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AN EXPERIMENTAL STUDY ON STRENGTH AND BEHAVIOR OF FLY ASH BRICKS USING LIME SLUDGE AND MARBLE DUST

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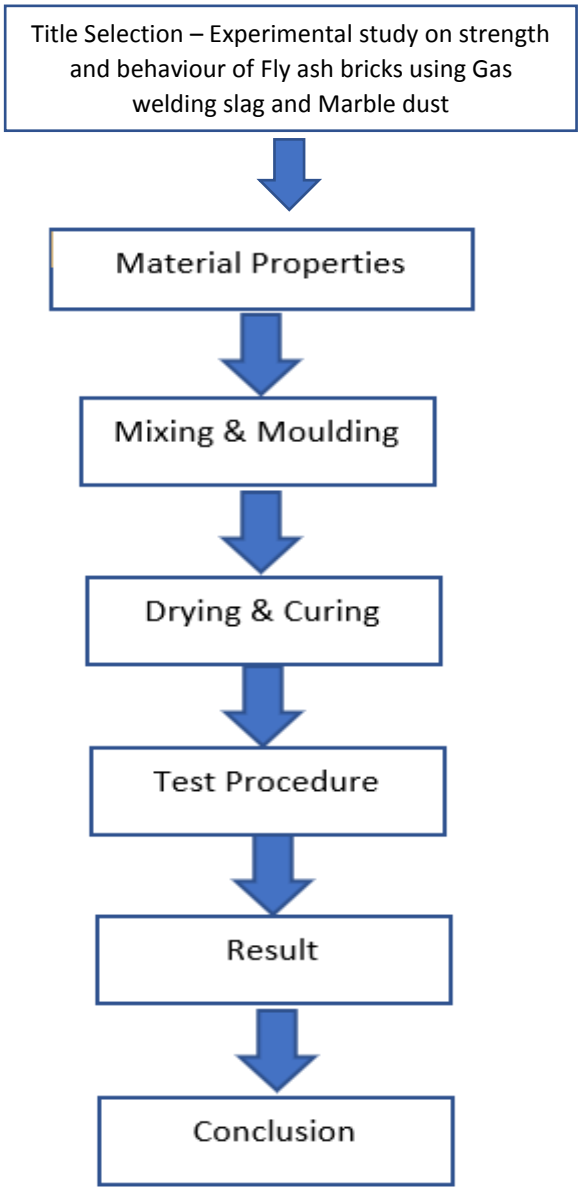
ABSTRACT: The combination of fly ash bricks have different percentage of the fly ash , Lime, Gypsum, Quarry dust, Lime Sludge are 64:9:2:13:12.The fly ash, Lime, Gypsum, Quarry dust, Marble dust are 66:15:2:13:4. The fly ash , Lime, Gypsum, Quarry dust, Lime Slu dust are 66:11:2:13:4 ricks there are main two types of the testing is done compressive strength test and water absorption test after 7,14,21 days. The experimental study shows that the marble dust and lime sludge combination mix gives good strength.

I. INTRODUCTION

Bricks plays a very important role in the field of construction industry. Fly ash bricks are used widely in construction of load bearing sections of the building. Now a days all the Manufacturing industries are emitting slag, dust, etc, as a solid waste material. These waste materials are dumped on the lands, which affects and pollutes the Environment adversely.

Replacing considerable amount of waste products in fly ash brick manufacturing will reduce the amount of waste materials dumped on the agricultural lands. And also minimize the percentage usage of fly ash and lime in the manufacturing.

II. METHODOLOGY



III. MATERIAL PROPERTIES

3.1.FLY ASH : Fly Ash is a by-product of the combustion of pulverized coal in electric power generation plants. This ash has pozzolanic properties. In the presence of water and free lime, the ash will react into cementitious compounds.

3.2.LIME: Lime is a calcium containing inorganic material in which carbonate, oxide and hydroxide predominate. In the strict sense of the term lime is calcium hydroxide. Lime is used in building materials is broadly classified as pure, hydraulic and poor lime can be natural or artificial and may be further identified by its magnesium content such as magnesium lime.

3.3.GYPSUM: Gypsum is the more common name for a mineral compound called calcium sulphate dihydroxide or sulphate of lime. It is generally found underground near deposits of limestone or other minerals formed by evaporation. One of the most common forms of raw gypsum is a pure white crystal called alabaster. The chemical composition is Hydrous calcium sulfate ($CaSo_4.2H_2O$)**.**

3.4.QUARRY DUST: Quarry dust is a byproduct of the crushing process which is a concentrated material to use as aggregates for concreting purpose, especially as fine aggregates. In quarrying activities, the rock as the Crushed into varies sizes during the process the dust generated is called crushed rock fines and it is formed as waste.

3.2.MARBLE DUST: Marble is a material used indoor flooring. The industry's disposal of the marble powder material, consisting of very fine powder, today constitutes one of the environmental problems around the world. major waste generating industries is the granite quarry and production industry by which around 70% of this precious mineral resource is wasted in the mining, processing, and polishing procedures.

3.4.LIME SLUDGE: The Lime sludge is a high quality hydrated lime slurry. Composed mainly of calcium hydroxide with miner parts of carbonate and compares its features to those of dry hydrated lime commonly used as a building material. Carbide lime has been used for decades as an alternative source for hydrated lime in such applications as municipal and industrial waste water treatment, flu-gas desulfurization.

IV. DESIGN MIX

Table-4.1.Conventional Bricks

Materials	Quantity (In %)
Fly ash	70
lime	15
Gypsum	2
Quarry dust	13

Table4.2.Lime sludge Bricks

Materials	Quantity (In %)		
	specimen-1	specimen-2	specimen-3
Fly ash	68	66	64
lime	13	11	09
Gypsum	2	2	2
Quarry dust	13	13	13
Lime sludge	4	8	12

Table-4.3.Marble dust Bricks

Materials	Quantity (In %)		
	specimen-1	specimen-2	specimen-3
Fly ash	66	62	58
lime	15	15	15
Gypsum	2	2	2
Quarry dust	13	13	13
Marble dust	4	8	12

Table-4.4.Combined Bricks

(Lime sludge+ Marble dust)

Materials	Quantity (In %)		
	specimen-1	specimen-2	specimen-3
Fly ash	68	66	64
Lime	13	11	09
Gypsum	2	2	2
Quarry dust	13	13	13
Lime sludge	2	4	6
Marble dust	2	4	6

V. EXPERIMENTAL RESULTS

5.1.COMPRESSIVE STRENGTH: The brick were tested for their compressive strength after 7,14 and 21 days of curing. The brick were tested in the in the testing machine by providing two of 6 mm thick iron plate, one below and one above the brick to allow uniform distribution of load on the brick.

Table-5.1.1.Conventional Bricks

Type of brick	Compressive strength in (N / mm^2)		
	7 days	14 days	21 days
Conventional bricks	3.75	4.33	5.52

Table-5.1.2.Lime sludge Bricks

Type of brick	Compressive strength in (N / mm^2)		
Lime Sludge bricks	7 days	14 days	21 days
specimen -1	3.35	4.15	4.34
Specimen -2	3.16	3.95	5.33
Specimen -3	3.75	4.34	5.92

Table-5.1.3.MarbleDust Bricks

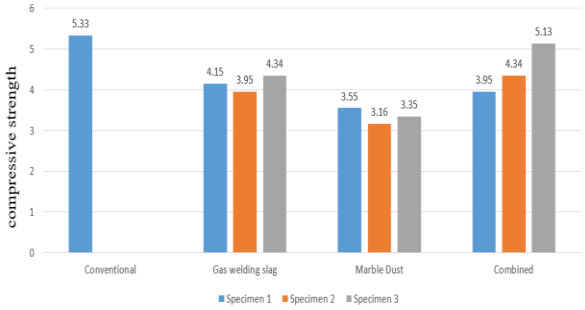
Type of brick	Compressive strength in (N / mm^2)		
Marble dust bricks	7 days	14 days	21 days
specimen -1	3.16	3.55	4.54
specimen -2	2.37	3.16	3.55
specimen -3	2.76	3.35	4.34

Table-5.1.4.limesludge+marbledust bricks

Type of brick	Compressive strength in (N / mm^2)		
Lime sludge+ marble dust bricks	7 days	14 days	21 days
specimen -1	3.16	3.95	5.53
specimen -2	3.55	4.34	7.11
specimen -3	4.15	5.13	6.91

Chart-5.1.1.comparision between the bricks

COMPRESSIVE STRENGTH COMPARISION



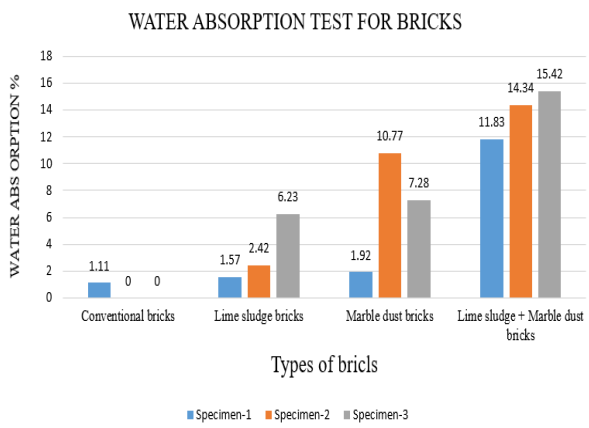
5.2.WATER ABSORPTION:

In the water absorption test procedure first dry the brick and obtain the weight then after a brick is put in the water pond for 24 hours. After 24 hours bricks are removed from water and+ after 3 minutes the weight of the bricks is measured.

Table-5.2.1.Wateraborption test

Method of bricks	Water absorption in %		
	specimen-1	specimen-2	specimen-3
Conventional bricks	1.11	-	-
Lime sludge	1.57	2.42	6.23
Marble dust	1.92	10.77	7.78
Lime sludge+ Marble dust	11.83	14.34	15.42

Chart-5.2.2.comparision between the bricks



VI. CONCLUSION

- Maximum Compressive Strength was attained when the percentage of Lime sludge, Marble dust and its Combination were 12, 4 and 4:4 respectively for methods of immersed curing.
- Water Absorption Capacity of these Bricks are relatively higher when compared to the Conventional bricks.
- Lime sludge-Marble Dust Bricks prove to be Energy efficient, lower in cost compared to conventional bricks.
- Thus it is observed that the industrial waste materials can be successfully used in a brick for the replacement of conventional bricks.

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