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Manufacturing of bricks by using waste Plastics and Recycled aggregates

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ABSTRACT: This report outlines the utilization of municipal plastic waste (MPW) in construction industries. 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 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. Utilizing MPW as construction materials especially in production of bricks is one of a promising step towards a sustainable resources and waste management. Plastic waste can substitute either partially or completely one or more of the materials in brick production. Further research based on recent research and a better understanding in utilization of plastic waste in brick is needed to produce a high durability and quality of bricks as well as to achieve the optimum balance in all aspects especially in terms of cost and functionality.

1. INTRODUCTION
1.1.1 DEFINITION OF PLASTICS:

Plastics are a wide range of synthetic or semi-synthetic materials that use polymers as a main ingredient. Their plasticity makes it possible for plastics to be moulded, extruded or pressed into solid objects of various shapes. This adaptability, plus a wide range of other properties, such as being light weight, durable, flexible, and inexpensive to produce, has led to its wide spread use. Plastics typically are made through human industrial systems. Most modern plastics are derived from fossil fuel-based chemicals like natural gas or petroleum; however, recent industrial methods use variants made from renewable materials, such as corn or cotton derivatives.[1]

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2. MATERIAL USED

1.1.9 Recycled Aggregates: Aggregates are granular materials used in construction work. They include sand, gravel, crushed stone, recycled concrete, recycled asphalt, recycled brick and slags. Examples of recycled aggregate include recycled concrete from construction and demolition waste material and railway ballast.

1.1.3 Global Production of Plastic and Generation of Waste Plastic

In modern life, plastics are ubiquitous. Its early usage dated back to 1600 B.C., at the time when human hands shaped natural rubber and polymerized into different useful objects in prehistoric Mesoamerica. Diverse usage and manufacturing of plastics and plastic products began in 1839 when polystyrene (PS) and vulcanized rubber were discovered. Production of bake lite which is the first truly synthetic polymer was in 1907 in Belgium, however, by 1930, bake lite was everywhere, especially in fashion, communication and electrical and automotive industries. It took a decade after this for mass production of plastics to begin and it has constantly expanded ever since.

Water:
Potable water is used for both mixing and curing work.

3.3 TESTS ON BRICKS:

3.1 Compression Strength test (BS 5628: Part1:1992)

In this test, the cubical brick specimen is placed in the compression strength testing machine. After placing it we will apply the load on the brick without any shock. The load will be increased at a rate of 140kg/cm^2 min continuously till the specimen's resistance to increasing load breaks down and it cannot withstand any greater load further. Recording the maximum load applied to the brick specimen and the appearance and type of failure is also noted along with any unusual features

COMPRESIVE STRENGTH = MAXIMUM LOAD APPLIED/ SPECIMEN AREA

COMPRESSIVE STRENGTH=F/A

Where,

F - Maximum load applied (KN)

A - Specimen Area (mm2)

2 Mould Preparations:

2.3.9 Melting: In this melting of plastic bottles is done. Plastic bottles are cut in to pieces and then these pieces are put in drum for melting. In the first step stones, drum and fire wood are arranged. The stones hold the drum and the firewood are ignited. Drum is heated to remove moisture from the drum. The plastics then put into the drum and allowed to melt.

2.3.10 mixing: Pieces of plastic are added into drum for melting until the proportion required by us is achieved. River sand is used for addition in plastic Crushed recycled aggregates dust mixture. When the temperature of the melted plastic in the drum is around 180o C-200o C then the Crushed recycled aggregates dust is added into the drum. The Crushed recycled aggregates dust and the melted plastic is stirred continuously so that both gets bonded perfectly. As the plastic pieces melt it start getting bonding with the Crushed recycled aggregates dust particles and hence the mixture required for brick is created.

2.3.11 Molding: In moulding process, the prepared mixture is then filled into wooden mould and then compressed by tamping rod. The pressure is applied by the tampering rod so as the mixture gets filled properly in the mould. Then it is left for cooling in air but before filling the mould apply oil on the walls of mould so that at last brick can be removed easily. The application of oil on the inner surfaces of the mould is must as after solidification the brick will not come out easily and to remove the mould some pressure must be applied that would wear the edges of the brick. So proper oiling is needed before filling the mixture in the mould. The brick then can be removed from mould after 24hours.

TABLE (1:5)

COMPRESSIVE SRENGTH(N/MM^2	COMPRESSIVE STRENGH TEST RESULT ON BRICKS		
	Specimen Identification	**Compressive strength**	**Average compressive *Strength (MPa)***
	Specimens 1	3.978	4.19
	specimens 2	4.23	
	specimens 3	4.46	

WATER ABSORPTION	WATER ABSORPTION TEST RESULT ON BRICKS			
	Specimen Identification	**W1**	**W2**	**Average absorption (%)**
	Specimens 1	3.585	3.680	2.813
	Specimens 2	3.397	3.492	
	Specimens 3	3.456	3.568	

TABLE (1:6)

COMPRESSIVE STRENGTH(N/MM^2	COMPRESSIVE STRENGH TEST RESULT ON BRICKS		
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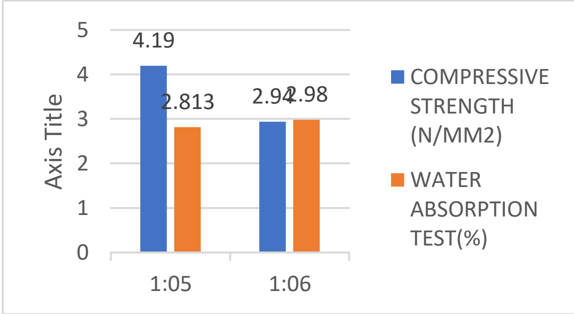

Fig : waste plastics

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Fig :Compressive test

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Fig : Mould (after casting)

CONCLUSIONS:

The proposed project presented above intend store solve in reducing the plastic waste disposal problem as it utilizes the waste even in its finest form and converts that useless material into a useful construction material. Extruder machine plays a prominent role in the conversion of waste plastic into its melted form. Also, extruder does not possess any threats to the environment and hence can be used without any restriction. It also helps in reducing the usage of natural resources which are utilized during the manufacturing of burnt bricks; also it reduces the pollution which is generated from kiln during brick manufacturing. The final end product can be used as brick, which is having a higher strength than conventional brick. Also, the water absorption capacity is higher in comparison to conventional brick with a lower weight. Its uses are not restricted as only brick; it can even be utilized as a building block by increasing the dimension of the mould. Also, it reduces the use of wire used for fencing. Floor tiles, sleepers, etc. can also be produced from it. This brick also turns out to be economical than conventional brick, by reducing the cost of incinerators for burning purpose and landfills.

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