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SUSTAINABILITY FACTSHEET #05

Clean clay brick firing technology: Habla Zig-Zag Kiln

Habla Zig Zag Kilns (HZZKs) offer an innovative and scalable kiln that is versatile and can be configured for either large or small commercial use.

The kiln provides a unique, energy efficient, low-emission technology with significant social, environmental and economic benefits. High temperatures and turbulent zig-zag air-flow in a long fire zone results in almost 100% fuel combustion. A critical benefit is that the volume can be scaled up or down to suit demand.

Technical Contributors

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ABOUT THE HABLA ZIG-ZAG KILN

The Habla Zig Zag Kiln (HZZK) was invented in 1927 by German engineer, Alois Habla. Its main characteristic is the long firing zone which is forced to move in zig-zag pattern through the brick assemblage.

The effectiveness of the long firing zone is due to an axial flow fan within the kiln, which creates a unique, induced draught, enabling even heat distribution, maximum heat generation and maximum energy extraction from fuel sources. This directional zig-zag controlled air turbulence creates higher temperatures, which increases fuel combustion efficiency and decreases fuel consumption. Heat from fired bricks, is reclaimed from behind the fire zone and moved forward ahead of the fire zone, accelerating the drying of green bricks and facilitating faster fire progress.

The heat available in the freshly burnt bricks is reclaimed and used to dry the green bricks, which also constitute the zig-zag partitioned walls, before these are subject to firing zone. The low-emission burning process helps mitigating the emission of greenhouse gases (GHGs) and soot (black carbon) emissions.

Due to the excellent control of the fire and the low brick setting height, it is ideally suited to fire perforated bricks and thin walled hollow large clay bricks; this conserves top soil, minimizes land degradation and reduces energy requirements for the production of bricks and clay products.

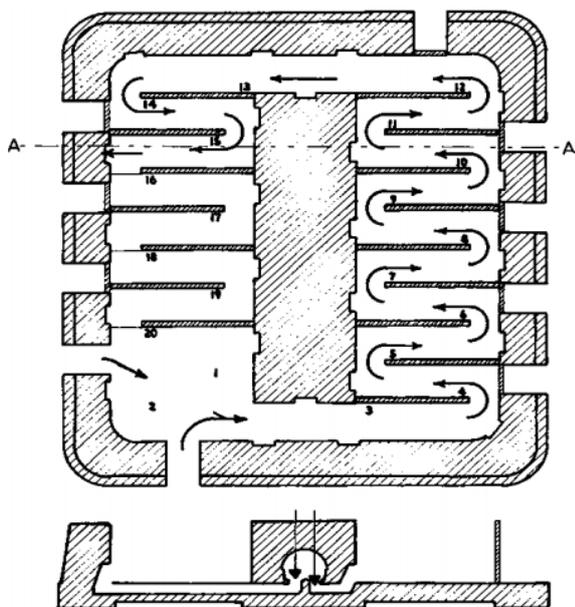


Figure 2: Schematic air flow in a Habla Zig-zag kiln.
Source: HablaKilns (2018) - Online

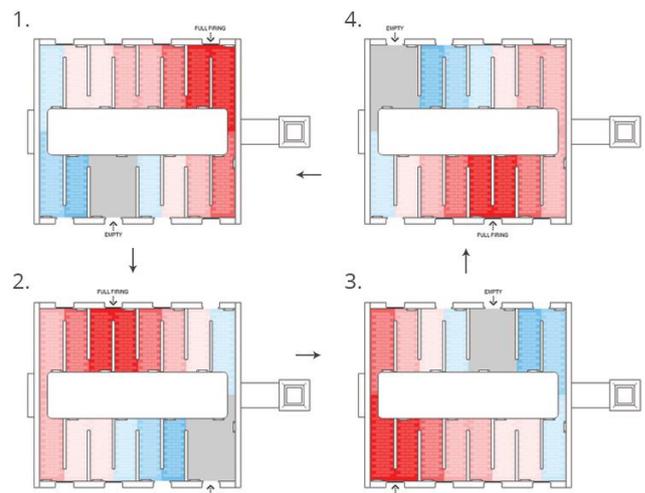


Figure 1: HZZK unique firing process Source: HablaKilns (2018) - Online



COMPETITIVE ADVANTAGES OF HZZK

A long fire zone

This enables almost complete combustion and fuel efficiency resulting in less than 2% fired brick waste, or 98% good product recovery. Moreover, reduced GHG and soot emissions also means there is no billowing smoke or black carbon on site due to almost total fuel combustion, which creates a clean, non-polluted working environment for the workforce.

Under roof

By operating under cover, moisture and temperature fluctuations are minimised and the kiln, green bricks and kiln workers protected from weather. This makes it particularly efficient in high-rainfall areas. The roof also allows for water collection (drinking and sanitation) and for the mounting of solar panels which can supply electricity for the fan and lighting for facility.

No tall chimney

Simplifies and reduces costs during construction.

Scalable in both continuous and semi-continuous mode

Its flexible design can meet the requirements of small as well as medium enterprises. For quality construction and load bearing walls, the bricks need to have adequate load bearing and crushing strength which is usually difficult to achieve through short-firing cycle and less-cooling periods as offered by VSBK and Tunnel kilns (Habla Zig-Zag Kilns, 2018).

The initial investment for Habla Kiln is lower than for many other comparable technologies, kiln maintenance requirements are almost negligible. Operation can be from semi-continuous to continuous, with varying sizes of brick. It can handle cheaper inferior fuels while still retaining efficiency and low pollution grade, make this kiln ideally suited to replace clamp kilns which are prevalent in the formal and informal bricking making sectors in South Africa (Habla Zig-Zag Kilns, 2018).

Product quality

The firing process results in a high-quality brick with consistent dimensions and specifications.

Reduced product waste

Wastage and breakages are reduced as there is less handling of the green bricks.



APPLICATIONS IN SOUTH AFRICA

The HZZK design is suitable for clay brick operations that want to replace clamp kilns without a huge capital investment. For larger operators needing additional capacity, more HZZK's could be built alongside, or larger HZZK options are available.

The first and only HZZK in South Africa is operated by Worcester Bakstene. The Habla Zig-Zag International team, in conjunction with Worcester Bakstene, finished construction of the kiln mid-April 2016, with its operation commencing in May the same year. The construction of the kiln required a modest capital investment and the kiln itself has a small footprint (size). The Worcester Brick kiln is housed in an open sided, roofed structure that insulates and protects from the weather. The kiln is made up of a number of chambers approximately 6 meters wide, insulated within a semi-permanent temporary covering created using unfired bricks and sand.

Green bricks are packed inside the kiln's chambers in a zig-zag fashion. The kiln's fire is pulled through stationary green bricks using an induced draught created by a small 7.5 kW bifurcated fan. As the firing zone moves around the kiln, fired bricks are unpacked from the "back", while fresh green bricks are packed well ahead of the fire. The heat ahead of the firing zone pre-dries green bricks. This decreases reliance on open-air hacklines and streamlines the total production chain from over 30 days to as little as 7 days.

The facility is no longer at risk from bad weather. The fuel used for initial ignition is coal nuts, but within a few days, only body fuel coal (added during clay preparation) is needed to keep the firing zone moving around the kiln continuously (CBA, 2018).



*Figure 3: Elevated view inside the Habla Kiln at Worcester Bakstene
Source: HablaKilns (2018) - Online*



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For further information:

The Clay Brick Association of South Africa

Website: www.claybrick.org