A STUDY ON PRODUCTION OF ECO BRICKS FROM INDUSTRIAL WASTE USING ALKALI ACTIVATED TECHNOLOGY

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Introduction :

Housing is a basic need. Owning a house is a problem for majority of the people in India due to expensive cost of construction. The need for locally manufactured building materials has been emphasized in many countries of the world. There is imbalance between the expensive conventional building materials coupled with depletion of traditional building materials. 60-70% of the families come under the low income group and housing becomes an acute problem to them. To address this situation, attention has been focused on low-cost alternative building materials. This results in reducing the cost of housing and to make affordable housing for India’s increasing population. Clay bricks are being used extensively and the most important building material is the construction industry. In India the building industry consumes about 20000 million bricks and 27% of the total natural energy consumption for their production. In addition to this, Clay bricks available in certain region are poor in quality and have lower compressive strength, higher water absorption, high efflorescence etc., which have forced engineers to look for better materials capable of reducing the cost of construction. Bricks are masonry units composed of inorganic non-metallic material and are widely used as building components all over the world. The bricks could be sun-dried or burnt. Burnt bricks are usually stronger than sundried bricks, especially if they are made of clay or clayey material. There are different categories of the bricks, depending upon the admixtures and raw material used for making bricks. It is also common that certain admixtures are added to burnt brick raw mixes to produce different effects in the finished product. Logically the unlimited use of clay is harmful to the society, as all the conventional clay bricks depend on good quality clay available from agriculture fields.

Objectives :

1) To minimize the depletion of top fertile soil of the formable land by utilizing the industrial waste.
2) To address the potential use of industrial waste of the raw material for the production of green bricks.
3) To decrease the firing temperature and consequently the CO2 emission.
4) To develop the low cost, low CO2 emission building material.
5) To vanish the clogging up of landfills by utilizing the sugar industry boiler ash and treatment sludge waste.
6) To compare the efficiency of the brick with conventional bricks.
7) To reduce the harmful gas emission while burning in sites.
8) To manufacture the bricks throughout the year without any seasonal constraints.

To reduce the amount of solid waste deposition rate by using industrial waste in production of eco bricks. And To compare the strength of bricks by Oven Drying Method and Conventional Method.

Methodology:
The manufacturing process includes the following steps.

Different proportion of Sludge, Boiler ash, Lime, Clay and NaOH will be fed into mixer where water will be added in the required proportion for homogeneous mixing. The proportion of raw materials may vary depending upon quality of raw materials. The process of Mixing of NaOH and lime to the sludge, Boiler ash and clay in the production of ECO Bricks is termed as “Alkali Activation Technology”.

After mixing the materials will be pressed into the mould and then bricks are placed on wooden pallets and will be kept as it is for two days. There after they are transported to open area where they are cured for 10 to 14 days. Also the bricks with same proportions are oven dried and different lab tests are carried out to compare the strength parameters and quality with the conventional bricks.

Different test on bricks includes the following:
   a. Crushing strength
   b. Hardness
   c. Soundness
   d. Water absorption

Results and Conclusion:
1. Waste materials are a major environmental problem, which is threat to the environment. Waste management in developing countries has been and still remains challenge, this has the potential for negative health effects on people and animals as well as degrading land and aquatic eco system.
2. As housing is a basic need 60-70% of the families come under the low income group and housing becomes an acute problem to them. To address the situation, in this project attention has been focused on low cost alternative building materials.
3. This project helps to minimize the depletion of top fertile soil of the formable land by utilizing industrial waste.
4. With the use of alkali activation technology, the effect of carbon dioxide emission in to the Environmental was completely reduce.
5. Also this project helped in vanishing the clogging up of landfills by utilizing the sugar industry boiler ash and sludge waste.
6. In this project different proportion of the industrial waste were added as a partial replacement of a clay in the production of Eco Bricks by using Alkali Activation technology, and the results were compared with a bricks having same proportions but without the addition of alkali compound. Comparing the results, efficient proportion is finalized.
7. The test results were compared with burnt and unburnt bricks with and without the addition of NaOH.
8. Compressive strength was found to be higher i.e. 3.97 N/mm2 for burnt bricks with Alkali technology and the proportions were 50:25:25 (Soil: Sludge: Ash or Lime).
9. Efficient water absorption of bricks were burnt to be 16.5% for burnt bricks with Alkali
technology and the proportions were 50:25:25 (Soil: Sludge: Ash or Lime)
10. The hardness property of the bricks is also achieved, when the brick is dropped from 1m height.
11. The soundness property of the brick is also achieved.
12. Even though the Alkali technique was adopted and clay is replaced by industrial waste, the results were obtained was not satisfactory.

Scope for Future Work :

1) Different admixtures can be added to increase the strength of the bricks.
2) The burning temperature of the bricks can also be optimized.
3) Other industrial wastes can also be added, and the study can be done.
4) The effect of lime, ash and NaOH with clay can also be studied thoroughly.

The proportions can be altered and the strength can be determined.