



Constructing structures using eco-bricks

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Abstract: Disposal of non-bio-degradable substances has become an issue of major concern now a days, mounds of garbage has been created over the earth surface. In order to deal with this problem a new concept of ecobricks also known as bottle bricks is trending. Ecobricks are a new class of building material which is made up of plastic bottles are filled with plastic wastes, sometimes with soil and can be further use for construction purpose.^[1] These are energy and resource efficient bricks and can be used to make garden spaces partition walls and full scale buildings such as schools and houses. Use of these bricks reduces the construction cost as well as reduction of the land pollution. This paper intends to investigate plastic bottles as a construction material. It also mentions the manufacturing as well as other properties of ecobricks. At the end different factors such as cost efficiency and reduction of pollution due to use of these bricks is also concluded.

Keywords: plastic bottles, cradle to cradle construction

I. INTRODUCTION

Plastic is a non-bio-degradable substance which takes thousands of years to decompose and hence creating land pollution as well as water pollution. Taking into account the increase of pollution new concept of eco bricks has been introduced.^[9] Eco bricks are also known as bottle bricks. These bricks are manufactured by using the non-bio-degradable wastes such as plastic bottles, plastic bags and other non-bio-degradable substances. Use of such bricks helps in reducing the overall cost of the buildings.^[8]

Materials used in making eco bricks:

- plastic bottles
- Plastic waste such as wrappers, plastic bags etc. for filling bottles.
- Bamboo sticks to compress the material inside the bottle.

Process of making bricks:

Effect of plastics on wildlife:

Step 1:

Take a dry and clean plastic bottle

Step 2:

Gather plastic wastes such as wrappers plastic bags cut it into small pieces and start filling the material inside the bottle.

Step 3:

Compact the filler material with the help of bamboo stick thereafter do a compression test of the brick by standing on it.



Do's in making eco bricks:

- ✓ Use bottle of uniform sizes
- ✓ Cut large plastic bags in small pieces for proper compaction
- ✓ Compress each layer with the help of bamboo stick after filling each layer
- ✓ Material inside the brick should be compacted in such a way so that it can withstand the weight of a person standing over for compression test without any deformation
- ✓ Place the cap tightly on the mouth of the bottle

Don'ts in making eco bricks

- ❖ Don't use sharp edged materials such as pin blade or nail etc.
- ❖ The bottle as well as filler material should be free from moisture
- ❖ Degradable material such as paper should be while filling the bottles.

Effect of plastic on wildlife:

- Birds get caught up in plastic bags and ultimately dies due to starvation
- Plastic bags , one ingested cannot be digested or passed by animals so it stays in the gut , leading to the very slow and painful death of the animals
- Thousands of whales,birds, seals and turtles are killed every year from plastic litter as they mistake plastic bags for food such as jellyfish.^[4]



Impact of plastic on environment:

- Chlorinated plastic can release harmful chemicals into the surrounding soil, which can then seep into groundwater or other surrounding water sources and also the ecosystem. This can cause serious harm to the species that drink the water.
- Components of plastics currently being studied for their health effects include poly-halogenated flame retardants, poly-fluorinated compounds (known as PFOS or PFOA) and antimicrobial compounds such as triclosan and trichlorocarbon.

Using soil as a filling material in making eco bricks:

- a) Filling bottle with soil and compacting the soil properly in order to attain maximum compressive strength
- b) Filling the top and bottom of the bottle with soil and plastic is sandwiched inbetween the two layers of the soil.

Properties of ecobricks filled with soil:

- It provides insulation to the building
- Makes the building bullet proof
- Disposal of sand as well as plastic becomes easier.

General principles of ecobricks:

- **Local transformation:**

Using the available otherwise polluting and toxic non-bio-degradable material to make useful ecobricks

- **Cradle to cradle construction:**

Ensuring that at the end of building's life ecobricks can be reused (cemented bricks cannot be extricate without destroying them and releasing their packed plastic)

- **Community collaboration:**

Focused collaboration in the society to create ecobricks that will be used to create something of the use to the community^[1]

Case studies of plastic bottle bricks:

1) **ECOARK exhibition hall, Taiwan:**

Taiwan based engineer Arthur Huang processed 1.8 million plastic bottles into honeycombshaped bricks for a boat shaped exhibition hall called the ECOARK.^[2]



2) **La Casa de Botellas, Argentina:**

Thefredo santa cruz family of Puerto Iguazu, Argentina crafted their home almost entirely from thousands of plastic bottles .walls coffeetables, bed platforms-even the steps to get to the front door are made up of plastic bottles. ^[2]



3) **Plastic bottle school, san Pablo, Philippines:**

Illac Diaz and the shelter foundation used 1.5 and 2 literbottles, and the results are actually 3 times stronger than concrete.^[2]



4) Tomislav Radovanovic plastic bottle house, Serbia

Serbian math professor Tomislav Radovanovic spent five years turning 13,500 plastic bottles into his dreamhome .The teacher's former students helped him. [2]



Durability of bottle bricks:

- This type of construction is more durable than that of brick construction
- The bottles can last as long as 300 years

Cost analysis:

- The cost of this construction can reduce 33% cost of house made of concrete and bricks.

Advantages of eco bricks over conventional bricks:

- Low cost
- Non-brittle
- Absorbs abrupt shock loads
- Bio climatic
- Re-useable
- Less construction material
- Easy to build
- Green construction
- Light weight

Disadvantages of eco bricks:

- It is un-decomposable and un-destructible
- On melting it releases a compound gas which is very harmful to the health and environment
- It weakens the ozone layer

- Most of the plastic is produced from the oil which is a scarce resource

Remedies to reduce disadvantages of plastic:

- ✓ By recycling of the plastic the undecomposition of plastic can be reduced
- ✓ Now-a-day renewable plastic is produced by oil by products and natural gases , so this proves to be better in future

Scope of eco bricks in India:

As India is a developing country there are a number of people are below poverty line who cannot even afford basic necessities:

- Food
- Shelter

For such people eco bricks can act as a boon for constructing their shelter with the minimum cost. As eco bricks are made with total waste which is otherwise filled in the lap of earth creating air as well as water pollution, hence this waste can be used for creating shelter for millions of people. Manufacturing cost of these types of bricks is very low.

Moreover these bricks are made with the material which is otherwise harmful for human beings, animals as well as for the environment.

These bricks can also provide source of income to the poor people if they start making eco bricks and then selling these bricks.

These bricks along with cost efficiency also provide aesthetic look to the structure hence can be used to give pleasing look.

As manufacturing of bricks cause air pollution, use of eco bricks in place of conventional bricks will contribute in reducing the air pollution

II. CONCLUSION

Eco bricks also known as bottle bricks are made with the help of plastic waste which is otherwise harmful for all living beings. Not only in India but globally the disposal of plastic has become an issue of major concern. In order to deal with this problem new concept of eco bricks came into existence. Material which is considered as waste can be utilized in making material for construction. Every year thousands of animals die due to effect of plastic hence if this plastic will be used in making something useful it would be beneficial in preserving our wildlife as well as,marine life^[4]. These bricks are very cheaper in cost therefore the dream of shelter of the poor people can be fulfilled by using these bricks. These bricks provide good insulation as well as are bullet proof hence can be used in areas which are prone to attacks. Drawback of these bricks is that they cannot be decomposed after use. It is also weakening the ozone layer by releasing harmful gases but these problems can be reduced by making plastic which can decompose. Recycling of the plastic can also contribute to reduce the negative effect of eco bricks. Overall eco brick is a cost efficient and resource efficient building material which can be used in order to deal with the various environmental problems as well for the reduction in the cost of construction.

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