Chameleon®

Controlling of EAF Process via Chameleon, Optic Fibre Measurement

Heraeus

Electro-Nite

SUSTAINABILITY CASE STUDY

Controlling of EAF Process via Chameleon, Optic Fibre Temperature Measurement

SEMI-SMART TEMPERATURE MEASUREMENT IN SIDDIK KARDEŞLER EAF PROCESS - TÜRKIYE

16/05/2023

With the increased demand for green steel, the EAF production route has become more significant for steelmakers. Non-controlled tapping processes, overheated production cycles, and tap hole clogging are more readily prevented issues with (Chameleon) a smart optic fiber temperature measurement system.

INTRODUCTION

The EAF uses mainly electric energy, with a small amount of chemical energy, to generate the heat required for the melting of recyclable scrap. During this study here are some of key questions that were raised:

How do you control your EAF tapping temperature? *Target hit ratio of tapping temperature fluctuates higher in conventional practise due to less frequent observations. Excessive energy and time are consumed when tapping temperatures exceed the target temperature.*

What is the temperature reduction between EAF and LF process? *While Chameleon measurements are taken in the EBT region, which is cooler and more homogeneous, a more precise correlation between EAF tapping and LF start temperature may be achieved.*

What is the frequency of tap hole cleaning? *Due to inefficient temperature monitoring in the furnace, steelmakers typically use tap hole cleaning in the EAF process. This process typically takes 30 seconds and causes steelmakers to lose time and productivity.*

SUMMARY

The measurement system (Chameleon) was installed and tested at Sıddık Kardeşler Steelplant as part of the energy cost reduction and productivity boost project. Fiber optic measuring wire was fed into the furnace from the EBT area via a dedicated feeder system and was controlled by a PLC system

RESULTS

1,1 MWH/HEAT

The use of Fiber Optic temperature measurements in EAF reduced the average energy usage per heat.

1,9 MINS/HEAT

The use of optic Fiber temperature measurements in EAF reduced the tap-to-tap time on average of all heats.

2882 TON-CO2/ANNUAL

Reduced the annual CO2 emissions with real energy savings.

CONCLUSION

By modelling the temperature increase with the dynamic tapping temperature prediction model, the Chameleon system delivers efficient energy and time control. Significant energy savings per heat were realised, and productivity was boosted by lowering tap to tap times, resulting in CO2 reduction and a significant contribution towards sustainability.

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Heraeus Electro-Nite

Controlling of Steelmaking Process via Smart Fiberoptic Temperature Measurement

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Brief

This technical leaflet, detailed information on smart temperature measurement and process control via fibre optic temperature measurement method in the liquid steel production process is shared.

1. Introduction

During the steel making process electric arc furnaces are seen as the heart of production. In EAF process scrap as raw material is generally melted using electrical energy and turned into liquid metal. During the melting and refining of scrap the biggest cost was calculated as energy consumption.

One of the main targets in EAF is to be able to tap the heat at the desired tapping temperature at the end of melting. The tapping temperature is controlled by manuel operation with dip measurements in general. With the CoreTemp (smart temperature measurement) system the tapping process is maintained more precisely via smart prediction system.

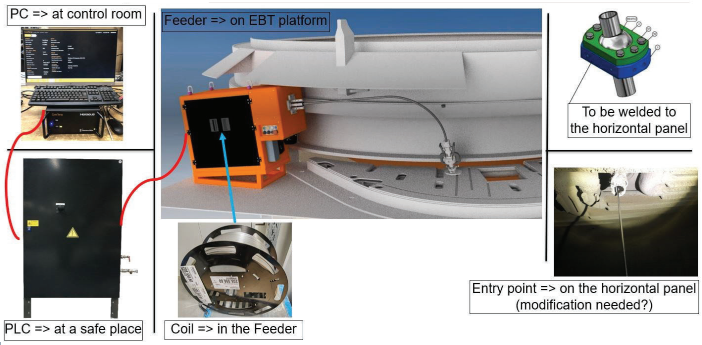
2. Technology

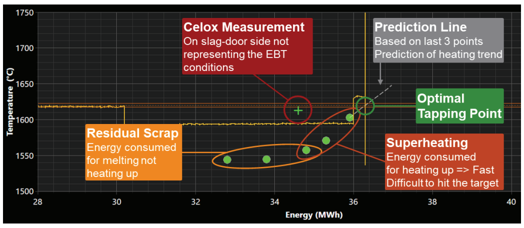
Coretemp

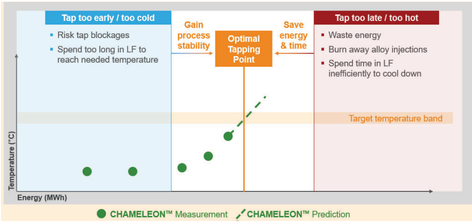
In general, the system is based on the principle of determining the steel temperature by radiation method, by entering the fibre optic wire into the steel with the help of a feeder from the EBT region, where the temperature is the most stable and homogeneous in the electric arc furnace. With the help of this system, it is possible to determine the tapping temperature of the EAF in the shortest time, independently of the personnel, and accordingly to provide energy savings.

As seen in the picture on the right, the system consists of Feeder, PLC, Control Computer, and parts to be placed in the EBT area.

SYSTEM PARTS







The temperature modelling of the system can be seen in the graphics on the left. By means of this modelling;

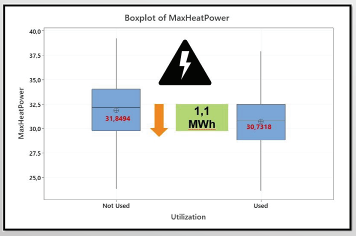
1. The EAF operator can control the time to reach the target temperature in the most effective way.
2. The system dynamically models the temperature increase depending on the energy consumed through the use of artificial intelligence and provides the operator's energy and time control.

3. Semi-Continuous Temperature Measurement Field Studies

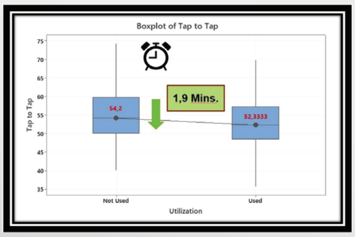
Studies have been carried out on the benefits controlling the temperature in electric arc furnaces with a semi-continuous system provides to the process.

3.1. Reference Application – 1 System Value Added

Evaluations have been prepared with a minimum of 3 months' data.

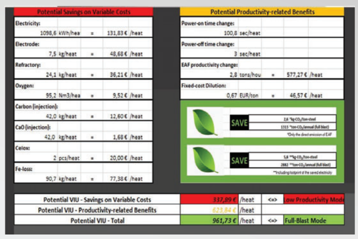


A) Comparison graph of energy consumed by CoreTemp used and unused heats.



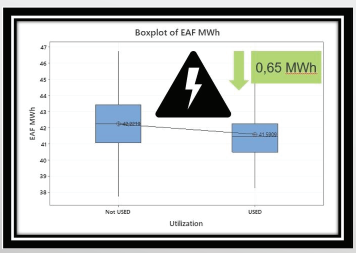
B) Comparison graph of time saving on tapping in heats with and without CoreTemp.

C) The performance of the system can be tracked remotly.



D) Comprehensive table of benefits of the system in addition to energy and time.

3.2. Reference Application –2 System Value Added



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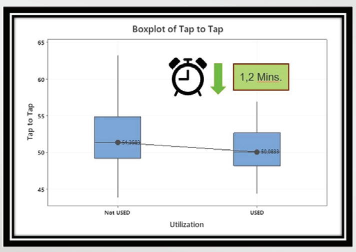

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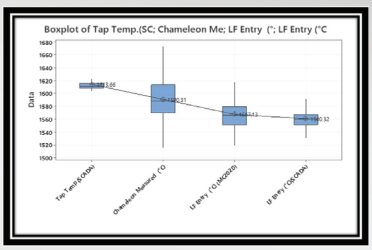

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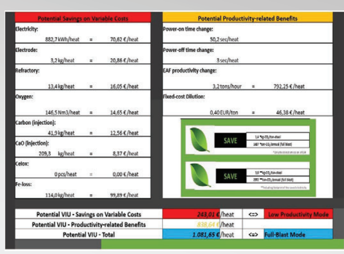

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