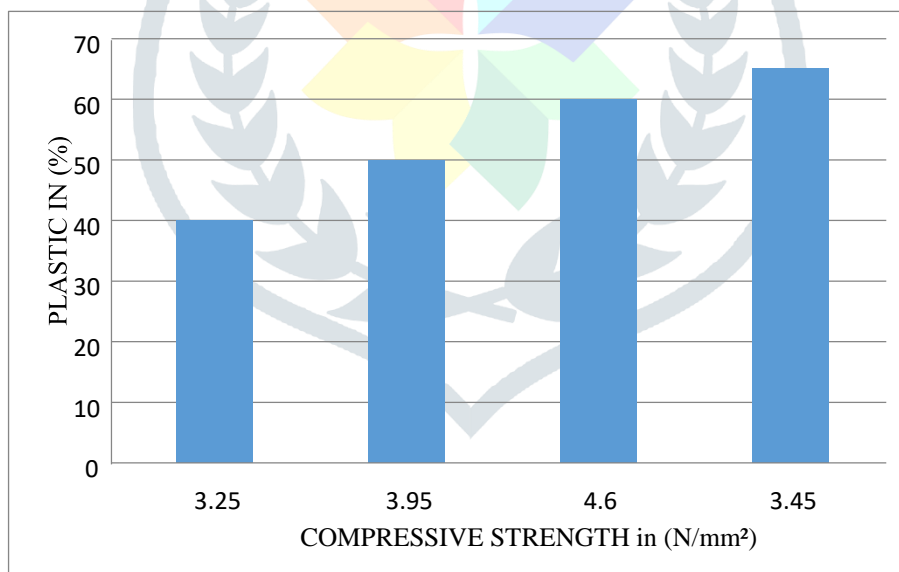
3.4.5 Efflorescence Test:

From the testing of efflorescence for the bricks, it was observed that the plastic soil bricks does not show any efflorescence. Since the plastic contains a smaller number of soluble salts in it. Hence finally proved that the efflorescence of the plastic brick was very less.

IV. RESULTS AND DISCUSSION

Table 3: Compressive Strength of Bricks

Plastic in (%)	Soil in (%)	Compressive strength(N/mm ²)
40	60	3.25
50	50	3.95
60	40	4.60
65	35	3.45



Graph 1: Compressive Strength

Following graph show the compressive strength of the plastic soil brick, x-axis represents compressive strength in (N/mm²) and Y-axis show the amount of plastic taken for manufacturing of one brick respectively based on 3000grams of soil sample.

Table 4: Water Absorption Test

Plastic in (%)	Soil in (%)	Water Absorption (%)
40	60	8.86
50	50	7.51
60	40	6.17
65	35	5.91

Thus, greater quality bricks absorb less amount of water, for a good quality bricks the water absorption should be less than 20% of its own weight, our sample shows 5.91% of water absorption when immersed for 24 hours in water.

Table 5: Hardness Test

Sl.no	plastic in %	soil in %	result
1.	40%	60	moderate
2.	50%	50	moderate
3.	60%	40	good
4.	65%	35	ok

Our sample of plastic soil brick show no deep impression when scratch with sharp tool, The brick which show no impression are good at hardness, therefore our sample are good at hardness.

Table 6: Soundness Test

Sl.no	plastic in %	soil in %	result
1.	40%	60%	ok
2.	50%	50%	good
3.	60%	40%	moderate
4.	65%	35%	ok

When two bricks make to strike with each other produced a ringing sound. The plastic bricks do not get any crack or damages during the process of checking the soundness, but the burnt clay bricks get abraded at their surface. Plastic bricks are good at soundness test.

V. CONCLUSION:

- 1) After performing compressive strength test on various mix proportions, we obtained the third-class brick property for the sample of (40% plastic & 60% soil), (50% plastic & 50% soil), and (60% plastic & 40% soil) respectively, in this current composition these bricks can serve excellently for water conservation purposes, underground tanks or to form an underlining for sanitary landfills.
- 2) After completion of the project, it was found that there is good compressive strength of plastic soil bricks with decrease in water absorption.
- 3) The water absorption of the plastic soil bricks is too less which makes it resistant to water and moisture.
- 4) The waste plastic from hotels, restaurants and other places can be utilized to manufacture plastic soil bricks.
- 5) Apart from soil any other similar material can be used with good engineering properties such as ballast waste.
- 6) The compressive strength of the plastic soil bricks is more than locally available third-class clay bricks and also less water absorption.
- 7) It eliminates burden on environment
- 8) The weight of plastic soil brick is less than clay bricks.
- 9) The experiment carried out show the strength of second-class brick respectively.
- 10) To increase the desired strength of the plastic brick, bitumen glass fibre, cement, concrete waste can be added to obtain first class brick strength.

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