MOBILE KILN

INTRODUCTION AND HISTORY

Mobile Kiln is a model in which the entire structure of the kiln can be moved using a rail system and stacked over the green bricks previously loaded for burning. The burners are coupled along the side of the kiln. The structure of this kiln is very lightweight, because it only uses ceramic fiber and steel layers. As fuel can be use biomass, gas or oil. Firewood usually employed can be chopped, briquettes and sawdust.

GEOPGRAPHICAL DISTRIBUTION:

<table>
<thead>
<tr>
<th>Country</th>
<th>N° of enterprises</th>
<th>Total Production (billion bricks/tiles/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>~ 100</td>
<td>~ 1.0</td>
</tr>
<tr>
<td>Peru</td>
<td>3</td>
<td>NA*</td>
</tr>
<tr>
<td>Bolivia</td>
<td>2</td>
<td>NA*</td>
</tr>
<tr>
<td>Paraguay</td>
<td>5</td>
<td>NA*</td>
</tr>
</tbody>
</table>

*NA*: Not available

FACTSHEET ABOUT BRICK/TILES KILN TECHNOLOGIES IN LATIN AMERICA

TYPE OF KILN

- Kiln

CHARACTERISTICS OF ENTERPRISES USING THIS TECHNOLOGY:

- Nature of Organisation: Industrial
- Level of mechanisation: Mechanised
- Type of bricks/ tiles produced: Hollow/perforated bricks - Tiles
- Annual production capacity of the enterprise: > 10 million bricks (medium to large scale)
- Operational period: Round the year

ESTIMATED N° OF OPERATIONAL ENTERPRISES AND TOTAL PRODUCTION (USING MOBILE KILN)
The Mobile Kiln has a rectangular shape and its dimensions can be quite variable, with width ranging from 3.4 to 9.4 m and length from 15m to 30m.

In the Mobile Kiln the brick loading is stacked and the structure of the kiln moves along the rails on the floor with the support of pushers/handles.

The firing cycle tends to be shorter compared with the traditional kilns, due to its lighter structure that absorbs less heat, and saves time in charging and discharging of materials.

The structure is made basically of metal and insulated with ceramic fiber.

The output of the combustion gases occurs in the central duct, at the bottom under the floor, and then continues to the chimney.

The burning takes 24 hours after burning, cooling starts and the kiln is moved out to the next batch.
MOBILE KILN

AIR EMISSIONS AND IMPACTS:

MEASURED EMISSION FACTORS

<table>
<thead>
<tr>
<th>(in g/kg fired bricks)</th>
<th>CO₂</th>
<th>Black Carbon (BC)</th>
<th>Particulate Matter (PM)</th>
<th>CO</th>
</tr>
</thead>
<tbody>
<tr>
<td>170</td>
<td>Not available</td>
<td>Not available</td>
<td>Not available</td>
<td>Not available</td>
</tr>
</tbody>
</table>

COMMONLY USED FUELS

- **Biomass**: Biomass (e.g., biomass briquettes, sawdust).

SPECIFIC ENERGY CONSUMPTION (SEC)

(measured at firing temperature of 750-950 °C)

Average: 1.80 MJ/kg fired bricks/tiles (estimated)

EMISSION STANDARDS

Emission standards are notified only for PM emissions

<table>
<thead>
<tr>
<th>Country</th>
<th>PM (mg/Nm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>730 (&lt; 10 MW)</td>
</tr>
</tbody>
</table>

COMMENTS ON EMISSIONS

The values of the emission standards of fixed sources depend on the thermal power rating (MW) of the sources (kilns).

This type of kiln usually produces low emissions of soot (particulate matter) due to the continuous fuel feed system and a better adjusting of the relation air/fuel.

FUEL AND ENERGY:

CAPACITY OF THE KILN

- **Production Capacity**: 150,000 to 250,000 bricks/tiles per week
  - Main brick size: 180 x 180 x 85 mm
  - Main tile size: 490 x 130 mm

- **No of Operators required**: 6

- **Payback Period**:
  - Simple Payback: 3.5 - 4.5 years
  - Discounted Payback (@ 6.5%): 3.8 - 5.0 years

FINANCIAL PERFORMANCE:

CAPITAL COST BREAK-UP

- **Material Cost**: 60%
- **Labour Cost**: 30%
- **Equipment Cost**: 10%
- **Total**: 100%

PRODUCTION CAPACITY

- **Production Capacity**: 150,000 to 250,000 bricks/tiles per week
  - Main brick size: 180 x 180 x 85 mm
  - Main tile size: 490 x 130 mm

PRODUCT QUALITY:

- **Product Quality**: (As per the local market perception)
  - GOOD 90%
  - INFERIOR 9%
  - LOSSES AND BREAKAGES 1%

DESCRIPTION ON PRODUCT QUALITY

Good quality product is expected.

OCCUPATIONAL HEALTH AND SAFETY (OHS):

- **Exposure to Respirable Suspended Particulate Matter**
  - Description about the exposure: low level of dust in the surrounding area.
  - No exposure risk has been identified.

- **Exposure to Thermal Stress**
  - Description about the exposure: burner operators are exposed directly to heat and some radiation.
  - No exposure risk has been identified.

- **Risk of Accidents**
  - Description about the exposure: danger of falling off during the bricks assembly in the kiln.
  - No risk has been identified.

Compliance with ILO standards and remarks on migratory labour and conditions of labour:

Practices followed at mobile kiln enterprises tend to comply with the International Labour Standards on occupational health and safety drawn up by ILO. Because of mechanisation of the processes, the working conditions of workers are relatively better with less exposure to emissions, minimal exposure to thermal stress and reduced risk of accidents. No migratory labour issues have been identified.
## MOBILE KILN

### CONCLUSION & REFERENCES:

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Mobile Kiln</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AIR EMISSION (G/Kg FIRED BRICK)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2 (estimated)</td>
<td>170</td>
<td>Low atmospheric emissions.</td>
</tr>
<tr>
<td>Black Carbon</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>PM</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>CO</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td><strong>FUEL &amp; ENERGY</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEC (MJ/kg fired brick)</td>
<td>1.80</td>
<td>Low fuel consumption in Mobile Kiln.</td>
</tr>
<tr>
<td><strong>FINANCIAL PERFORMANCE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Cost (USD)</td>
<td>70.000 to 400.000</td>
<td>High capital investment and high return of investment.</td>
</tr>
<tr>
<td>Production Capacity</td>
<td>6-24 million bricks/year</td>
<td></td>
</tr>
<tr>
<td>Simple Payback</td>
<td>0.6 – 1.7 years</td>
<td></td>
</tr>
<tr>
<td><strong>PRODUCT QUALITY</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Types of product</td>
<td>All types of product</td>
<td>Uniform temperature distribution across the kiln cross-section.</td>
</tr>
<tr>
<td>Good Quality Product</td>
<td>&gt;90%</td>
<td></td>
</tr>
<tr>
<td><strong>OHS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposure to dust</td>
<td>minimal</td>
<td></td>
</tr>
<tr>
<td>Exposure to Thermal stress</td>
<td>minimal</td>
<td>Mobile Kiln has good OHS conditions, mainly related to work exposition and emissions gases.</td>
</tr>
<tr>
<td>Risk of accidents</td>
<td>minimal</td>
<td></td>
</tr>
</tbody>
</table>

### ACKNOWLEDGEMENT:

The project team would like to acknowledge the financial support received from the Swiss Agency for Development and Cooperation for the preparation of these fact-sheets.

### Note:

In the initial stage of this initiative of developing factsheet on brick kiln technologies, factsheet are developed for South and South-East Asia and Latin America regions. Factsheet on brick kiln technologies of other regions will be developed over time.

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### FOR MORE INFORMATION:

### REFERENCES:

References are provided as ‘Endnotes’.

2. Ibid.  
3. Field observation.  
4. Ibid.  
5. By its initials in Portuguese  