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Comparative Study on Rice Husk and Ground Nut Shell in Fly Ash Bricks

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Abstract: ***In India, large quantities of fly ash being generated, as most of our energy demand is met through coal based thermal power station. The fly ash generation is expected to grow further as coal would continue to remain major source of energy at least for next 25 years. The fly ash which is a resource material, if not manage well, may pose environmental challenges. At the same time world-wide agricultural footprint is fast growing, with vast agricultural land cultivation and active expansion of the agro based industries. The resulting large quantities of agricultural wastes, unfortunately, are not always well managed or utilized. These wastes can be recycled, such as by retrieving fibres from disposed leaves and fruits bunches, and then incorporate in brick making. The Agricultural Waste was sourced from Rice Husk and Ground Nut Shell added within the range. This research describes change in the physical properties such as weight, density etc. and mechanical properties like compressive strength of fly ash bricks made by adding different Agricultural Waste.***

Keywords: ***Agricultural Waste Fly Ash Bricks, Agro-waste in Bricks, Fly ash bricks with agro-waste.***

I. INTRODUCTION

Fly ash is comprised of the non-combustible mineral portion of coal. When coal is consumed in a power plant, it is first ground to the fineness of powder. Blown into the power plant's boiler, the carbon is consumed — leaving molten particles rich in silica, alumina and calcium. These particles solidify as microscopic, glassy spheres that are collected from the power plant's exhaust before they can "fly" away — hence the product's name: Fly Ash.

TABLE 1 CLASSIFICATION OF FLY ASH

Class F Fly Ash	Class C Fly Ash
It is achieved by burning anthracite and Bituminous coal.	It is achieved by burning of younger lignite and sub bituminous coal.
Fly ash contains less than 20% lime.	Fly ash contains More than 20% lime.
It requires an activator for making cementatious products.	It does not require an activatorfor making cementatious products.
	
Source:http://www.caer.uky.edu/kyasheducation/flyash.shtml	Source:http://www.caer.uky.edu/kyasheducation/flyash.shtml

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II. EXPERIMENTAL MATERIAL

a) Fly Ash (Class F)

An Experimental work was carried out with Class F type of Fly Ash. The chemical compositions of Fly Ash are given in following Table2.

FIGURE 1: FLY ASH

TABLE 2
CHEMICAL COMPOSITIONSOF FLY ASH

SR. NO.	CHEMICAL COMPOSITIONS	% VALUE
1	Silicon dioxide (SiO_2)	62.22
2	Magnesium oxide (MgO)	6.09
3	Total Sulphur trioxide (SO_3)	3.00
4	Calcium Oxide(Cao)	5.30
5	Aluminium Oxide (Al_2O_3)	7.63
6	Ferric Oxide (Fe_2O_3)	7.63
7	Loss on ignition	0.13

b) Rice Husk

Rice husk is a major agricultural by product obtained from the food crop of paddy. It contains 16 to 18 % pure silica by weight and on burning the rice husk yields 20-25% ash with more than 90% silica. About 35 million tonne of paddy is produced in India, which yields more than 7 million tonne of rice husk annually.One ton of rice husk, on completion of combustion, produces 200 kg of ash.

FIGURE 2: RICE HUSK

c) *GROUND NUT SHELL*

FIGURE 3: GROUND NUT SHELL

Groundnut shell is an agricultural waste obtained from milling of groundnut. The ash from groundnut shell has been categorized under pozzolana, with about 8.66% Calcium Oxide (CaO), 1.93% Iron Oxide (Fe_2O_3), 6.12% Magnesium Oxide (MgO), 15.92% Silicon Oxide (SiO_2), and 6.73% Aluminium Oxide (Al_2O_3). The utilization of this pozzolana as a replacement for traditional stabilizers will go a long way in actualizing the dreams of most developing countries of scouting for cheap and readily available construction materials.

d) *Lime*

An Experimental work is carried out with Acetylene carbide waste lime. The chemical compositions of lime are shown in following Table3.

TABLE 3
CHEMICAL COMPOSITIONS OF LIME

SR. NO.	CHEMICAL COMPOSITIONS	% VALUE
1	Silicon dioxide (SiO_2)	5.39
2	Magnesium oxide (MgO)	2.42
3	Sulphur trioxide (SO_3)	0.98
4	Calcium Oxide(Cao)	28.60
5	Aluminum Oxide (Al_2O_3)	1.06
6	Ferric Oxide (Fe_2O_3)	0.39
7	Loss on ignition	25.25

III. SOURCE OF MATERIAL

TABLE 4
SOURCE OF MATERIALS

SR. NO	INGREDIENTS	SOURCES
1	Fly Ash	Nova, Ahmadabad, Gujarat
2	Sand	Bodeli, Gujarat
3	Quarry Dust	Sevaliya, Gujarat
4	Sludge Lime	Kota, Rajasthan
7	Ground Nut Shell	AartiFedal Works, Anand, Gujarat
8	Rice Husk	Sarashwati Rice Mil, Tarapur. , Gujarat

IV. EXPERIENTIAL METHODOLOGY

Various raw materials of brick mix in desired proportion are blended intimately in dry or wet form. In this Standard Mix proportion is given following Table5, And in that mix proportion Agricultural wastes are added 1%, 2%, 3%, 4%, 5% by weight of the brick.It is observed that the bricks produced are found to be superior then that of conventional Red burnt clay bricks.

TABLE 5
MIX PROPORTION OF FLY ASH BRICKS

MATERIAL	PROPORTION IN %
Fly Ash	60
Sand	15
Quarry Dust	15
Lime	10

Compressive strength test

FIGURE 4: TESTING OF SAMPLE BRICKS

TABLE 6
RESULTS OF COMPRESSIVE STRENGTH

TYPES OF BRICK	AVERAGE COMPRESSIVE STRENGTH (N/mm^2)		
	7 Days	14 Days	21 Days
Fly Ash	6.123	6.685	7.896
Clay	5.078	5.339	5.557
GNS_1	7.129	7.426	7.826
GNS_2	6.540	6.890	7.452
GNS_3	6.340	6.601	6.878
GNS_4	5.976	6.086	6.330
GNS_5	5.870	5.986	6.278
RH_1	6.324	6.624	7.861
RH_2	6.256	6.313	6.552
RH_3	6.086	6.112	6.261
RH_4	5.840	5.913	6.102
RH_5	5.310	5.815	6.035

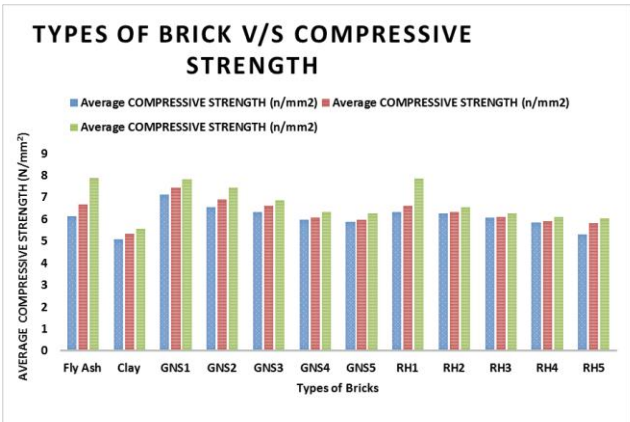

FIGURE 5: TYPES OF BRICK V/S COMPRESSIVE STRENGTH (N/mm^2)

Water Absorption Test

FIGURE 6: DRY WEIGHT OF SAMPLE BRICK

FIGURE 7: CURING OF SAMPLE BRICK

TABLE 7
RESULTS OF WATER ABSORPTION TEST

TYPES OF BRICK	AVERAGE WATER ABSORPTION TEST (%)		
	7 Days	14 Days	21 Days
Fly Ash	13.231	12.125	10.192
Clay	18.234	17.264	14.231
GNS_1	13.986	12.047	10.256
GNS_2	14.284	12.623	11.267
GNS_3	15.230	12.753	11.368
GNS_4	17.665	13.658	12.367
GNS_5	17.265	15.246	14.258
RH_1	16.958	12.365	10.147
RH_2	16.785	14.256	12.016
RH_3	17.215	15.985	13.256
RH_4	18.265	14.231	13.641
RH_5	19.241	15.698	14.751

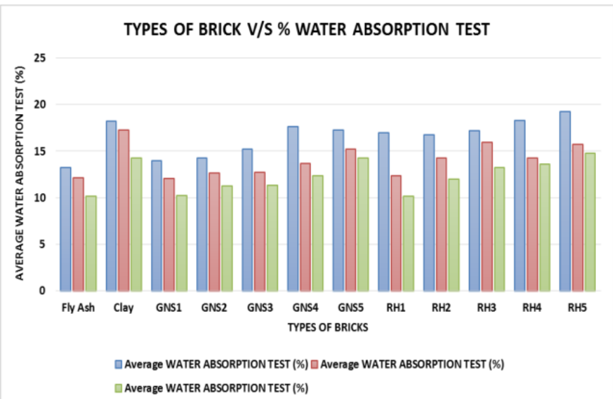

FIGURE 8: TYPES OF BRICK V/S % WATER ABSORPTION

V. CONCLUSION

After all the effort and present experimental work the following observation are made by replacement Rice Husk and Ground Nut Shellin fly ash bricks with different percentage and conclude that….

a) Class F Fly ash is utilized in the brick manufacturing work as judicious decision taken by Engineers.
b) As the percentage of the Rice Husk in brick increases, the compressive strength of the brick increases. In this experimental work 1% fibre addition in the brick gives the maximum strength 7.861N/mm^2 after 21 days. Also Ground Nut Shell1% addition in the brick gives the maximum strength 7.826 N/mm^2 after 21 days.
c) As the compressive strength of the brick increases, the water absorption of the brick decreases. In this experimental work maximum compressive strength after 21 days is 7.861 N/mm^2, where minimum water absorption is 10.147% after 21 days in Rice Husk Fly Ash Brick.
d) As the compressive strength of the brick increases, the water absorption of the brick decreases. In this experimental work maximum compressive strength after 21 days is 7.826 N/mm^2, where minimum water absorption is 10.256% after 21 days in Ground Nut ShellFly Ash Brick.
e) Use of fly ash and Agro Waste help in prevention of environmental degradation and use of agriculture land utilised in clay brick production.

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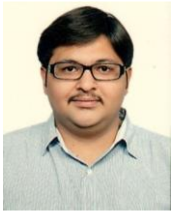

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