Building a model Vertical Shaft Brick Kiln (VSBK) at Village Baidyapur, Nadia, West Bengal

1. TITLE OF THE PROJECT:

Building a model Vertical Shaft Brick Kiln (VSBK) at village Baidyapur, Nadia, West Bengal for the economical, energy efficient and environment friendly manufacture of bricks.

2. Duration:

3 July 2006 to July 2008

3. EQUIPMENTS ACQUIRED IF ANY:

a. Civil structure of VSBK 1 no.
b. Unloading trolleys 4 nos.
c. Unloading screws 2 nos.
d. MS staircase 1 no.
e. 10 hole digital temperature scanner 1 no.
f. Water storage and distribution 1 set
g. MI thermocouples 4 nos.

4. SUMMARY OF PROGRESS MADE:

The major achievements of the project can be grouped into the following categories:

1. Infrastructural achievements

- Construction and operation of a 2 shaft VSBK; green brick mixing and moulding equipment
- Various infrastructural materials and kiln performance monitoring equipments

2. Technical achievements

2a. Product quality

It was commonly believed by local experienced brick makers and brick firing experts that a short cycle firing e.g. VSBK is not suitable for Indo Gangetic soils and that proper quality cannot be achieved as compared to fixed chimney firing. The quality monitoring results have proven that in a short cycle firing e.g. VSBK, even better product quality in terms of strength and water absorption can be achieved. The only negative part was the achievement of the dark cherry red colour as obtained in fixed chimney.

Product quality in VSBK

2b. Energy consumption

Consistent operation of VSBK has shown a reduction of external fuel consumption i.e. coal (Ranigunj variety Grade F) by more than 50-70% through use of carbonaceous waste materials as internal fuel

2c. Waste material utilization

In VSBK firing system, carbonaceous waste materials (sponge iron waste – dolochar) have been successfully used as an internal fuel between 5-7% by weight. Compressive strength measurements have shown that use of internal fuel does not affect the fired brick quality in any way. However the processing of the soil has to be improved compared to the conventional manual mixing process usually followed in Indian brick industry.

2d. Economic feasibility

The detailed project analysis shows a production cost of Rs. 1300-1700 per 1000 bricks. The prevalent average selling price in and around project area is around Rs. 3500-4500 per 1000 bricks. Thus the VSBK project has a payback period between 2-3 years for a 250 days working period.

3. Social achievements

- Formation of 3 Self Help Groups for operation of brick production through VSBK technology
- On-the-job training and capacity building of local ST population for energy efficient brick production
- Initiated savings scheme through earnings from VSBK
- Formation of children groups for productive use

1. INTRODUCTION

Red bricks are and will be the dominant building materials for construction in decades to come. This is particularly true for developing countries with large natural resource reserves of soil e.g. India, Afghanistan, Sri Lanka, Nepal and Bangladesh. Despite the advent of alternate building materials, the demand for red burnt bricks will always be on the rise. This is true for India also particularly the Indo-Gangetic plains especially West Bengal. It is estimated that in West Bengal urban population and urban income are expected to grow exponentially over the next decades. With an increased country emphasis on quality infrastructure and "shelter for all" this will trigger a growth in housing leading to a high demand of bricks. The Indian brick industry is huge. With approximately 1,20,000 registered units and an equal number of unregistered ones, Indian brick industry produces approximately 160 billion bricks per year generating revenues of approximately 5.1 billion USD. The industry employs more than 8 million workers directly and an equal number depends on the same indirectly. Brick production is one of the significant energy consuming activities in India. The green brick making is traditionally done by manual moulding process.

In West Bengal and nearby states, e.g. Bihar, Orissa, Assam, Jharkhand, the major firing technology adopted is the fixed chimney BTK. The predominant fuel used is Anthracite coal brought from Ranigunj, Dhanbad belt. Apart from fixed chimney BTK's, the presence of high draught BTKs are also common. Due to inefficient burning of fuel and improper firing practices, there is a high degree of air pollution. This is particularly true for kilns occurring in clusters, especially Barasat-Basirhat belt in South Bengal. These clusters are often close to high urban concentrations and in high wind movement conditions; dump their particulate matters near human settlements.

Some of the salient characteristics of the brick industry are:

- Operation of most of the units are limited to approximately 5-7 months;
- It is labour intensive;
- Fuel cost is approximately 50% of the total production costs;
- Highly dependent on weather conditions (rainfall).

The major problems that the brick manufacturers encounter are:

- Lack of proper quality green brick moulders;
- Lack of availability of quality firing personnel;
- Rising cost of fuel like coal;
- Increasing cost of land in and around urban areas;
- Non availability of appropriate and suitable technology for SME's,

Given the excessive demand and concomitant production of bricks throughout West Bengal, steady increase of units in this sector is forthcoming. Cleaner technologies and improvement of practices in existing techniques would significantly decrease the energy requirements and environmental emissions from this industry. In this context the immediate need is demonstration of fuel efficient, alternate technologies with environment friendly operating systems which can also ensure better quality finished products thereby increasing profitability. Opportunities also exist in improvement in savings of energy and appreciable reduction in environmental emissions through better practices and use of internal fuel in existing brick firing technologies. Use of internal fuel and other waste materials is also expected to reduce the top soil usage thereby saving agricultural soil. This is expected to substantially improve the lives of not only the workers but also nearby population.

2. Objectives

The primary objective of this project is to build a two-shaft '**Vertical Shaft Brick Kiln' (VSBK)** at Baidyapur Village, District Nadia, West Bengal as a reliable demonstration for the economical, energy efficient and environment friendly manufacture of bricks, in order to carry out the localization and adaptation work for the entire eastern region on a scientific basis.

3. Project Area

The project area is in gram panchayat Baidyapur 1 under Ranaghat II block of Ranaghat district of West Bengal.

4. Methodology Followed

The investigation, testing and analysis of soils (Annexure 5) prevalent in the Nadia region in particular, and the entire eastern region in general, followed by documentation and dissemination of results addressed a major part of the localization and adaptation work on a scientific basis, and was a significant contribution to the scientific component of this project.

Training of local masons in VSBK design and layout

Manpower resource development, training and awareness generation in the local community highlighting the advantages of the VSBK technology and correlation of VSBK technology with the needs of the local community was done during the commissioning of the VSBK facility. Once the VSBK facility was operational, procurement of raw materials was followed by green brick production, firing and testing of the finished product.

At each stage of the project, formal documentation of scientific research and field-testing results were maintained. The reusability of project deliverables, in conjunction with appropriate training programs, will permit the rapid dissemination of information and promote the replication and proliferation of VSBK technology throughout the eastern region.