

# Review Paper on Use of STP Sludge as a Construction Material

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**Abstract-** Human activities on earth produce considerable quantities of waste, which increases due to rise in population. That is more than 2700 million tons per year, including industrial and agricultural waste from rural and urban societies. Now a day, Brick is one of the most important masonry unit as a building material due to its properties. Many attempts have been made to incorporate wastes into the production of bricks. In this paper we experimentally describe the recycling of the waste products like STP Sludge by incorporating it into bricks. It is a practical solution for problems like cost expenditure on waste management and its effect on environment. The STP sludge and Fly ash is extremely close to brick clay in chemical composition. The sewage treatment process generates a sludge that must be disposed-off in an environmentally sound manner. The sludge generated in most of the treatment systems around the world is discharged into the nearest watercourse. Among all disposal options, the use of sludge in producing constructional elements is considered to be the most economic and environmentally sound option. This paper reviews the recycle of sewage treatment plant sludge and Fly ash against fired clay bricks. Bricks so formed have adequate crushing strength, hardness and water absorption. So, it could be a potential substitute for clay bricks.

**Keywords—** Waste Sludge, Reuse, Brick Manufacturing,

## I. INTRODUCTION

The sewage treatment process generates a sludge that must be disposed-off in an environmentally sound manner. The sludge generated in most of the treatment systems around the world is discharged into the nearest watercourse. Among all disposal options, the use of sludge in producing constructional elements is considered to be the most economic and environmentally sound option. This paper reviews the recycle of sewage treatment plant sludge and Fly ash against fired clay bricks. Bricks so formed have adequate crushing strength, hardness and water absorption.

## II. RELEVANCE / MOTIVATION

The treatment and disposal of sewage sludge is an expensive and environmentally sensitive problem. It is also a growing problem world-wide since sludge production will continue to increase as new sewage treatment works are built and environmental quality standards become more stringent. With some traditional disposal routes coming under pressure, and others such as sea disposal having been phased out, the challenge facing sludge managers is to find cost-effective and innovative solutions whilst responding to environmental, regulatory and public pressures. Recycling and use of wastes are the preferred options for sustainable development, rather than incineration or land filling.

This study is undertaken to find that weather sludge can be used as a construction material so that it will be one method to dispose waste water sludge. Therefore it is decided to focus in this particular topic.

## III. LITERATURE REVIEW

Utilization of industrial waste in construction material In the present age the waste generated from industries is the huge concern for the environment, health, and cause for land filling. Recycling of such wastes and using them in construction materials appears to be viable solution not only to the pollution problem but also an economical option in construction. In view of utilization of industrial waste in construction material, the present paper reviews various waste materials at different levels in construction material. Compressive strength of concrete and mortar incorporating different waste materials is reviewed and recommendations are suggested at the outcome of the study. The reviewed approach for development of new construction material using industrial waste is useful to provide a potential sustainable source. (Agrawal, et.al, 2014)

### *Disposal problems can be drastically reduced*

A rapid increase in the number of mineral water plants is an indicator of increased public awareness on importance of consuming safe drinking water. Increased environmental awareness among people exerts high pressure on water production industry for safe disposal of residues generated in water treatment plants. The sludge disposed

during the various water treatment processes can be a major concern for water treatment plants. Most of the water treatment plants discharges the sludge in to the rivers or as land fill with no treatment .The discharging of sludge in to water body leads to accumulative rise of aluminum concentrations in water, aquatic organisms, and human bodies. There is an increasing interest in disposal by Sludge is an inevitable by-product of wastewater treatment. The disposal problems can be drastically reduced if sludge can be recycled into building and construction materials. This paper reports the use of sludge as new and non-conventional construction materials as an alternative means of sludge disposal. Sludge percentage is varied from zero to thirty percentages by weight. Parameters such as compressive strength and water absorption are studied as per BIS (Bureau of Indian Standards) procedure. Water treatment plant sludge up to 15 % can be added to get the higher compressive strength of 8.30N/mm<sup>2</sup>. (Shoba 2015)

#### ***Sewage sludge in the production of roof tiles***

The present study verifies the possibility of incorporating sewage sludge in the production of ceramic mass for ceramic roof tiles. Domestic sewage sludge and clay from ceramic industries of the northeast region of Brazil were used. The raw materials were chemically and mineralogical characterized. Seven hundred and fifty tiles were manufactured using different concentrations of sludge (2%, 4%, 6%, 8% and 10% of sludge dry mass). The high amount of organic material (71%) from the sludge shows itself as being main factor on affecting the quality of roof tiles. The increased dosage of sludge implies a linear tendency of increased absorption and decreased load rupture on flexion. Results have shown the possibility of using nearly 4% of sludge (dry matter) on ceramic mass to manufacture roof tiles with no interference in its final product properties, in compliance with current international standards.(Ingunza, et.al, 2015)

#### ***Disposal of human sewage***

Disposal of human sewage has become a necessity for societies, today. The construction of treatment plants has caused problems with huge contents of dry sludge. It has been found that each person produce 35 to 85 grams of solid sludge per day. In recent years, waste production has increased dramatically in developing nations such as Iran. There are two methods for the disposal of solid waste (dry sludge) including land filling and using the sludge as fertilizer. Both of these methods have been prohibited by Iran's Environmental Organization, due to the dangers of heavy metals present in the sludge. Due to these limitations, high volumes of dry sludge have been produced and

collected in treatment plants. Alborz sewer treatment plant is an industrial-domestic unit which collects sewage of more than 500 factories. The production of dry sludge is about 2.5 to 3 tons a day in this treatment plant. In the present research, the dry sludge of Alborz treatment plant was used as filler in concrete. Worldwide, a great deal of research has been carried out to use dry sludge in concrete mixture. In this research, the dry sludge of a sewage treatment plant was characterized, and its effects on the performance of concrete were evaluated.

To evaluate the effects of dry sludge on concrete performance, its physical and mechanical properties were studied. Thereafter, concrete specimens were produced with water to cement ratios of 0.45 and 0.55, and with sludge contents of 0, 5, 10, 20 and 30 percent. Finally, compressive strength of the specimens was measured. (Jamshidi, et.al, 2011)

#### ***Dry sludge as an additive***

This paper evaluates the use of dry sludge as an additive in construction material like concrete and cement brick. For which it must be guaranteed that the resulting concrete and mortar has the appropriate compressive strength. In earlier work in the subject it was shown that the addition of sludge reduces compressive strength of concrete. In which for 6% maximum strength is achieved, making it suitable for light reinforced concrete in small scale. We subjected the concrete specimens to different additions of sludge in percentage as replacement of natural sand in order to evaluate the compressive strength and compare them with the reference concrete (not containing sludge) in the review of utilization of that waste, this paper reviews various proportion of sludge usage in bricks. Thus compressive strength of brick is calculated and compared with the standard 1:4 proportion cement brick. This review is an approach on whether bricks made from waste are useful to provide sustainable solution. (Josh, et.al, 2016)

#### ***Partial substitute***

The present study investigates the possibility of using water treatment plant (WTP) sludge of New Assiut city (Assiut- Egypt) 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. The produced brick samples after drying process and firing at 1000 OC for 6 hr.,s , 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. The test results indicate that, the sludge ash proportions are one of the most important key factors determining the brick 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.(Mageed et.al, 2011)

***It is a practical solution for problems like cost expenditure on waste management***

Brick is one of the most important masonry unit as a building material due to its properties. Many attempts have been made to incorporate wastes into the production of bricks. In this paper we experimentally describe the recycling of the waste products like STP Sludge and Fly ash by incorporating them into bricks. It is a practical solution for problems like cost expenditure on waste management and its effect on environment. The STP sludge and Fly ash is extremely close to brick clay in chemical composition so, it could be a potential substitute for clay bricks. The sewage treatment process generates a sludge that must be disposed-off in an environmentally sound manner. The sludge generated in most of the treatment systems around the world is discharged into the nearest watercourse. Among all disposal options, the use of sludge in producing constructional elements is considered to be the most economic and environmentally sound option. This paper reviews the recycle of sewage treatment plant sludge and Fly ash against fired clay bricks. (Yadav and Agnihotri, 2014)

**IV. PROPOSED WORK**

***a. Objective***

1. To study the properties of STP sludge as a construction material.
2. To design the brick, concrete block and paving blocks with varying proportion.
3. To compare conventional and STP added products economically.
4. To check the strength of STP added products and comparison with conventional products.
5. Suggestive recommendations will be made on use of STP sludge as a construction material on basis of above results.

***b. Research Methodology***

For this dissertation work it is proposed to carry out the work in the following phases.

1. Initially relevant literature study will be done.
2. Sludge sample taken from domestic sewage water treatment plant and its Properties will be test.
3. Following construction materials will be manufactured using sludge

1. Concrete blocks

2. Bricks

3. Paving block

4. Standard tests as per IS Specification will be conducted on bricks.

***c. Expected Outcome***

This project study will be helpful in the Conservation of natural resources as well as it will create better way to dispose of the waste water sludge. After experimental work, suggestions and recommendations will be made on use of STP sludge as a construction material

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