# RENEWAL OF THE KILN INSULATION

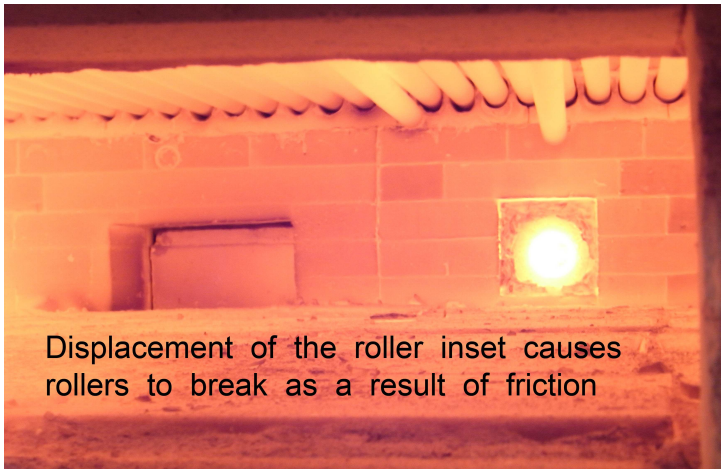
# DEMANDS AND PROPERTIES

The insulation is the barrier that bounds the inner chamber of the process:
+ It prevents heat dispersion, allows heat control and reduces energy consumption.
+ It avoids damage to adjacent elements.
+ It provides safety for workers by minimising the risks inherent to work with high-temperature facilities.

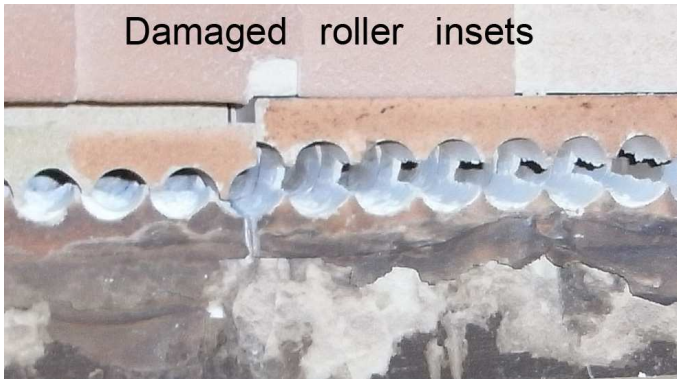
Efficient performance of the above functions translates into notable economic **SAVINGS** (lower energy consumption, less damage, fewer risks).

The stresses that the insulation needs to withstand, owing to the high temperature variations in kiln start-ups and shut-downs (which occur ever more frequently), low quality of the applied materials, or deficient maintenance and repair operations, end up by generating fractures, detachments, displacements, etc.

Once such damage has occurred, a decision for renewal needs to be taken, and a choice must be made between two possibilities: insulation consisting of lightweight refractory bricks or material with low-density refractory fibre.

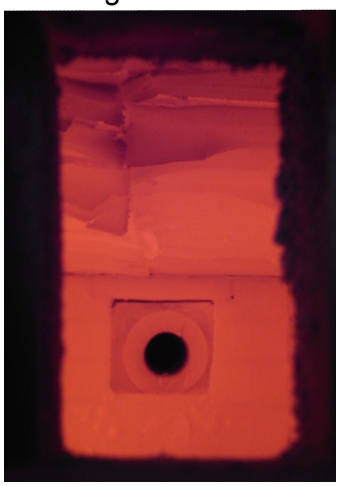



The method involving **refractory brick** exhibits low thermal shock resistance, greater heat accumulation, larger weight, and requires using structural features such as the so-called ‘roller insets’ or ‘wall insets’ (for the passage of the rollers and support of the upper walls), which are a source of problems since they may shift during heating and cooling periods, and can break or prevent roller extraction when rings of dirt form from the glaze or clay, etc.




Refractory brick requires very slow temperature variations in order to avoid damage by thermal shock.

Breakage of vault bricks



The method involving **refractory fibres**, owing to their very low density, exhibits minimum heat accumulation per unit insulation volume, magnificent performance in relation to thermal shock, and less weight, so that lighter-weight, better-supported structures can be used. They also eliminate the need for auxiliary items (roller insets, etc.).
Refractory fibres can be adapted to different work systems: continuous (365 days a year), with sporadic stops, weekly from Monday through Friday, with a COMPLETE shutdown on weekends without any energy consumption or need for auxiliary guard workers.

Refractory fibres are suitable for production involving frequent shut-downs and start-ups, including daily production in smaller-sized kilns, eliminating the night shift, with a complete kiln shut-down, as is common practice in third-fire lines.

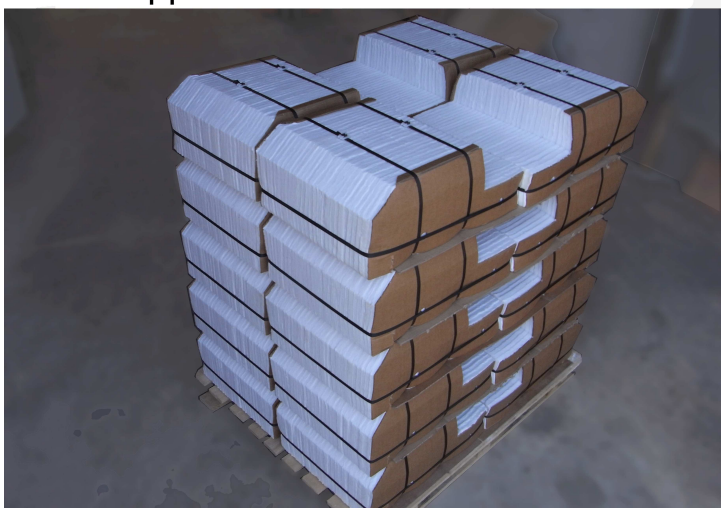
Inappropriate insulation for a given kiln use or inadequately made insulation will lead to numerous problems in production, impaired product quality, interruptions, energy consumption, and risks for the rest of the machinery and the workers. In addition, it shortens the useful life of repairs and of the kiln itself.

Lightweight refractory brick and refractory fibre linings are both appropriate for facilities intended for continuous operation, with one or two stops a year, performed slowly, and also with slow service start-ups.

# METHOD

In this system approach, the Prosec technical department has been engaged for years in applying refractory fibre linings, developed in the course of over 30 years as roller kiln manufacturers.
As a specialised company in this type of lining, Prosec has the expertise and technical know-how to carry out these operations with assurance and speed.
Our technicians, after reviewing the kiln conditions and identifying the area to be replaced (walls and vault, or just the vault, etc., generally of the peak temperature area), determine the dimensions and particular characteristics of the new insulation so that it will work optimally.
The system adapts to any charge width and working temperature – from third-fire products to technical porcelain tile, from glazed roof tile to extruded stoneware tile, etc.

Upper wall fibre blocks



Physically, fibre blocks are installed in the upper walls, the blocks being of own design and manufacture, which are secured rigidly together with microporous panels in the second fire face. The vault is also made up of compact fibre blocks, with variable dimensions and characteristics, depending on the particular use involved, suspended from a structure resembling transverse continuous 'beams', forming a perfectly airtight and uniform closure.
Owing to their properties: less weight per unit volume, lower thermal inertia (less heat absorption and retention), lower expansion, etc., than refractory insulation, the system is subject to lower stresses and eliminates the risk of elements detaching from the ceiling.
In addition, it allows any 'beam' to be readily disassembled and the inner chamber to be accessed, without a great number of rollers needing to be disassembled, as occurs in kilns with refractory brick insulation, which are usually accessed through the entrance and exit.


In order to provide the best available technique, the compact fibre-block system designed by PROSEC enables kilns to withstand abrupt variations in temperature, while also adding key advantages such as:

1. Lower installation cost.
2. Greater insulation capacity.
3. Shorter response time in start-ups and shut-downs.
4. Lower energy consumption.
5. Operational flexibility in running the kiln.

**1. Lower installation cost**: The installation and subsequent maintenance operations take less time than for refractory brick, therefore requiring less labour.
Troublesome features such as roller insets, etc. are suppressed.

**2. Greater insulation capacity**: The compact fibre elements exhibit a greater insulation capacity than brick. Therefore, there are smaller heat losses and greater inner uniformity.

**3. Shorter response time in start-ups and shut-downs**: Start-up and shut-down operations can be performed faster and more safely, without producing any types of problems relating to thermal shock.
In fact, roller kilns are currently running, which start up and shut down daily, at a working temperature of 1200ºC.

**4. Lower energy cost**: The greater insulation capacity, low thermal inertia, and installation techniques of the fibre blocks allow leaks, and excessive emissivity and energy accumulation of the insulation to be eliminated. Since start-ups and shut-downs can be carried out according to individual needs and this is done rapidly (the kiln reaches working temperature in two to four hours, depending on kiln size), unproductive consumption (e.g. weekends at maintenance temperature, slow start-ups and stops, even in emergencies, etc.) is also eliminated.

**5. Greater operational flexibility**: As there is absolutely no thermal shock effect, the work at the facility can be scheduled on a continuous, weekly or daily basis, thus eliminating **unproductive** costs relating to kiln management.
This type of insulation **is the most appropriate** for plant operation during a work week, enabling a COMPLETE shut-down during weekends, without worker shifts.

Example of renewal in firing zone walls and ceiling

# EXAMPLE OF INSULATION REPLACEMENT UPPER WALLS AND CEILING

**1º**

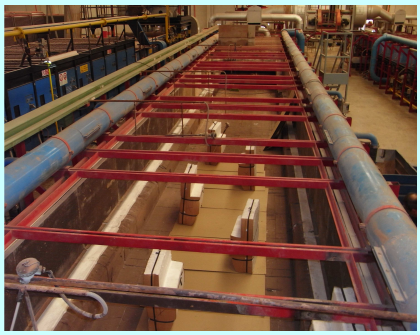
Study and determination of kiln conditions and dimensions

**2º**

Wall blocks made by PROSEC

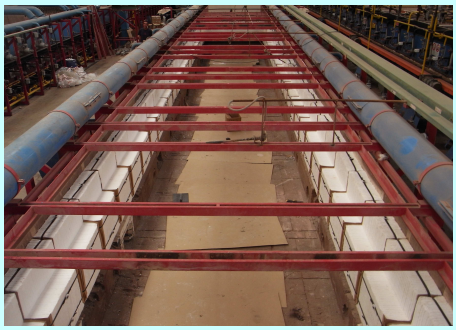
**3º**

Vault beams with customised dimensions



**4º**

Preparation for wall block assembly



**5º**

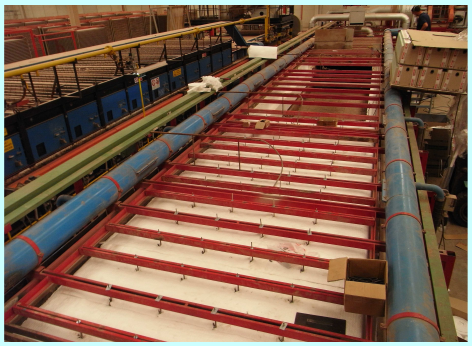
First step in wall assembly

**6º**

Second step in upper wall renewal

**7º**

Definitive location of the kiln walls



**8º**

Vault installation

**9º**

Result of the upper insulation renewal

## ADVANTAGES OF THIS INSULATION:

1. LOWER installation COST.
2. GREATER INSULATION capacity.
3. LOWER energy CONSUMPTION.
4. SHORTER response TIME in start-ups and shut-downs.
5. GREATER OPERATIONAL FLEXIBILITY in the use of the production line.