



MANUFACTURING OF HIGH STRENGTH CERAMIC BRICKS WITH USE OF WASTE PLASTICS AS A BINDER MATERIAL

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Abstract: In this research work we are trying to overcome the major municipal problems of solid waste plastics material as the huge use of plastic in day today life. The waste plastic is major challenge for any country in the world because of its impact on health and environment. The waste plastic material is producing lot of environmental pollutions and consumption of plastics by the marine species and animal are also more affected and the result is death in huge rate, such problems can be overcome by utilization of plastic materials in many ceramic and road constructions applications. In this research work we are collecting the waste plastic from different areas and utilizing it for many ceramics and road construction work, hence it is possible to reduce over dumping effect of plastic and save the environmental and health issues. The work is accomplished by using the crushed plastic with the different ratio and mixed with the sand and other composition to produce the many ceramic products which can give the good strength.

Index Terms - Silica sand waste plastic, Heater, blender machine etc.

I. INTRODUCTION

The solid waste plastic material is the biggest challenge for every country in the world. The presence of plastic material act as pollutant in environment and its effects on the human and animals' health, beyond this the plastic adversely effect on drainage systems water pollution and oceans, most of the animals and sea spices dies by eating the plastics, The plastic cannot be decomposed easily, it will retain till the 4500 years. As per the article published the sultanate of Oman produces around 204 KT of waste plastic in the year 2016.It is expected that it may increase about the 38% till the 2030.As the safety measure in Oman Ministry of Environment and climate Affairs, decided to ban of single use plastic to control the plastic usage. Some of the plastic materials can be recycled and it will be converted into the plastic granules and reuse them for many useful products, even though the more percentage of plastic will be unused. This research work belongs to overcome some of the challenges by utilize of waste plastic into many useful ceramic products as an additive, which will increase the strength of the ceramic material and reduce the cost of product and control the environmental pollutions.

II. OBJECTIVES AND SCOPE OF WORK

- The overwhelming dumping of plastic in Sultanate of Oman or any country will lead to ban of use of plastic bags. As per the report Published the government has announced the ban of plastic bags in sultanate.
- The rate of waste plastic is increasing rapidly and has become challenging for the decompose.
- plastic cannot be dissolved easily. it will be remaining undissolved for the almost 4500 of years even after buried of plastic into the underground.
- It is the biggest challenge for the Municipal of any country to carrying of waste plastics and putting it to the away from the cities.
- The disposal of Plastic material is eaten by the many animals like cows and camels and hence the result many surveys found death of animals with more percentage.
- If the plastics are decomposing in the marine, then many species are eaten those plastics and are result are same death of fish, tortoise, sea horse and similar animals.

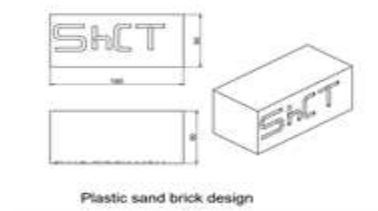
III.CONCEPT OF PROJECT

The basic concept of the project is to reduce the contamination of plastics and used that plastic into the many useful application like manufacturing of ceramics product and construction of road. This project is the study of mixing of waste plastic material along with the ceramic materials and improve the strength of material. The different composition of plastic to sand with different ratio from 30:70 to 15:85 is mixed for the many trails, and then the product is assessed with compressive strength and

water absorption test. The plastic can be utilized as thermo plastic waste only, because this material can utilize in the recycle form. Also, the same plastic can be mixed with bitumen and used it for the road construction which can improve lot of strength.

IV. MATERIALS AND METHODS

The given below figure is the product design of this project. It is the design of ceramic plastic brick used silica and thermoplastic material with different ration of mixing.



Plastic sand brick design

Fig 1 Product Design

V. RESEARCH METHODOLOGY,

1. Primary we need to collect the waste plastic material from different location around the cities.



Fig 2 Waste Plastic

2. Crushing the plastic material into the small fine grain size around 4-5 mm size.
3. Collecting the sand and separated sieve test:



Fig 3 Sand and Sieve

4. Measured the weight of sand and crushed waste plastic based on the sand and plastic ratio.



Fig 4 Weighing

5. Make the Mold then heat the mixture unless it becomes semi liquid and then poured into the cavity.



Fig 5 Heat the Mixture

7. The final shape of the product.



Fig 6 Final Shape

Merits

- Recycling of waste plastic
- Reducing environmental pollution
- Overall cost of brick will be low.
- Keep city clean.
- Strength of brick more
- Long life of brick

Demerits

- It produces unpleasant smell while heating.
- The initial cost of project is expensive.
- While burning of plastic it produces smoke.

VI. RESULT AND DISCUSSION

We have made many trails with different percentage of mixture of waste plastic and sand..

Table-1 Different trail for different mixture of sand and waste plastic

Sr No	Trails	Ratio mixture
1	1	30:70
2	2	25:75
3	3	20:80
4	4	15:85

a) Compressive Test Conducted.

Compressive strength values for different trails Test.

Table-2 Compressive force value taken from compressive test.

Sr No	Trials	Ratio	Compressive force (KN)
1	1	30:70	101
2	2	25:75	275
3	3	20:80	205
4	4	15:85	235

b) Compressive strength calculation.

Compressive strength of brick (Trial 2-25:75) = Compressive load /Cross section area.
 $= 275/90 \times 190 = 16.08 \text{ N/mm}^2$

Table-3 Compressive strength value for different ration mixtures

Sr No	Trail	Concrete/polymer Ratio	Compressive force (KN)	Compressive strength (N/mm ²)
1	1	30:70	101	5.906
2	2	25:75	275	16.0818
3	3	20:80	205	11.9883
4	4	15:85	235	13.742

Table-4 Compression strength comparison Plastic sand brick with other standard bricks

Concrete Hollow block Grade A (KN)	Clay Brick with 1-3 class (KN)	Plastic sand brick (KN)
3.5	10.3	5.906
5.5	6.8	16.0818
8.5	3.43	11.9883
15	2.45	13.742

c) Water Absorption Test:

The brick is dip in the water for 24 Hrs.

Table-5 Weight of sample before and after the water dip test.

Sr No	Trails	Ratio mixture	Weight before dip in water (Kg)	Weight after dip in water (Kg)
1	1	30:70	2.478	2.509
2	2	25:75	2.465	2.489
3	3	20:80	2.245	2.262
4	4	15:85	2.350	2.403

Water Absorption calculation (Trail -2)

$$W = \frac{W_2 - W_1}{W_1} \times 100$$

$$W = \frac{2.489 - 2.465}{2.465} \times 100$$

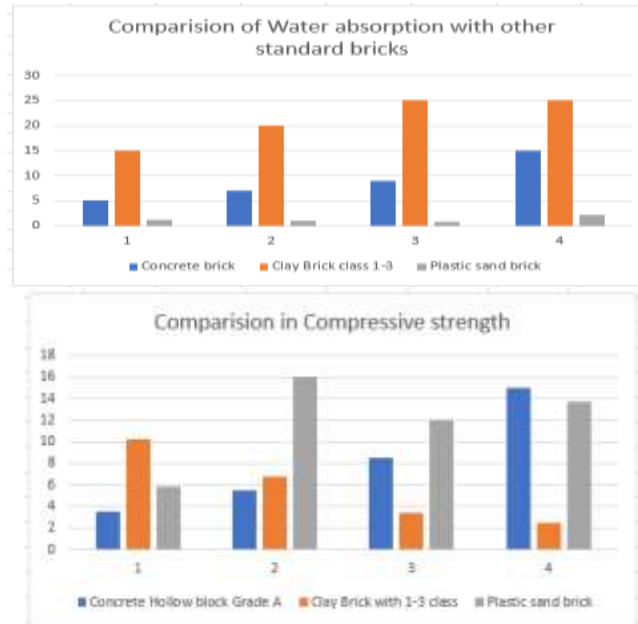
$$= 0.97 \%$$

Table-6 Water abortion percentage value for different ration mixtures.

Sr No	Trails	Ratio mixture	Weight before dip in water (Kg)	Weight after dip in water (Kg)	Water absorption Percentage (%)
1	1	30:70	2.478	2.509	1.2
2	2	25:75	2.465	2.489	0.97
3	3	20:80	2.245	2.262	0.752
4	4	15:85	2.350	2.403	2.2

Table-7 Comparison Plastic sand brick with other standard bricks.

Concrete brick	Clay Brick class 1-3	Plastic sand brick
5%	15%	1.2 %
7%	20%	0.97%
9%	25%	0.752%
15%	25%	2.2%



After the test conducted in the lab the compressive strength and the water absorption of the product is very optimized. This product is compared with other standard similar product, we found that our product is better than other materials.

CONCLUSION

This research work shows that the utilization of waste plastic can be useful in many ceramic applications. From the results like compressive strength of brick and water absorption test, it is clear that this product is giving better result than other bricks. The Plastic bricks can help to reduce the environmental pollution.

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