SHODH SAMAGAM

Online ISSN : 2581-6918

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A REVIEW ON WASTE FLY ASH ADDITION IN CLAY TO ENHANCE THE QUALITY OF BRICKS MATERIALS

ANINDITA BANERJEE[1], Research Scholar,
Dr. M. Z. KHAN[1], Associate Porfessor, (Research Supervisor),
Dr. A. K. CHOUBEY[2], Assistant Porfessor,
UMAKANT SRIVASTAVA[1], Research Scholar,
[1]Department of Physics, Dr C. V. Raman University, Kota, Bilaspur, Chhattisgarh, India
[2]Department of Physics, CCET, Bhilai, Chattisgarh, India

ORIGINAL ARTICLE

Corresponding Autor's :
ANINDITA BANERJEE[1], Research Scholar,
Dr. M. Z. KHAN[1], Associate Porfessor,
(Research Supervisor),
Dr. A. K. CHOUBEY[2], Assistant Porfessor,
UMAKANT SRIVASTAVA[1], Research Scholar,
[1]Department of Physics, Dr C. V. Raman University, Kota, Bilaspur, Chhattisgarh, India
[2]Department of Physics, CCET, Bhilai, Chattisgarh, India

shodhsamagam1@gmail.com

Received on : 23/05/2019
Revised on : -----
Accepted on : 25/05/2019
Plagiarism : 07% on 23/05/2019

Abstract :-

From B.C., basically the clay bricks are used in building construction. This type of bricks are manufacturing by a traditionally way which have less compressive strength, high water absorption qualities, low durability, high thermal conductivity etc. From this purposes the clay bricks haven't been better quality to provide the building construction in case of environmental issues. In modern period of advance technology, purposes the new idea to focus in the qualities of bricks by waste coal combustion fly ash with additives such as lime, gypsum and clay materials. To main discussion about, how to use the waste materials of coal combustion of fly ash materials for manufacturing the better qualities of bricks that balancing the environmental issues from FA.

Keywords :- FA, bricks, waste additive materials, environmental issues.

Introduction :-

The clay bricks are used for building construction. This brick has less compressive strength, high water absorption quality, low durability, high

thermal conductivity etc. This bricks are basically manufactured by a traditional way. The evidence of this bricks are civilization of Mohenjo-Daro, Harappa etc.

But now a day, fly ash bricks are very popular. FA is produced from the combustion of coal in thermal power plant for producing current.

FA is a waste product. For utilization of this product, many researchers work on it. FA bricks also be a part of it. By this project FA is utilized.

FA is a fine; glass- like powder recovered from coal fired electric power generation. It consist of Silica (54.53%), Alumina (22.82%), Iron oxide (9.96%), Calcium Oxide (0.03%), Magnesium Oxide (0.51%), Titanium Oxide (1.07%) etc. It is mainly an Oxide material.

Here many type of FA produced on the basis of chemical compound. There are three type of FA such as class N, class C, and class F.

Class C FA is generate by the streamlet of Sub-bituminous coal. This ash contains 20% lime. Class F FA is generate by the streamlet of bituminous coal. This ash contains 7% lime.

Every year in India, 112 million tons FA produced from thermal power plant. But its 38% are used in every year in India. FA is very harmful for our environment. For this reason, its utilization is much needed.

For bricks, the FA is used. By FAL-G technology FA bricks are manufactured. For this bricks preparation also used materials are clay, lime, gypsum, sand etc.

Review of Related Literature :-

Waste FA used for brick making to enhance the quality of brick. Here some researches on FA bricks is shown below.

In the year 2002, Kumar et al., studied about FA-lime-gypsum bricks and hollow blocks. Here FA, lime, calcined phosphogypsum and water are used for brick preparation. In result, the strength of the sample was increasing. Here gypsum was worked as a good binder. When increasing the amount of FA then bulk density of bricks was decreased and water absorption increased.

In the year 2005, Lingling et al., observed that when he replaced the raw materials of bricks with high volume ratio. Here he uses FA with an high amount and clay with an little amount. In the result, water absorption quality of bricks decreased.

In the year 2006, Lin et al., used the MSWI for FA bricks making. Here 40% MSWI are used. In result, by adding of MSWI slag the bricks has light weight. Bulk density of the bricks was decreased and compressive strength of the bricks was perfect.

In the year 2007, Cicek et al., researches about lime based steam autoclaved fly ash bricks. Here for bricks construction quartz sand, FA, lime etc. are used. when the quartz sand 40% in the sample then the compressive strength is 3.74 MPa and when the quartz sand 20% and lime 12% in sample then the compressive strength is 4.75 MPa. Water absorption of this bricks was 30%. Heat conductivity of the brick was (0.34-0.36)W/mk. This brick has low weight.

In the year 2008, Celik et al., studied about FA from different thermal power plant. He was studied about chemical and physical properties of the FA. He charecterised the FA by SEM, XRD, FTIR process. At a result, when increasing the particle size of FA then decrease compressive strength.

In the year 2009, Cultrone et al., added FA in clayey for improve the quality of bricks. By using the FA, in result the brick was low cost. this bricks was less damage then clay bricks.

In the year 2009, Turgut et al., added waste glass as a raw materials in concrete blocks. By increasing the amount of waste glass, the compressive strength, flexural strength, splitting tensile strength of the brick were increases.

In the year 2011, Chen et al., for construct eco- friendly bricks used the hematite talings. He also used clay, FA as raw materials. By the use of hematite tailings, the water absorption of brick was (16.54-17.93) % and the compressive strength of the brick was (20.03-22.92) MPa.

In the year 2013, Chetana et al., he gives a reviewed about FA and recycled coarse aggregate in concrete: New Era for Construction Industries. In this paper he concluded that the use of FA in concrete enhance the durability and strength quality of concrete.

In the year 2014, Sumathi et al., added lime, gypsum and Quarry dust as a raw materials in FA bricks. Here he use the FA (15-50)%, Gypsum(2%), Lime(5-30)%, and Quarry dust(45-55)%. The compressive strength of the brick was 7.91 N/nm2. and the water absorption of the brick was 10.9%. Here When increase the water absorption quality of bricks then decrease the compressive strength of the bricks.

In the year 2015, Cicek et al., used FA for building bricks construction. Here he use FA 88%, lime 12%, water in mixture 20%. In result, compressive strength of this brick was 76.5 Kg f/Cm2, flexural strength of this brick was 5.6 Kg f/Cm2.

In the year 2016, Ardeshir et al., gave a review about brick from light weight and waste material. he concluded that by use waste material in bricks here we utilize the waste material. By use of light weight material, light weight brick was produced and by this process at low temperature high heat isolation bricks produced.

In the year 2017, Abdeen et al., studied about properties of fired clay bricks mixed with waste glass. He used clay and waste glass powders a raw materials. He used waste glass powder from (0-40)%. The compressive strength, bulk density and firing shrinkage increases when the amount of glass powder increases. here compressive strength of the bricks depend with the fine particle size of the waste glass powder.

In the year 2017, Sett et al., studied about FA. He gave FA charecteristics, problems and possible utilization of its. From this the problem of FA is pollutes the environment. It is harmful for our human body. It affects the agriculture field. FA is use for bricks, cement, disposal preparation. It is also useful for enhance the quality of solid.

In the year 2018, Hariharan et al., manufacture brick with waste glass powder. He used waste glass powder by the replacement of clay. By the replacement of 40% waste glass. The compressive strength of the bricks 4.1 N/mm2 and the water absorption was 11.55%.

YEAR	RESEARCH SCOLAR NAME	RAW MATERIALS	RESULT
2002	Kumar	FA, Lime, Calcined Phosphogypsum, Water	Brick has lower bulk density but good water absorption quality.
2005	Lingling	FA, Clay	Brick has good water absorption quality.
2006	Lin	MSWI, FA	This brick has better bulk density and perfect compressive strength.
2007	Cicek	FA, Lime, Quartz sand	This bricks has compressive strength (3.74-4.75)Mpa, water absorption quality 30% and heat conductivity (0.34-0.36) w/ mk.
2009	Cultrone	FA, Clayey	This brick less damage then clay brick.
2009	Turgut	Waste glass	Increase compressive strength and flexural strength of this brick.
2011	Chen	Clay, FA,	This bricks has Water absorption quality
		Hematite tailings	(16.54-17.93)% and compressive strength (20.03-22.92)Mpa.
2014	Sumathi	Quarry dust,	This brick has compressive strength
		Gypsum, Lime, FA	7.91N/nm^2 and water absorption quality 10.9%.
2015	Cicek	FA, Lime, Water	This brick has compressive strength 76.5kgf/cm^2 and flexural strength 5.6 kgf/ cm^2.
2017	Abdeen	Clay, waste glass	Increase the compressive strength, bulk density and firing shrinkage of this bricks.
2018	Hariharan	Clay, waste glass	Compressive strength 4.1 N/ and water absorption 11.55%.

Methodology :-

By this following process, brick is manufacture :

- At first collect the all raw materials which are needed.
- Then all raw materials are grinded finely.
- Now all raw materials are weight by weight machine.
- All raw materials are mixing properly. Then making the bricks.
- After making bricks drying it for 24h at room temperature. Then its firing for 4h at (600-1000)ÚC.

- After firing testing the parameters of the bricks such as compressive strength, water absorption quality, brick size, thermal conductivity etc.

Conclusion & Suggestion :-

Based on this above review following conclusion are stated :-

- When bricks is made by FA and clay then its compressive strength about (20.03-22.92) Mpa and water absorption quality about (16.54-17.93)%.
- When brick is made by FA and lime then its compressive strength (4.75-7.91) N/ and water absorption quality (10-30) %.
- When bricks is made by waste glass and clay then its compressive strength 4.1 N/ and water absorption quality 11.55%.
- Fly ash bricks are less damage then clay bricks.

From this above review we suggest that fly ash bricks has better quality and low cost. By the use of FA in this purpose a large amount of FA is utilized and save our environment from pollution.

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