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Utilization of STP Sludge and sugarcane pressed mud to manufacture bricks

Arpita N. Pawar
pawararpita703@gmail.com
JSPM's Imperial College of Engineering and Research, Pune, Maharashtra

Dr. Navnath V. Khadake
nvkhadake_civil@jspmicoer.edu.in
JSPM's Imperial College of Engineering and Research, Pune, Maharashtra

ABSTRACT

In this study STP sludge and sugarcane press mud is used as a replacement material for fly ash brick. This study is done 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. Bricks are the building material used for the construction of walls, pavements and other constructions. In previous days mud blocks were being used in construction but now clay bricks are used. While manufacturing the clay bricks the Carbon dioxide emission is more. Many attempts have been made to overcome these problems. So, the industrial waste materials and the by products are used in the manufacturing of bricks. Here we have used the municipal sewage treatment plant sludge (STP) and the sugarcane waste produce i.e. press mud with fly ash and lime so that we get the binding and compressive strength in good amount. Here the bricks are done without burning, so the greenhouse gas emission is minimized. 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 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.

Keywords— *STP sludge, Sugarcane press mud, Fly ash, CO_2 emission*

1. INTRODUCTION

Bricks have been used from many centuries. The present study, is an attempt made with mixing STP sludge and sugarcane press mud with other materials. STP sludge can actually act as an adjoining material with cement and can be used as a successful building material. If it's mixed with cement then it actually increases the strength of the cement. If you compare both the components of cement and STP sludge, then we got some results like this. Successful research has been performed to check the strength. It's is concluded that it actually increases the strength of cement. In sugar mills, sugar is produced through many processes and produces so much solid waste in the production. The major byproducts of the sugar industry are Bagasse, Molasses and Press mud. Press mud is a byproduct obtained from the clarification process of sugarcane juice, raw juice has non-sugar contaminants are removed using a mixture of chemical reactants such as sulfur and lime. For every 100 tons of crushed sugarcane 3.3 Tons of filter cake remain as a byproduct. The main chemical component of press mud is CaO. Sugarcane press mud can be used as filler component in bricks.

1.1 STP Sludge

Now a day, disposal of sewage has become a necessity for societies. The construction of treatment plants has caused problems with huge content of dry sludge. It has been found that each person produces 35 to 85 grams of solid sludge per day. In recent years, waste production has increased tremendously in developing nations such as India.

There are two methods to solve the problem such as disposal of solid waste including land filling and using dry sludge as fertilizers. But by both these methods some harmful material remains in sludge which can cause some harm to environment including land, air and water. In the sense grit sludge may be generated in a grit channel or chamber. Grit particles are removed because they could damage the pumps and other equipment. Table 1 shows composition of STP sludge.

Table 1: Composition of STP Sludge.

Elements	%
SiO_2	43.12
Fe_2O_3	5.26

Al_2O_3	15.97
CaO	5.56
MgO	0.85
Na_2O	0.5

2. OBJECTIVES

- The Conservation of natural resources.
- To give better environment to the town and people.
- Economical design and light weight product.
- Reduce in construction cost and to maintain economy.
- To achieve the strength in brick and investigation for checking the feasibility.
- To examine the effect of dry sludge in brick properties.
- Reduce pollution.

3. LITERATURE REVIEW

- The STP Sludge can be used for the manufacturing of brick as a strong material and very cost effective. Also, the Type-A brick in this project investigation may prove economical and strength. Also, the water absorption for this brick is in range of 14 to 15% that means it follow the condition for the requirement of first-class brick. Also, if use of this brick can make design easy and dead load which comes on structure can be controlled at some level.
- The maximum percentages of dry sludge and sludge ash that could be mixed with clay for brick making are 40% and 50% by weight, respectively. Beyond that, bonding of the mixture is poor and extrusion of the bricks results in overuse of the products. The large amount of organic matter present in the sludge results in high shrinkage of the bricks during firing. The texture and finishing on the surface of the bricks made from the mixtures of clay and sludge are rather poor, and they may not be acceptable for use of facing brick.
- Specific gravity of the bricks decreases as the percentage of STP sludge increases. For the sludge ash bricks, the specific gravity of the bricks increases slightly as the percentage of sludge ash increases. Water absorption of the bricks increases as the percentage of dried sludge increases. This indicates that durability of the bricks would be lower if higher percentages of sludge are used. Bricks made with sludge ash have lower water absorption rate than those with dried sludge. This indicates that bricks made with sludge ash would probably have a better durability than those made with dried sludge.

4. METHODOLOGY

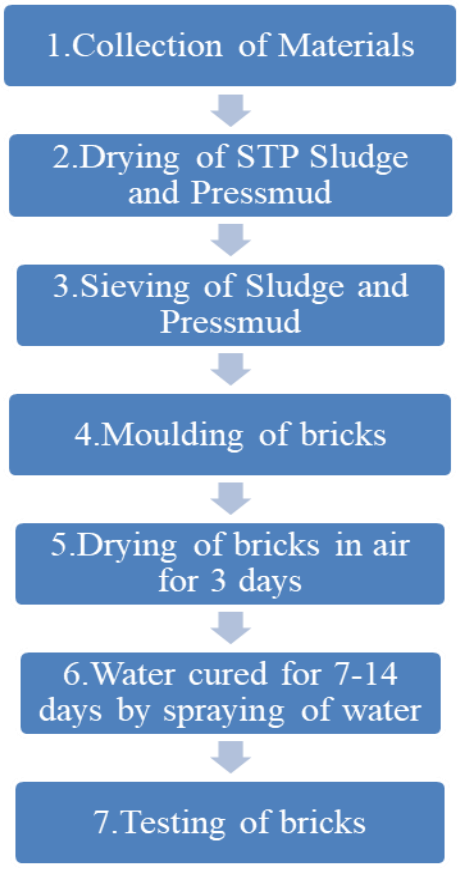

Fig. 1: Methodology

The methodology of this paper is represented in Figure 1.
Preparation of clay is as follows

- Molding
- Drying
- Burning.

4.1 Preparation of clay with sugarcane press mud

The earth for block is set up in the accompanying request.

- Un-ruining: In this process the top layer of the mud which is of 200mm from inside and outside is taken out and scraped. The mud which is in the top layer soil is contaminated with pollutions and thus it is not taken to manufacture bricks. This clay is later on mixed with sugarcane press mud to increase the strength of bricks.
- Burrowing: In this mud is taken out from the beginning. The mud is spread on the ground which is levelled, which is deeper than the general level. The height of stacks of mud is around 600mm to 1200mm.
- Cleaning: In this process the mud that we got in the burrowing need to be cleaned of stones, rocks, vegetable. If that these particles are in more, the mud needs to be washed and screened.
- Weathering: The mud is then kept in the air for softening. This period of this process takes approximately two to three weeks.
- Mixing: In the mixing process the mud is made free. The mixing gives amicable combining. It is completed by taking small amount of clay every time and turning it up and down in a vertical way. The mixing makes mud to fit for the following phase of hardening.
- Tempering: In this process after adding the water and clay it is kept for several days with disturbing. Here the mud is passed to an appropriate level of hardness and it is made done for the next operation of trim. In a pug process fit for hardening adequate amount of clay are around 15000 to 20000 bricks.

In a pug process there is a funnel shaped iron tub which is having cover. The base is made of timber, which is made by using two wooden planks. The breadth of the tube at the base is of 800mm and that at the top is of 1m. There is an arrangement is made so that the mud can be put in the tub.

A vertical shaft is made at the focal point of the tube. A little alarm made with steel is kept at the lower part. A slope is provided to gather the pugged mud. When the mud has been gathered in adequate amount, the gap at the base of the tube is opened and pugged mud is taken out. This is then continued in which moving and nourishing of mud is done and removing the pugged mud from the bottom is done. When the hardening is done the block, which will be having 3mm width is moved.

4.2 Molding

The molding is done by two methods:

- Hand Molding
- Machine Molding

4.2.1 Hand molding: In this the bricks are made by hand i.e. physically. The molds are in rectangular shape which is open at top and bottom. They can be made from wood or steel. If it is made from wood then well-seasoned wood is used. A margin is provided to the molds in the form of handles to the extended part. This mold which is of metal or steel is now settled on the edges of wooden molds to make them more durable. The thickness of steel mold is 6mm.They is utilized for assembling bricks on a large scale. The steel molds are stronger than wooden.

Then the bricks are kept for drying and burning. The bricks arranged by hand are of two kinds: Ground molded and Table molded
Ground molded bricks: Here the ground is 1stly levelled and some amount of fine sand is sprinkled over it. The shape or mold deepen in water and then kept on the ground. Then adequate amount of mud is taken and dashed in the mold. The mud is squeezed properly so that it can fulfill each on every corner of the mold. The extra mud is taken out by using wooden hit or a wire. The form is then lifted up so the brick will be in the ground. The shape is kept in water and it is set simply close to the past block to set up another brick. The procedure is done continuously until the ground is filled with crude bricks. A frog is the mark of depth around 10mm to 20mm which is put on crude block molding. It fills two needs.
1. It indicates the trade name of the manufacturer
2. In brick work, the bricks are laid with frog uppermost. Thus, affords a key for mortar when the next brick is placed over it.

The bricks which are of better quality and having frogs on their surface are utilizes by wooden surface or sheets. A bed is made up of thin wood. The piece is greater than the shape and it has a projection of around 6mm height on its surface. The wooden shape is called trim. It is dipped in water and kept on the ground. After that the up is smashed in shape forcefully is so that every corner is fulfilled. And then it is passed on the bed for drying. It is dried by the longest side.

4.3 Drying

If the moist bricks are kept for burning as is it they will definitely break. So that drying is very important. For the drying process a stack is made of 12 to 12 layers of bricks and the bricks are kept longitudinally. The bricks are laid along and over the stock in substitute layers. Every one of the bricks is put on edges. The bricks kept for sun drying until it becomes hard and the dampness percentage is 2%.

4.4 Burning

Bricks are kept at high temperature so that the strength, capacity n reddish brown color is got. The temperature is kept of 1100 degree so that all the water is evacuated bringing about the hard and thick mass. Bricks are not consumed over this temperature since it will bring about the softening of the bricks and will bring about a twisted shape and a hard mass when cooled which won't be workable while brickwork. Bricks can be singed utilizing the accompanying strategies:
(a) Clamp Burning
(b) Kiln Burning

4.4.1 Clamp Burning: The clip is transitory structure which is made up on the ground and having a height of 6 feet. The structure is made temporary. Here 2000 to 10000 bricks can be burnt. Here low grass, cow dung, litter is used as fuel. The initial cost of the structure is very low as there is no structure is built. Here no supervision is needed. And about 60% of bricks are burnt in good quality. The clamp burning takes about 2 to 6 months for burning and cooling.

5. CONCLUSIONS

STP Sludge can be used as a replacement material as it is having similar properties like cement. The behavior properties of sludge are like cement the coz of this is it is having magnesium n silica. So this can be used as a partial replacement to cement. As it is having properties like MG n silica it can be use in the manufacturing of bricks. As we know this STP sludge is a waste material and it causing pollution to the land, so according to this study the pollution can be reducesed.This theory is on using STP sludge and sugarcane press mud in the manufacturing of brick sand test are done on them. Different set of mixing proportion of the material were manufactured which were experimented for different no. of days, samples are utilized for the examination of the various properties of the bricks.

6. REFERENCES

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