Heraeus

Electro-Nite

SUSTAINABILITY CASE STUDY

Bath level management in the Consteel DC Electric Arc Furnace

A CASE STUDY AT NUCOR STEEL HERTFORD COUNTY ON THE IMPACT OF USING CORETEMP TO CONTROL HOT HEEL LEVEL AND END-POINT BATH LEVEL IN THE CONSTEEL EAF AND THE RESULTING POSITIVE EFFECTS ON INPUT ELECTRICAL ENERGY AND GRAPHITE ELECTRODE USAGE.

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The study evaluated the criticality of temperature, bath level, and hot heel control in a Consteel EAF. Increased control of these parameters resulted in lower input power requirements and lower electrode consumption per heat, increasing EAF operating efficiency.

INTRODUCTION

Is the Consteel EAF process in control with regards to temperature? Can the control of the hot heel level be improved and what are the benefits of doing so? What Is the necessary endpoint bath level to run the Consteel EAF the most efficiently?

The control (or lack thereof) of the steel temperature directly impacts how much energy must be input into the charge to fully melt and heat. Does the steel bath heat homogeneously and how does that impact the melting process?

What effect does the residual hot heel level have on the melting and heating process for the following heat?

Does the hot heel level need to be measured directly or can it be controlled by controlling end point bath level?

SUMMARY

CoreTemp, a no-one-on-the-floor, on-demand level and temperature measurement system was Installed on the EBT of NUCOR Steel Hertford County's Consteel EAF. Unlike traditional immersion probe measurement methods, CoreTemp feeds optical fiber cored wire into the melt to perform the measurements.

The EAF operators used the system to measure both steel bath temperature and level on every heat with the following objectives:

1) Increase temperature control of the melting process and assess bath temperature homogeneity.

2) Control the endpoint steel bath level

3) Control the residual hot heel level after tap

The ultimate goal of the project was to increase the life of the furnace refractory for each campaign and Increase the operational efficiency of the Consteel EAF process.

RESULTS

2.47 MWH/HEAT

A reduction of electrical input energy per heat of 0.70 MWh to 2.47 MWh, depending on the maintained endpoint bath level (resultant hot heel level).

0.074 KG/TON

A reduction in graphite electrode usage of 0.074kg per melted metric ton.

12% INCREASE

12% increase in the average number of heats on the refractory bottom.

CONCLUSION

1) Operator safety was improved by reducing or eliminating the need to go out on the operating floor for measurements.

2) Input electrical energy per heat and graphite electrode consumption per melted ton were significantly decreased, reducing plant Scope 1 and Scope 2 carbon emissions.