The Consortium

- Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V.
- K1-MET GmbH
- HUN-REN Institute for Computer Science and Control
- VDEh-Betriebsforschungsinstitut GmbH
- Tata Steel Nederland Technology bv
- Saarstahl AG
- voestalpine Steel & Service Center GmbH
- voestalpine Group-IT GmbH
- Fraunhofer Austria Research GmbH
- Spectral Industries bv
- European Steel Technology Platform (ESTEP)

Focus

Transitioning to low-carbon, green and sustainable steel production by integrating digitalization, utilizing process data, and involving skilled personnel.

Aim

To make steel production “greener”, more digital and more economical.

Impact

- Improve steel quality
- Optimize scrap usage
- Enhance energy efficiency
- Potentially save 800 million € annually while reducing CO_2 emissions by up to 6 million tons.

Contact

Dr.-Ing. Madalina Rabung

Phone +49 681 9302-3882
madalina.rabung@izfp.fraunhofer.de

Fraunhofer Institute for Nondestructive Testing IZFP
Campus E3 1
66123 Saarbrücken

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Demonstration of Digital Twins for a Green Steel Value Chain

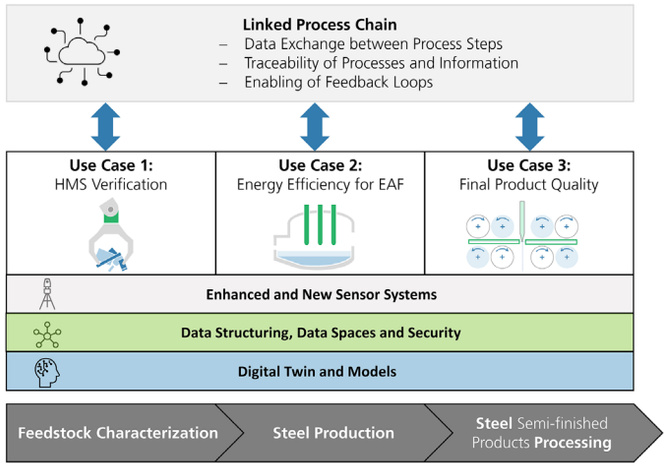
DiGreeS

www.digrees-horizon.eu

DiGreeS

The goal of "DiGreeS" is to develop a user-friendly digital platform for networked production, to make steel production "greener", more digital and more economical.

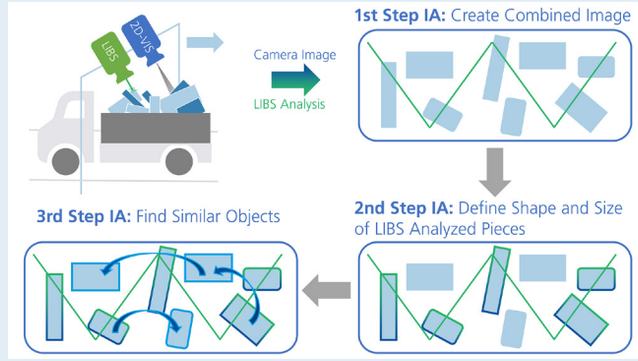
Optimized Product Quality, Lower CO_2 Emissions, Lower Energy Consumption, Lower Costs



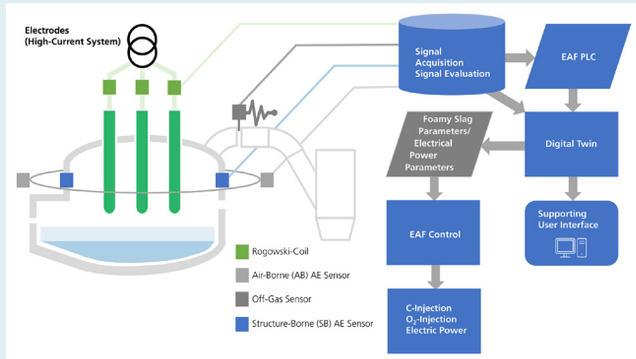
DiGreeS aims to develop comprehensive digital twins to

- improve the efficient verification of steel scrap,
- improve the real-time control of crude steel production at the electric arc furnace (EAF),
- improve the quality of intermediate and end products, and to increase process yield,
- exploit the potential of novel sensor technologies, artificial intelligence and machine learning technologies to support the optimal use of process data,
- increase the product quality of the steel products, the raw material and energy efficiency of the manufacturing process and thus increase their recyclability.

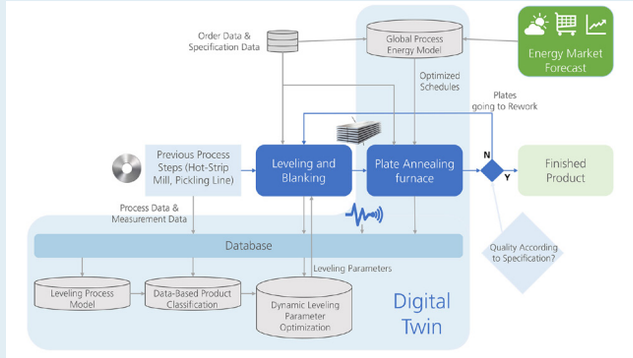
Use Cases - Challenges and Solutions



Use Case 1



Use Case 2



Use Case 3

Use Case 1: Heavy Melting Scrap (HMS) Verification

DiGreeS will use camera images and surface chemical analysis to provide a bulk analysis of HMS truckloads with focus on Cu and S, to reduce the likelihood of unexpectedly high levels of impurity in the steel-making process and to improve the quality of crude steel output. The sensor information will be used to train an AI model to classify the HMS pieces and attribute a "representativeness indicator" to pieces of a given class.

Use Case 2: EAF Process Control

DiGreeS will use a combination of novel sensors and hybrid dynamic process models to monitor the progress of feedstock melting and the height of foamy slag, which are essential for efficient energy transfer from the arcs to the melt and on the off-gas analysis to monitor in real-time relevant process parameters.

Use Case 3: Quality Assurance of Semi-finished Products particularly Steel Sheets

An AI-based optimization model will be developed, incorporating available data, upstream process data, and process knowledge to classify final product quality and dynamically adjust levelling parameters to optimize production, reduce deviations, the need for re-work, and thus the CO_2 footprint.