

## Fired Clay Bricks

Burnt bricks are the preferred walling material in many countries of the world. For thousands of years they have withstood sun and rain, earthquakes and wars. They are warm in cold weather and cool in the heat, they can be used time and again.



Most bricks are produced by Small Businesses of the informal sector, using simple methods and providing local employment. In most southern countries bricks usually are burnt in batch kilns, but in Africa most often in open clamps, which are extremely inefficient and consume large amounts of firewood, contributing to deforestation. Brick burning is becoming a major threat to the environment.

But there are solutions to improve performance and diminish or eliminate the use of firewood:

- Efficient kilns
- Substitute firewood
- Use natural additives



A giant Bull Trench Kiln in India

## About efficient kilns

It is the firing process that makes the difference, and the type of kiln determines the degree of efficiency that can be achieved.

**Open clamps** of different shapes and sizes have been used for many centuries; they are highly wasteful of fuel (usually coal or firewood) and today are seldom used outside of Africa.

**Simple batch kilns** have been developed and used in Europe Asia and Latin America since the middle ages, they are usually fired with wood and are somewhat more efficient than open clamps.

In Asia a continuous semi-open kiln type was invented (**Bull trench kiln**) and thousands are in operation today, there is a certain improvement in fuel efficiency, but often with a loss in quality of the bricks.

The continuous "**Hoffmann kiln**" uses closed chambers which contribute to good fuel efficiency. It allows for firing with a wide array of fuels, well suited for coal or agro waste (rice husk, coffee husk, sawdust etc). However, investment costs for a Hoffmann kiln are high and it demands a steady production of several thousand bricks per day.

The **semi-continuous kiln** is its simplified version and exists in many designs and forms, combining medium investment costs with acceptable fuel efficiency.

In China the "**vertical shaft brick kiln**" was invented some decades ago and improves fuel efficiency at roughly similar construction costs as the semi-continuous kiln. However its operation requires more skill and until now it is only proven with coal dust as fuel. An experimental operation with agro-waste as fuel is underway in Nicaragua.



Vertical shaft brick kiln in Nicaragua

### Substitution of firewood

In most kilns firewood can be partially or even completely substituted by other fuel. An attractive form is to convert waste into **Solid Fuel Briquettes** (SFB). This can be achieved through different means; we favor a low-cost technology using simple hand operated presses (as used in the production of SSB's). Solid Fuel Briquettes made under controlled conditions from saw dust, rice husk, coffee husk, sugar cane straw, bagasse or many other agro-wastes have high calorific value and can be used for controlled burning of clay products.



Firing a batch kiln with Solid Fuel Briquettes

### Using natural additives to the clay

When fired at temperatures over 900 degrees clays change their physical structure and become harder and highly resistant to humidity. Special clays and additions along with higher firing temperatures produce high-quality products such as refractory bricks (used to line high temperature kilns), roof tiles, pottery, ceramic tiles, chinaware etc.

The process is divided into three stages,

- mining / mixing
- forming
- firing

In the production of clay bricks, mining and mixing is generally done manually by small producers and mechanically by larger factories. Small producers usually rely on slop-molding or sand-molding, both require only minimal investment and are labor-intensive. The product varies greatly in quality according to the quality of the soil used and the skill of the workers. Mechanized producers rely on extrusion for bricks. They usually integrate holes into their bricks, thereby saving on raw material and fuel as well as improving quality, allowing for higher grade clay to be used (minimizing cracking).



Sand molding clay bricks

### Upgrade brick production

In many countries fired clay bricks are the dominant walling materials. Upgrading of fuel efficiency is the most important step, including changing to different fuels (agro-waste, briquettes). This could be done through the production of briquettes manually made of agro-waste and clay; they can be used like firewood and have similar calorific values. This is mainly a solution for itinerant producers. Stationary producers should be instructed and encouraged to build simple kilns (batch or semi-continuous). The use of top-soil is another problem, but this is a problem more difficult to resolve. In many cases natural additives can improve quality of bricks and lower fuel consumption.

The **ECOSUR SOUTH** network provides comprehensive know-how transfer including feasibility studies, technical training, business skills and scientific knowledge appropriation.

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