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## ***“Utilization of Waste Plastic for Usable Goods”***

***Amol More***

*Assistant Professor*

*Department of Mechanical Engineering*

*Aissms's Institute of Information Technology, Pune, India - 411001*

***Corresponding Author's Email: - amolmorecoep@gmail.com***

### ***Abstract***

*There has been a considerable imbalance between the availability of conventional building materials and their demand in the recent past. On the other hand the laterite quarry waste is abundantly available and the disposal of waste plastics (PET, PP, etc.) is a biggest challenge, as repeated recycling of PET bottles poses a potential danger of being transformed to a carcinogenic material and only a small proportion of PET bottles are being recycled. Because of costly conventional recycling techniques, there has been an increased demand for more scientific and innovative technologies to effectively recycle these materials. One such effort is the efficient use of waste plastic and laterite quarry waste with a small quantity of bitumen, to develop an alternative building material such as bricks with negligible water absorption and satisfactory strength in comparison with Laterite stone to satisfy the increasing demand of conventional building materials. Eco-bricks, polyethylene terephthalate (PET) bottles filled with mixed inorganic waste, have become a low cost construction material and a valid recycling method to reduce waste disposal in regions where industrial recycling is not yet available. Because Eco-bricks are filled with mixed recovered materials, potential recycling of its constituents is difficult at the end of its life. This study proposes considering Eco-bricks filled with a single inorganic waste material to work as a time capsule, with potential for recovering the filling material when other ways of waste valorization are available within those communities that currently have no better recycling options.*

**Keywords:** *Plastic bricks, Eco-bricks, polyethylene terephthalate (PET), Waste plastic*

## INTRODUCTION

Plastic bottles are certainly ubiquitous they bring us everything from house hold cleaners to soft dryings to things so readily available as water these bottles, while convenient, do have disadvantages when used on as wide a scale while most of these disadvantages are environmental in nature the consequences could have widespread economical consequences in the long-term. Eco-bricks is the name for PET bottles filled with some material that could be used as building blocks.

There are experiences of bottles filled with soil, and other filled with compressed inorganic waste materials, particularly plastics, foams, packaging and cellophanes. Communities and non-governmental organizations (NGO's) consider the Eco-brick as a valid recycling way to reduce their plastic waste disposal volumes. Moreover, this handmade building block has become an accessible/low cost construction material for social projects in regions where litter and informal dump sites are a common problem and industrial recycling might not be yet available. Examples of regions where there are reported Eco-brick

building projects include countries in Latin America, Africa, and South Asia. Most of Eco-brick based construction projects are social projects where communities work together for a common goal such as educational centers and recreational spaces. There exist motivation techniques to get the participants' help with the collection of materials and filling of bottles, such as graded school work, or trading complete Eco-bricks per clothing or toys.

## LITERATURE REVIEW

Puttaraj et al. examined that efficient usage of waste plastic in plastic-soil bricks has resulted in effective usage of plastic waste and thereby can solve the problem of safe disposal of plastics, also avoids its widespread littering and the utilization of quarry waste has reduced to some extent the problem of its disposal. Plastics are produced from the oil that is considered as non-renewable resource. Because plastic has the insolubility about 300 years in the nature, it is considered as a sustainable waste and environmental pollutant. So reusing or recycling of it can be effectual in mitigation of environmental impacts relating to it. It has been proven that the

use of plastic bottles as innovative materials for building can be a proper solution for replacement of conventional materials.

Vikram Pakrashi et al., examined Eco-brick is a viable resource for construction purposes with a number of possible applications. The bricks are relatively easily manufactured with controlled weight and packing. Eco bricks have relatively good compressive strength, with values matching that of basic concrete cubes.

The weight of Eco-brick was observed to hold a nearly relationship with load at failure and with specific strength. Eco-bricks have a relatively good specific strength. They are lightweight but strong for the weight they bear.

Andreas Froese et al., concluded that when the bottles are filled with soil or sand they work as bricks and form a framework for walls or pillars. Different types of walls varying in size and orientation of the bottles are built. The compression strength and fracture behavior of each wall are measured and compared. PET bottle walls can bear up to 4.3 N/mm<sup>2</sup> when the bottles are filled with sand which is the weakest filling material.

The bottles bear one third of the load while the plaster bears two thirds. Plaster made of clay or a cement mixture fills the space between all bottles while a roof made of wood or corrugated metal completes the house. As only regional products are used the houses are cheap and can be afforded even by poor families. Additionally the method has so far proven to be earthquake resistant and allows short construction periods.

Materials and Methods: An Eco-brick is a building block made entirely from unrecyclable plastic. It's created by filling a plastic bottle with clean, dry plastic until it's packed tightly and can be used as a building block.

- Choose your plastic
- Prepare your plastic
- Get a stick
- Remember what to put in your Eco-brick
- Weigh your Eco-brick.

These are few main points to remember while making a eco-brick.

**DESCRIPTION**



Plastic products have become an integral part of our daily life as a basic need. It is produced on a massive scale worldwide and its production crosses the 150 million ton per year globally. In India approximately 8 Million ton plastic products are consumed every year (2008).

Its broad range of application lies in films, wrapping materials, shopping and garbage bags, fluid containers, clothing, toys, household and industrial products, and building materials. Our brick is a mixture of 2-3 plastic bottles and used plastic bag. it also has some added adhesive and chicle in order to maintain its durability. this brick is tough, durable, light weighted and affordable.

**METHODOLOGY**

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, With the laterite quarry waste to manufacture an alternative building material by which both the questions of a scientific disposal of waste plastic as well as scarcity of traditional building materials can be answered. The laterite quarry waste was collected from Aletti. When the laterite stone is cut from the quarry nearly 15-20% of laterite waste is obtained. This waste was crushed using rammers and sieved in a 2.36mm IS sieve. This sieved laterite soil was brought to laboratory for preparation bricks. This soil was sun-dried to reduce the water content. A mould of size 20x10x10cm was

prepared. Bricks of different mix proportions were prepared, for each brick 3kg of the later-ite soil was added with varying bitumen content of 2, 5 and 10% along with variation in percentage of plastic. Bricks were prepared by compacting through vibration. 9kg of clean sieved laterite quarry waste is collected. 70% of plastic (PET) by weight of soil is cleaned and heated to a molten state. Then sieved soil is added at intervals with proper mixing.

At the final stage 2% of bitumen by weight of soil is added and mixed for uniform distribution to prepare 3 bricks. The hot mix is poured into the mould and then compacted by vibration. The bricks are demoulded after 30 min and air dried for a period of 24hr for proper heat dissipation. of each mix proportion bricks were prepared and tested for compressive strength in the compressive testing machine.

#### **Steps To Prepare Plastic Bricks:**

- 1) Collection of Materials.
- 2) Batching,
- 3) Melting,
- 4) Mixing,
- 5) Moulding,
- 6) Curing

#### **Collection of Plastic Materials**

The plastic material should be collected from the factories waste and hospital waste and industries waste and also food packages and plastic bottles this will come under the LDPE (Low-density polyethylene) plastic type.

#### **Batching of Plastic**

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.

#### **Burning of Waste Plastic**

After completion batching the plastic waste was 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 90-110 degrees centigrade.

#### **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.

### **Moulding**

After completion of proper mixing, we place mix into required mould. In these projects we use the normal brick sizes (19x9x9 cm). after 2 days remove the brick from the mould and then done curing.

### **Curing**

The test specimens after molding were allowed to dry for a period of 24 hours. The specimens were kept in curing tank and allowed to cure for a period of 28 day

### **Materials Used**

Plastic, Cement, Sand, Water, Fly ash, Chewing gum, Fevicol

## **TESTS ON PLASTIC BRICKS**

### **Water absorption test**

In this test, bricks are weighed in dry condition and let them immersed in fresh water for 24 hours. After 24 hours of immersion, those are taken out from water and wipe out with cloth. Then, brick is weighed in wet condition. The difference between weights is the water absorbed by brick. The percentage of water absorption is then calculated. The less water absorbed by brick the greater its quality. Good quality brick doesn't absorb more than 20% water of its own weight.

### **Efflorescence Test**

The presence of alkalis in bricks is harmful where it forms a gray or white layer on brick surface by absorbing moisture. To find out the presence of alkalis in bricks, this test is performed. In this test, a brick is immersed in fresh water for 24 hours.. If the whitish layer visible about 10% of brick surface, then the presence of alkalis is unacceptable range. If that is about 50% of surface, then it is moderate. If the alkali's presence is over 50%, then the brick is severely affected by alkalis.

## **CONCLUSION**

This work effectively converts waste plastic into useful building materials like building bricks and floor interlocks which

can effectively reduce the environmental pollution and further decreases the problem of waste plastics in the society. Rather than the waste plastics going into the landfill or incinerators it can be used as construction materials at a much lower cost after undergoing certain specific processing. It also reduces the construction cost by eliminating the use of mortar during construction by using recyclable.

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