

COMPARITIVE REVIEW ON FLY-ASH BRICKS AND NORMAL CLAY BRICKS ON THE BASIS OF ENVIRONMENTAL ASSESSMENT

¹ASHUTOSH, ²Y.K.KUSHWAHA (Assistant Professor)

CIVIL ENGINEERING DEPARTMENT

VAUGH INSTITUTE OF AGRICULTURE ENGINEERING AND TECHNOLOGY, SHUATS, PRAYAGRAJ

Abstract- Earlier bricks were constructed using mud or clay-bearing earth and dried in sunlight in order to harden it. As time passed by no more drying of bricks in sunlight was performed but a replacement i.e. kiln came into use. Kilns consuming coal, saw dust were used to dry bricks. This process of manufacturing results in large amount of carbon emissions and depletion of top soil rich in fertility. Some of the major pollutants released in the manufacturing process of clay bricks are carbon dioxide, carbon monoxide, nitrogen oxide, fluorides and particulate matters etc. The size of particulate matters is less than 10 microns and complex in mixture of different organic and inorganic substances which are harmful to human health. Dust released is in large quantity. The land where brick kilns are constructed gets degraded and abandoned afterwards. Soil rich in fertility is lost. The area covered for brick is large. In case of fly-ash bricks, the main ingredient i.e. fly-ash is one of the naturally occurring by products from the coal combustion process and is nearly same as volcanic ash. As fly-ash itself is a waste, the use of waste product for some meaningful purpose helps in waste management. Dumping land area gets reduced; pollution is checked and thus is eco-friendly. To avoid environmental threats brick made of industrial waste that is fly-ash from the waste as a residue from the different industries and factories, this types of bricks is termed as fly ash bricks which is composed by the different materials such as lime, In this report author will focus on the replacement of fly ash bricks in place of clay bricks as construction material focusing on environmental aspects.

Keywords— Fly-ash bricks, land degradation, soil fertility, soil erosion

I. INTRODUCTION

Fly-ash bricks are manufactured using major content of fly-ash generated as thermal power plant waste. Other raw materials used are lime, gypsum. Fly-ash bricks manufacturing comes under solid waste management and reuse system. It consists of mostly of silicon dioxide, aluminium oxide and iron oxide.

The earliest bricks were dried bricks which were formed from clay-bearing earth or mud and dried (usually in the sun) until they were strong enough for use. But as times passed, the process of production of these bricks have transformed to a great extent. The bricks are no more dried in sun but in kilns which can be coal fired kiln, saw dust fired kiln etc. This manufacturing process results in carbon emissions and depletion of top soil. The removal of topsoil has direct impact on agricultural crop production via reduced fertility status of soil.

MATERIALS AND METHODOLOGY

FLY-ASH BRICKS

Fly Ash Bricks are manufactured using Major percentage of fly ash generated from Thermal Power stations. Other raw materials used along with Fly Ash are lime and gypsum.

Fly ash is a fine, glass-like powder recovered from coal-fired electric power generation. They consist mostly of silicon dioxide (SiO₂), aluminum oxide (Al₂O₃) and iron oxide (Fe₂O₃).

PRODUCTS AND ITS APPLICATION

Fly ash lime bricks are chemically bonded bricks manufactured by utilizing 80- 82% of fly-ash, which is a major waste by-product of pulverized coal fired in Thermal Power Stations, 9-10% of lime, 9-10% of sand and accelerator. The process know-how has been developed by Central Fuel Research Institute.

FINAL PRODUCT GENERATED

Process of manufacture of Fly ash bricks involve the following stages of operations.

1. Lime and gypsum are grounded in pan mixer with optimum water.
2. Sand and fly ash are added to the pan mixer
3. Water is again added to the pan mixer once the uniform dry mixture of fly ash, sand and cement is achieved.
4. Moulding machinery- fly ash mixture is either hydraulically pressed or compacted through vibratory press.
5. The bricks are taken out of mould.
6. Shaping of bricks in the press.

- 7. The bricks are air dried for about 1-2 days.
- 8. Water curing is done for around 14 days for strength to be achieved.
- 9. Sorting, inspection and quality control tests prior to sale.



MIXER



Fly-ash brick making machine

DISPOSAL/ REUSE OF THE BY PRODUCT GENERATED

The fly ash and gypsum wasted during the production of fly-ash bricks can be reused.

LIST OF MACHINERY REQUIRED:

1. Skip hoist including feed hopper.
2. U-Shaped mixer/double-shaft mixer/ counter-current mixer.
3. Belt conveyor
4. Press feed hopper with vibrator
5. Rotary table press.
6. Transfer & Curing cars.
7. Curing chamber/autoclave
8. Boiler, capacity 500 Kg
9. Pollution control equipment.
10. Weighing balance & testing equipment's.

CLAY BRICKS

Kiln Construction in India

Kiln is the most important part of brick manufacturing process and it is the place where bricks are burnt in large in permanent structures. In fixed chimney, the green bricks are burnt to make solid final product with very little change in the shape. The industry needs environmentally sound technologies for firing bricks, which primarily concern about local environment and at the same time which enhance energy efficiency and reduce GHG emissions. Local environmental concerns have led to the formulation of emission standards for brick kilns that were announced by the Government of India in April, 1996, the emission standards specify the permissible limits for suspended particulate matter in flue gases from brick kilns.



Process of clay brick manufacturing

Result and discussion

Comparison between fly-ash bricks and clay bricks is done on the basis of environmental effects arising in the manufacturing process and the health issues arising afterwards.

NORMAL CLAY BRICK	FLY-ASH BRICK
Waste generated requires land for disposal	Waste generated is reused again
Requires fertile clay soil for manufacturing process	Generated from waste released from thermal power plant
Soil degradation and soil erosion due to excessive exploitation of top soil	No effect on soil as there is no exploitation of soil cover
Costly in construction of rigid pavement at a far distance from its production	Fly-ash bricks can be economically used in construction of rigid pavements at far off distances.
No principle of reuse	Based on the principle of reuse
No focus on solid waste management	Focuses on solid waste management

NORMAL CLAY BRICK	FLY-ASH BRICK
Health issues like musculoskeleton disorder to the workers while performing hand moulding	No such issue
Direct contact with heat as process of manufacturing is generally hand-made	Machinery work is performed so less contact with materials.
Huge amount of dust released which cover the leaves of nearby crops restricting their photosynthesis process	Dust release is very less in quantity
Time taking procedure. Nearly takes 4-5 days	Fast process. Time taken is 5-6 hrs.
High amount of fuel consumption generally coal based fire kilns.	No such consumptions of fuel
Large amount of heat is generated at the time of hardening	No need of heat for hardening process
time of hardening process	

CONCLUSION

Manufacturing of brick leads to environmental degradation due to the emission of significant quantities of particulates and gaseous pollutants. It is clearly visible that brick kilns operation emit large quantities of air pollutants. The level of different air pollutants (gaseous and dust) in the ambient air is higher during the operation of brick kilns for burning bricks.

Fly-ash used as wasted product and environment is directly protected by reducing solid waste disposal. Being a sustainable and renewable substance fly-ash can lead to limiting in land degradation. Utilization of fly-ash in brick manufacturing through cost effective technology will save the fertile top soil required for agricultural production. Thus it is the best way of solid waste management and reuse method which decreases landfill problems.

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BIOGRAPHY



ASHUTOSH

B.tech from AKTU

B.Tech project on Estimation and Costing

M. Tech Transportation Engineering from SHUATS