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Case Study

May 1996

HiRAM® burners and StepFire™ control improve quality and reduce cycles time by 30%

Background

Acme Brick Company in Bridgeport, Texaas was interested in increasing the control over their beehive kiln.

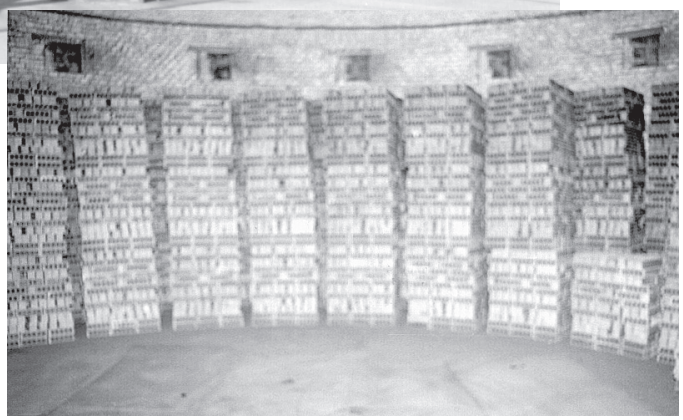
This case study documents improved temperature uniformity, increased product quality, reduced cycle time, and substantial fuel savings. These successes have been attributed to the use of Fives North American's high velocity Hi-Ram Burners and the StepFire control system.

Initial Conditions

Acme Brick was firing a 42' diameter by 20' high beehive kiln with twenty small high velocity burners, giving the kiln a total input of 30 mm Btu/hr. The firing cycle of each load was manually controlled by the kiln firemen.

Each load consisted of approximately 500,000 pounds of face brick set in cubes which were then stacked 9'-9" high in the kiln with a lift truck. Temperature distribution was poor. Vertical differentials as high as 1150 °F were measured between two points within the kiln during the early stage of the firing cycle. This resulted in longer cycle times in order to reach uniformity through the load and contributed to Acme Bricks dissatisfaction with the quality of their product.

42' diameter beehive kiln with new HiRAM® Burners and StepFire™ Control System

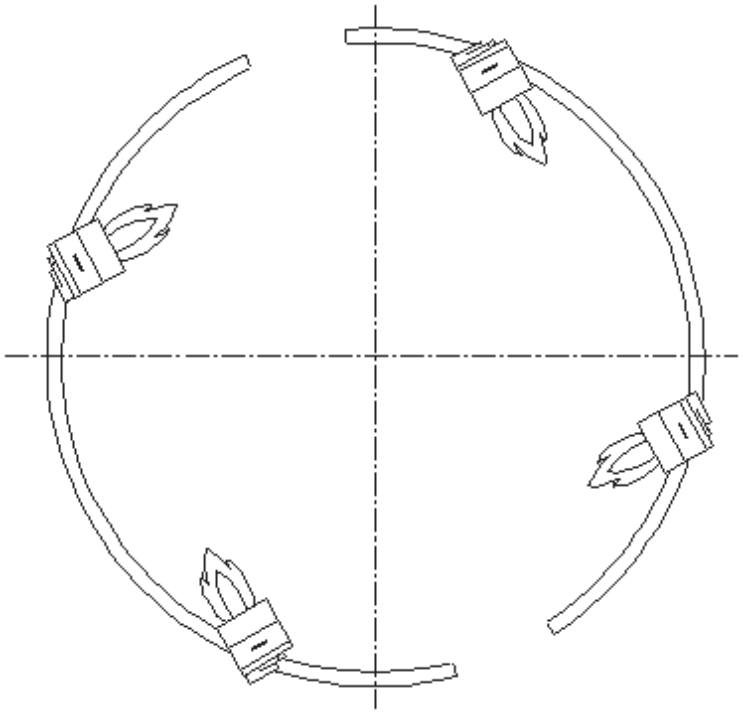


Fork lifts are used to place stacks of face brick along the inside wall. Previous burner tile openings can be seen toward the top of the kiln.

Installation

Based on previous studies and preliminary trials with a single large high velocity burner, 4 FivesNA #4575-9 High Velocity Burners were installed in place of the 20 small high velocity burners. The existing combustion air blower, air and fuel trains, exhaust system and furnace pressure damper were used.

A new control system was installed which included StepFire, individual flame supervision, ramp-soak, over-temperature limit, furnace pressure and O2 trim control. Control was implemented through a PLC with an operator interface. This allows the automatic or manual selection of four operating modes; StepFire, XS air, flashing, and cooling. In this specific application, control was High-Low with an "on-ratio" turndown of 10:1, with the StepFire cycle timing being measured in minutes rather than the usual 20-seconds.



In a form of tangential firing, four HiRAM burners, positioned above the load and angled slightly down, significantly improve temperature uniformity.

Results

After the installation of the new HiRAM burners and the StepFire control system, firing times were reduced by 30% and fuel consumption was reduced by 16.5%. This was attributable to a combination of better heat penetration and increased control over the kiln. Though this accomplished Acme's goals, there were additional benefits to the installation.

Product quality and uniformity were found to have improved dramatically. Size variation was reduced from 5% to 1.5%, the compressive strength spread was reduced by 1000 psi, and the 24-hour cold water absorption spread was reduced from 6% to 1%.

Heat distribution through the kiln was improved by the addition of the HiRAM burners and StepFire control system. The maximum differential of the vertical kiln temperature was reduced significantly. This has been illustrated by the maximum temperature differential between the two points in the kiln being decreased from 1150 F to 450 F.