

“Refrasense”: An Embedded Sensor For Continuous Monitoring Of The Thickness Of The Refractory Lining Of Industrial Boilers, Kilns And Furnaces

Ref-Nr:



Technology abstract

RefraSense is a patented sensor from Greece for live monitoring the thickness of refractory linings of boilers, furnaces and kilns, evolved from a sensor monitoring the

thickness of the heat shield of space capsules. RefraSense continuously monitors the refractory lining and enables cost-saving by allowing optimum maintenance planning and reduction of risk and energy use. It is inexpensive and available for custom-fitting applications(TRL6-7).

- Private group -

- Paris Rallis -

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Technology Description

All industrial boilers, kilns and furnaces used for heating water, calcination, smelting and metal refinement are internally lined with a layer of high-temperature ceramic refractory which protect the container and reduce thermal energy losses. Such refractory linings wear down over a period of use due to mechanical and chemical wear and therefore information of the rate and extent of wear at any given time (i.e. the thickness of refractory lining remaining) is critical to ensure optimum safety and energy utilisation. Currently, the only way to measure the thickness of the remaining refractory is to stop the process, empty the boiler or furnace and use various thickness-measuring instruments internally or externally. This is a very expensive process, since it means a stop to production and very significance production losses, but, because of the criticality of the refractory lining, most industries carry out such maintenance operations conservatively - they replace the lining as often as possible even when it is not necessary.

To address this, the technology provider has developed the RefraSense sensor which is embedded into the refractory lining to continuously monitor the remaining thickness of the refractory lining during furnace operation without the need to interrupt production. It has been successfully tested, demonstrated in industry and patented and is now ready custom-fitting. The new technology allows continuous monitoring of the refractory lining of

boilers, kilns and furnaces and its use will enable major cost-savings by allowing optimum maintenance planning and elimination of risk and energy wastage. In addition, the sensor has excellent prospects for monitoring the thickness of the protective heat shield of high speed space craft as they enter the atmosphere.

RefraSense is inexpensive and is now available for custom-retrofitting in existing boilers, furnaces and kilns or to incorporate in an integrated system for condition monitoring of new equipment.

Innovations & Advantages

RefraSense is a highly innovative and unique sensor for continuous thickness monitoring of materials where other measuring methods cannot be used, i.e. extreme conditions and temperatures, impossible to reach etc. It is the only sensor available which can be embedded in a material and give continuous measurement of the material's thickness as it wears down without the need for any human intervention or stoppage of production.

The available resolution depends on the application and it can reach 0.5mm for small amount of surface erosion. Maximum depth of monitoring of industrial refractories (amount of surface recession) can be as much as 10cm with a resolution of about 2mm.

Once installed, the sensor requires no maintenance and the material thickness (or surface recession) can be recorded in a computer for later retrospective analysis etc. It is a very valuable tool for determining the erosion behaviour of new refractories and for planning and evaluating refractory maintenance operations.

Further Information

The RefraSense sensor is very thin and easy to install between the refractory bricks or embedded inside the refractory mass (fireclay) during rebuilding of the refractory. It is custom-adapted to each boiler or furnace or other application according to operating conditions and can be adapted to practically any conditions and atmospheres such as

oxidative or reducing or corrosive, very high temperatures (for TPS-recession monitoring of space capsules, surface temperatures can reach 3000oC) etc.

Current and Potential Domains of Application

Measuring thickness of refractory or other protective layers subject to erosion and wear inside boilers, furnaces and kilns in the metal, ceramic and other industries.

Boilers for producing steam are used in all processing industries.

