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Comparative Study of Bricks Made of Waste Materials (Flyash and Coconut Shell)

Ritu Rai[1], Prateek Goyal[2] and Rohit Kumar[3]

[1]PG Student, MMM University of Technology
[2]UG Student, Raffles University
[3]Raffles University
E-mail: [1]ritsrai26@gmail.com, [3]rohitsingh2260@gmail.com

Abstract—*Fly-ash is a waste material generated by burning of coal; its disposal has become headache for government. It needs to be disposed and in such a way that it does have any adverse effect on the environment. Since the energy demands are increasing vigorously and in India we have very high dependency on thermal source of energy, this has led to very high generation of fly ash, and it is to increase for the next few decades. Considering the urgent disposal of fly ash, fly ash bricks were introduced. There are various wastes which can be added in fly ash bricks without affecting their property. Coconut shell is one such kind of waste. The main motto of this research is to add coconut shell in fly ash bricks within specific range and observe the changes in the physical properties of the bricks like weight, density and the compressive strength of bricks.*

1. INTRODUCTION

The power generation in India has always a concerned area as power is considered as an engine to growth for developing countries. Coal is widely available in India and has been utilized for power generation with huge generation of fly ash. The annual generation of ash generation is expected to reach about 225 million tons by 2017.[1]

Coconut shell is one of the important fillers produced in tropical countries India, Sri Lanka, Malaysia. Coconut shell filler is a potential candidate for the development of new composite because of their high strength, modulus properties, hard wearing quality and high hardness, good acoustics resistance, non toxic, and resistant to microbial and fungi degradation and not easily combustible.[2]

The very high demand of construction materials such as clay bricks has led to exploitation of the topmost layer of fertile soil. Therefore to overcome this problem an alternative was needed to halt this exploitation. In spite of just finding out the alternative for this, if we use the waste materials which have a very large disposing problem, then that would have double benefit on the environment and natural resources. A new kind of brick was invented in 2007 by Henry Liu called the fly ash brick. The uprising demands of electricity have forced the thermal power plants to work on their highest capacity leading to the increase in production of fly ash. This waste product's disposal has become a matter of concern for the government. Therefore the invention of this brick has been welcomed with open arms. On moving further with the forthright approach if another waste material as coconut shell could be used along with fly ash brick without affecting the compressive strength and physical properties of the brick.

The aim of the study is to determine the suitability and effect of introduction of coconut shell to fly ash bricks.

2. MATERIALS AND METHODS

The materials used during the study process are as:-

Coconut shell: this was obtained locally in Neemrana, Rajasthan state.

Stone dust: this was obtained locally from Patan, Rajasthan state.

Cement: Shree Cement, a brand of Ordinary Portland cement available locally in Neemrana was used.

Water: potable water was used both for mixing as well as for curing of the bricks. The coconut shell was dried for twenty four hours to remove moisture from it. The shell was broken manually. The coconut shell waste passing through 12mm sieve and retaining on 10mm sieve were taken.

The mixture for the brick was made using 50% fly-ash, 35% stone dust, 10% cement and 5% coconut shell wastes. Water was added 25% to the weight of the fly-ash. Using the above specified ratio the bricks of 150mm x 75mm x 230mm were casted. The bricks were cured and crushed after 7, 14 & 28 days respectively to determine the compressive strength. The strength results are presented in the table below.

3. RESULTS AND DISCUSSION

After all the effort and present experimental work the following observation are made by adding coconut shell in fly ash bricks and conclude that….

- Fly ash bricks satisfy all codal provisions.
- Fly ash bricks are much superior to clay bricks available in local area and as such can prove to be boom in building construction field. These have several advantages over clay bricks.
- Fly ash bricks should be manufactured with full care and the process should be monitored constantly. The bricks manufactured should be regularly tested for various parameters.
- Fly ash bricks manufacturers should be given proper and adequate technical support. R&D support centers may be established throughout the country so. That the products become popular and acceptable to consumer.
- Based on the experiment done on clay bricks, a significant increase in the compressive strength was found 109.16MPa.
- Based on the experiment done on fly ash bricks, a significant increase in the compressive strength was found 153.16 MPa
- Based on the experiment done on fly ash bricks with coconut shell, a significant increase in the compressive strength was found which is 58.50MPa.
- It was found from the experiment that the fly ash bricks absorbed least amount of water where as the clay bricks absorbed the maximum amount of water.
- The fly ash bricks with coconut shell waste absorbed water almost equal to the fly ash bricks.
- The efflorescence observed was highest in clay bricks, normal in fly ash bricks with coconut shell waste and almost nil in fly ash brick.
- IIt is observed from the above project work that the coconut shell waste in fly ash bricks did not give the strength as given by the bricks without the coconut shell waste.
- SSo, these bricks with waste material can only be used where the bricks are used for partition purpose and no heavy load is applied on them.

Table 1: Compressive Strength of bricks

S No.	Compressive strength of Clay Bricks	Compressive strength of Fly Ash Bricks	Compressive strength of Fly Ash Bricks with coconut shell waste
1	123	146	35
2	120	130	37
3	104	175	56
4	94	145	72
5	80	199	67
6	134	124	84

Table 2: Percentage absorption in clay bricks

S No	W1	W2	% age Absorption
1	2.21	2.95	25.08
2	2.26	2.95	23.39
3	2.13	2.85	25.26
4	2.22	2.93	24.23
5	2.33	3.03	23.10
6	2.09	2.68	22.01

Table 3: Percentage absorption in flyash bricks

S No	W1	W2	% age Absorption
1	2.82	3.10	9.03
2	2.75	3.05	9.83
3	2.93	3.20	8.40
4	2.99	3.35	10.74
5	2.74	3.08	11.03
6	2.64	2.93	11.26

Table 4: Percentage absorption in flyash bricks with coconut shell waste

S No	W1	W2	% age Absorption
1	2.78	3.05	8.85
2	2.64	3.10	14.83
3	2.93	3.19	8.15
4	2.85	3.26	12.57
5	2.77	3.17	12.61
6	2.81	3.12	9.93

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