

Utilisation of Waste Plastic for manufacturing of Plastic Bricks

Prof. Mohan Dusane, Aman Dable, Subhash Dhotre, Pravin Jadhav
 Department of Civil Engineering, Mumbai University
 Vidyavardhini's College of Engineering and Technology,
 K.T. Marg, Vasai Road (W), Palghar – 401202.

ABSTRACT

Plastic is a non-biodegradable substance which takes thousands of years to decompose that creates land as well as water pollution to the environment. The plastic usage is large in consumption and one of the largest plastic waste is polyethylene. As amount of clay required for brick is huge, In this project these waste plastic are effectively utilized in order to reduce the land space required to dump these waste. This creates prevention from various harmful Diseases. Polyethylene bags are cleaned and added with fine aggregates at various ratios to obtain a high strength bricks that possess thermal and sound Insulation properties. This is one of the best ways to avoid accumulation of Plastic waste. It also helps in reducing the use of sand. We are going to use Crushed sand (IS 2386 Part 1),Waste plastic(IS 14535) and for the manufacturing of Bricks. We are going to perform 4 tests. The size of mould is 190x90x90 mm.The equipments that are going to be used are CTM Machine, Oven, Trowel, Tank and Mould. We are using four ratios(Plastic:Sand) 1:2 , 1:2.5 , 1:3 , 1:3.5

KEY WORDS

Plastic Waste, Low density Polyethylene,Polyethylene properties,Plastic sand bricks

INTRODUCTION

Building materials like bricks, concrete blocks, tiles, etc. are popularly used in construction. However, these materials are expensive and hence common people find it difficult to easily afford them. Moreover, these building materials require certain specific compositions to obtain desired properties. Plastic is one of the recent engineering material which have appeared in the market all over the world.

Plastic waste is increasing day by day throughout the world. It pollutes the environment and it has harmful effects on living organisms. It takes thousands of years to decompose. Reuse and recycling of waste plastic has environmental benefits not only related to the safe disposal of bulk waste, but also to the reduction of environmental impacts that arises due to burning of plastic. Our project is related to the manufacturing of bricks by mixing sand and waste plastic. This will help us in reducing the amount of waste plastic effectively.

LITERATURE REVIEW

We referred various research papers for the manufacturing and Testing of Plastics Bricks.

Some of them are as follow:

- P.Tharun Kumar, R.Sujithra had published their research in International Journal of Science and Engineering Research on manufacturing and testing of Plastic Sand Bricks in April 2017.In that they Manufactured two bricks and they performed various test First brick-(fly ash ,sand) Second brick-(sand ,plastic) at ratio (1:3,1:4,1:5) .

Cost Efficiency, Resource Efficiency, Reduction in emission of Greenhouse Gases were the outcomes of their research.

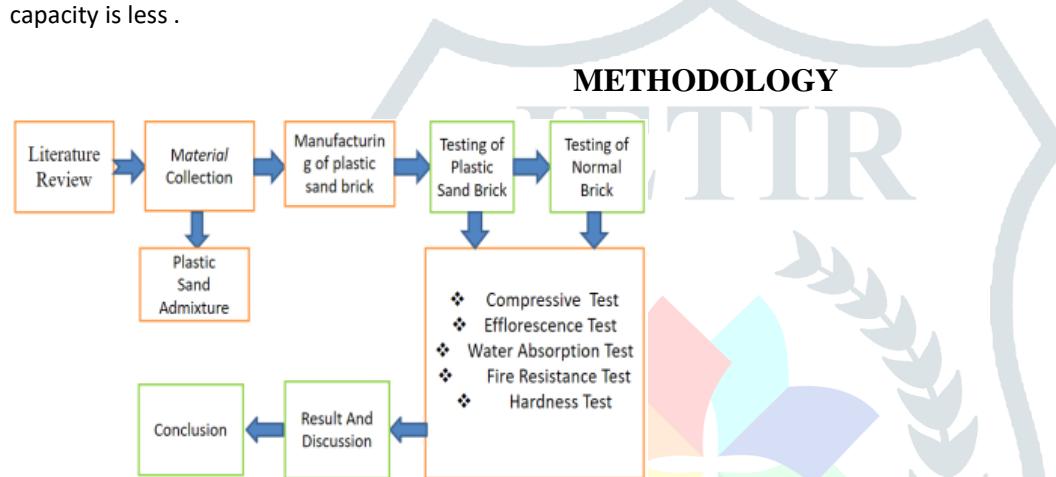
- S.C. Rangwala had written one book on Engineering Material in 1969.In that book he explained Various Constituent of bricks ,their Properties and manufacturing Process .

- L. Singh,P. Singh,S. Thockchom had published their research in International Journal of Engineering Technology, Management and Applied Science in March 2017.They performed Comparison between two Plastic Bricks Material Compact Disc and Plastic Bottle at ratio (1:1.5) .They found that Strength of Plastic Bottle Brick was more than Compact Disc Brick

- Dinesh.S ,Kirubakaran.K had published their research in International Journal of Applied Engineering Research dated on January 2016. They performed Manufacturing of Plastic Sand Brick by Waste Plastic and River Sand and performed various test at ratio (1:2,1:3,1:4,1:5,1:6).

They Obtained better results than traditional Bricks.

- Hiremath.P Shetty.S Rai.N had published their research in International Journal of Technology Enhancement and Emerging Engineering Research dated on May2014.They use Plastic and Clay in Manufacturing of Bricks. They found that these bricks were approximately 48% Cheaper than Laterite Stone Bricks .
- S. Kamble ,D. karad had published their research in International Journal of Advance Research in Science and Engineering dated on December 2017. They utilized Waste Plastic generated in Mumbai City for the manufacturing of Brick at ratio (1:5.25) .They found that it helps in reducing the quantity of waste plastic generated in City .
- Shrimali.S had published his research in International Journal of Mechanical and Production Engineering dated on October 2017 . He analyzed the compressive strength and technical feature of Plastic Brick with different proportion using laboratory test. He reached on conclusion that As Increase the amount of waste plastic, will increase its compressive strength .
- Shah ,Garg.H,Patel.R had published their research in International Journal of Mechanical and Production Engineering dated on October 2017 . They used the principle that the Manufacturing of Bricks by using Waste Plastic Dust(polyethylene bags ,Plastic Bottles etc.). They got the result that Compressive Strength is more than the conventional Brick and its water absorption capacity is less .



RESULTS AND DISCUSSION

Compressive Test

The brick specimen was placed in compression testing machine and the load is to be applied without shock and increased continuously at a rate of approximately 140 kg/cm² min until the resistance of the specimen to the increasing load breaks down and no longer load can be restrained. The maximum load applied to the specimens is to be recorded and the appearance of the brick and any unusual features in the type of failure is noted.

Compressive strength = Maximum load / Area of specimen

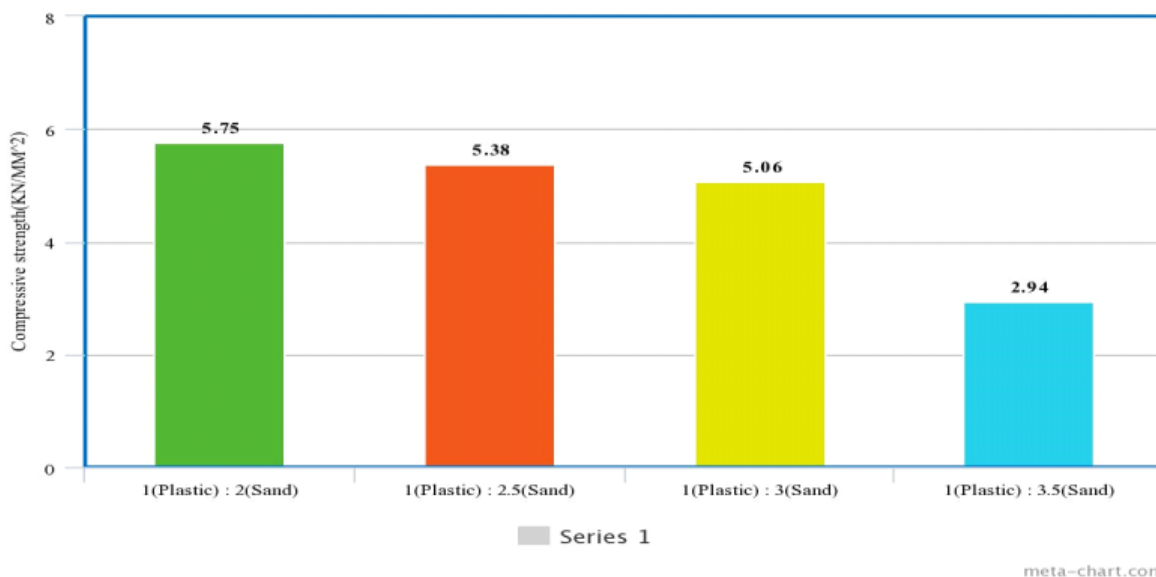
Comparison of Compressive strength of Plastic sand bricks possessing various ratios.

Proportion 1:2 1:2.5 1:3 1:3.5 1 :1.5:0.5

Compressive Strength 5.75 5.38 5.06 2.93 3.83
(KN/mm²)



COMPRESSIVE STRENGTH TESTING RESULT



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

$$\text{water absorption} = (w_2 - w_1 / w_1) * 100$$

By performing water absorption test on various proportion of bricks, it showed that the bricks absorbed negligible amount of water.



Efflorescence test

The presence of alkalis in bricks is harmful where it forms a grey or white layer on bricks 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 then it is taken out from water and allow to dry in shade. If whitish layer is not visible on surface it proof that absence of alkalis in bricks.

We have done efflorescence test on various proportion of bricks we have observed that no patches appeared on a bricks.



Hardness Test

In this test a scratch is made on the brick surface with steel rod (or any hard material can be used) which was difficult to imply the bricks were hard. This shows the brick possess high quality.

By performing hardness test on bricks of various proportion we found a blur scratch on it which shows that our brick is quite better than the conventional brick.



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CONCLUSION

The Plastic sand bricks possess more advantages which include Cost efficiency, Reduction in the emission of greenhouse gases. We also found that the compressive strength of bricks can be increased by using plastic and sand. Due to plastic content in Brick it absorb negligible amount of water which is good to improve it's quality. This method is suitable for the countries which have the difficulty to dispose /recycle the plastic waste. The natural resources consumed for the manufacturing of Plastic sand bricks are very much less when compared to its counterparts. The manufacturing cost could be reduced further by replacing the crushed sand with quarry dust or other waste products. Owing to the numerous advantages further research would improve the quality and durability of plastic sand bricks.

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