Effect of Fly Ash and Rice Husk Ash on the Properties of Burnt Clay Bricks

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Abstract— **This study involves the experimental investigation of effect of fly ash and rice husk ash on the properties of burnt clay bricks. Determine the properties of the bricks casted with varying proportions of admixtures is taken into consideration whether the admixtures can be used for the production of clay bricks. On seeing the present day demand for bricks, an attempt is made to study the behavior of bricks manufactured using, different waste materials like rice husk ash and fly ash. The main aim of this work was to compare the compressive strength of the bricks. The bricks were made, sun dried and burnt in a kiln, and then with the help of Compression Testing Machine (C.T.M.) finely their compressive strength was calculated. From this test in this research work it was concluded that the bricks with fly ash as the waste material admixture, gave the highest compressive strength.**

Index Terms— **Clay, Compressive strength, Fly Ash, Rice Husk Ash, Bricks**

I. INTRODUCTION

A brick is a block made of clay burnt in a kiln. It is one of the primary building materials known to mankind. Bricks are composed of inorganic non-metallic material and are widely used as building components all over the world. Over time, bricks have appeared, gained prominence, lost importance and then come to the forefront again with various styles of architecture. Burnt bricks were used in ancient Indian.

The need for locally manufactured building materials has been emphasized in many countries of the world because of their easy availability and low cost. Bricks also have been regarded as one of the longest lasting and strongest building materials, made from locally available sources, used throughout history. Ordinary building bricks are made of a mixture of clay, which is subjected to various processes, differing according to the nature of the material, the method of manufacture and the character of the finished product. After being properly prepared the clay is formed in molds to the desired shape, then dried and burnt. Burnt bricks are usually stronger than sundried bricks, especially if they are made of clay or clayey material. Burnt clay bricks are weaker compared to bricks made of cement in terms of strength and durability. Another important factor adding to the disadvantages of burnt clay brick is the environmental impact involved in the manufacturing process of clay bricks. To overcome these drawbacks an attempt has been made to increase the overall efficiency of clay brick by adding other suitable materials along with clay in the manufacturing process. In this project, we have tried to study the effects of adding fly ash and rice husk ash to the conventional clay bricks. The effect of addition of fly ash and rice husk ash, in varying percentages, to different properties of clay bricks such as compressive strength, water absorption etc. is investigated.

Considering all the points discussed above, there is a need to find some alternative so as to reduce the impact of clay brick manufacturing process on the environment and at the same time increase the overall performance of the bricks. This research aims to achieve both the mentioned improvements by using admixtures along with clay during the manufacturing process. Certain group of admixtures are added to increase the bond between the particles and thus the strength of the brick. The recent non-traditional pozzolanic admixtures used for brick production include wood ash, sawdust ash and fly ash. A second category of admixtures includes organic matter, such as rice husks, sawdust, coal, etc., which burn out when the bricks undergo firing. They regulate the temperature to which the brick is fired during burning, which is of paramount importance. The higher the firing temperature, the higher is the quality of the finished product.

II. MATERIAL USED FOR THE STUDY

A. Clay:

Clay soils are compounds of silica and alumina. Calcareous clays have calcium carbonate and will burn to a yellow or cream color. Non-calcareous typically contain feldspar and iron oxides, and will burn to a brown, pink or red, depending on the amount of iron oxide. The silica in the clay, when fired at 900-1200 degrees C, will turn to a glassy phase. This process, called vitrification, will turn the clay to a crystalline structure. Therefore, for the process of vitrification temperature is important. If under-fired, the bonding between the clay particles will be poor and the brick will be weak. If the temperature is too high, the bricks will melt or slump. Vitrification does not have to be complete, and does not actually occur in many of the small traditional brickmaking plants around the world. However, the vitrification does occur enough to give sufficient

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strength to the brick. It takes approximately 3 cubic meters of clay soil to make 1000 bricks.

B. Fly ash:

Fly ash is the by-product of coal combustion collected by the thermal power plant in very large volumes. All fly ash contain significant amounts of silicon dioxide (SiO2), aluminum oxide (Al2O3), iron oxide (Fe2O3), calcium oxide (CaO), and magnesium oxide (MgO). However, the actual composition varies from plant to plant depending on the coal burned and the type of burner employed. Fly ash also contains trace elements such as mercury, arsenic, antimony, chromium, selenium, lead, cadmium, nickel, and zinc.

The power requirements of the country are rapidly increasing due to growth of industries.65% of the total power produced in India is by thermal power plants and hence there is an increase in fly ash production. Further Indian coal contains 30 to 40% of ash content which further gives rise to air pollution, soil pollution, disrupts ecological cycles and causes other environmental hazards. Fly ash also contains traces of toxic substances which may affect human health, plant life and also the land on which fly ash is deposited. The disposal of this waste material is a matter of great concern from the environmental and ecological point of view

C. Rice Husk Ash

Rice husk ash (RHA) is obtained by burning rice husk. Physical properties of RHA are greatly affected by burning conditions. When the combustion is incomplete, large amount of un-burnt carbon is found in the ash. When combustion is completed, grey to whitish ash is obtained.

The amorphous content depends on burning temperature and holding time. Optimum properties can be obtained when rice husks are burnt at 500 - 700°C and held for short time, this temperature at which the husk is being burnt is less than that required for formation of clinkers in cement manufacturing process, the resulting ash can be used as a replacement of cement in concrete. The pozzolanic activity of rice husk ash is effective in improving the strength.

III. MATERIAL TESTING

A. Specific Gravity:

The specific gravity test was done using pycnometer for all samples passing through 4.75mm IS sieve.

Sr. No	Material	Specific Gravity
1	Clay	2.20
2	Fly Ash	2.00
3	Rice Husk Ash	0.47

B. Compressive Strength Test:

The compressive strength of the samples prepared was determined in a Compression testing Machine for each type of mixture prepared six samples of 100% Clay, 5% mixture of Fly Ash in clay (95% Clay+5% Fly ash) And 5% mixture of rice husk ash in clay(95% + 5%) then find the average compressive strength and water absorption ratio.

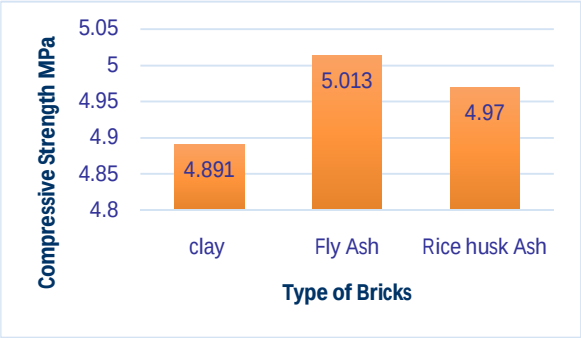

Fig.1 Compressive Strength Vs Different Type of bricks

C. Water Absorption Test

The water absorption of the samples prepared was determined by 24 hour water immersion. For the research 6 samples of each composition were tested and average of the results is to be considered.

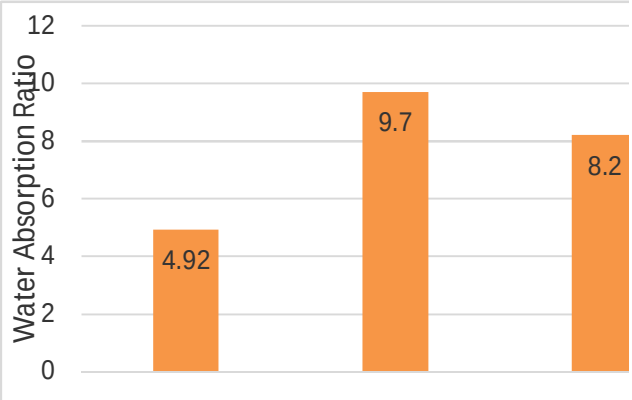

Fig.2 Water absorption Ratio Vs. Different Type of bricks

IV. CONCLUSIONS

From the experimental data following results conclude:

- The clay burnt bricks manufactured with fly ash and rice husk ash had similar appearance when compared to the conventional clay bricks.
- The brick having rice husk ash as an admixture showed lower compressive strength and higher percentage of water absorption when compared to the conventional clay bricks.
- The clay bricks having fly ash as an admixture showed the high compressive strength.

REFERENCES

[1]Ashish Kumar Parashar and Rinku Parashar (2012), "Comparative Study of Compressive Strength of Bricks Made With Various Materials to Clay Bricks", International Journal of Scientific and Research Publications, Volume 2, Issue 7.

[2]Akshay Satish More, AhadTarade and Ashwani Anant (2014), "Assessment of suitability of fly ash and rice husk ash in clay burnt bricks" International Journal of Scientific and Research Publications, Volume 4.

[3] Agrawal B.N, Kohli S.M (2010), "New Building Materials and Construction World", Standard Publication House.

[4] Samir Mistry (2002), "Thesis report on study on compressive strength of fly ash bricks", Sardar Patel University, V.V.Nagar, Gujrat.

[5] Jayesh Pitroda (2010), paper on "A study of utilization aspect of fly ash in Indian context", presented at the National Conference on environmental impact of thermal power plants .

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