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Probability Analysis of Utilisation of STP Sludge and Sugarcane Hard-Pressed Mud to Manufacturing of Bricks for Justifiable Construction

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Abstract- The construction industry is one of the dynamic industry. It provides employment to weaker section of rural area and also opens new platform to skilled and educated peoples. The press mud is a material which is obtained from the clarification of sugar. The disposal of this waste into the environment causes the land pollution so this study made will be a better solution for this problem. The municipal sewage sludge and sugarcane press mud are added at different percentages such as 10, 15, 20 and 25. Now a day as we know there is increase in the demand of construction work so as comp aired to that the demand of making of bricks is slow and it is creating hazardous effect on the nature. So in this study STP sludge and sugarcane press mud is used as a replacement for making of brick. Here I have made bricks that are made without burning them so that the CO2 emission is controlled. And also it is aimed to reduce the STP sludge and sugarcane waste dumping in the earth to protect the environment from hazardous and also increment of low-cost brick towards the construction industry for the sustainable development. Here we have used sludge and sugarcane press mud along with fly ash and lime for better binding strength. So this attempt made will be a better solution for the CO2 emission .The results have shown that the bricks have shown the better binding strength. Hence requirement of raw and final materials like cement, sand , steel , aggregates, paints , pipes , wires and cables, tiles, sanitary and bath wares, Admixtures , compounds and bricks are increased in the market. The manufacturers are having mass quantity of orders of above material in day today life. The one of the important material is brick which is very important material for construction industry. For manufacturing of bricks fine clay or mud is the basic material which is naturally available. Due to heavy requirements of bricks, the excavation of soil / ground is more and continuous in all villages which is maximum utilization of natural resources. The maximum use of natural resources is not good and not desire at all.

I. INTRODUCTION

The existing provisions of water, food and sanitary are not enough and required to increase to facilitate to end user of rural as well as urban area.

The natural resources are limited and not long lasting, however to explore alternative sources for bricks. Bricks are manufacturing with naturally available material like mud or disintegrated soil. The disposal of wastages generated out of working of sugarcane factories and STP sludge are another time-consuming task. The correct and rational method of disposal of above wastages needs manual efforts and additional expenditures to maintain the environmental cycle.

Bricks have been used for more centuries. The present investigation, an attempt made with mixing municipal sewage treatment plant sludge and sugarcane press mud with other constituents. Biologically degradable and non-degradable organic and inorganic pollutions present in the wastewater in soluble, colloidal or suspended form are removed by various methods in treatment plants. The suspended solids and certain dissolved solids that present in the wastewater as well as the ones which are added or cultural by wastewater process, are suspended in the form of settle able solids. Thus, sludge is the solids, liquids or semisolids residuals generation as a by-product of water treatment. Generally sludge contains 0.25-12% solids by weight, depending on the operation and the processes used. The sludge treatment/disposal signifies 50% of the capital and operation costs of wastewater treatment plant. Sludge can become a problem if they are improperly managed or disposed of. It may causes three impacts on the environment in different phases such as the gaseous, liquid and solid. Influence on the percolating water result in the grounds water contaminant. Influence on quality of the soil in the area.

This is primarily due to the increase in the cost of basic building materials like burnt brick, steel, cement, timber, etc. As a result, the cost of construction using conventional building materials and construction is very high for normal housing. Construction costs are beyond the affordable capacity of the economically Weaker Section and Low Income Group and a large cross section of the Middle Income Groups, whose income levels have not increased commensurately.

The attempt made to use waste material for manufacturing of good construction material is better solution for this problem.

- Fly ash bricks are generally considered better than normal bricks due to their Strength.
- The fly ash brick is economical and brings down the construction cost considerably.
- The easily available in the market in cheaper cost is also one the positive point.
- The fly ash bricks are having more advantaged over clay red bricks.
- The fly ash bricks are very useful as these are ecofriendly and saves cost of disposal of STP and sugarcane wastages considerably.
- The basic difference in fly ash brick and conventional red brick is furnished below,

Properties	Red bricks	Fly ash bricks	Remarks (for fly ash bricks)
Colour	Vary	Uniform	Good appearance
Density	1600–1750 kg/m^3	1700–1850 kg/m^3	Higher load bearing
Compressive strength	6.93 MPa	8.36 MPa	Higher load bearing
Water absorption	15–25%	10–14%	Less dampness
Dimensional stability	Very low tolerance	High tolerance	Saving in mortar up to 25%
Wastage during	Up to 10%	Less than 2%	Saving in cost up to 8%
Transit plastering	Thickness vary on the both sides of walls	Even on both sides of walls	Saving in plaster up to 15%
Environmental advantage	Nil	Absorbs CO_2 from atmosphere	Eco-friendly

Source https://theconstructor.org/building/fly-ash-bricks

II. OBJECTIVES

- To reduce the construction cost
- To examine the effect of dry sludge in brick properties.
- To give better environment to the town
- To Conservation of natural resources.
- To achieve strength in brick and investigation for check feasibility.
- To reduce pollution

In 2011, the EPA commissioned a study at the United States National Research Council (NRC) to determine the health risks of sludge. In this document the NRC pointed out that many of the dangers of sludge are unknown and unassessed. The National Research Council published "Bio solids Applied to Land: Advancing Standards and Practices" in July 2002. The NRC concluded that while there is no documented scientific evidence that sewage sludge regulations have failed to protect public health, there is persistent uncertainty on possible adverse health effects. The NRC noted that further research is needed and made about 60 recommendations for addressing public health concerns, scientific uncertainties, and data gaps in the science underlying the sewage sludge standards. The EPA responded with a commitment to conduct research addressing the NRC recommendations. Residents living near Class B sludge processing sites may experience asthma or pulmonary distress due to bio aerosols released from sludge fields.

III. LITRATURE REVIEW

1. Utilization of Water Treatment Plants Sludge Ash in Brick Making: The present study investigates the possibility of using water treatment plant (WTP) sludge as partial substitute for shale in brick making. Due to the high content of organic matter in water sludge, incineration of the WTP sludge is necessary to remove of all organic compounds contained therein. For brick making, mixture of various proportions from 10 % to 50% by weight of sludge ash added to shale are used as raw materials in hand molding brick making.
2. The produced brick samples after drying process and firing at 1000 for 6 hrs. received a series of tests including firing shrinkage, weight loss on

ignition water, absorption, bulk density, compressive strength, slake durability and efflorescence test. Satisfactory results were achieved when the percentage of sludge ash was up to 30% (by wt.) or less in the mixture. The specifications of the produced bricks match the Egyptian standard ES: 1756/1989 of fired clay building units for non-load bearing walls.

3. The test results indicate that the sludge ash proportions are one of the most important key factors determining the quality. Reuse of sludge ash as a construction and building material converts the waste into useful products that can alleviate the disposal and environmental problems.
4. Brick Manufacturing from Water Treatment Sludge and sugar cane pulp wastages: For thousands of years, bricks have been made from clay. The water treatment plant sludge is extremely close to brick clay in chemical composition. So, the sludge could be a potential substitute for brick clay. The water treatment process generates a sludge that must be disposed of in an environmentally sound manner.
5. The sludge generated in most of the treatment systems around the world is discharged into the nearest watercourse, which leads to accumulative rise of aluminum concentrations in water and human bodies. This practice has been linked to occurrence of Alzheimer‘s disease. Among all disposal options, the use of sludge in producing constructional elements is considered to be the most economic and environmentally sound option.
6. The physical and mechanical properties of the produced bricks were then determined and evaluated according to Egyptian Standard Specifications (E.S.S.) and compared to control brick made entirely from clay. From the obtained results, it was concluded that by operating at the temperature commonly practiced in the brick kiln, 75 % was the optimum sludge addition to produce brick from STP sludge. The produced bricks properties were obviously superior to the clay control-brick and to those available in the Egyptian market.
7. In many countries, sludge is a serious problem due to its high treatment costs and the risks to environment and human health. The sludge presents increasingly difficult problem to cities of all sizes because of the scarcity of suitable disposal sites, increasing labor costs, and environmental concerns. The study investigated the use of water treatment sludge incorporated with clay. In this study bricks were produced with sewage sludge, and compare produce brick with regular brick. Bricks with a sludge were capable of meeting the relevant technical standards. However, if bricks with more than 30 % sludge addition are not recommended for use because they are brittle in nature and easily broken even when handled gently as well as color is not as per the requirement.
8. Bricks Manufactured From Sludge: Sludge resulting from wastewater treatment plants creates problems of disposal. Generally, dewatered sludge‘s are disposed of by spreading on the land or by land filling. However, for highly urbanized cities, sludge disposal by land filling might not be appropriate due to land limitation. Incineration might be an alternative solution. However, a substantial amount of ash will be produced after the burning process and must be disposed of by other means. This paper presents the results of the utilization of dried sludge and sludge ash as brick making materials.

IV. METHODOLOGY

1. Collection of materials
2. Drying of STP sludge
3. Sieving of sludge and pressure
4. Molding of bricks
5. Drying of bricks in air.
6. Water curing in required period.
7. Testing of bricks.

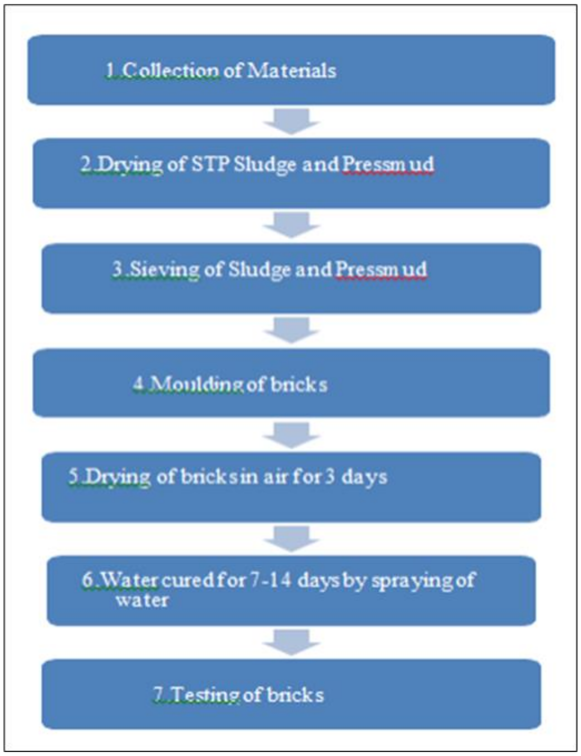

Fig. Manufacturing process of STP mud bricks

During the time spent assembling bricks, the accompanying unmistakable operations are included. Preparation of clay i) Molding ii) Drying iii) Burning

1. Un-ruining: The best layer of the mud, around 200mm inside and out, is taken out and discarded. The mud in top soil is brimming with pollutions and thus it is to be rejected to prepare bricks. This clay is combined with sugarcane press mud in order to increase the strength of bricks.

2. Burrowing: The mud is then uncovered from the beginning. It is spread on the leveled ground, only somewhat more profound than the general level. The stature of stacks of mud is around 600mm to 1200mm.

3. Cleaning: The mud as got during the time spent burrowing ought to be cleaned of stones, rocks, vegetable issues. On the off chance that these particles are in abundance, the mud is to be washed and screened. Such a procedure normally will end up being troublesome and costly.

4. Weathering: The mud is then presented to the air for softening and progressing. The period differs from couple of weeks to full season.

5. Mixing: The mud is made free and any fixing to be added to it, is spread out at its best. The mixing shows private or amicable blending. It is completed by taking a little measure of earth each time and turning it all over vertical way. The mixing influences mud to fit for the following phase of hardening.

6. Hardening: During the time spent treating, the mud is conveyed to an appropriate level of hardness and it is made fit for the following operation of trim. Plied or squeezed under the feet of man or dairy cattle. The treating ought to be done comprehensively to acquire the homogeneous mass of mud of uniform character. For assembling great bricks on a vast scale, treating is done in a pug mill. A regular pug process fit for hardening adequate earth for an everyday yield of around 15000 to20000 bricks. A pug process comprises of a funnel shaped iron tub with cover at its best. It is settled to a timber base which is made by settling two wooden boards at a correct edge to each other. The base of the tube is secured with the exception of the opening to take out pegged earth. The breadth of pug process at the base is around 800mm and that at the best is around 1m.The arrangement is made in the best cover to put mud inside pug process.

V. CALCULATION OF EMBODIED ENERGY

Drying the moist bricks, if brunt, are probably going to be split and distorted. Hence the formed bricks are dried before they are taken for the following operation of consuming. For the drying the bricks are laid longitudinally in the piles of width equivalent to two bricks, A stack comprises of ten or eight tiers. The bricks are laid along and over the stock in substitute layers. Every one of the bricks is put on edges. The bricks are permitted to dry until the point that the bricks are progressed toward becoming cowhide hard of dampness content around 2%. 4. Testing of bricks:- In this I have taking different test on bricks to calculate the strength of bricks and to compare with other bricks. These tests are as follows: 4.1Compression test:-

Compressive strength determines the load-carrying capacity of a material or an element. To understand clear, let‘s take an example of a boy weighs 12kg sitting on a small chair.

Fig. Collection of materials

= Rs 8 per kg
Amount of lime = 2 Ton / 100000 bricks
= 0.02 kg / Brick
So, Cost of lime
= 8 *0.02
= Rs 0.16 per Brick
Total Cost = Cost of (fly ash + Sludge+ Labor + lime)
= 0.18+0+0.3+0.16
= Rs 0.64 per Brick
= Almost under Re 1.00

Fig. Drying of Bricks

Thus the calculations for overall manufacturing of fly ash bricks are given above.

CONCLUSION

The following conclusion can be drawn from the result obtained from the experimental investigations.

i. The compressive strength test carried out at 21days the comparison made between the conventional fly ash brick with four proportion of sludge as per IS code 3495Part1:1992.
ii. It has been observed that in case of compression test, for80% sludge, compressive strength comes to maximum.
iii. Water absorption test carried out for 24hours the comparison made between the conventional fly ash brick with four proportion of sludge as per IS code3495Part2:1992.
iv. Study shows that water absorption values for the bricks is less than 4% so the brick required very ease amount of water for curing.
v. Environmental effects from wastes and disposal problems of waste can be reduced or controlled through this research.
vi. Environment is protected from the emission of CO2.
vii. A better measure by an innovative Construction Material is formed through this project.

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