Press Release

February 2022

CAPRI Steel Solidification Sensor

In CAPRI project, steel producer SIDENOR in collaboration with the research institute BFI, aims to improve their production yield and reduce the environmental impact of the steel production, using advanced product tracking, digital twins, and machine learning. As a first step, BFI has developed a soft sensor for the steel solidification process in the continuous casting machine. The sensor provides insights into the temperature and shell thickness evolution of the solidifying steel and creates the digital twins of the steel billets, the intermediate products which are cut from the continuous strands at the end of the casting machine. By feeding also all the upstream data from secondary metallurgy and the casting process to the twin, the sensor provides a solid basis for the risk and anomalies detection, which will identify anomalous situations in the production early on and help the operator to make informed decisions about the further processing of the semi-products.

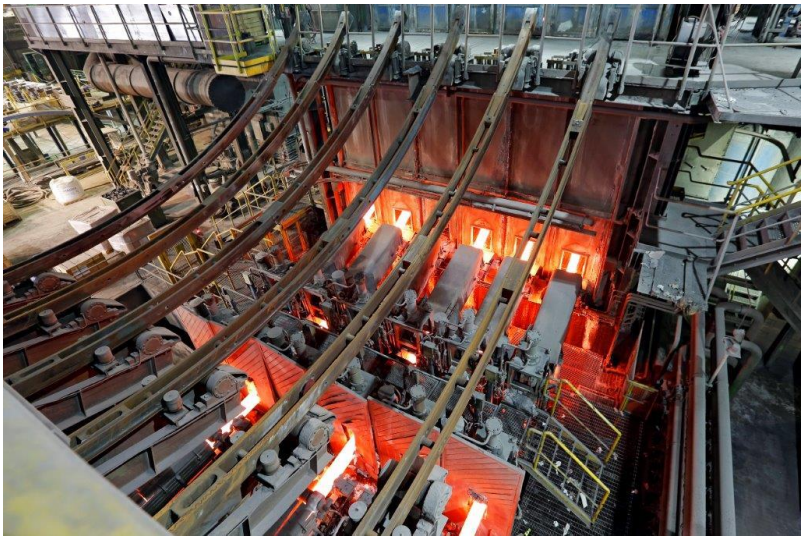

Figure 1: SIDENOR's continuous casting machine

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 870062.

The solidification sensor consists of a state-of-the-art numerical temperature and solidification model based on the 3-dimensional heat flow equation with reasonable simplifications that enable the real-time operation of the process simulation. Boundary conditions are calculated from available online measurements, for instance of the steel temperature in the tundish (the vessel from where the liquid steel flows into the casting mould), temperatures and flow rates of mould cooling water, as well as flow rates of spray water loops applied in secondary cooling zones. These calculations have been calibrated to fit historical datasets with measurements of strand surface temperatures.

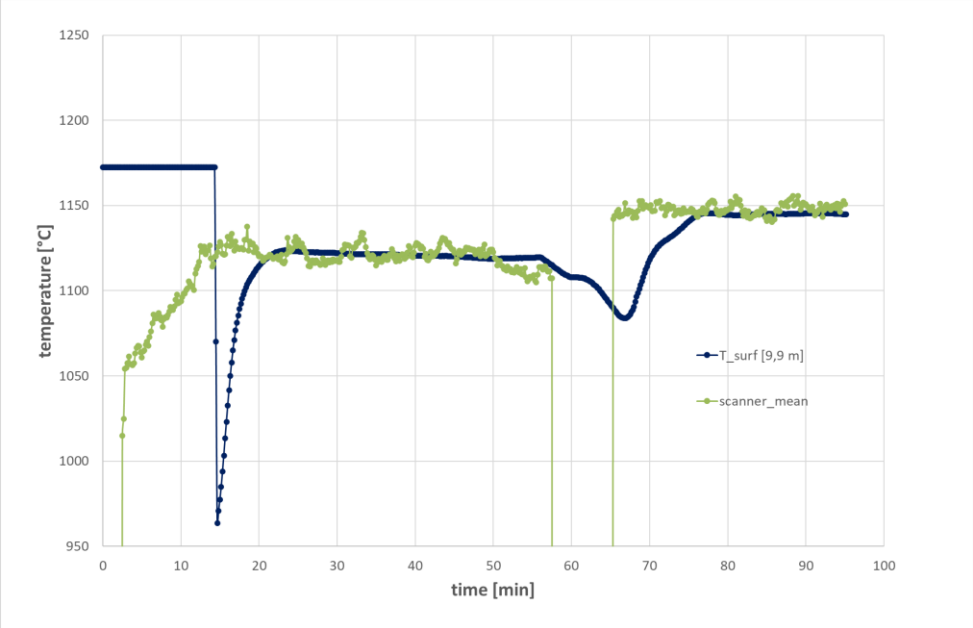

Figure 2: Simulated versus measured surface temperature of a casting strand

A web-based user interface is being developed, which will enable the user both to access the current state of the strand in the casting process, such as the temperature field, shell thickness and the so-called metallurgical length, as well as to replay historical castings.

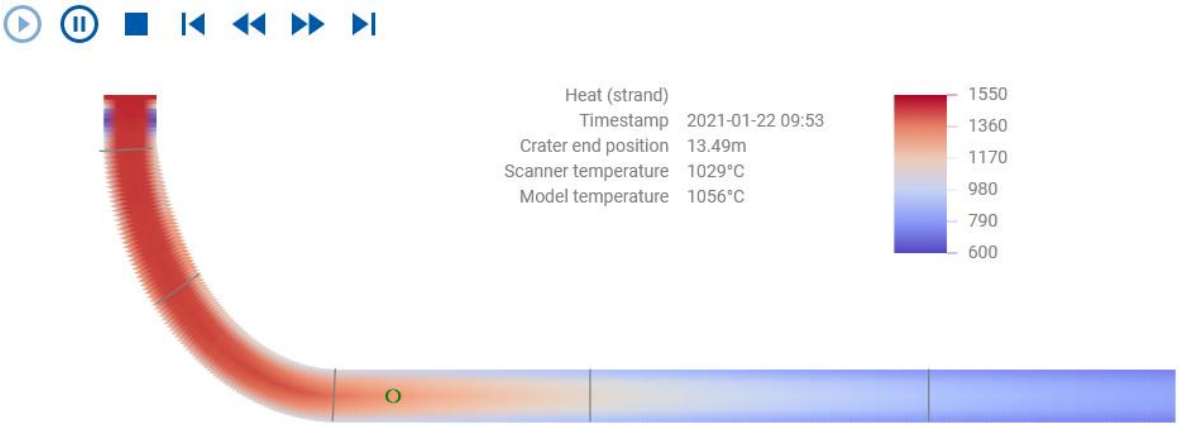

Figure 3: Simulation of the surface temperature evolution in a casting strand, visualized in the web interface.

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About the project

Project Full Name: **C**ognitive **A**utomation Platform for European **PR**ocess **I**ndustry digital transformation

Project ID: 870062

Start Date: 01/04/2020

CAPRI (www.capri-project.com) is a 42-month H2020 project that brings cognitive solutions to the Process Industry by developing, testing, and experimenting an innovative Cognitive Automation Platform (CAP) towards the Digital Transformation. To achieve that, CAPRI enables cognitive tools that provide existing process industries flexibility of operation, improving the performance across different indicators (KPIs) and state of the art quality control of its products and intermediate flows.

Three main technical objectives enabled by the development, testing and experimentation of an innovative Cognitive Automation Platform (CAP) for three use cases from process industry (asphalt, pharmaceutical tablets and steel billets and bars manufacturing), are being pursued:

- **Process Industry Digital Transformation & Automation** through digital technologies like data collection, storage, and knowledge extraction to provide detailed insights into process control and resource availability.
- **Improved performance and flexibility in the process industry** via digitalisation of process industries to dramatically accelerate change in resource management, improve their performance and flexibility and in the design and the deployment of disruptive new business models.
- **Next generation process industry plans** for their autonomous operation of plants based on embedded cognitive reasoning, while relying on high-level supervisory control as well as providing support for optimised human-driven decision-making.

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