

REUSE OF PLASTICS IN SOIL BRICKS SUBSTITUTING TRADITIONAL BRICKS

M. Brindha¹, R. Jeya Kumar², B. Karthick Kumar³, M. Mohamed Rizwan⁴

¹Assistant professor, Department of Civil Engineering, Sethu Institute of Technology, Kariapatti, Virudhunagar, India.

^{2,3,4}B.E., Student, Department of Civil Engineering, Sethu Institute of Technology, Kariapatti, Virudhunagar, India.

Abstract - One of the major issue discussed from the last decade is high utilization of plastics and its technique, as no such effective techniques is yet discussed. So the utilization of these waste plastics is done by manufacturing the plastic soil bricks which will indeed pause for the scientists to discover the effective degradation techniques for more than about 30-40 years. In this attempt of work has been made to manufacture the bricks by using plastics. Due to the usage of waste plastic materials environmental pollution can be reduced as much as possible. It is done to satisfy the increasing demand of construction materials.

1. INTRODUCTION

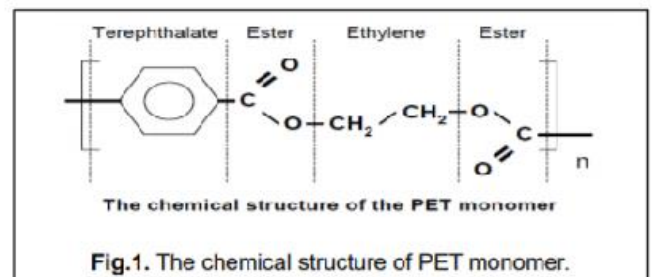
Bricks are one of the oldest known building materials dating back to 7000BC where they were first found in southern Turkey and around Jericho. The first bricks were sun dried mud bricks. fired bricks were found to be more resistance to harsher weather conditions, which made them much more reliable brick for use in permanent building, where mud bricks would not have been sufficient fired bricks were also useful for absorbing any heat generated throughout the day then releasing it at night. During 12th century bricks were reintroduced to northern Germany from Northern Italy. This created the brick gothic period which was reduced style of Gothic architecture previously very common in northern Europe.

1.1 General

Soil is a loose, unconsolidated material on the earth's crust and it is formed by the weathering of solid rocks. The laterite formation was named in southern India 1807, and it was described by Francis Buchanan-Hamilton. He named it from the Latin word "later" which means brick. This rock can be easily cut into brick shaped blocks for building construction. The laterite stone is rich in iron and aluminium and it is formed in hot and wet tropical areas. A good reservoir of laterite stone is present in the coastal Karnataka and some northern parts of Karnataka and also in the northern parts of Kerala, due to which lot of quarrying of laterite bricks takes place. In quarries while cutting out the laterite stones with the help of cutting machines which produces 15-20% of soil wastes which pose a problem of disposal. The quantity of plastic waste in Municipal Solid Waste (MSW) is expanding rapidly.

1.2 Chemical structure of a waste plastic (polyethylene terephthalate) [technical news letter]9

The monomer for the production of Poly ethylene terephthalate (PET) is ethylene teryphthalate and this consists of the ethylene molecule (-CH₂ - CH₂-), two ester molecules (-COO-), and the teryphthalate ring molecule. The only atomic species present in PET are therefore hydrogen, oxygen, and carbon. Burning PET generates only carbon dioxide (CO₂) and water (H₂O). So there is no potential danger of harmful gas emission even when PET is burnt but in the present work only melting of PET was required. The structure of the PET monomer is shown below



1.2 properties of plastic (1)

Physical properties of PET where as given in table 1

TABLE 1 -: Physical Properties of Poly Ethylene Terephthalate

Coefficient of Thermal Expansion	7 x 10 ⁻³ /°C
Long Term Service Temperature	115 - 170°C
Melting point	260°C
Specific Gravity	1.3 - 1.4
Water Absorption	0.07 - 0.10%

2. LITERATURE REVIEW

2.1 LITERATURE REVIEW 1

- **AUTHOR NAME** :1) Ronsk shah 2) Himanshu garg 3) Parth Gandhi 4) Rashmi Patel 5) Anand Daftardar
- **JOURNAL NAME** : International Journal of Mechanical And Production Engineering, ISSN: 2320-2092,
- **PUBLISHED ON** : Volume- 5, Issue-10, Oct.-2017.
- The main objective of this research work is to develop an efficient way to effectively utilize the waste plastic .which is a great threat for the sustainment of ecological balance and to reduce the plastic waste which is increasing day by day. Bad effects of plastic waste are felt throughout the world. So, in order to solve this issue, an attempt is done to reduce the disposal problem of plastic waste by using plastic extruder machine. Compression strength test was performed on the plastic dust brick and its strength was found to be 6.66 .N/mm² which is higher than red clay bricks which have a compressive strength of 3-5 N/mm².

2.2 LITERATURE REVIEW 2

- **AUTHOR NAME**: Priyanka Mahajan, Darshan Girase, Dr. A. R. Lokhande.
- **JOURNAL NAME**: International Journal for Research in Applied Science & Engineering Technology (IJRASET)
- **PUBLISHED ON**: *Volume 6 Issue 1, January 2018.*

A brick is building material used to make walls, pavements and other elements in masonry construction. Traditionally, the term brick referred to a unit composed of clay, but it is now used to denote any rectangular units laid in mortar. [1] This rock can be easily cut into brick shaped blocks for building construction. The laterite stone is rich in iron and aluminum and it is formed in hot and wet tropical areas. A good reservoir of laterite stone is present in the coastal Karnataka and some northern parts of Karnataka and in the northern parts of Kerala, due to which lot of quarrying of laterite bricks takes place. The quantity of plastic waste in Municipal Solid Waste (MSW) is expanding rapidly. This is due to rapid growth of population, urbanization, developmental activities and changes in life style which leading widespread littering on the landscape.

2.3 LITERATURE REVIEW 3

- **AUTHOR NAME** : Mr.N.Thirugnana sambantham, P.TharunKumar,R.Sujithra,R.Selvaraman, P.Bharathi5
- **JOURNAL NAME**: International Journal of Science and Engineering Research (IJOSER).
- **PUBLISHED ON** : Vol 5 Issue 4 April -2017 .

Plastic is a non-bio-degradable substance which takes thousands of years to decompose that creates land as well as water pollution to the environment. The quantity of plastic waste in Municipal Solid Waste (MSW) is expanding rapidly. It is estimated that the rate of usage is double for every 10 years. The Plastic usage is large in consumption and one of the largest plastic wastes is polyethylene (PE). The utilization of earth based clay material resulted in resource depletion and environmental degradation. As amount of clay required for brick is huge, in this project these waste plastics are effectively utilized in order to reduce the land space required to dump these wastes. This creates the prevention from various harmful diseases. Polyethylene (PE) bags are cleaned and added with fine aggregate at various ratios to obtain high strength bricks that possess thermal and sound insulation properties. This is one of the best ways to avoid the accumulation of plastic waste. It also helps to conserve energy, reduce the overall cost of construction and hence in this project, an attempt is made to manufacture the plastic sand bricks by utilizing the waste plastics.

- Key words :

Plastic waste, low density polyethylene, polyethylene properties, plastic sand brick, bricks

3. EXPERIMENTAL INVESTIGATIONS

3.1 COMPRESSIVE TEST

Compressive strength test on bricks are carried out to determine the load carrying capacity of bricks under compression. This test is carried out with the help of compression testing machine.

1) Procedure of Compressive Strength Test on Bricks

1. Place the specimen with flat face s horizontal and mortar filled face facing upwards between plates of the testing machine.
2. Apply load axially at a uniform rate of 14 N/mm² (140 kg/cm²) per minute till failure occurs and note maximum load at failure.
- 3.

4. 3. The load at failure is maximum load at which the specimen fails to produce any further increase in the indicator reading on the testing machine.



Fig -1: compression strength sample

3.2 WATER ABSORPTION TEST

Water absorption test on bricks are conducted to determine durability property of bricks such as degree of burning, quality and behavior of bricks in weathering.

A brick with water absorption of less than 7% provides better resistance to damage by freezing. The degree of compactness of bricks can be obtained by water absorption test, as water is absorbed by pores in bricks.

The water absorption by bricks increase with increase in pores. So, the bricks, which have water absorption less than 3 percent can be called as vitrified.

This test provides the percentage of water absorption of bricks and procedure of the same is discussed below.

3.2.1 Apparatus

A sensitive balance capable of weighing within 0.1% of the mass of the specimen and ventilated oven

3.2.2 Procedure of Water Absorption Test

1. Dry the specimen in a ventilated oven at a temperature of 105 °C to 115°C till it attains substantially constant mass.
2. Cool the specimen to room temperature and obtain its weight (M1) specimen too warm to touch shall not be used for this purpose.
3. Immerse completely dried specimen in clean water at a temperature of 27+2°C for 24 hours.
4. Remove the specimen and wipe out any traces of water with damp cloth and weigh the specimen after it has been removed from water (M2).



Fig -2: Water absorption test sample

3.3 HARDNESS TEST

In this test, a scratch is made on brick surface with the help of a finger nail. If no impression is left on the surface, the brick is sufficiently hard.

4. RESULT AND DISCUSSIONS

4.1 COMPRESSIVE STRENGTH TEST

Specimens are to be tested and their results are to be tabulated in the below table.

TABLE 2 -: Compression Test For Brick Samples

Sl.no	Percentage of plastic (%)	Percentage of Quarry dust (%)	Average compressive strength (N/mm ²)
1	1	2	5.12
2	1	3	4.23
3	Conventional	brick	3.15

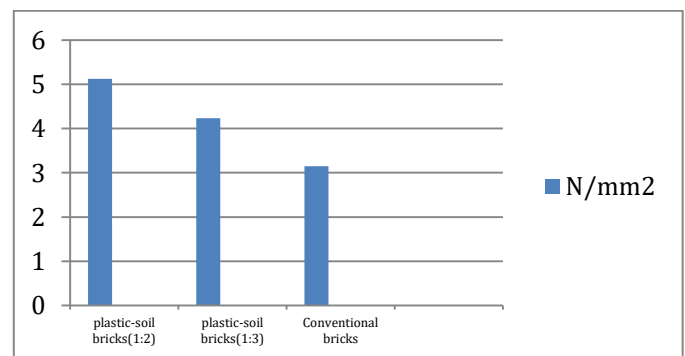


Fig -3: Compressive strength graph

4.2 WATER ABSORPTION TEST

Specimens are to be tested and their results are to be tabulated in the below table.

TABLE 3 :- Water Absorption Test For Brick Samples

Sl.no	Percentage of plastic (%)	Percentage of quarry dust (%)	Water absorption (%)
1	1	2	1.02
2	1	3	1.10
3	Conventional	Brick	3.15

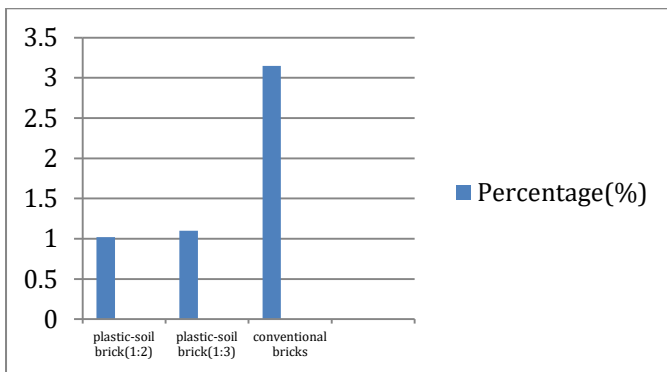


Fig -3: Compressive strength graph

5. CONCLUSION

From the addition of percentage of wastes in the bricks, we would like to conclude that, The waste that are added in the bricks are quite increased in percentage, will tends to reduce the compressive strength of bricks from the minimum standards of compressive strength 5.12 N/mm² so if the percentage of wastes added are quite increased it should have are strict in limitation of size 1/10th of normal bricks. By following the above standards will totally reduce the “waste plastic materials” from the environment.

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- 2) 1) Priyanka Mahajan, 2) Darshan Girase, 3) Dr. A. R. Lokhande, International Journal for Research in Applied Science & Engineering Technology (IJRASET), Volume 6 Issue I, January 2018.
- 3) 1)Mr.N.Thirugnanasambantham,2)P.TharunKumar,3)R.Sujithra,4)R.Selvaraman,5)P.Bharathi, International Journal of Science and Engineering Research (IJOSER), Vol 5 Issue 4 April -2017 .