

## Major increase in brick kiln production through improved systems control

### Background

A refractory brick manufacturer had an immediate need to improve their ability to control their kiln and to increase production. To satisfy these needs the company worked in partnership with Fives North American Combustion, Inc. to retrofit their tunnel kiln control systems.

This study documents the significant increase that this major manufacturer experienced after installing components and systems from FivesNA. The understanding of how this was accomplished centers around the improved temperature uniformity achieved with the installation of #4447-IV Tempest® burners.

### Installation

Working with Fives North American Combustion, the company retrofitted their kiln following two strategies; first, control over the kiln could be significantly improved with the addition of monitoring and control systems; second, kiln production could be increased significantly through the installation of high velocity Tempest IV burners.

The following equipment was installed:

- 42 #4446 Tempest® IV Burners
- 8 #4659 Pre-Mix Burners
- #8351A-T EPIC II Furnace Pressure Transmitter
- #8800 Kiln Ram Control System
- #8880 StepFire™ Control System
- Allen Bradley PLC SCL500 Series Processors
- Variable Frequency Drives
- Zircoa Oxygen Probe Assembly

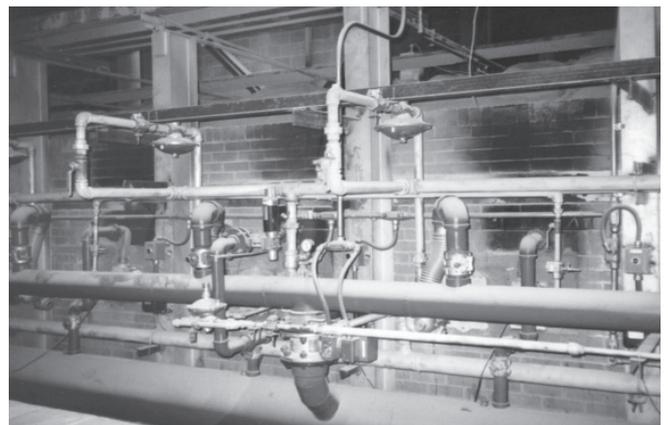
### Initial Conditions

This company approached the retrofitting of their brick tunnel kiln with two goals in mind:

- 1) To significantly increase their ability to control the kiln.
- 2) To increase their production capability.

The kiln is 472' long and had been running at 100% capacity with the original pipe-cap burners and controls. Normal operating temperatures were in the range of 2250°F to 2850°F. Future goals included increasing the operating range to 3000°F, improving their control over the kilns temperature profile and increase the soak time in the firing zones.

In 1993-94, the demand for this companies products started skyrocketing. Consequently, sales increased and it became necessary to operate the kiln 100% of the time at 100% of its production capability. But, because the number of orders for their products continued to increase, it became critical that they increase production to the maximum potential of the kiln.



*StepFire™ Control System with Tempest® Burners*

## Results

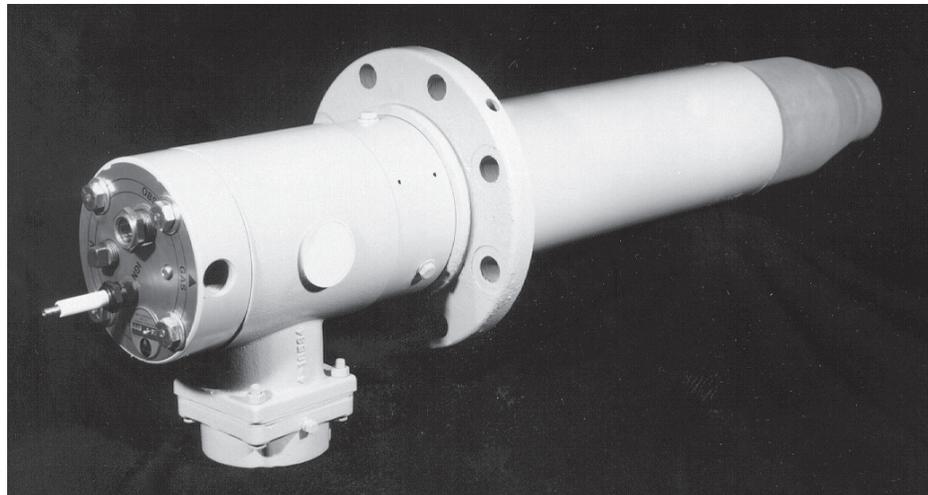
With improved control over their kiln, the company was able not only to increase the high temperature soak time in the firing zones, but was also able to increase temperatures in other key areas.

Within six months, the company was able to increase their production by 50%. By taking advantage of the improved convective heat transfer to the product provided by the high velocity characteristics of the Tempest burners, 30% of the production increase can be attributed to tighter stacking of the bricks which resulted in more bricks per car. The improved heat penetration therefore allowed the kiln to fire larger loads per car while simultaneously increasing the quality of the product. The remaining 20% can be attributed to an increase in the push rate of the cars. After the kiln was retrofitted, the product was being heated faster and more uniformly, resulting in a substantial

decrease in the total car travel time required, by as much as 1.25 hours/car.

■ This 50% increase in production has allowed the company to realize a return of their investment within four months.

Because of the limited availability of labor, upstream constraints in other parts of the manufacturing process, long needed kiln repairs and other plant specific issues, the company has found it necessary to limit the present production rate of the kiln to the above mentioned rate. Once these issues are resolved, it will be possible to increase the push rate of the cars even further. Ultimately, the installation of Fives North American burners and controls will have provided this company with the potential for as much as a 100% increase in their production capabilities.



4446 Tempest® Burner