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Sludge- Fly Ash Brick

Shantanu S Sonawane

[a]*1168, Tanaji Chowk, Sinnar, Nashik-422103*

Abstract

If building materials are concerned, brick is among the most widely used masonry units. There have been several attempts to incorporate waste materials into brick making. The STP sludge and fly ash were incorporated into bricks by experimentally recycling them. In addition to reducing expenses on wastewater treatment, the sludge generated by the process has to be disposed of in an environmentally friendly way. World-wide, sludge generated by most treatment systems is discharged into nearby waterways. Constructional elements made from sludge are regarded as the most environmentally sound and economically efficient disposal option among all disposal methods. The purpose of this paper is to provide an overview of the recycling of sludge and ash when compared with fired clay bricks. As a result of this formation, bricks have adequate crushing strength, hardness, and water absorption, as well as waste management and its environmental impact. Creating any brick also involves a lengthy process, which involves mixing the materials and molding them, then burning them in the kiln for hours. By using cement, we have used a convenient method. Since cement sets in no time, no kiln is required for heating. During this research, an attempt has been made to hold out an experimental study to search out the effect of partial replacement of sewage-dried sludge in various percentages on the fly ash bricks' properties and compressive strength

Keywords: Brick, STP sludge, Fly ash, Environment

1 Introduction

For thousands of years, bricks have been made of clay. Brick is one of the foremost common masonry units as a building material because of its properties. Several attempts are made to include wastes in the production of bricks, for example, rubber, limestone dust, wood sawdust, processed waste tea, fly ash, polystyrene and sludge. Utilizing such wastes by incorporating them into building materials could be a sensible answer for pollution drawbacks. This project reviews the recycling of various wastes into bricks. Most factory-made bricks with differing kinds of waste have shown positive effects on the properties of bricks. An environmentally sound approach should be taken to the treatment and disposal of sludge generated at water treatment plants. Coagulant sludge is generated by water treatment plants that use metal salts like aluminum sulfate (alum) or ferrous chloride as an agent to get rid of turbidity. Due to the fact that these discharges violate the allowable stream standards, the standard practice of discharging the sludge directly into a nearby stream is becoming less acceptable. Metal concentrations in water increase as a result of discharging sludge into water bodies. Water treatment plants are expected to be more cautious when displacing aluminum-laden solids. There is a striking similarity between the chemical composition of water treatment plant sludge and brick clay. Therefore, brick clay could be substituted with sludge.

There are many problems related to groundwater contamination and air pollution because of the engineered landfills of the sludge from STP. There should be a proper solution for the STP sludge which is of no use in the STP. Similarly, there is another waste material that we are using in our brick is Fly ash. Fly ash is also a waste product for thermal electricity plants. But many studies have been done on using fly ash in brick. And today several fly ash brick plants are being developed. We have also used cement for giving the most effective strength to the brick. Firstly we used clay for strength purposes but it didn't work and the method for making them was very vast, hence we used cement to maintain that balance of strength and cost. However, it also needs to be recognized that construction is also ad- adversely affecting the environment, through physical disruption. The depletion of key renewable resources like fertile topsoil, forest cover, and excessive consumption of energy. The adoption of cost-effective, environmentally friendly technologies is therefore highly important by updating the standard technologies and also by using locally available materials, as well as by using appropriate and intermediate technologies incorporating modern materials with efficient, effective technology inputs.

1. Methodology

1.1. *Detailed information about experimentation*

1.1.1. *Collection of material*

The three material were collected are

- Sludge: Sewage water treatment plant, Agar Takli, Nashik generates wet sludge as a residue from the treatment plant. The same wet sludge was sun dried and used for making bricks.
- Fly Ash: Fly Ash was collected from Dirk India Pvt.Ltd, which processes the ash generated from Thermal Power Station.
- Cement: OPC cement of grade 53 was purchased from local dealer

2.1.2. Sieving of material

After Sun drying the sludge was sieved through 1.75 mm sieve.

2.1.3. Proportion

Cement, Sludge and fly ash were took in proportion by their volume as per weight.

- First the material were completely filled in the mold and then weighted; which gave 100 percent volume of material in weight
- Then we took the required volume of material according to proportion for preparation of brick.

2.1.4. Mixing

A proportion of cement, sludge, and fly ash is mixed in three proportions with proper water content. Initially, the proportion is mixed dry and then water is added at interva

Cement	Sludge	Fly ash	Water content
50%	30%	20%	35%
50%	40%	10%	30%
50%	25%	25%	33%

RESULT AND DISCUSSION

1. **The test conducted on bricks are**

1.1. Compression test

Procedure of Compressive Strength Test on Bricks

- Place the specimen with flat face s horizontal and mortar filled face facing upwards between plates of the testing machine.
- Apply load axially at a uniform rate of 14 N/mm^2 (140 kg/cm^2) per minute till failure occurs and note maximum load at failure.
- The load at failure is the maximum load at which the specimen fails to produce any further increase in the indicator reading on the testing machine.

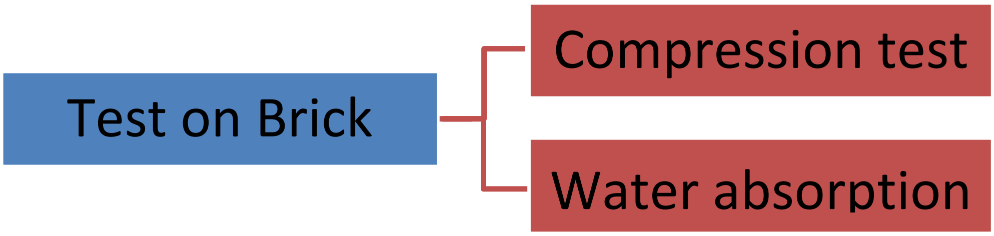
1.2. Water absorption test

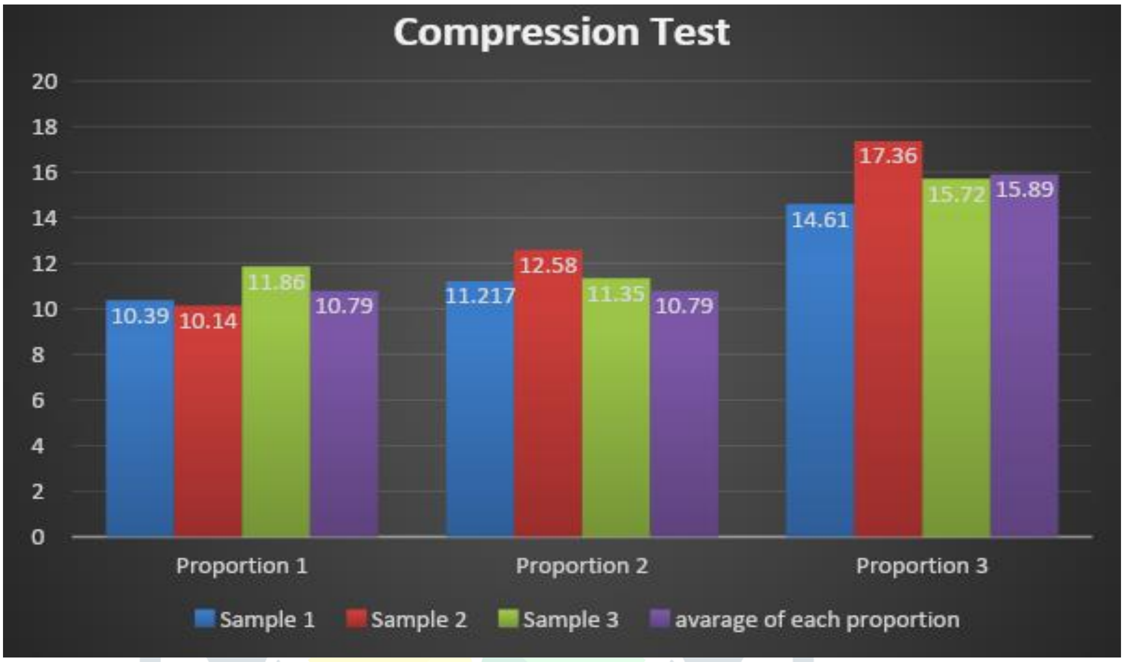
Procedure of Water Absorption Test

- Dry the specimen in a ventilated oven at a temperature of 105 °C to 115°C till it attains substantially constant mass.
- Cool the specimen to room temperature and obtain its weight (M1) specimen too warm to touch shall not be used for this purpose.
- Immerse completely dried specimen in clean water at a temperature of 27+2°C for 24 hours.
- Remove the specimen and wipe out any traces of water with damp cloth and weigh the specimen after it has been removed from water (M2).

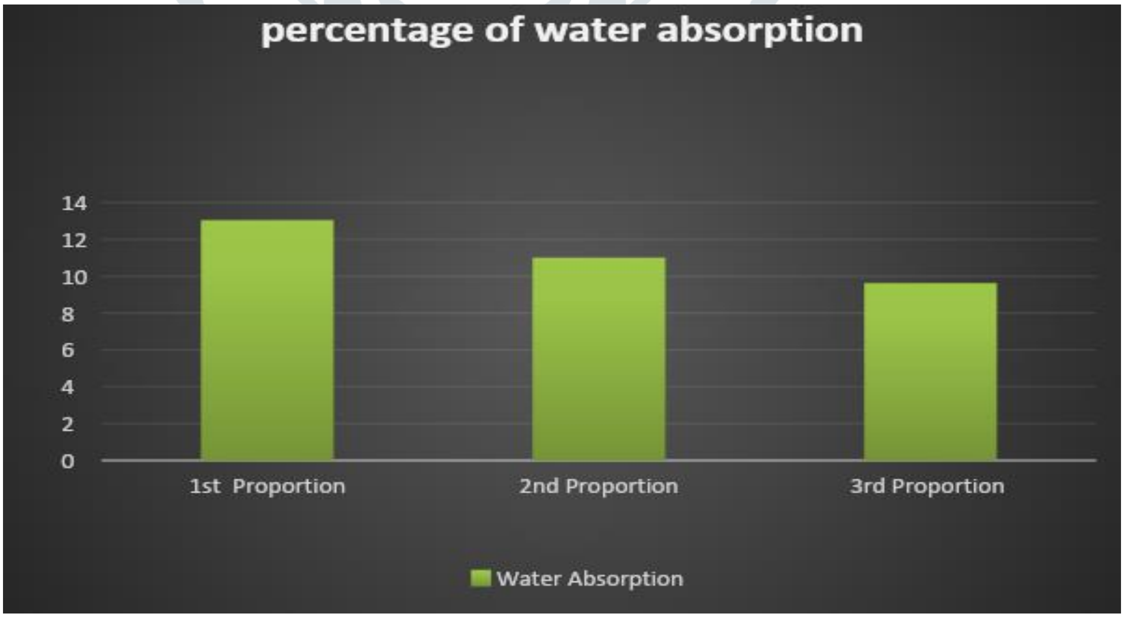
2. table below represents the results of the test conducted on bricks

Tests	Proportion	Samples	Results	Average strength
Compressive Strength	Proportion 1 *50:40:10*	Sample No. 1	10.39 N/mm²	10.79 N/mm²
		Sample No. 2	10.14 N/mm²	
		Sample No. 3	11.86 N/mm²	
	Proportion 2 *50:30:20*	Sample No. 1	11.217 N/mm²	10.79 N/mm²
		Sample No. 2	12.58 N/mm²	
		Sample No. 3	11.35 N/mm²	
	Proportion 3 *50:25:25*	Sample No. 1	14.61 N/mm²	15.89 N/mm²
		Sample No. 2	17.36 N/mm²	
		Sample No. 3	15.72 N/mm²	
Water Absorption Test	Proportion 1 *50:40:10*	Sample No. 1	13.06% (Water absorbed)	
	Proportion 2 *50:30:20*	Sample No. 2	11.02%(Water absorbed)	
	Proportion 3 *50:25:25*	Sample No. 3	9.63%(Water absorbed)	





Results of compression tests together



Result for water absorption

CONCLUSION

Fly ash and water sludge present a significant disposal problem, and due to a projected increase in their abundance in the future, we investigated the possibility of reusing and disposing of these wastes safely and responsibly. Considering that fly ash and sewage sludge have some mutually beneficial properties, it has been proposed that these two waste products be combined with cement to create a material that is suitable for the production of structural bricks.There is no question that fly ash as well as sewage sludge are waste products that can be reused and utilized effectively. Rather than being considered a liability, waste products will be seen as assets, which will result in significant benefits for society in terms of waste reuse and environmental protection. Furthermore, as a result of this change, there will be no increase in environmental costs, and the cement will be preserved as well.

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