

Utilization of Plastic Waste for Making Plastic Brick

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Abstract - Plastic is one of the daily increasing useful as well as a hazardous material. At the time of need, plastic is found to be very useful but after its use, it is simply thrown away, creating all kinds of hazards. Plastic is non-biodegradable that remains as a hazardous material for more than centuries. The quantity of plastic waste in Municipal Solid Waste (MSW) is expanding rapidly. It is estimated that the rate of expansion is double for every 10 years. This is due to rapid growth of population, urbanization, developmental activities and changes in life style which leading widespread littering on the landscape. They are non-biodegradable and also researchers have found that the plastic materials can remain on earth for 4500 years without degradation In India approximately 40 million tons of the municipal solid waste is generated annually, with evaluated increasing at a rate of 1.5 to 2% every year. Hence, these waste plastics are to be effectively utilized. Today, it is impossible for any vital sector to work efficiently without usage of plastic starting from agriculture to industries. Thus, we cannot ban the use of plastic but the reuse of plastic waste in building constructions, industries are considered to be the most practicable applications. Plastic soil brick possesses more advantages which includes cost efficiency, resource efficiency, reduction in emission of greenhouse gases, etc. Plastic soil brick is also known as “Eco-Bricks” made of plastic waste which is otherwise harmful to all living organisms can be used for construction purposes. It increases the compressive strength when compared to fly ash bricks. By use of plastic soil bricks, the water absorption presence of alkalis was highly reduced. Owing to numerous advantages further research would improve quality and durability of plastic soil bricks.

Key Words: Waste Plastic, Concrete, Plastic pieces, Compressive Strength, Pavement Block

1. INTRODUCTION

Plastic is a very common material that is now widely used by everybody in the world. Plastic plays a predominant role in reusable in this era, as it is compact and light in weight. Common plastic items that are used are covers, bottles, and food packages. The great

problem with plastic is its decomposition. Plastic is made of polymer chemicals and they are nonbiodegradable. This means that plastic will not decompose when it is placed in earth. Though plastic is a very useful material that is flexible, robust and rigid they become waste after their use and they pollute the air and land. Recycling is processing use waste materials into new products to prevent waste of potentially useful materials. The increase in the popularity of using eco-friendly, low cost and lightweight construction materials in building industry has brought about the need to investigate how this can be achieved by benefiting to the environment as well as maintaining the material requirements and their standards. From the advantages of plastic recycling procedure is used. For the production of plastic bricks is an optimal method for controlling the problem by decomposition of plastic waste and also it costs economical for the production of building materials. In this study, plastic waste from factories will be used to incorporate with cement and sand to produce sand bricks. The bricks will then be tested to study the compressive strength, efflorescence and water absorption. In the recent past research, the replacement and addition have been done with the direct inclusion of polyethylene, polyethylene terephthalate (PET) bottles in shredded form, chemically treated polyethylene –fiber, PET in small particles form by replacing natural coarse aggregate. Most of replacements have been done by volume calculation, and showed the decreased in compressive strength as the increased plastic waste. In this study, recycled plastic waste have been introduced in the form of crushed. The replacement of plastic waste material has been done by weight.

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2. OBJECTIVES

- 1) To study the properties and conducted test of standard red brick
- 2) Research done on plastic bricks project done in India.
- 3) To prepare plastic brick sample and conduct various brick test.
- 4) To compare standard red brick with the plastic brick sample through various parameters on it.

3. METHODOLOGY

1. Collection Of waste: The plastic material should be collected from the factories waste, municipal town panchayath and hospital waste and industries waste and also food packages and plastic bottles this will come under the LDPE, PET bottles, Carry bags, HDPE plastic type. Aggregate like Red soil, Coarse sand & crush can be collected from the nearest masonry shop.

2. Batching: Measurement of materials for making brick is called batching. After collection of materials we separate the types of plastic and remove any other waste presented in the collected material and check that any water content in in sample collected ten proceed for burning.

3. Melting: After completion batching the plastic waste were taken for burning in which the plastic bags are drop one by one into the container and allowed to melt. These would be done in closed vessel because to prevent the toxic gases released into atmosphere. These will be at the temperature of 90-115 degrees centigrade.

4. Mixing: Mixing of materials is essential for the production of uniform and strength for brick. The mixing has to be ensure that the mass becomes homogeneous, uniform in color and consistency. Generally, there are two types of mixing, Hand mixing and mechanical mixing. In this project, we adopted hand mixing. until the entire plastic content required for making plastic brick of one mix proportion is added into it. then these plastic liquids thoroughly mixed by using trowel before it hardens. The mixture has very short setting bags are turned to molten state; the river sand is added to it. The

sand added is mixed time. Hence mixing process should not consume more time

5. Moulding: The mixture is then poured into the brick mould made from plywood and is compacted by using tamping rod or steel rod. The surface is finished by using trowel. Before placing the mixture into the mould, the sides of the mould are oiled to easy removal of bricks. Mould removed after 24 hours. The mould is used for preparing brick in uniform shape. The size of mould is 230×103×77 mm. The mould were assembled and placed on the base plate. The faces must be thinly coated with mould oil to easily demould after casting.

6. Curing: The test specimens after compaction were allowed to dry for a period of 24 hours. The specimens were kept in ordinary curing tank and allowed to cure for a period 1 day.

4. RESULT AND DISCUSSION

Table -1: Test Result

Sample NO	Material	Water Absorption	Compression Load (KN)	Compressive Strength (N/mm ²)
1	50%plastic 50% Aggregate	0.31%	100	5.74
2	30% Plastic 70% Aggregate	0.32%	140	5.96
3	60%plastic 40% Aggregate	0.33%	160	6.94
4	40% Plastic 60%Aggregate	0.35%	160	6.94

1. Water absorption of plastic sand brick was seen very low as the percent of aggregate is less. Ratio of the material does not have much impact on the water absorption. The average water absorption percentage is 0.32%.

2. Compression Various mixing proportion are taken to study results. With plastic, aggregate like crush sand, coarse sand, red soil are mixed in various percentage. Four samples are taken with different ratio..

3. The compressive strength of plastic brick was seen very high. The max load of 190 KN was applied. The compressive strength id directly proportional to quantity of plastic used in brick. It increases with increase in quantity of plastic. The average strength is 7.59 N/mm²

4. CONCLUSION

1. Waste plastic, which is available everywhere, may be put to an effective use in brick.

2. Plastic bricks can a very good alternative of traditional earthen bricks. In comparison with conventional brick, the strength of plastic sand bricks is high
3. Plastic sand bricks reduce the usage of clay in making of bricks.
4. Plastic bricks can be used for exterior walls; however they must not be used in load bearing walls.
5. Cost of manufacturing per unit plastic brick is significantly lower than traditional earthen bricks, hence they are cheaper alternative.
6. Plastic bricks are water resistant, hence can be used in underwater structures
7. Reusing plastic will reduce environmental pollution.
8. There is no alkali in plastic brick whereas it is present in conventional brick.
9. This method is suitable for the countries which has the difficult to dispose /recycle the plastic waste. The natural resources consumed for the manufacturing of plastic soil bricks are very much less when compared to its counterparts.

REFRENCES

- [1] Dinesh S; Dinesh A; and Kirubhakaran k., "Waste Plastic in Manufacturing of Bricks and Paver Blocks" International Journal of Applied Engineering Research, Vol.2 (4), pp. 364-368.
- [2] Nitin Goyal ; Manisha., "Constructing structures using eco-bricks", International Journal of Recent Trends in Engineering & Research . Vol.2 (4), pp. 159-164.
- [3] Maneet P D; Pramod K; Kishor Kumar; and Shanmukha Shetty., "Utilization of Waste Plastic in Manufacturing of Plastic- Soil Bricks" International Journal of Engineering Research and Technology, Vol.3 (8), pp. 529-536.
- [4] Puttaraj M.H; Shanmukha S; Navaneeth Rai P.G; and Prathima T.B, "Utilization of Wate Plastic in Manufacturing of Plastic-soil Bricks" International Journal of Technology Enhancement and Emerging Engineering Reseach Vol. 2(4), pp. 102- 107.
- [5] Santha Kumar A.R; "Concrete Technology" Oxford University Press. New Delhi.
- [6] Daftardar, R. Patel, R. Shah, P. Gandhi and H. Garg, "Use of Waste Plastic as a Construction Material" IJEAS, vol.4, no.11, 2017.
- [7] Central Pollution Control Board, "An overview of Plastic Waste Management" Delhi, pp. 1-22, 2012.
- [8] Raj, R.Kotian, N.G. Ashwath. "Study on Laterite-Cement bricks" Project report, K.V.G College of Engineering, Sullia.DK. 2011 -2012.
- [9] P. M. Hiremath, S. Shetty, N. Rai, "Utilization of Waste Plastic In Manufacturing of Plastic Soil Bricks" IJTEEE, vol. 2, no. 4, 2014.
- [10] S. Bose, S. Raju, "Utilization of waste plastic in Bituminous Concrete mixes", Roads and Pavements, vol. 3 2004.
- [11] M.M.Reddy .k, Ajitha .B and Bhavani.R(2012) "Melt- Densified Post-Consumer Recycled Plastic Bags Used as Light Weight Aggregate in Concrete",IJERA,vol. 2, no.4, pp.1097-1101, 2012
- [12] K. Prem Kumar1 , M.Gomathi2 1,2(Assistant Professor, Civil Engineering Department, Periyar Maniammai University, Production of Construction Bricks by Partial Replacement of Waste Plastics.
- [13] Sachin Anant Kamble., Dnyandevkarad., (2017) "Plastic Brick" International Journal of Advance Research in Science and Engineering, ISSN 2319-8354.
- [14] Thirugnanasambantham .N., P. Tharun Kumar., R. Suijthra., R. Selvaraman., P. Bharathi., (2017) "Manufacturing And Testing of Plastic Sand Bricks" International Journal of Science and Engineering Research, Issue 4.
- [15] Shanmugavalli., Gowtham., P. Jeba Nalwin., B. Eswara Moorthy., (2017) "Reuse of Plastic Waste in Paver Blocks" International Journal of Engineering Research & Technology, ISSN: 2278-0181
- [16] Gopumohan., Jikku Mathew., JithhinNinan Kurian., John Thomas Moolayil., (2016) "Fabrication of plastic Brick Manufacturing Machine and Brick Analysis" International Journal for Innovative Research in Science & Technology, ISSN: 2349-6010.
- [17] S.V. Giri Babu., S. Krishnaiah., (2018) "Manufacturing of Eco -Friendly Brick: A Critical Review" International Journal of Computational Engineering Review, ISSN 2250-3005, Issue 2.
- [18] Pradeep. M., K. Veeraselvam., K. Tamil Thendral., (2019) "Analysis of Load Bearing Wall with opening using Waste Plastic Brick" International Research Journal of Engineering and Technology, Issue 02.
- [19] Rajarapu Bhushaiah., Shaik Mohammad., D. Srinivasa Rao., (2019) "Study of Plastic Brick Made from Waste Plastic" International Research Journal of Engineering and Technology, Issue 04

- [20] Mojtaba Valinejad Shoubi, Azin Shakiba Barough
(2013) Investigating the Application of Plastic
Bottle as a Sustainable Material in the Building
Construction. International Journal of Science,
Engineering and Technology Research (IJSETR)
2(1): 2278 -7798.