SYHEAT-OPS

Reheating furnace process optimization

BENEFITS

SYHEAT-OPS business model focused on quality gives competitive advantages and makes it possible to conquer leading market positions

SYHEAT-OPS is mandatory to ensure a proper product rolling (temperature uniformity, decarburization) or the achievement of the targered mechanical properties (H, YS, UTS)

High efficiency; a leading factor nowadays, with high commodity costs and strict environmental normative

SYHEAT-OPS automation ensures meeting targets for:

> Energy savings

> Emissions limits

> Production yield

PROCESS

Heating of steel is an important process in the steelmaking operation because it affects directly the rolling process. Proper heating is a fundamental prerequisite for good finished product quality.

> Heating is a slow process;
> It demands giving products the right amount of energy at the right time;
> The furnace state is not observable, except at the end of the process when it is too late to get any correcting action.

The only effective way to control a heating unit is by the use of mathematical models and a feed-forward control strategy based on them.
The first step to control a heating furnace is to measure what is inside it.
The use of temperature measuring instruments have always been debated, thus the mathematical model of the heat-diffusion process is used as a virtual sensor of products in furnace.
A multi-layer finite difference model is applied to each product in order to evaluate material bulk temperature and uniformity.
Numerical grids are automatically positioned across the product length and adaptive grid refinement makes it possible to fit them exactly to product geometry, in order to achieve numerical model stability and accuracy.
Product temperature depends on the steel diffusivity of heat exchanged with furnace environment. All relevant heat exchanges are considered at each grid node:

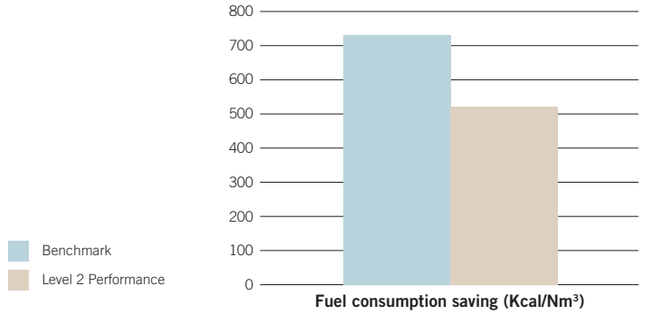
> Heat exchange with chamber;
> Heat exchange and shadowing effect between products;
> Heat exchange and shadowing effect with skids;
> Heat exchange with hearth.
Using a multi-layer model it is possible to take into account all the relevant -and unwelcome- heating effects that influence product quality, like beam-blank flange over-heating, skid marks, or head-tail temperature disuniformity.

EQUIPMENT

The modern approach of automation is based on system models, that act as virtual sensors of the plant.
Heating furnace model is tailored to the process, combining three factors:
> product model;
> chamber model;
> metallurgical model.
This technology can be applied to all kinds of heating and treatment process.

PERFORMANCE ACHIEVEMENTS

> Tata Steel / UK - Long
> ArcelorMittal Group / Romania, Poland - Long, structurals
> Gerdau Group / Brazil, USA, Mexico - Long, structurals
> Bushan / India - Long, structurals
> Sidenor Group / Greece, Bulgaria - Long
> Posco / Vietnam / - Structurals and rails
> Emirates Steel / UAE - Structurals and rails
> Benteler Steel Tube / USA - Tubes
> Vallourec Star / USA - Tubes



MODEL PREDICTIVE CONTROL - LEVEL 2
• model-based setup
• temperature control
• advanced plant operation management