



Case Studies on Cleaner Brick Production

Case Study No.4

Utilisation of Flyash in Clay Fired Brick Making

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1 Introduction

1.1 Background

In several of the developing countries, fired-clay bricks are the prevalent building materials and are still produced through traditional technologies and practices. Some of these practices have adverse impacts on the environment. Various studies have established that improvements in technology and practices can reduce fuel consumption and pollutants emissions (including black carbon) significantly. Climate and Clean Air Coalition (CCAC) is a collective effort of governments of some of the countries along with United Nations Environment Programme (UNEP) towards mitigation of the impacts of short-lived climate pollutants and address the climate change. The CCAC Brick Production Initiative is aimed at substantial mitigation of emissions of black carbon and other pollutants from brick kilns through employing a range of technology and policy approaches. International Centre for Integrated Mountain Development (ICIMOD), is coordinating CCAC-BPI activities in South Asia.

The reduction in emissions can be achieved through shifting to efficient brick kiln technologies as well as through production of resource efficient products such as perforated/hollow bricks or flyash-clay bricks (utilizing flyash, an industrial waste, in brick making). The objective of these case studies is to showcase the examples of brick manufacturing enterprises who have adopted these measures to improve efficiency and reduce emissions. In this endeavour, case studies on four brick manufacturing enterprises operating in South Asia region have been developed. These case studies are focused on:

1. Production of perforated bricks;
2. Production of bricks through Natural Draft Zigzag Kiln;
3. Production of bricks through Hybrid Hoffman Kiln (HHK);
4. Utilisation of flyash in brick making.

This case study is focused on an enterprise that is utilizing flyash in brick making.

1.2 Introduction to Flyash-Clay fired bricks

Flyash-clay fired bricks are fired clay bricks in which flyash is mixed with clay in appropriate proportions to reduce the consumption of clay and utilize flyash which is an industrial waste generated from thermal power plants. The proportion in which flyash can be mixed with clay depends upon the properties of clay. The amount of flyash that is usually mixed with clay, depends primarily on the properties of the clays and usually varies from 5-15 % (north India region) to 50-60% (central India region around Nagpur).

The advantages of mixing flyash with clay for brick making are:

- Reduced clay consumption and in turn, reduced impact on natural clay resources;
- Utilisation of industrial waste, like flyash, which is generated in huge quantities from the thermal power plants;
- Reduced fuel consumption as fuel is only consumed in firing of clay (vitrification of clay), and some heat provided by the carbon present in the flyash.



Figure 1: A lot of flyash-clay bricks stacked after firing (finished product)

1.3 Brief description of the enterprise

Name of the company/enterprise	Harpreet Bricks Company
Location	Yamunanagar, Haryana, India
Name of the owner	Mr. Harpreet Singh
Type of products	Solid flyash-clay fired bricks
Source of flyash	Deenbandhu Chhotu Ram Thermal Power Plant, Yamunanagar, Haryana
Type of kiln technology	Fixed Chimney Bull's Trench kiln (FCBTK)
Type of fuel used	US Coal

Operational season	~ 6 months
Total annual production	7 million bricks
Method of production of flyash-clay bricks	Mixing of flyash with clay through mixer; manual moulding; drying in Sun; and firing in FCBTK

2 Production process

The schematic of production process being practiced at the manufacturing plant of Harpreet Bricks Company is shown in the picture below:

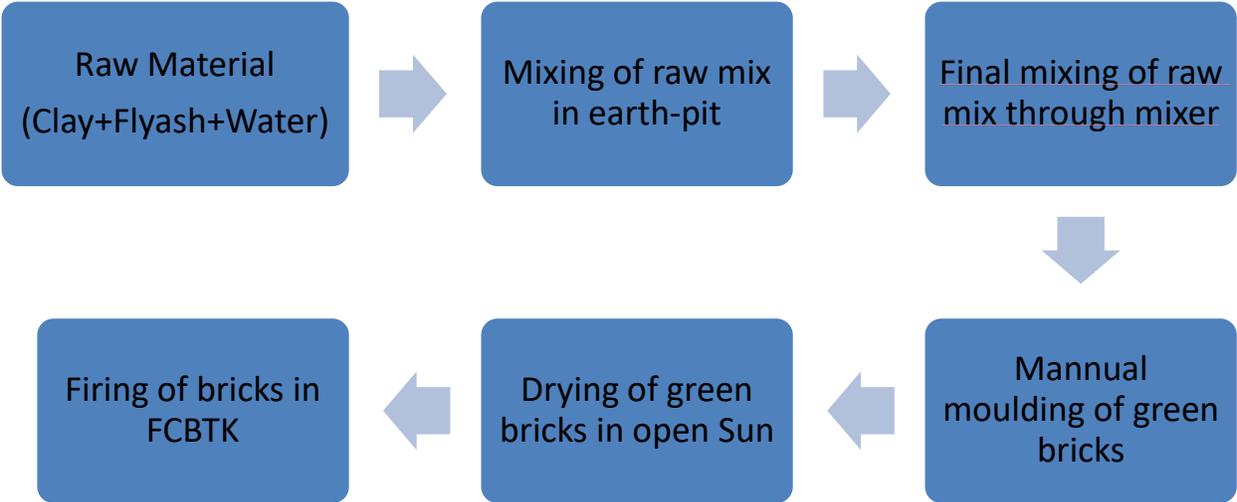


Figure 2: Schematic of production process at the manufacturing plant of Harpreet Bricks Company

The critical part in the utilization of flyash in brick making is the preparation of raw mix which requires homogeneous mixing of flyash with clay in appropriate proportion. The steps involved in the preparation of raw mix and moulding of green bricks being practiced at the manufacturing plant along with the photographs is described below:

<p>The raw materials (clay, flyash and water) are poured into the earth-pit in appropriate proportions with the help of tractor trolleys.</p>	
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Initial mixing of the raw materials in the earth-pit is done through a JCB.



The final mixing of raw materials to get a homogeneous raw-mix is done through a tractor mounted mobile mixer. Raw materials from the earth pit is poured into the mixer from the open top, using a JCB. The raw-mix from the mixer is discharged into a tractor trolley which is used for transporting the raw-mix to the moulding area.



The tractor trolley unloads the raw-mix at the moulding area.



The green bricks are moulded manually and are dried in open Sun as in the case traditional brick making process.



Cost of the equipment being used for preparation of raw-mix:

- Cost of mobile mixer – INR 200,000 (~ US\$ 3,000)
- Cost of tractor – INR 400,000 to 500,000 (~ US\$ 6,000 -7,000)
- Cost of JCB – INR 1.5 – 1.8 million (~ US\$ 20,000 -25,000)

If JCB and tractors are already being used in a kiln for clay preparation, then only the investment for mixer would be an additional investment in order to utilize flyash in brick making.

3 Main Features and Benefits of the product (Flyash-clay fired brick)

Main features:	
Photograph of the product	
Size of the bricks	230 x 100 x 75 mm
Proportion of flyash mixed with clay	~ 8% by volume
Weight of green bricks	3.4 kg

Weight of fired bricks	2.8-2.9 kg
Cost of flyash ¹ including the cost incurred in mixing process	INR 300 per 1000 bricks
Cost of clay	INR 400-500 per 1000 bricks
Cost of fuel	INR 1200 per 1000 bricks
Selling price of bricks	INR 4000-4200 per 1000 bricks
Advantages:	
Reduction in clay consumption	~ 8 %
Reduction in fuel consumption in firing	5-10 %

4 Conclusions

- Utilisation of flyash in brick making results in reduction in clay consumption as well as reduction in fuel consumption; hence helps in reducing impacts on natural resources.
- This plant has employed a very basic and low cost mixing equipment. There are examples where higher capacity and advanced mixers are also being used depending upon the production capacity and the proportion in flyash can be mixed with the clay.

¹ Flyash is provided by thermal power plant free of cost for brick making, however cost is incurred in transportation of flyash from power plants to the kiln site.