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Experimental Study on Partial Replacement of Sand with Bottom Ash

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Abstract

Environmental polluted by waste materials which can be treated as a construction material in order to reduce the waste disposal. Dry sludge is available at free of cost and it can be mixed with brick while in turn reduce the cost of brick and also control the pollution. The use of dry sludge in brick can save the ferrous and non-ferrous metal industries disposal, land pollution, cost and produce a greener brick for construction. After doing the practical and find that some properties are match with soil. In this work, dry sludge can be used instead of soil and form a brick using various proportions of dry sludge 10%, 20%, 30%, 40%. Based on limited experimental investigation concerning the water absorption and compressive strength of brick, observations are made regarding the resistance of partially replaced dry sludge. The water absorption decreased up to 20% replacement of soil by dry sludge. Compressive strength increases when replacement of dry sludge percentage increases when compare to traditional Brick. A better measure by an innovative Construction Material is formed through this research work.

Keywords: Dry sludge, construction, waste, pollution, brick

1. INTRODUCTION

Waste may be defined as an unwanted material generated after the manufacturing process of industrial, or from agricultural, or from house hold activity. It is the discarded material which essential requirement of disposal. Waste causes many nuisances in the environment .it produces many types of viral or bacterial infection for the human and animal which create bed effect on health.

Data will be collected pertaining to available methodologies and applications of dried sludge used in the brick. Based on the collected data analysis will be made to find out the most suitable methodology that can be applied for replacement of dried sludge in brick as soil. It is required to study the compressive strength, water absorption, weight and other aspects as well as economical as parts in detail inform the stakeholders for maximizing its use [1,2].

The water sludge is generated from the treatment of water with alum. Due to the similar mineralogical composition of clay and WTP sludge, this study investigated the complete substitution of brick clay by sludge incorporated with some of the agricultural and industrial wastes, such as rice husk ash (RHA) and silica fume (SF). Three different series of sludge to SF to RHA proportions by weight were tried, which were (25: 50: 25%), (50: 25: 25%), and (25: 25: 50%), respectively. Each brick series was fired at 900, 1000, 1100, and 1200oC. From the obtained results, it was concluded that by operating at the temperature commonly practiced in the brick kiln, a mixture consists of 50% of sludge, 25% of SF, and 25% of RHA was the optimum materials proportions to produce brick from water sludge incorporated with SF and RHA. The produced bricks properties were obviously superior to the 100% clay control-brick and to those available in the Egyptian market [3].

Recovery of waste constituents from industrial waste is a cost-effective solution in control of environmental pollution. Present investigation deals with the feasibility of usage of sludge obtained from sand beneficiation treatment plant in the production of bricks and their durability. The experimental results show that the brick earth can be replaced with treatment plant sludge up to 40% by weight without loss in strength and other brick characteristics considered satisfactory for conventional purposes. Apart from that when reference specimens and test bricks (5% Sludge) were immersed in various concentrations of hydrochloric acid (HCl) solution at different immersed ages, the loss of weight is found to be less in test bricks than that in reference bricks. Hence, at 5% of replacement, the quality of bricks is superior to the bricks made from earth alone and can be used for superior work of permanent nature [4].

2. METHODOLOGY

The fibrous residue of sugarcane after crushing and extraction of its juice known as bagasse. The mixture of filter mud is an available soil conditioner and important source of plant nutrients. The benefits are greatest when the product is spread evenly and when normal fertilizer programs are adjusted to reflect the nutrient of mud/dried sludge.

There are two methods to solve the problem such as disposal of solid waste (dry sludge) including land filling and using dry sludge as a fertilizer. But by both these methods some harmful material remains in sludge which causes harm to environment including land, air and water as a whole. In the sense grit sludge may be generated in a grit channel or chamber. Grit particles are removed because they may damage pumps and other equipment. Here we try dry sludge too replace as a soil.

3. EXPERIMENTAL ANALYSIS

Determination of quantitative size distribution of particles of dried sludge to fine grained fraction and the procedure are

1) Take a suitable quantity of oven dried sludge. The mass of dried sludge sample required for each test depends on the maximum size of material.
2) Clean the sieve to be used and record the weight of each sieve and the pan.
3) Arrange the sieves to have the largest mesh size at the top of the stack. Pour carefully the soil sample into the top sieve and place lid over it.
4) Place the sieve stack on the mechanical shaker, screw down the lid, and vibrate the dried sludge sample for 10 minutes.
5) Remove the stack and re-weight each sieve and the bottom pan with the soil sample fraction retained on it.
6) Initial mass of soil sample taken for analysis (kg) = 0.500 kg.

Manufacturing of bricks can be done using hand molding method. The molds are in rectangular shape made of wood or steel which are opened at the top and bottom. The longer sides of molds are projected out of the box to serve it as handles.

Percentage of sludge	Soil	Sand (Murrum)	Sludge	Water
10%	58%	10%	26%	40 lit
20%	50%	8%	28%	42 lit.
30%	44%	7%	30%	44 lit.
40%	48%	5%	33%	45 lit.

Table.1 Mix design for bricks

A sensitive balance capable of weighing within 0.1% of the mass of specimen and ventilated oven. Three numbers of whole bricks from samples collected for testing should be taken. Dry the specimen to room temperature of 105 c to 115c till it attains substantially constant mass. Cool the specimen to room temperature and obtain its weight specimen too warm to touch shall

not be used for this purpose. Immerse completely dried specimen in clean water at a temperature or 27+2c 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.

Water absorption, 20 % by mass after 24 hours immersion in cold water. Water absorption of the given bricks = 20 %. When tested as above, the average water absorption shall not be more than 20% by weight up to class 125 and 15% by weight for higher class.

No. Of Bricks	Conventional Bricks	10% Sludge Bricks	20% Sludge Bricks	30% Sludge Bricks
1	2330gm	2130gm	1790gm	1570gm
2	2340gm	2140gm	1800gm	1560gm
3	2360gm	2100gm	1770gm	1580gm
4	2340gm	2140gm	1780gm	1575gm
5	2330gm	2120gm	1770gm	1565gm
6	2350gm	2140gm	1780gm	1570gm
7	2330gm	2120gm	1790gm	1580gm

Table 2 Weight of Bricks

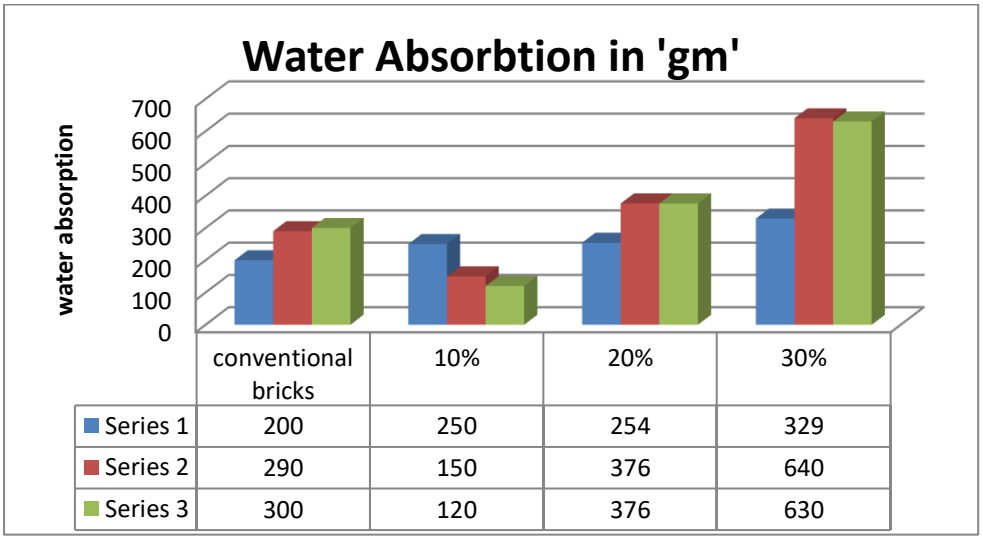

Fig.1 Water absorption of bricks

No. Of Bricks	Conventional Bricks	10% Sludge Bricks	20% Sludge Bricks	30% Sludge Bricks
1	2700gm	2750gm	2130gm	1850gm
2	2950gm	2450gm	2145gm	1860gm
3	2800gm	2620gm	2124gm	1870gm

Table 3 Weight of bricks after water absorption

4. CONCLUSION

Dry sludge is freely available and it can be used with various proportions such as 10%, 20%, 30%, 40% of brick making. Based on limited experimental investigation observations are made regarding the resistance of partially replaced dry sludge. The water absorption decreased up to 20% replacement of soil by dry sludge.

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