HORUS PROJECT :
Smart reheating furnaces
for competitive and
sustainable steel processes

sidenor

The project **HORUS** gathers three of the most outstanding companies in Spain's steel sector, members of the Spanish technological steel platform, PLATEA (Sidenor, Acerinox and ArcelorMittal), which share the general objective of developing innovative technology solutions aiming at improving productivity, the efficiency of energy resources as well as the sustainability of processes.

These developments will be applied to one of the most energy-consuming steel processes: the reheating of the semi-product before hot rolling.

GENERAL OBJETIVE OF THE PROJECT

Within the framework of the **strategy programme of the National Consortia of business technical Research (CIEN)** sponsored by the Centre for the Development of industrial Technology (CDTI), a project named **HORUS** (**HO**rnos de **R**ecalentamiento Inteligentes para procesos Sider**Ú**rgicos Competitivos y **S**ostenibles – Smart reheating furnaces for competitive and sustainable steel processes), has been launched, which aims at developing innovative technologies for increasing **productivity, energy efficiency and sustainability** in industrial furnaces, thus addressing the challenge of reducing energy operating costs and greenhouse gas emissions, so as to **improve Spanish steel sector's competitiveness and change it into a European reference**.

SIDENOR'S OBJECTIVES

In participating in the HORUS Project, SIDENOR mainly aims at **implementing Industry 4.0 in the reheating furnaces, by means of developing transient control systems in furnaces, advanced sensors and new smart control algorithms**.

The following actions will be performed within the framework of this three-year-project:

1. Modelling the movement of smoke inside the furnace, in various load conditions in order to observe how its variation affects the heterogeneous heating of the material.

2. Developing a 150 kW pilot-plant hybrid furnace prototype and validating its operation by means of an energy efficiency study and a product quality analysis.

3. Studying the deformation and tensional level of the billets due to the temperature gradient in the furnace.

4. Developing a smart decision-making system which includes correlation algorithms as well as a test plan before validating the proposed solutions in the hot rolling facility.

The first challenge of the project is currently about to be achieved.

Within the framework of this first challenge, SIDENOR has been working in the following activities.

- Modelling of the reheating furnace and analysis of the smoke movements inside the furnace, with a normal load situation and billets of 185x185 mm. The same simulation will be performed annually, but with a new format of 240x240 mm. T**he objective of this simulation was to observe the distribution of smoke movements inside the furnace**. Thanks to the performed simulation, SIDENOR was able to identify some occurrences which may affect the quality of the rolled billets, such as the burners' direct impact or a wrong distribution of smoke inside the furnace. This modelling avoids jeopardizing the refractory due to the burners' impact.

- Development of advanced sensors for high-temperature operation. The potential applications of these new sensors might be, for example, the measurement of the temperature of the refractory so as to determine its waste or the measurement of the temperature when smoke is released.

- Validation of the algorithms and developed models for process data treatment and definition of the subsystem which will collect and assess the processed data as well as take decisions with regard to the operation of the reheating furnaces or reallocation of production orders.
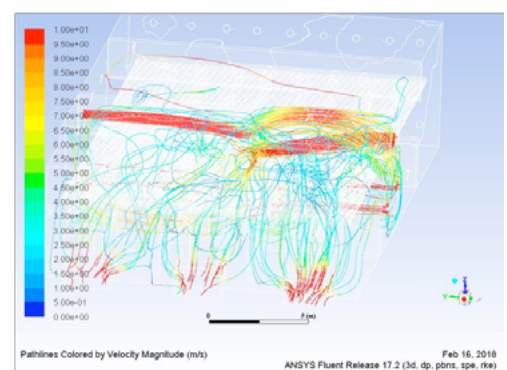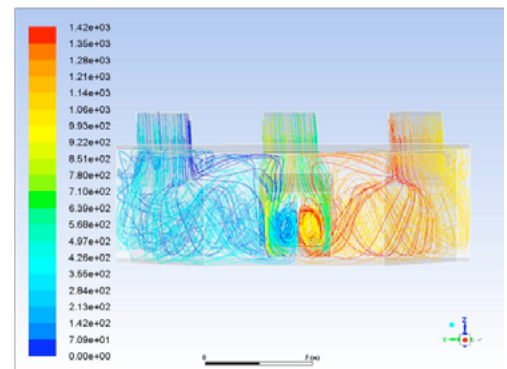
Within the framework of the project, SIDENOR has collaborated with the technology centres of SIDENOR R&D, TECNALIA RESEARCH & INNOVATION and DEUSTO-DEUSTOTECH, which have actively participated in the described activities.