VDEh-Betriebsforschungsinstitut GmbH

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Technical Group: TGA 5

Smart consideration of actual ladle status monitored by novel sensors for secondary metallurgy process parameters and ladle maintenance strategies

SmartLadle

Public

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Deliverable 7.2 –Initial setup of a project web page

Due 12 / 2021
Lead beneficiary: BFI

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Project summary

What is the effect of the actual ladle status -new to worn- on steel bath properties? How do e.g. temperature or fluid flow vary with ladle conditions? When is the optimal moment for re-lining?

SmartLadle will provide a solution for online monitoring and dynamic incorporation of actual ladle status for process control. A soft sensor for ladle status shall be developed, supported by a smart sensor for detecting refractory wear and thermal status. Measurement data, models and advisory tools shall provide information for decision making to operators to adapt ladle metallurgy process parameters to actual ladle status and decide about maintenance actions.

Definition of terms used in the project

Soft sensor: Mathematical calculation of value of a process parameter that is difficult or so far impossible to measure directly and online, based on other process values, measurements, models and smart sensor data

Smart sensor: Combination of a pure sensor for the acquisition of a measured value, e.g. refractory temperature, and a small computing unit with implemented simplified models, e.g. for refractory wear

ML model: Data-driven model that analysis data and detects relationships (linear or non-linear) among variables based on real-world data using Machine Learning (ML) Techniques

1. Web page and structure

Due to a restructuring of the entire BFI website, the SmartLadle project website cannot yet be put online. Nevertheless, the content for the web page was prepared and will be uploaded as soon as possible.

The following information will be given in German and in English (see also below):

- Contact person
- Project partner
- Project title
- Content of project
- Picture related to project
- Keywords

Contact person

Name	Birgit Palm

Partner

Partner 1	Schmiedewerke Gröditz GmbH
Partner 2	Swerim AB
Partner 3	Uddeholms AB
Partner 4	Sidenor Investigacion y Desarrollo

Funding Reference

RFCS: 101034017

Title (ENGLISCH)

SmartLadle - Smart consideration of actual ladle status monitored by novel sensors for secondary metallurgy process parameters and ladle maintenance strategies

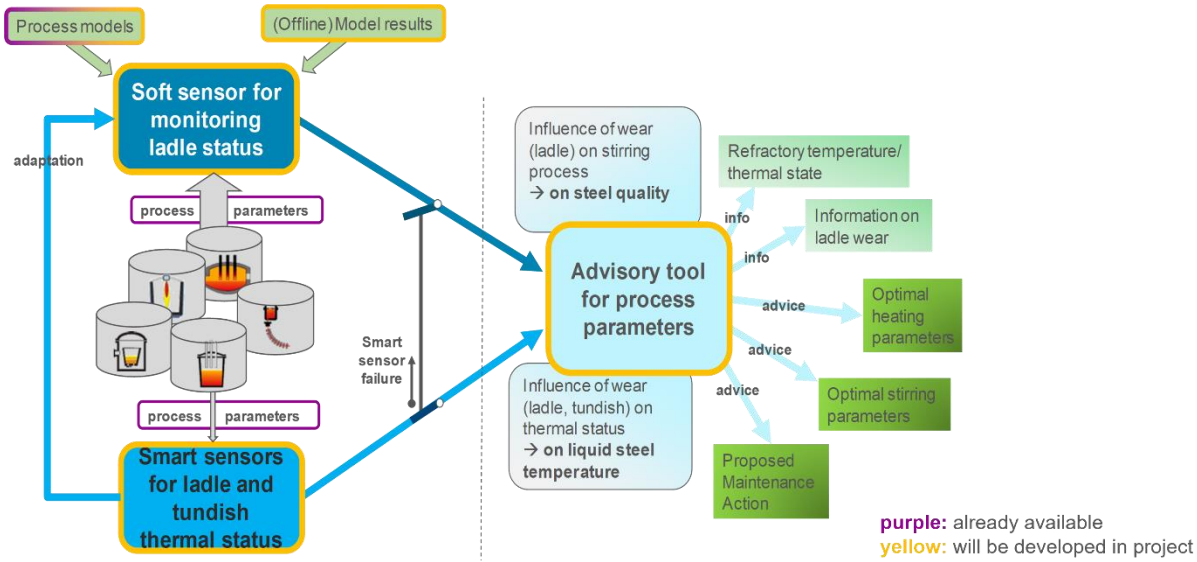
Content (ENGLISH)

The overall objective of this proposed project is the online monitoring of the ladle status using a soft sensor supported by a new smart sensor and a data-based solution for the dynamic consideration of the actual ladle status in process control.
The soft sensor for ladle status shall collect all available process data, including the information from the new smart sensor, during the liquid steelmaking process, in order to enable a robust and reliable estimation of the ladle status. The data of other metallurgical vessels and the tundish conditions are also considered in the solution as important boundary conditions for the liquid steelmaking ladle treatment processes.
The liquid steel production process shall be improved by adjusting the process parameters (e.g. stirring strategy, ladle reheating time between two heats) to the actual ladle status (e.g. ladle wear and thermal status, ladle history). This will be achieved by developing an Advisory Tool.

Work packages:
WP1: Monitoring of initial ladle status and process conditions
WP2: Development of smart sensor and test of a fast slag analysis
WP3: Preparative modelling
WP4: Development of soft sensor and plant trials for optimisation of ladle refractory and operational process parameters
WP5: Development of automatic monitoring of ladle status and Advisory Tool
WP6: Test and verification of sensors and Advisory Tool
WP7: Management, reporting, and dissemination

Project duration: 01.07.2021-30.06.2024

Picture



Title of picture:
Structure of monitoring and Advisory Tool

Labelling (below picture):
The structure of the complete monitoring and the novel Advisory Tool for the actual ladle status is shown together with input and output variables, where the framing colour "purple" indicates already existing variables and "yellow" the tools/variables to be developed within SmartLadle

Keyword(s) (ENGLISH)

smart ladle, soft sensor, ladle status, refractory wear, dynamic process control, maintenance scheduling, secondary metallurgy, Cyber Physical System