JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Papercrete Bricks: Eco- Friendly Building Material

kagitapu itukalu - paryavarana nesthalu

[1] Girada Lakshmana Rao ,

[1]School Asst (Physical Science) , ZPHS Veeraghattam , Parvathipuram Manyam District , Andhra Pradesh ,India, 532460

Abstract : A large amount of non-renewable resources is consumed by the construction industry throughout the world. Bricks, cement are main material of construction field. Especially Brick kilns are destroying the air quality. Although industrialization is very important for the development of a country, this is a bitter fact that that it speeds up the process of environmental degradation as was observed at the vanduva village of veeraghattam mandal, Parvathipuram Manyam Dist. In order to address these issues it has become imperative to push the boundaries of research in the field of innovative sustainable echo friendly building material. This study is one such kind of efforts. Papercrete is a new composite material comprising of waste papers and cement. This could help eradicate a few of the environmental hazards caused by the construction industry. In this study we observed both operational and non-operational phases using filter papers to assess the suspended particle matter in the air surrounding brick kilns.

***Index Terms* – Brick Kilns , Paper Brick , thermal resistivity , compressive strength , Efflorescence,**

I. INTRODUCTION

Brick production is a very large and traditional industry in many parts of Asia. The brick sector in India although Unorganized is terminates in size. India is the second largest brick producer (china dominates with 54% share) in the world. Now, it is an established fact that small scale industries are one of the major contributors to atmospheric pollution in environment. Among small scale industries, the brick kiln industry is a booming industry as the demand for bricks is increasing almost universally due to fast economic growth, urbanization and prosperity. The raw materials used for brick productions are soil clay or sediments from river, which are rich in fine particles. Most of the brick kilns use Assam coal, slack coal and/or lignite which contain high level of sculpture and high ash content 6% wood and others are used as fuel by brick kilns. Burning of this coal produces high level of sculpture dioxide and black carbon. In certain areas, low grade carbonaceous materials such as rick husk, bagasse and wood/saw dust are also used as a part or full replacement of coal. In India, fire clay bricks are produced in about 42000 small and medium scale brick kilns which operate normally using 4-5 million metric tonnes of coal each year.

India's present housing shortage is estimated to be as high as 31 million according to census and out of these shortages 24 million units are in rural areas and 7 million units in urban areas. Such a large housing construction activates require a huge amount of money. Out of this total cost of house construction, building materials contribute to about 70% of cost in developing counties like India. The increase in the popularity of using environment friendly, low-cost and light weight construction materials in building industry gas brought about the need to investigate how this can be achieved by benefiting the environment as well as maintaining the material.

2. Objective of the Research :

The objective of the study is to investigate the properties of Papercrete bricks that were prepared out of waste paper, quarry dust and Fly Ash in varying proportions of 25%, 40% and 55%. The following properties were studied and a comparative study with conventional bricks was done:

- Mechanical properties
- Weight comparison
- Quality Standards like hardness, soundness and fire resistance
- Environmental compatibility
- Thermal resistivity
- Water absorption test

3.background study :

On my study the following are identified

In Non-operational Phase of bricks making suspended particle Mass are normal in the atmosphere. In operational Phase of bricks making suspended particle Mass are abnormal in the atmosphere. CO_2 rises 0.03% to 0.5% at visited brick industry.Five lakhs of bricks making in an operational season at visited brick industry.Five tonnes of wood be consumed in every operational season.8.65 tonnes of CO_2 omitted by the brick kilns in every operational season at visited Area.40% people effected by the pollution in operational seasons in the nearby village.25% of people are effected to lungs and throat infection by the brick pollution.95% of people are not aware bricks can make by using waste paper.70% of people are ready to use bricks made from waste paper.20% of cost reduced when using alternative echo friendly bricks.

Then we decided to prepare bricks from waste paper .

To reduce this environmental degradation we suggest to make bricks from Waste Paper:

After decided to take project, we think a lot to make an alternative echo friendly bricks for building construction. Then we take a decision to make bricks from waste paper. Soon we take this thought to my guide teacher .He suggested us to meet a civil engineer to know the characteristics of bricks. We take suggestions from the Civil engineer and ready to prepare the Paper Bricks with satisfying all the characteristics can a brick hold. The following procedure we followed.

4. RESEARCH METHODOLOGY

The methodology section outline the plan and method that how the study is conducted. This includes Universe of the study, sample of the study,Data and Sources of Data, study's variables and analytical framework. The detailsare as follows;

4.1Population and Sample

I used 100 population and make a survey to collect the information . prepared a questioner and collected information that impact of carbon particles released from brick industry on human health .

4.2 Data and Sources of Data

For this study secondary data has been collected. From the website of https://www.ccacoalition.org/projects/improving-worker-skills-transform-indias-brick-sector for the sample firms are obtained from Jan 2018 to Dec 2020. And from the website of climate and clean air coalition variables are collected for the period of five years. The time series seasonal data is collected on stock prices for sample firmsand pollution released by brick kinls variables for the period of 5 years.

5. Theoretical framework

Procedure to prepare Papercrete Bricks:

Research Details: Materials Used To attain these goals, materials were collected from various

sources.

Paper: In this study, paper is the main constituent material. Different types of Papers are like newspapers, record sheets, old newspapers, magazines. Paper is nothing but wood cellulose, which is considered as a fibrous material. Cellulose is the second most abundant material on earth after rock. Cellulose is a natural polymer with a long chain of linked sugar molecules i.e., β-D-glucose. The cellulose chain bristles with polar -OH groups. These groups form many hydrogen bonds with -OH groups on adjacent chains, bundling the chains together. The hydrogen bonding forms the basis and strength.

Cement : Cement used in this study was 53 grade Ordinary Portland Cement (OPC) conforming to IS: 8112 – 1989 cement used.

Fine Aggregates: Fine aggregates used was River Sand and Manufactured Sand (M-Sand).

6. Experimental Procedure;

There is no specific procedure for casting the bricks and the procedure followed in this investigation was as per our conveniences. The mix proportion adopted was 1:1.5:1.75 [Cement: Paper sludge: River Sand & M-Sand]. River sand was used as M-sand has the tendency to absorb more water. Of the total ratio of sand content, 60% was M-Sand. The bricks were cast in this ratio and the tests on the bricks were then conducted after 14 and 21 days.

6.1Preparation of Paper Sludge:

The papers used were from a variety of sources. Newspapers, record sheets, magazines, etc., These papers were torn into small pieces and soaked in water for 3 – 4 days until they started degrading to paste like form. Then the papers were removed from water and ground in a mixer to obtain the paper sludge. The pulp is later taken on non-absorbent plate after having the extra water squeezed out. This pulp generating procedure consumed a lot of time and was tedious. But for mass production, mechanically operated tow mixers can be recommended to reduce the cost

Quality of bricks following 8 tests can be performed. In these tests some are performed in laboratory and the rest are on field.

- Compressive strength test
- Water Absorption test
- Efflorescence test
- Hardness test
- Size, Shape and Colour test
- Soundness test
- Structure test
- Thermal Conductivity test.

6.2 Statistical tools and econometric models

The statical information provided here and the tools are based on survey and information from different sources . graphical representation given in this data is based on my survey .

6.3 Descriptive Statistics

Descriptive Statics has been used to find the maximum, minimum, standard deviation, mean and normally distribution of the data of all the variables of the study. Normal distribution of data shows the sensitivity of the variables towards the periodic changes and speculation. When the data is not normally distributed it means that the data is sensitive towards periodic changes and speculations which create the chances of arbitrage and the investors have the chance to earn above the normal profit. But the assumption of the APT is that there should not be arbitrage in the market and the investors can earn only normal profit. Jarque bera test is used to test the normality of data.

7. Data analysis and interpretation:

In Non-operational Phase of bricks making suspended particle Mass are normal in the atmosphere.In operational Phase of bricks making suspended particle Mass are abnormal in the atmosphere.CO_2 rises 0.03% to 0.5% at visited brick industry.Five lakhs of bricks making in an operational season at visited brick industry.Five tonnes of wood be consumed in every operational season.
8.65 tonnes of CO_2 omitted by the brick kilns in every operational season at visited Area.40% people effected by the pollution in operational seasons in the nearby village.25% of people are effected to lungs and throat infection by the brick pollution.
95% of people are not aware bricks can make by using waste paper.70% of people are ready to use bricks made from waste paper. 20% of cost reduced when using alternative echo friendly bricks.

8. Test to Justify the Qualities of Brick:

Quality of bricks following 7 tests can be performed. In these tests some are performed in laboratory and the rest are on field

1. **Compressive strength test :**

Weight of the Papercrete Brick: = 2.86 kg

Papercrete area= 22cmx9.5cm = 209 cm^2

Compressive Strength of the brick = $\dfrac{\text{Maximum load at failure in N}}{\text{Average net area of the phases under compression}}$

= 73150N/ 20900mm2

Compressive Strength of the brick = 3.5 N/m2

2. **Water absorption test** : :

Weight of the paper brick before M1= 2.696 kg	Wight of the clay brick M1= 1.896 kg
Weight of the paper brick after immersed an dkept into 24 hours M2 = 3.220 Kg	M2= 2.330 Kg
Rate of absorption of water by paper brick = M2 – M1/ M1 x100 = 3.320- 2.220 / 2.220 x100 = 19.4%	Water absorption capacity of clay brick 2.320 – 1.896 / 1.896 x100 = 17.7%

'If a brick absorbed less than 20% of water by its original weight, declared that Good Quality Brick'.

3. **Fire resistance test :** we tested thee brick with fire it can able to resistance the fire
4. **Efflorescence test:**

20% of white layer formed over the exposed area of the brick. So it indicates moderate in Efflorescence Test

5. **Hardness test :**

Our Papercrete brick dropped from one meter height it can't break. So Hardness Test is passed.

6. **Soundness test:**

our brick makes sound when two bricks are collided

7. **Structure test.**

Our papercrete bricks structure is good.

8. **Size, Shape and Colour test :** Rectangular in shape, Grey in colour

8.1 Comparison of the Models

I compare the normal brick and paper brick in all dimensions. like strength, water absorption, heat resistance and soundness. in al areas paper brick proved well and most efficiency.

9. RESULTS AND DISCUSSION

Results : We achieved good results by using Waste Paper to prepare papercrete bricks.Papercrete bricks are light weight & Hard in strength. Papercrete bricks passed all the tests can hold a good quality brick..Papercrete bricks are low thermal conductivity bricks.Papercrete bricks can transport easily. People are aware, that there are no significant damages, if uses papercrete bricks in building construction.. We save much land fill space by using waste paper

9.1 Results of Descriptive Statics of Study Variables

Test	Normal brick	Paper brick
1.strength	4.7 N/ m2	3.5 N/m2
2. water asportation	17.7 %	19.4%
3.Efflorescence test:	15%	20%
4. Hardness	Dropped from 1m height, cant break	Dropped from 1m height, cant break
5. soundness	Gives less sound when touching	Gives more sound when compare with clay brick

6. structure test	Good structure	Good structure
7. fire resistance	Good	Good

Table 9.1 :

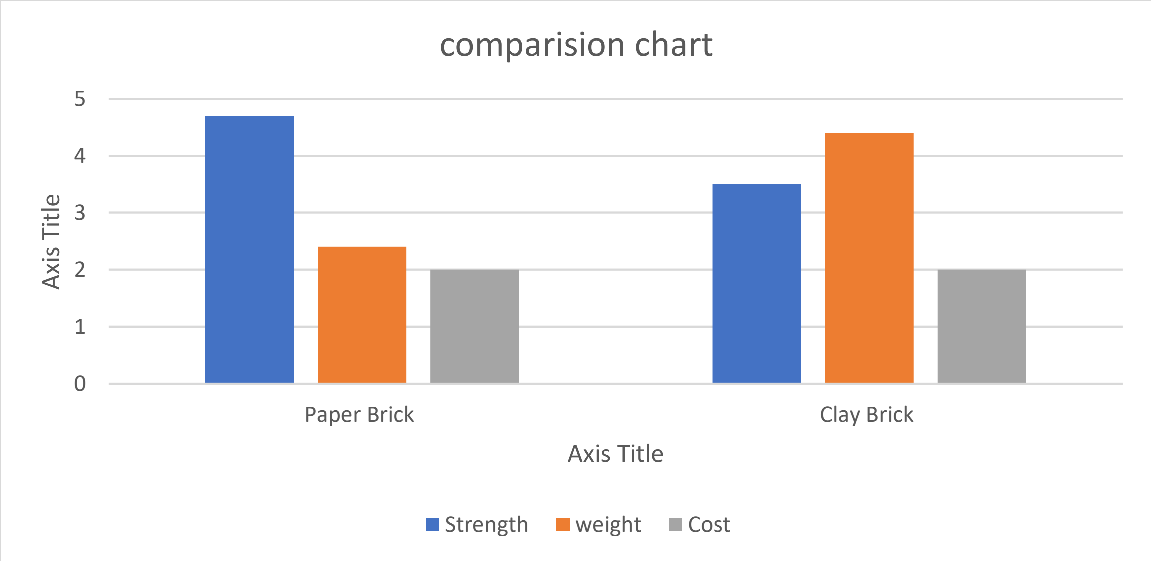

Table 9.2

Mixture proportion	Normal clay brick /100	Paper brick /100
Mixture -1	Rs 91	Rs 75
Mixture -2	Rs 64	Rs 59
Mixture – 3	Rs 78	Rs 75

CONCLUSION :

Papercrete brick consists of recycled material and therefore cost is low compared to conventional bricks. Papercrete can be easily moulded into any shape. Bricks are much easier for someone to lift to any desired height and very good surface finish can be achieved. Papercrete bricks are suitable for non-load bearing walls only. Papercrete has good fire resistance. The weight of this brick is almost half the weight of conventional clay brick. Due to less weight of these bricks, the total dead load of the building will be reduced. These bricks are potentially ideal material for earthquake prone areas as they are lightweight and flexible. These bricks are not suitable for water logging and external walls. It can be used in inner partition walls. This research is just an initiation to papercrete study. However, further studies are required on following issues: Modification of mix proportions to achieve optimum properties. Addition of materials like coconut fibres to improve compressive strength of papercrete.

sss

Acknowledgements:

1. Smt G Pagadalamma DEO Parvathipuram Manyam
2. Sri P Krishna Murty Dy EO , Srikakulam
3. Sri B Somabara Headmaster ZPHS Veeraghattam
4. SRI CH Kameswara Rao ,Scholar , Visakhapatanam

REFERENCES

1) Topcu IB, Canbaz M, "Properties of concrete containing waste glass", Journal of Cement and Concrete Research, Vol 34, 2004, pp 267–274.

2) Shayan A, "Value-added utilisation of waste glass in concrete", Journal of Cement and Concrete Research, Vol 34, 2004, pp 81–89.

3) Shi C, Wu Y, Riefler C, Wang H, "Characteristic and puzzolanic reactivity of glass powders", Journal of Cement and Concrete Research, Vol 35, 2005, pp 987– 993.

4) Data received from https://www.ccacoalition.org/projects/improving-worker-skills-transform-indias-brick-sector

5) https://www.researchgate.net/publication/358236942_Pollutant_Emissions_from_Brick_Kilns_and_Their_Effects_on_Climate_Change_and_Agriculture

6) https://www.researchgate.net/publication/228259852_The_Economic_and_Environmental_Impacts_of_the_Waste_Paper_Trade_and_Recycling_in_India_A_Material_Balance_Approach

7) 8) Myriam Marie Delcasse*, Rahul V**, Abhilash C***, Pavan M K****, Gangadhar*****
*Assistant Professor, Dept. of Civil Engineering, Maharaja Institute of Technology Mysore, Mandya-38,

8. **Brick kilns: Cause of Atmospheric Pollution**

9. **Bhat Mohd Skinder[1], Ashok K. Pandit[1], Afeefa Qayoom Sheikh[1] and Bashir Ahmad Ganai[1]***
[1]Centre of Research for Development/Department of Environmental Science, University of Kashmir Srinagar (J&K) India

9. **A Study of Impact of Brick Industries on Environment and Human health IN UJJAIN City (INDIA)**
Rizwana Khan and Harish Vyas*
Govt. Kalidas Girls College, Ujjain (INDIA)

10. Singh A.L. and Asgher Md. S., Impact of brick kilns on land use/landcover changes around Aligarh city, India