

CHAMELEON

Tap into new Electric Arc Furnace Optimization Potentials

Chameleon

Semi-continuous, optical temperature measurement

Introduction

Current automatic lances use disposable probes to determine the temperature of the steel bath. The temperature measurement is done by dipping the probe into the liquid steel. These single dip measurement systems however cannot guarantee problem free tapping at all times. Due to low measurement frequency (2 to 3 minutes between dips) and inhomogeneous temperature distribution within the furnace (highest at slag door and lowest at tapside). This results in process blockages due to too early tapping decisions or spending too much energy as the furnace is overheated based on too high safety margin to fully melt scrap metal.

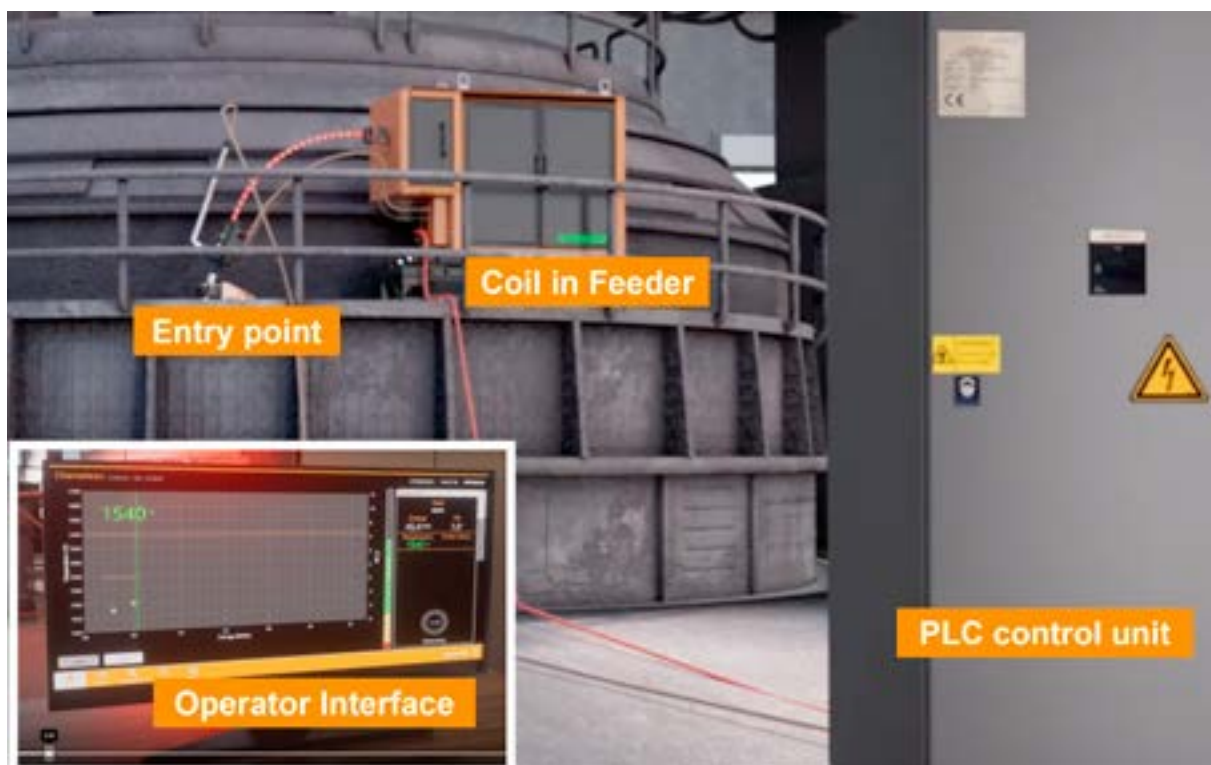
A novel application of optical fiber based measuring was developed capable of delivering accurate temperature readings every 10s. Black body radiation from inside the liquid steel pool in the Electric Arc Furnace (EAF) is transmitted through a shielded optical fiber onto a light emission detector where Planck's law is applied. A semi-continuous temperature profile can be established to help accurately define the desired end point of the melting cycle.

Benefits

- Chameleon measurements take 10 seconds versus 2 to 3 minutes with a lance and disposable probe
- Quicker reaction time due to instant data availability in the control room
- Temperature evolution prediction allows your operator to reliably tap at the optimal time
- Optimize power on time to save energy
- Reduce overheat and decrease carbon footprint
- Increase safety because Chameleon is operated from the control room during the process

The system

The Chameleon instrument is an automated, optical fiber based measuring system capable of delivering accurate temperature readings of liquid steel during the operation of electric furnaces. The instrument is developed to withstand the harsh environment around the EAF.



With an optical fiber, a stable temperature is quickly detected and sent to the plant Level2 to be displayed on the user interface. A semi-continuous temperature profile helps the operator accurately define the desired end point of each melting cycle. No operator is needed near the furnace during the process because the Chameleon system is remotely controlled from the safety of the control room.

STANDARD FEATURES

Rugged, shop floor construction

- A robust wire feeder assembly designed for the shop floor
- A rugged control cabinet with armored interface cables

Shop floor safety designed

- High capacity, individually calibrated, fiber optic coils capable of approximately 650 measurements
- Coil (consumable) replaced every week

High visibility controls and displays

- The remote human machine interface (HMI) connects the operator with the system to take measurements on-demand with an unmatched cycle time over existing measurement solutions

Reliable measurement technology

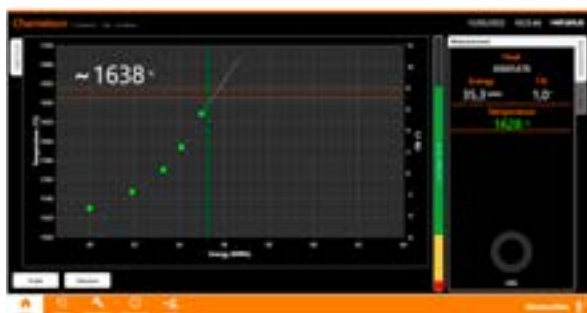
- As a leader in temperature measurement technology for molten metal, Heraeus Electro-Nite calibrates and tracks each coil system for consistent accuracy



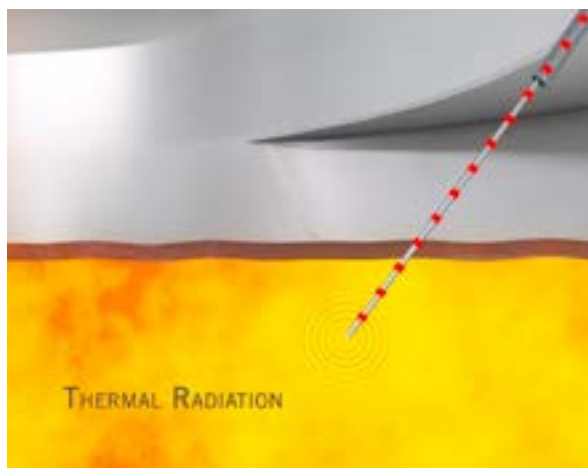
Blowing lance on the horizontal panel



Feeder with optical fiber coil



Measurement result



Thermal radiation

Technical data

Item	Description
Measurement application	Temperature Measurement in Electric Arc Furnace
Measurement channel	One analog input
Sample rate	600 samples/second
Measurement ranges	1500 to 1750°C (752 to 3182°F)
Accuracy	STDEV of 5°C over the coil length
Display resolution	1°
Display units	°C or °F
Power supply provided by the plant	3x400VAC+PE / 50-60Hz / 4 KW
Compressed air provided by the plant	3 to 8 bar
Air flow provided by the plant	2800 l/min blowing lance (max 5000 l/min) with a hose diameter of 3/4"
Operating ambient temperature range	-20°C (-4°F) to 60°C (140°F)
Different hardware components:	
Feeder	2 versions, left or right oriented, Dimensions: 1170x825x490 mm (WxHxD), 450 kg
Control Unit	Voltage input 400 VAC Power: I _{max} : 16A, I _{cc} :10kA, earthing system TN-S Dimensions: 800x1400x400 mm (WxHxD), 110 kg
Processor Unit	Voltage input 120 or 220V (2A) Different level2 communication protocols (Profibus, Profinet, Ethernet IP, Modbus TCP)

