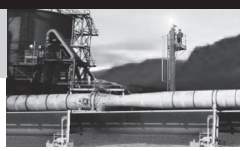
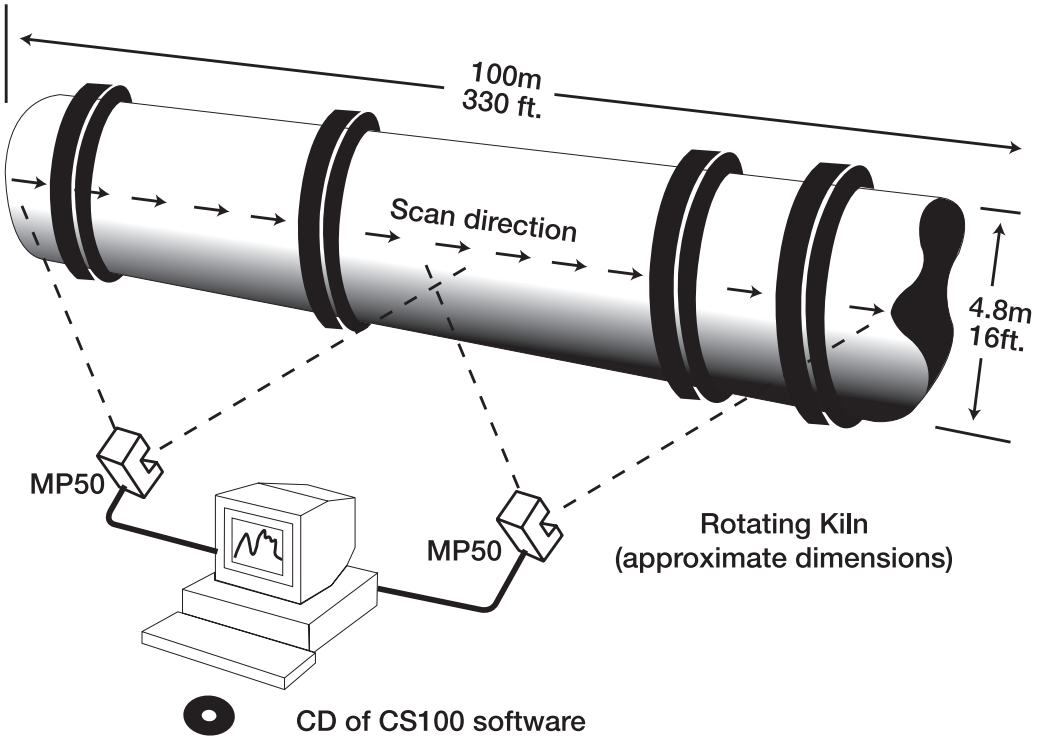


Cement Kiln



DESCRIPTION OF APPLICATION

A major and critical phase of cement production is the physical conversion of lime, first mixed with other raw materials, then super-heated in order to make it "hydrophilic" which means it is starved for moisture and will instantly absorb any it comes in contact with. When later mixed with water and sand this solution becomes cement. Limestone is first ground into fine powder, preheated in a tall cyclonic tower, then super-heated in a continuous, rotating kiln to temperatures up to approximately 1600°C (2912°F). This process gives limestone the proper physical and chemical properties necessary for cement production. Heating limestone drives off moisture, impurities, and gases (such as C02). A typical input rate of 190 tons/hour can be reduced to an output rate of 110 tons/hour.

Along the interior length of the kiln, temperatures range from about 800°C (1472°F) at the entrance to about 1600°C (2912°F) also called the "burning zone." Lining the interior wall of the kiln are one or more layers of brick material, called refractory, that insulate the outside metal shell from the heat inside. There are typically different types of brick layers from the hot to the cold zones in the kiln.

Major Benefits

- 24-hour temperature monitoring
- Early hot spot detection
- Increased refractory life
- Reduced maintenance costs
- Reduced refractory downtime

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PROBLEM

The brick wears down over time and periodically needs replacing – typically once or twice a year. Production is suspended during this maintenance procedure for a significant length of time. The objective is to run the kiln as long as possible before needing to stop for maintenance, but even more critically, ensuring there is no damage to the kiln's metal shell.

In addition to normal wear of the refractory material, there is the possibility one or more bricks could fall out of the insulation layer. This causes the shell to be directly exposed to the heat, and a 'hot spot" develops that can seriously damage or destroy the shell.

Another problem is the difficulty in monitoring the burning activity inside the kiln. The temperature of the outside metal shell can be used as an indicator of the "burn profile" along the kiln's length and can provide information regarding the temperature changes inside the kiln. In the past, kiln shell temperature monitoring has been done manually by periodically checking the shell with a handheld infrared thermometer. In some cases, online sensors were mounted on elaborate tracks and physically moved along the length of the kiln or rotated to point at different sections of the kiln.These approaches provided only a single spot measurement at any one time and could take hours to cover the entire kiln surface.

RAYTEK SOLUTION

The Raytek CS100 kiln monitoring system (CS101 for one line scanner, CS102 for two linescanners) can measure 1024 temperature points per scanner at a rate of 36 scans per second. The scanners, with a distance-to-spot ratio of 300:1,can be mounted as far away as, for example, 30 meters (100 feet) and still detect hot spot of10 cm diameter (4 inches). This data can be displayed for a single scan as either a temperature profile along the kiln, or can be viewed as a thermogram of the shell's entire surface. These linescanners are mounted inside environmentally protective enclosures.

The continuous monitoring of the shell's surface allows precise evaluation of the refractory material's condition at all times. If even a single brick falls out, its location can be identified as a hot spot within one rotation of the kiln, and the CS100 system automatically alarms when the high temperature limit is exceeded by the hot spot temperature.

Also, monitoring the temperature profile along the outside of the kiln shell can give an indication of the profile along the inside of the kiln. This allows perfect temperature regulation of the heating process. Each scanner sends up to three 4-to-20 mA outputs or a single relay output preset alarm to the customer's control system to warn the operator if a hot spot develops. The CS100 system provides key features such as kiln thermal mapping, refractory management, alarm management and options such as live ring migration monitoring, fan control and fiber optic cables.

BENEFITS

The continuous monitoring of the entire surface area temperature of the kiln allows careful evaluation of the condition of the refractory material on the inside. With this data, maintenance schedules and production time can be optimized to provide maximum life of there fractory. This also helps to eliminate unanticipated and extremely costly emergency shutdowns. In the event of a single brick failure in the refractory lining, it can be identified with an alarm within one rotation of the kiln and prevent costly shell damage. The direct cost and lost production resulting from this type of damage can total $200,000 or more, depending on the time required for repair.

In addition, the temperature profile along the outside of the kiln shell provides a good indication of the temperature profile inside. This information can be used to regulate the kiln temperature and to set the heating operation to improve both quality and productivity.

Raytek Automation Products: Noncontact Temperature Measurement for Industrial Applications

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