

SFIP - using cyclonic burner technology

Additional production with lower fuel usage

Situation

Encore Wire, McKinney, Texas is aggressively searching for methods to reduce energy costs and streamline operations searching for methods to reduce energy costs and streamline operations.

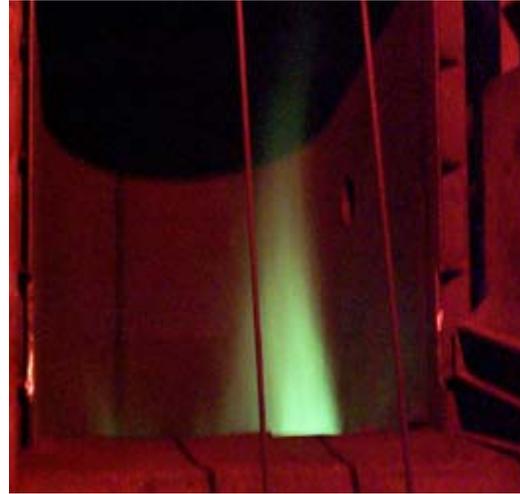
Plant Description

Encore's 25' high shaft furnace has a 6.5' diameter lining of silicon carbide brick. Premix burners with silicon carbide tile blocks fire radially through the lining in two rows. The first row at hearth level contains seven burners, the second row located 5' above contains eight burners.

Copper cathode plates, baled wire scrap and copper chops (small pellets) are charged at the top of the furnace. The radial burner flames impinge upon and melt this material as it descends through the shaft.

Copper emerges in liquid form at the hearth from a single tap-hole between the burners on the lower row. The temperature of the copper at this point is about 2,020 F, while the oxygen content of the copper is maintained between 60 and 90 ppm.

Copper from the furnace transfers through a launder to a premix burner-fired holding furnace and then on to a casting wheel that feeds a rolling mill to produce copper rod.



Cyclonic burners as viewed from charge area

Current Process

The shaft furnace currently melts 27 tons/hour of copper. The strictly-controlled combustion atmosphere in the shaft furnace maintains the optimum oxygen content in the molten copper by reference to the analysis of externally combusted mixture samples from four premix manifolds. The resulting oxygen content and cleanliness of the molten copper influences the metallurgical properties of copper rod and wire produced from the casting, rolling and drawing process.

Solution

FivesNA evolved the SFIP method of spinning the combustion gases inside the shaft furnace to provide a helical path that extends the contact of the gases with the charge. This has the effect of a virtual height extension of the shaft, enhances heat exchange by the longer path and thus increases the fuel efficiency of the furnace.



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Combustion Equipment

Fives North American Combustion, Inc. has developed the new 4645 premix burner for the SFIP method. Using furnace-specific silicon carbide burner tiles, the SFIP system solution fires four of these burners in a furnace-specific orientation from locations above the existing burner rows. 3065 mixers and 7216's provide mixture, air is from a 42 osi blower.

Results

The copper temperature exiting the furnace is higher, enabling Encore to reduce launder and holding furnace firing rates. This alone provides a meaningful decrease in fuel consumption.

- Encore achieved a melting capacity increase of approximately five tons/hour.
- The operating characteristics of the furnace are more manageable. There are fewer furnace "hang-ups" where the charge sticks inside the shaft.
- The furnace accumulates less slag on the hearth, extending burner life and reducing the need for shutdowns to clean the furnace and burners.
- The plant can process higher quantities of high margin materials such as copper chops.
- Energy savings in the furnace, not including the launder and holding furnace, are estimated at 5%.



4645 Burner at Furnace