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MANUFACTURING OF BRICKS FROM EFFLUENT SLUDGE AND FLY ASH

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ABSTRACT:
The disposal of effluent waste is the major problem in treatment plants as it causes many harmful effects to the environment. Sludge is the main product from effluent waste. Conventional brick is mostly prepared by using clay. Chemical composition of sludge is nearly similar to the clay. Hence sludge can be used as a replacement for clay, soil in manufacturing of bricks.

1. Introduction

Brick is one of the most important construction elements. The history of brick manufacturing goes back 8000 years when the fabrication of the earliest sun dried clay bricks was discovered. Sludge generated at effluent treatment plants should be treated and handled in an environmentally sound manner. Coagulant sludge is generated by effluent treatment plants, which use metal salts such as aluminum sulfate (alum) or ferric chloride as a coagulant to remove turbidity. The traditional practice of discharging the sludge directly into a nearby stream is becoming less acceptable because these discharges can violate the allowable stream standards. The discharging of sludge into water body leads to accumulative rise of aluminum concentrations in water, aquatic organisms, and, consequently, in human bodies. Some researchers have linked aluminum's contributory influence to occurrence of Alzheimer's disease, children mental retardation, and the common effects of heavy metals accumulation . It is recognized that the disposal of aluminum-laden solids from water treatment plants will receive a closer scrutiny in the coming years.

The disposal of effluent wastes comprises as one of the major worldwide environmental problems as these wastes render the environment unfriendly. The growing demand for waste utilization has made solid wastes like sludge and demolition waste an essential composition of this study. The possibility of reduction of the production costs provides a strong logic for use of this waste.

Generally sludge, bio degradable materials are dumped in the land, and they decompose over the period of time. This study involves the usage of sludge, construction and demolition waste as an essential ingredient. The sludge was checked for its physical characterization such as bulk density, compressive strength and chemical properties such as water absorption percentage, presence of toxic metals such as Pb, Zn, Cu and Fe for the commercial purpose.

1.1 Problem Statement-

- Now a day, disposal of effluent has become a necessity for societies. The construction of treatment plants has caused problems with huge content of dry sludge. In recent years, waste production has increased dramatically in developing nations such as India.
- There are two methods to solve the problem such as disposal of solid waste (dry sludge) including land filling and using dry sludge as fertilizers. 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.

1.2 Objectives:

- To suggest alternative to conventional brick.
- To design light weight brick.
- To achieve strength and feasibility.
- To examine the effect of dry sludge in brick properties.
- To find the suitable mix proportions.

2. Materials collection , Mix design:

- Collection of materials:-
  - Collection of sludge, fly ash, cement, M.sand & water etc.
- Test on materials:-
  - Test on sludge: specific gravity of sludge.
- Mix design of bricks:-

  Percentage of sludge, soil, fly ash, sand ,water is decided.

Table -1 Mix design

Sludge	Fly Ash	M.Sand	cement	water
%	%	%	%	
0	50	30	20	As per Requirement
10	40	30	20	
20	30	30	20	
30	20	30	20	
40	10	30	20	
50	0	30	20	

- **Manufacturing of bricks**
  - Weight batching
  - Mixing of material

- Casting of bricks
- Placing of bricks

3. Results and Discussions Testing of bricks

- Compressive strength test.
- Water absorption test.
- Efflorescence test.
- Size, shape and color test.
- Soundness test.
- Hardness test.

1. Compressive strength.

Sample no.	% of sludge	Compressive Strength (KN)	Compressive Strength (N/mm^2)
1	0	55	2.4
2	10%	52	2.2
3	20%	52	2.2
4	30%	50.4	2.2
5	40%	38	1.6
6	50%	29	1.2

2.Water absorption Test:

No. Of Bricks	% of sludge	Weight before Test (Kg)	Weight after Test(kg)	% of Water Absorption
1	0	2.74	3.12	13.9
2	10	2.76	3.09	12.0
3	20	2.85	3.14	10.2
4	30	2.52	3.38	34.1
5	40	2.51	3.07	22.3
6	50	2.73	3.12	14.3

3. Efflorescence test- No efflorescence

4. **Size, shape and color test**- Results are within limits
5. **Soundness test**-The bricks not broken and a clear ringing sound is produced.
6. **Hardness test** - sufficiently hard.
7. **Bricks with more percentage** of sludge has
8. lower compressive strength than low
9. percentage of sludge
10. **Cost of bricks** with higher percentage of sludge is lower than cost of higher percentage of fly ash.
11. **Weight of higher percentage** - sludge bricks is comparatively higher than lower percentage sludge bricks.

4. Conclusion:

[1]. The compressive strength of the brick with upto 30% is same value as compared to the 40 and 50% of sludge waste.

[2]. In water absorption test the absorption of water percentage is decreased in 40 and 50% of sludge waste.

[3]. Cost of the sludge waste bricks is less compared to the fly ash brick.

[4]. Hence this waste replacement instead of fly ash is cost wise effective and also reduce the environmental degradation.