

VARANASI CLUSTER

The BEE-SME program focuses on energy efficiency improvements of Micro, Small and Medium Enterprise (MSME) sector in India. The major activities of the program include (1) Sector specific approach for energy efficiency and technology upgradation through facilitation of implementation of Detailed Project Reports (DPRs) on energy efficient (EE) technologies, (2) Technical assistance and capacity building, and (3) Energy mapping of SME sector.

About the cluster

Varanasi is one of the important brick clusters in India having about 300 brick kiln units. The brick kilns are spread out in areas, such as Mohan sarai, Munari, Raichandpur, Haruhua, and Sarnath. Int Nirmata Parishad (INP) represents the cluster level industry association, which is quite active in the cluster. Varanasi cluster, like most of the other clusters in India predominantly uses hand-moulding for green brick manufacturing and Bull's Trench Kilns (BTKs) for firing process.

Profile of the brick kiln

The brick kiln identified under the project is located in village Undi in Varanasi brick manufacturing cluster. It uses hand-moulding for producing green bricks and BTK technology for firing of bricks. The basic raw material used for making brick is clay. The average size of the fired brick is 225 X 109 X 71 mm. The weight of the fired brick is about 3 kg. The kiln produces about 28,000 bricks per day. The kiln uses coal as fuel and consumes about 14 tonnes per lakh fired bricks.

Brick Production Process

Clay winning and preparation

Green brick moulding & drying

Firing and cooling

Unloading and storing

Project intervention

Under the BEE-SME program, a financial support of ₹5 lakh (maximum) was provided to brick kiln units towards retrofitting into zig-zag technology. This case study focuses on successful adoption of energy efficient zig-zag firing technology by a brick kiln in Varanasi brick cluster. The brick kiln is one of the 10 units that are participating in the BEE-SME program for adoption of zig-zag technology in their existing BTK.

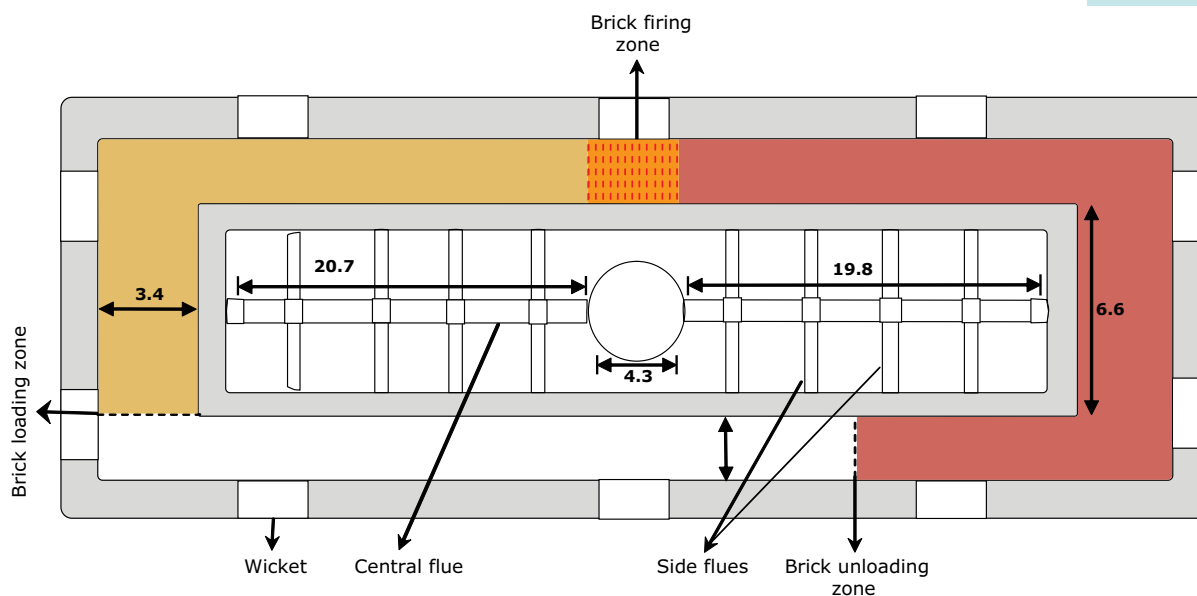
Salient features of zig-zag firing technology

- Increased length of firing zone
- Increased residence time of fuel
- Enhanced absorption of heat by the product
- Reduced flue gas temperature
- Lower specific energy consumption
- Reduced formation of un-burnts and related emissions

Project impact

The brick kiln retrofitted BTK as per zig-zag technology. After adoption, the length of firing zone has increased from 1.6 m to 11.5 m. The increased length ensures enhanced residence time for the fuel that results in improved/complete combustion.



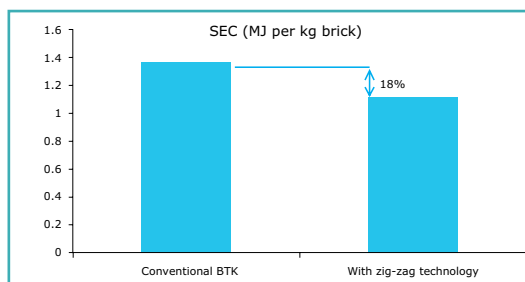


Schematic diagram of the kiln with zig-zag technology

Note: All dimensions are in meter (not to scale)

Retrofitting Cost

Item	Value (₹)
Brick (3.0 lakh)	7,50,000
Technical assistance	1,00,000
Labour charge	3,96,000
Tools & equipment	1,00,000
Cement (400 bags)	1,00,000
Misc (6%)	90,000
	15,36,000



Total investment
₹ 15.4 lakhs
 Total annual monetary savings
₹ 25.78 lakhs
 Payback period
7 months

Estimated savings

Parameter	Conventional BTK technology	Zig-zag technology
Fuel cost (₹/lakh fired bricks)	1,36,400	1,12,400
Savings in fuel (₹/year)		14,08,000
Share of first class bricks (%)	65	85
Savings due to increased output of first class bricks (₹/year)		11,70,000
Total monetary savings (₹/year)		25,78,000

Disclaimer

This case study has been compiled by TERI on behalf of BEE under BEE-SME program. While every effort has been made to avoid any mistakes or omissions, these agencies will not be in any way liable for any inadvertent mistakes/ omissions in the publication.

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