Characteristics of Paperbrick with Inequitable Substitution of Cement

M.S. Britto Jeyakumar, Y. Kamala Raju

Abstract— Paper bricks are key construction materials for buildings in general and for low cost housing in particular. To keep up with sustainable development movements and increasing competitive pressure in the industry, building materials of the upcoming have to be of lesser weight, more force capable and lower cost. The use of recycled materials is also critical for long-term sustainability.

The intention of this paper is to develop lightweight paper brick from waste paper with lowest amount. The paper was hydrating and spin to obtain paper mash slurry after mixing with cement, and cast to shape. Compressive strength and water absorption were found. The results showed that investigational bricks are upper compressive force, water absorption when compared to those of existing masonry blocks. Quick cost estimation indicated that bricks could be made at a lower cost than those available in the market. It is fulfilled that paper bricks as of waste paper possess smart property and high-quality strengths. Sustainable and rate issues are also addressed. The result show the arrangement of paper dissipate and cement provides improved results for produce economical latest bricks.

Keywords : Sustainability, paper waste, paper-pulp slurry,water absorption.

I. INTRODUCTION

Since a big call for has been positioned on constructing material industry particularly inside the ultimate decade, because of the growing population which causes continual storage of building substances, the civil engineer has been challenged to transform industrial wastes to useful building and construction materials

Then with the help of graph, a comparison between Compressive strength, Water absorption and Efflorescence of ordinary bricks and paper bricks was determined. Before manufacturing the bricks, different properties of materials (cement and paper) were verified. After that, bricks were made and sun dried and then with the help of compressive strength machine (CTM), their compressive strength was calculated. The purpose of this study was to use waste paper to produce light weight masonry bricks. At make we have covered a type of paper brick before, but it was used simply as fire starter

Rahul Ralegaonkar and Sachinmandavgane of the Visveavaraya National Institute of Technology in India have come up with a process to make paper bricks designated for creation instead of destruction. It started when they visited a paper recycling plant in 2009. They learned that 15% of the material that went through the plant was piled up into an un sighting sludge and sent to a landfill.

Raleganokar and Mandavgane decided to take some of that sludge back to their lab and play around with it along with students over the summer. They are found when the bricks were made at 90% recycled paper mill waste and 10% cement. The slurry is mechanically mixed pressed into moulds, and left in the sun to dry. The bricks are half the cost of conventional ones, much lighter and could be a suitable to the Indian construction economy, which is 30% deficit in brick masonry (Including rice husk, fly ash,cotton waste etc.)

II. LITERATURE REVIEW

Rahul Ralegaonkar and Sachin mandavgane of the Visveavaraya National Institute of Technology in India have come up with a process to make paper bricks designated for creation instead of destruction. It started when they visited a paper recycling plant in 2009. they learned that 15% of the material that went through the plant was piled up into an un sighting sludge and sent to a landfill.

Physical properties of Paper

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Physical properties of Cement

Cement is the most important material for Civil Engineering Construction of Buildings, Dames, Bridges, Channels, Culverts, etc. It must be understood that cement is a chemical and reacts when mixed with water. Cement particles develop a type of growth on its surface until it link up with the growth from the neighbouring cement particles. It is this linking which results in progressive stiffening, hardening and strength development.

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The chemical reaction continues in the presence of free water, moisture or humidity present within the mass or outside. The mix becomes harden and stronger with age. This strength development is significant in the first month but it does not continue at a much slower rate for many years is called " HYDRATION " of cement and is accompanied by generation of heat which is called "Heat of hydration"

III. RAW MATERIALS

In the experimental work **raw materials** used as follows :

Cement:

In this have a look at, cement which is used is an normal port land cement. It acts as an awesome binder with paper sludge to supply paper brick. It hardens quickly when mixed with paper sludge and water.

Paper:

Paper used in this research was taken as waste news paper and in this project.

Sample preparation:

In this study, three different mix ratios were used as shown table 1 the water and waste paper mixes were kept constant and the proportion of cement was varied. For each ratio, ten samples were prepared.

The standard brick mould size 190*90*90 mm

IV. EXPERIMENTAL WORK & RESULTS

Methods used to prepare the Paper brick:

The desecrate paper was soaking in water for day.

Fig. 1 In wet condition and in dry condition

Pour the cement into the paper pulp and blend it thoroughly

Now upload the water and mix it at a uniform shade

Pore the mixed proportion into the mould

Fig. 2 shake the blend to take out the air with the facilitate of Vibrator apparatus

Fig. 3Remove the forms (moulds)

Fig. 3Let the Bricks dry for at least one week.

Compressive force of bricks : (I S 3495 : 1992)

A wall or column carrying a compressive load behaves like any other strut, and its load bearing capacity depends on the compressive strength of the materials, the cross sectional area and the geometrical properties as expressed by the slenderness ratio.

1) Compressive testing machine (CTM)

2) Scale for measuring dimension of brick

$$\text{Compressive Strength} = \frac{\text{Maximum load at failure}}{\text{Area of the in mm}}$$

The normal Compressive strength of bricks (IS 3495: 1992) is 35Mpa.

Fig. 4 While doing the Compressive strength in Laboratory:

Formulae for Water absorption:

$$\text{Water absorption} = \frac{M2-M1}{M1} * 100$$

The average of result shall be reported.

while hardened, the standard water absorption shall not be extra 20% by weight.

1) NIL: - When there is not perceptible deposit of efflorescence.

2) Slight: - Not more than 10% area of the brick covered with a thin deposit of salt.

3) Moderate: - Covering up to 50% area of the brick.

4) Heavy: - Covering 50% or more area but un accompanied by powdering or flaking of the brick surface.

5) Serious:- When there is a heavy deposit of salts accompanied by powdering and flaking of the exposed surfaces.

While doing Efflorescence in laboratory:

Caluclations For Compressive Strength

$$\text{Compressive Strength} = \frac{\text{Maximum load at failure}}{\text{Area of the in mm}}$$

Size of the brick 220*80*70mm

- For 85% of newspaper crush,15% of cement:
  Load at failure = 60 KN
  Compressive strength = $(60*10^{3)} / 220*80$
  = 3.41Mpa
- For 80% of newspaper crush, 20% of cement :
  Load at failure = 55 KN
  Compressive strength = $(55*10^{3}) / 220*80$
  =3.13 Mpa
- For 75% of newspaper crush, 25% of cement :
  Load at failure = 65 KN
  Compressive strength = $(65*10^{3}) / 220*80$
  = 3.70 Mpa

Table I: Compressive Strength

Specimen	% Of Cement Add	Compressive Strength in (Mpa)
S1	15%	3.41
S2	20%	3.13
S3	25%	3.70

Calculations For Water Absorption

Formulae for calculating Water absorption = $\frac{M2-M1}{M1}*100$

M1 = The weight of the brick is before pour into the water

M2 =The weight of the brick after taken from the water

For 85% of newspaper crush, 15% of cement

M1 = 810gm M2 = 1100gm

Water absorption = $\frac{1100-810}{810}*100 = 35.8\%$

- For 80% newspaper crush, 20% cement

M1 = 760gm M2 = 1010gm

Water absorption = $\frac{1010-760}{760}*100 = 32.8\%$

- For 75% Paper pulp, 25% cement

M1 = 900 M2 = 1160

Water absorption = $\frac{1160-900}{900}*100 = 28.8\%$

Table- II: Water Absorption Results

Specimen	% Of Cement Add	Water Absorption in (%)
S1	15%	35.8
S2	20%	32.8
S3	25%	28.8

Calculations for Efflorescence

For 85% of newspaper crush, 15% of cement

For more than 10% of area of the brick covered with a thin deposit a thin deposit of salt.

Efflorescence is Slight

For 80% newspaper crush, 20% cement

For surplus 10% of region of the brick covered with a thin deposit a thin deposit of salt.

So, It has Slight Efflorescence

For 75% Paper pulp, 25% cement

For surplus 10% of region of the brick covered with a thin deposit a thin deposit of salt.

So, It has Slight Efflorescence

Table III. Efflorescene results:

case	% Cement include	Efflorescence
S1	15%	Slight
S2	20%	Slight
S3	25%	Slight

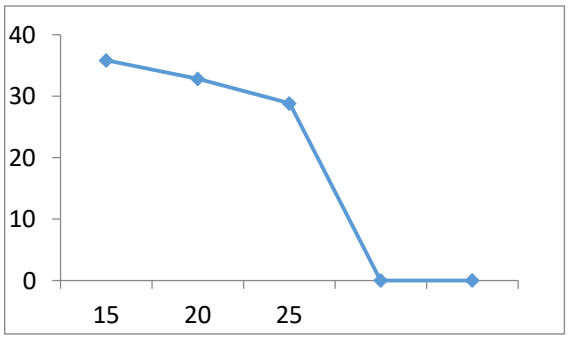

Fig5. Cement in % vs Water absorption in %

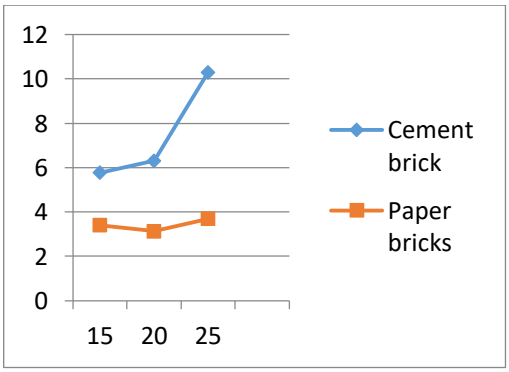

Fig 6. Comparison of Compressive strength between Cement brick and Paper brick

Cement in % vs Compressive Strength in Mpa

Table IV: Test Results

Case	% Of Paper Sludge	% Of Cement
C 1	85%	15%
C 2	80%	20%
C 3	75%	25%

The 190*90*90 mm size bricks were prepared and used as test specimens to determine the compressive strength and water absorption respectively. The specimens were prepared with various percentages of cement and paper sludge.

Table V: Compressive Strength opted :

Case	% Of Cement Add	Compressive Strength in (Mpa)
C 1	15 %	3.41
C 2	20 %	3.13
C 3	25 %	3.70

Table VI: Water Absorption grades

Case	% Of Cement Included	Water Absorption in (%)
C 1	15 %	35.80
C 2	20 %	32. 80
C 3	25 %	28. 80

Table VII: Efflorescence opted

Specimen	% Of Cement Included	Efflorescence
C 1	15 %	Slight
C 2	20 %	Slight
C 3	25 %	Slight

V. CONCLUSIONS

Based on the experimental investigation the subsequent effects were determined.

The superior (%) Of cement substitute in paper brick and compressive energy of the bricks have studied.

Paper bricks extra low-priced the time required to prepare bricks much less in comparison to normal bricks

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