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AN ASSESMENT ON CHARACTERISTICS OF BRICKS WITH WASTE PAPER PULP

M. Jayaram¹ & Ch. Leela Phaneendra²

^{1&2} Assistant professor, Department of civil engineering college, Vikas Group of Institutions, Vijayawada, India

ABSTRACT

Bricks are the most important constituents in the construction work. Bricks will play an important role in construction as they give support and strength to the structure. To reduce the cost of masonry units in every aspect of building construction, the perfect substitute has to be find out. Hence an attempt is made to use the waste paper pulp generated from various sources of household and industries in Bricks. Every year huge amount of paper is producing as waste material. In this project mortar bricks are manufactured by replacing waste paper pulp in fine aggregate of 5%,10%,15%,20% and 25%. The size of the Brick was 300mm X 150mm X 100mm. Water Absorption and Compressive strength are the main properties that are observed in this experimental work. Physical properties are also investigated and results are concluded.

Keywords: *Bricks, Paper pulp, Waste alternatives, Waste paper pulp.*

I. INTRODUCTION

Most of the construction work never complete with the masonry work, which including partition walls and other forms of work. Current investigations in the construction industry are working to fast up the construction activity in less time. So increasing the Brick dimension and usage of waste alternative materials are the main challenges to save economy of structures. In view of that, Waste paper is one of the major material which is producing in tons of amount as a waste material.

Most waste paper ends up with land fill and dump sites than those recycled. Recycling of that waste paper contributing in the usage of Non renewable resources in construction and daily life. It has been estimated that paper contributes about 35% of the total municipal solid waste. Hence the usage of paper pulp in making of bricks would considerably reduce the wastage of this municipal solid waste.

II. MATERIALS

Cement used is of Ordinary Portland Cement of 53 grade confirming to IS 12269-1987. Fine aggregate used are of Natural River sand from nearest locality in Vijayawada.

GGBS is one of the major materials which is replaced in cement. GGBS is obtained from VENSPRA LABS limited, Vijayawada. Lime and Gypsum powder are the other materials which had included to improve the binding capacity of raw materials.

Quarry dust is also one of the major material to be replaced with natural sand in order to reduce the sand content. The usage of waste alternatives like dust results in reducing the cost of the brick. The quarry dust is obtained from the nearest crusher plant.

Sand is the major constituent in this experimental work. Natural River sand of Zone – II is used in this work.

Paper Pulp is a main material was used to replace fine aggregate. The Paper pulp is mainly prepared by soaking of the waste paper in water for 24 Hrs. After the soaking process, the wet paper is grinded to generate Pulp.

Lime and **Gypsum** are the other materials which are used to replace cement to maintain better bonding and strength. Detailed sieve analysis is done for River sand and is confirming to Zone-II

Properties of materials are shown below in Table.1

Table 1 Material Properties

Material	Specific gravity	Fineness modulus
Cement	3.15	285 m ² /Kg
Sand	2.66	2.88
GGBS	2.15	380 m ² /Kg
Gypsum	2.31	320 m ² /Kg

III. EXPERIMENTAL INVESTIGATIONS

In the mix design process, cement sand mortar ratio was taken as 1:4 and 1:6. From this 1:6 was selected for casting of the bricks.

The detailed material proportions are given in the Table 2

Table.2 Material Replacements

Material	Percentage
Fine aggregate with Paper Pulp	5%, 10%,15%, 20% and 25%
Cement with GGBS	35%
Cement with Lime	10%
Cement with Gypsum powder	5%

The Brick specimens are casted of size 300 X 150 X 100 mm in order to find out the necessary properties. These are tested after 7days, 14 days and 28days of curing.

The trail mixes finalized are shown below in Table.3

Table.3 Trail mix details

Mix	Cementitious material (%)				Fine aggregate (%)		
	Cement	GGBS	Lime	Gypsum	Sand	Dust	Paper Pulp
Control	50	35	10	5	50	50	0
Trail 1	50	35	10	5	50	45	5
Trail 2	50	35	10	5	50	40	10
Trail 3	50	35	10	5	50	35	15
Trail 4	50	35	10	5	50	30	20
Trail 5	50	35	10	5	50	25	25

IV. RESULTS AND DISCUSSIONS

Water Absorption:

For calculating water absorption the bricks are initially measured for its weight before curing. After 24 hrs of curing the weight is calculated. The water absorption is calculated by using the necessary formula.

$$(W_2 - W_1)/100$$

Table 4 Water Absorption of Bricks

S NO	Trial	Water Absorption (%)
1	Control	3.5
2	Trial 1	4.8
3	Trial 2	5.5
4	Trial 3	6.8
5	Trial 4	7.8
6	Trial 5	8.6

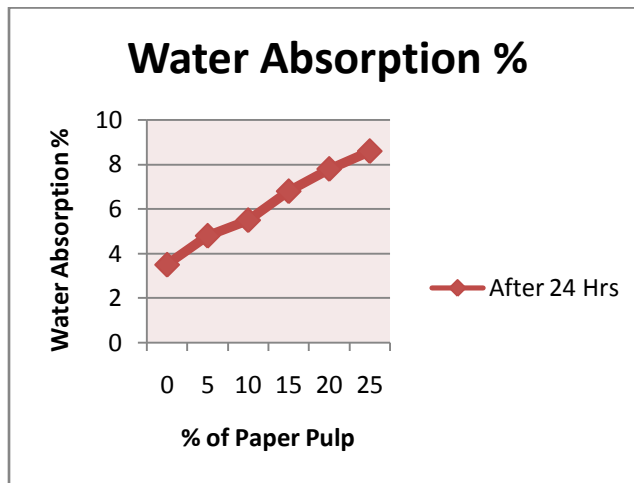


Fig 1 Water Absorption of Bricks

Compressive strength:

The compressive strength results are tabulated below in Table.5

Table.5 compressive strength of Brick

Mix	Compressive strength (N/mm ²)		
	7 days	14 days	28 days
Control	5.65	7.62	9.65
Trail 1	5.80	8.01	9.86
Trail 2	6.52	8.54	10.90
Trail 3	6.20	8.10	10.20
Trail 4	5.14	6.53	7.65
Trail 5	4.24	5.20	7.15

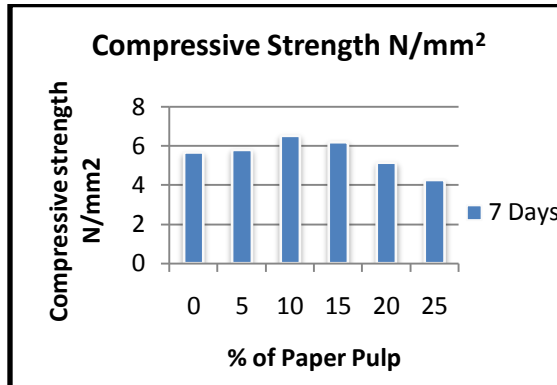


Fig 2 Compressive strength of Bricks at 7 Days

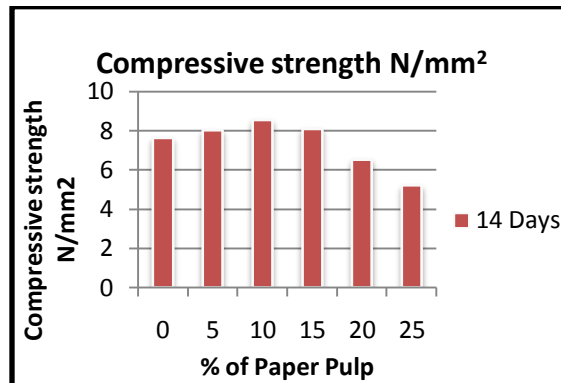


Fig 3 Compressive strength of Bricks at 14 Days

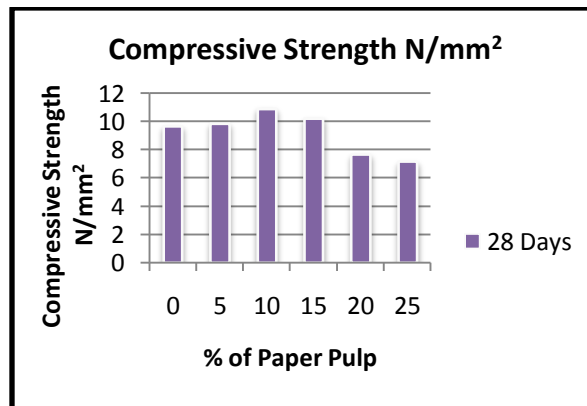


Fig 4 Compressive strength of Bricks at 28 Days

V. CONCLUSIONS

These following conclusions are given based on the above experimental results

1. By this present investigation we can suggest that the usage of paper pulp in the manufacturing of Bricks.
2. All the Bricks in Trials have successfully achieved their satisfactory results.
3. We can replace a maximum of 15% paper pulp in the manufacturing of Bricks.

4. Each of the brick can cover a maximum number of 3 clay bricks in its volume. So we can reduce some material cost as well as mason cost also.
5. The maximum compressive strength of 10.90 Mpa has observed for Trial 2 and 10.20 Mpa for Trial 3.
6. It can also be conclude that by increasing paper pulp content, water absorption of Bricks was also increasing.
7. These paper pulp bricks are effectively suitable for compound walls, partition walls and for all possible applications in buildings.
8. These bricks are also called as Eco Friendly Bricks by the replacement of waste alternatives like paper, Quarry dust and GGBS.
9. These paper pulp Bricks are perfect alternatives for regular clay bricks in cost and strength consideration



Fig 5 preparation of pulp



Fig 6 Paper pulp Bricks



Fig 7 soaking of paper



Fig 8 compression test for Brick

REFERENCES

- [1] IS 1077 – 1992 Code for Common Burnt clay building bricks
- [2] IS : 3495 (Part I to IV) 1992 Methods of tests on burnt clay building bricks
- [3] IS 13757 – 1993 Code for Common Burnt clay Fly ash building bricks
- [4] Rohit Kumar Arya, Rajeev Kansal (2016)- “ Utilization of Waste Papers to Produce Eco friendly Bricks ”- *International Journal of Science and Research (IJSR)*, ISSN (Online): 2319-7064.
- [5] M.Scinduja, S.Nathiya (2014) – “Innovative Brick Material” – *International Journal for Research in Applied Science & Engineering Technology (IJRASET)*. ISSN: 2321-9653.
- [6] Rachna M N, E. Ramesh Babu (2014) – “Experimental investigation on Robosand as replacement material of Fine aggregate in Normal concrete” – *Journal of IJATES*, Vol 2 (2014), Issue 7, July 2014.
- [7] Alaa.A.Shakir, Sivakumar Naganathan (2013) – “Development Of Bricks From Waste Material: A Review Paper” – *Australian Journal of Basic and Applied Sciences*, ISSN 1991-8178.
- [8] Umarfarook H. Momin (2017) – “Highly compressed flyash based papercrete brick” – *International Research Journal of Engineering and Technology (IRJET)*, Volume: 04 Issue: 12 Dec-2017
- [9] Dr. Sandeep Kumar Srivastava (2017) – “Study of Ecofriendly Light Weight Bricks using waste Paper- A Review” – *International Journal of Engineering Technology Science and Research IJETS*, ISSN 2394 – 3386 Volume 4, Issue 12.