

Application**brief**

Eclipse Product:

ThermJet Burners

Submitted by:

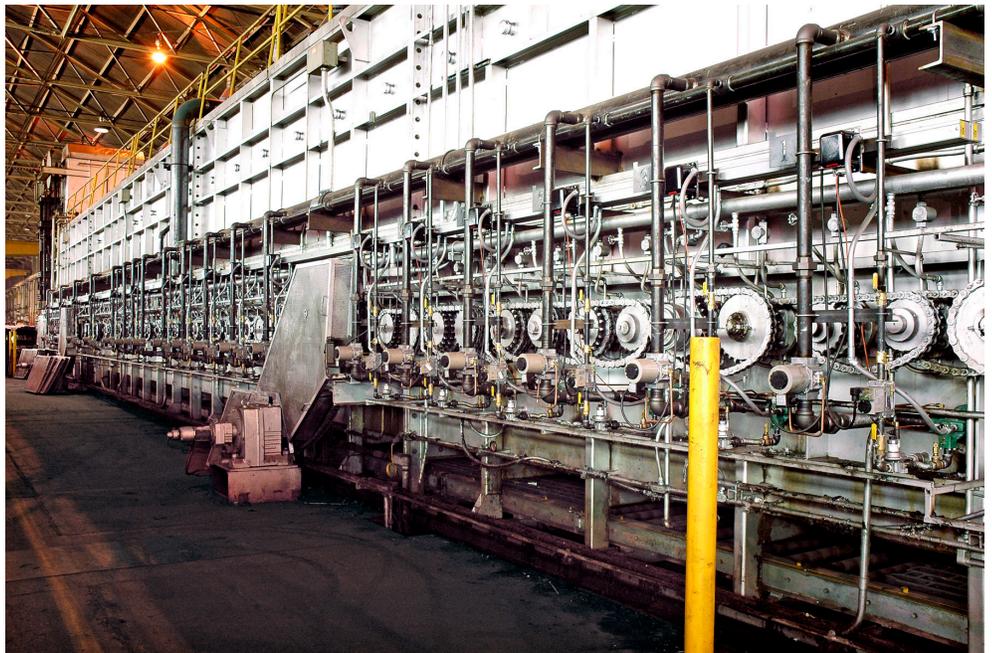
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Application:

Pulse Fired Roller Hearth Furnace

Description:

H-A Industries, located in Hammond, Indiana, was founded in 1993. It is a state-of-the-art, value-added processing division for Castle Metals. Since their inception, they have spent millions of dollars on leading-edge processing equipment to insure the highest quality of carbon and alloy bar products and offer cost savings solutions for their customers. They currently employ two roller hearth furnaces to anneal, normalize, normalize and temper or stress relieve to exacting requirements in bar sizes from ½” diameter thru 16” diameter.



Roller Hearth Furnace - Drive Side. (Guards removed for photo to enhance visibility.)

One of their furnaces was originally designed for indirect firing, but over time the need for this type of operation was not in high demand. Tube replacement costs coupled with frequent maintenance and down time forced H-A to reexamine the furnace and its combustion system. To assist them in this evaluation process, they contacted Armil/CFS in South Holland, Illinois. Armil offers a full range of combustion and control services for users of high temperature furnaces, kilns, and other high temperature equipment. H-A and Armil had worked together successfully in the past on a number of projects. It was decided that a rebuild was required and the furnace would be converted to direct firing. The radiant tube burners would be replaced with Eclipse ThermJet high velocity burners. It was felt that this would increase efficiency, reduce maintenance and down time, cut fuel consumption and reduce overall operating costs due to the elimination of recirculating fans and large cooling air blowers. Due to the plant layout and existing cat walks and traffic patterns, the low mounted burners were located on the drive side of the furnace.



TJ Burner set up for high/low pulse firing

The new furnace configuration has ten zones with a total of 34 Eclipse ThermJet model TJ040 burners. The first four zones contain a total of 22 burners positioned over and under the load. The burners are fired with a high/low pulse firing system. Thermal input is adjusted by the cycling of multiple burners within each zone from high to low fire for controlled periods of time. Zone 4, the first cooling zone, has two burners positioned over and under the load. Operation is high/off pulse firing. In cooling mode, full air (no fuel) passes through the burners. Four additional cooling air ports were provided. Zones 5,6,7,8 and 9 make up the balance of the cooling zones. Each zone has two ThermJets positioned over and under. Operation is high/off pulse fired and in cooling mode full air (no fuel) passes through the burners.

Temperature, logic and safeguard circuits were designed to provide personnel and equipment protection as outlined in NFPA 86 (Standard for Ovens and Furnaces) and NFPA 70 (NEC). The existing PLC, PanelMate operator interface and control panels were modified to incorporate the new combustion system. A freestanding NEMA 12 enclosure was provided for flame supervision and pulse firing controls. An Allen-Bradley programmable logic controller is used to take the temperature PID loop signal from the existing PLC and sequence the pulsing of the burners.

A flame supervision network for the 34 burners provided pre-ignition purge and ignition trial timers. It features a fully modular design for ease of maintenance and self checking circuitry for optimum safety. Ultra-violet scanners monitor each burner. Relays, timers, pushbuttons and indicating lights completed the control system. Remote of the panel are (34) ignition transformers and (34) UV flame detectors.



This large scale conversion is easily balanced due to symmetrical pipework.

With the removal of the (28) radiant tube burners, (26) cooling tubes and (12) recirculating fans, a total of (66) cover/patch plates were fabricated and installed. Furnace flues were incorporated in the recirculating fan cover/patch plates. Tube support hardware was removed from the drive side of the furnace and counterweighted barometric type dampers were provided on all flues. In addition, all (66) cover/patch plates were insulated with a ceramic fiber lining of a thickness equal to the surrounding areas. Locations where the (54) tube supports were removed also required patching.

The rebuild went smoothly and the furnace was back on line three days prior to the estimated date. All of the expectations were met. Operational versatility was improved because of better control and flexibility in the heating and cooling zones. Heat up time was decreased from three or four hours to one hour and fuel consumption has been decreased by 30% to 35%. Electrical costs were greatly reduced with the removal of recirculating fans and cooling air blowers. In addition, maintenance costs have dropped substantially.



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