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# An Experimental Study on Cement Brick by using Industrial Waste

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**ABSTRACT:** This study aims to characterize bricks produced by the addition of the agricultural waste materials (sugarcane bagasse), plastic waste. Disposing off these waste materials is a very challenging task and is a hazard to environment. The sugarcane bagasse, plastic wastes were collected locally from the bardoli. These were mixed for brick manufacturing. Mechanical properties i.e. compressive strength and durability properties i.e. water absorption of these bricks were evaluated. Furthermore, the additions of wastes have reduced the weight of bricks which decrease the overall weight of the structure leading to economical construction. Therefore, it can be concluded that the addition of waste materials in brick manufacturing can minimize the environmental burden leading towards more economical and sustainable construction.

**KEYWORDS:** plastic wastes, sugarcane bagasse ash (SCBA), water absorption, eco-friendly, compressive Strength and durability properties.

## I. INTRODUCTION

The traditional construction materials such as bricks, concrete, pavement blocks and tiles are being produced from the existing natural resources. This damaging of the environment due to continuous exploration and depletion of natural resources. A brick is building material used to make walls, pavements and other elements in masonry construction. Traditionally, the term brick referred to a unit composed of clay, but it is now used to denote rectangular units made of clay-bearing soil, sand, and lime, or concrete materials.

Sugarcane is one of the major crops grown in over 110 countries and its total production is over 1500 million tons. In India only, sugarcane production is over 300 million tons/year that cause about 10 million tons of sugarcane bagasse ash as an un-utilized because of that it is as waste material. Each ton of sugarcane generates approximately 26% of bagasse (at a moisture content of 50%) and 0.62% of residual ash.

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). But plastic is a relatively cheap, durable and versatile (able to adopt) material and its product have brought benefits to society in terms of economic.

## II. OBJECTIVES

1. To improve the strength and stability of bricks by adding sugarcane bagasse ash and waste plastic.
2. To check whether manufactured brick is better than traditional bricks.
3. To utilise industrial waste into traditional brick.

## III. METHODOLOGY

To increase in the strength of cement brick i.e. compression strength, water absorption and efflorescence. To increase in strength we have performed various mix proportions. First of all we have partially replaced the sand with sugarcane bagasse ash in proportions of 5%, 10%, 15%. The brick mortar was mixed using hand mixing procedure. Cement and sand are mixed thoroughly for 1-2 minutes. After that half water is added and mixed properly then after again 25% - 25% water is added until the mortar get it in gel form and casted in mould.

Table 1 Mix proportions of raw materials

Brick series	Sand(S)	SCBA
S	100	-
SCBA5	95	5
SCBA10	90	10
SCBA15	85	15

After test which ever brick series is has good strength is chose and then waste plastic and SCBA is partially replaced in cement brick. The mix proportions of as shown in the table 2. We have taken two mix ratio 1:6 and 1:7

Table2 Mix proportions of raw materials

Brick series	Sand(S)	SCBA	WP
S	100	-	
SCBA+WP	85	10	5
SCBA+WP	80	10	10
SCBA+WP	75	10	15

Test of this specimen is conducted at 7 and 28 days. Figure of hand mixing of cement brick mortar as shown below



Figure 1 Sieve analysis test for fine aggregate



Figure 2 Manufacturing of bricks by manually



Figure 3 Specimen of Sugarcane bagasse ash



Figure 4 Specimen of sugarcane bagasse ash and waste plastic

#### IV. EXPERIMENTAL RESULTS

After that we conducted tests on specimen and we founded that SCBA10 has maximum compressive strength and water absorption is in the limit i.e. 20% and nil efflorescence. As shown below in the bar chart of brick of mix ratio 1:6 have maximum compressive strength.

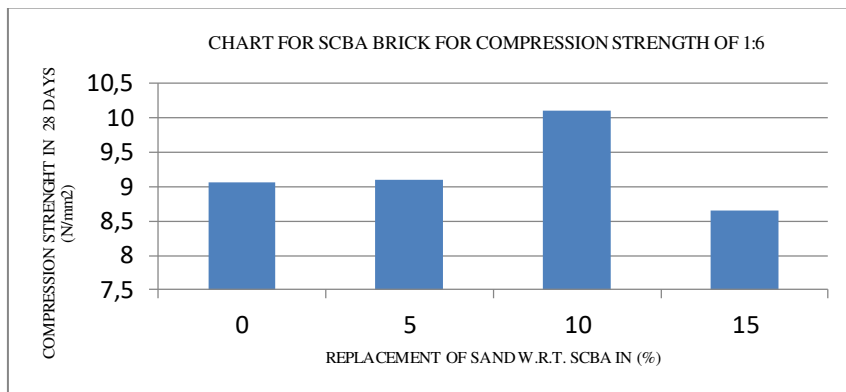


Figure1 Compression strength of cement brick of SCBA in 1:6

And as shown below in the bar chart of brick of mix ratio 1:7 have maximum compressive strength.

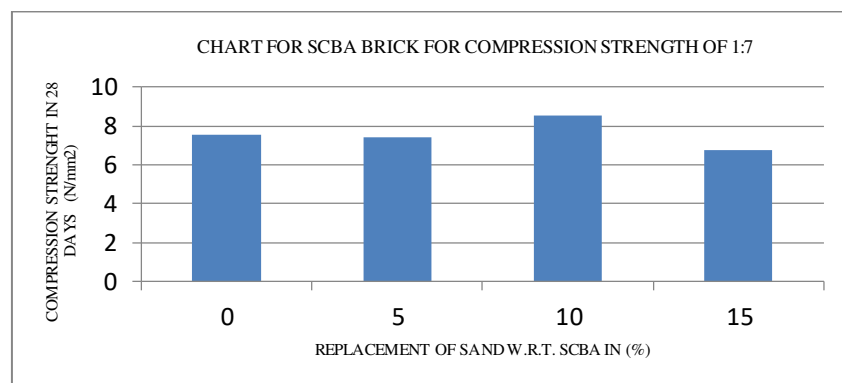


Figure 2 Compression strength of cement brick of SCBA in 1:7



As shown in results 10% of SCBA have maximum compressive strength. So by fixing this proportions and partially replacing of waste plastic in cement brick. The results of SCBA+WP are shown below by bar chart.

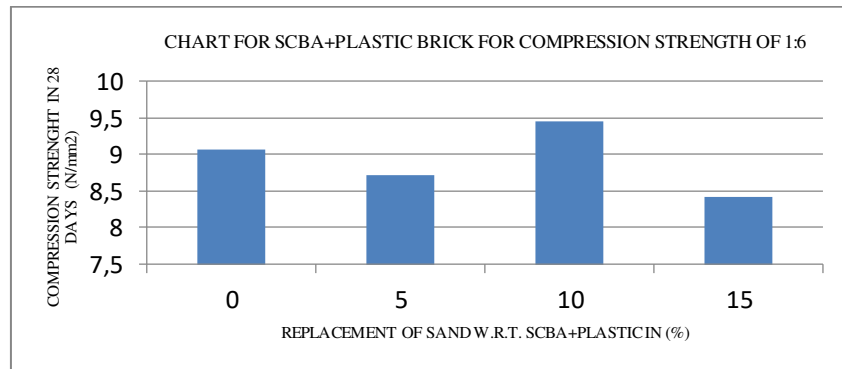


Figure 3 *Compression strength of cement brick of SCBA+WP in 1:6*

And the result for the 1:7 mix ratio of SCBA+WP is shown in below bar chart.

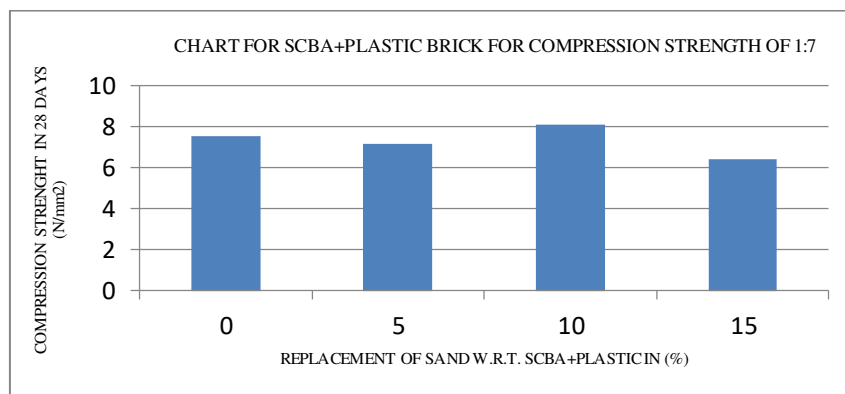


Figure 4 *Compression strength of cement brick of SCBA+WP in 1:7*

In the both mix ratio 10% has water absorption in limit as per IS code 3495-2(1992). There is no efflorescence is seen specimen.

## V. CONCLUSION

After manufacturing of bricks made of sugarcane bagasse ash (SCBA) by partial replacement of sand in bricks, we performed destructive i.e. compression strength and non-destructive test i.e. water absorption and efflorescence. There is no efflorescence in any bricks.

We have observed that compression strength of 10% of SCBA partial replacement of sand in 1:6 as well as 1:7 has obtained maximum strength in brick. But water absorption of 10% of SCBA has 13.59% in 1:6 and water absorption of 10% of SCBA has 18.23% in 1:7 which is under permissible limit i.e. 25%. The cost unit brick is 5.618 Rs/- for 1:6 and 5.338 Rs/- for 1:7.

So, we have made brick of combination of SCBA and plastic. We have observed that compression strength of 10% of (SCBA+ Plastic) partial replacement of sand in 1:6 as well as 1:7 has obtained maximum strength in brick. But water absorption of 10% of (SCBA +Plastic) which is under permissible limits i.e. 25%.



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