

Analytical modelling of nitrogen content prediction in pig iron and molten steel during steelmaking process

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Funded by the EU NextGenerationEU through the Recovery and Resilience plan for Slovakia under the project No. 09I03-03-V04-00047

PROJECT OBJECTIVES

This project aims to predict nitrogen content in molten metal at various steelmaking stages (pig iron, BOF/EAF crude steel, and secondary steelmaking). To achieve this, we will analyze real operational data, preprocess, synchronize, and process data. Statistical procedures will be used to develop predictive models, which will be tested and compared using machine learning techniques. The accuracy of these models will be quantified and compared to actual measurements. Additionally, analytical modeling techniques will be used to understand the relationship between factors like chemical composition, temperature, and nitrogen content. The effectiveness of the methodology will be assessed by comparing predicted and actual nitrogen values, using statistical indicators like MAE, MPE, and MAPE. The goal is to achieve high prediction accuracy within a 5-10 ppm range.

RELEVANCE, QUALITY AND NOVELTY

The current methods for predicting nitrogen content in molten metal are insufficient and rely heavily on empirical experience and traditional procedures. This often leads to suboptimal quality, especially when input materials or production processes change.

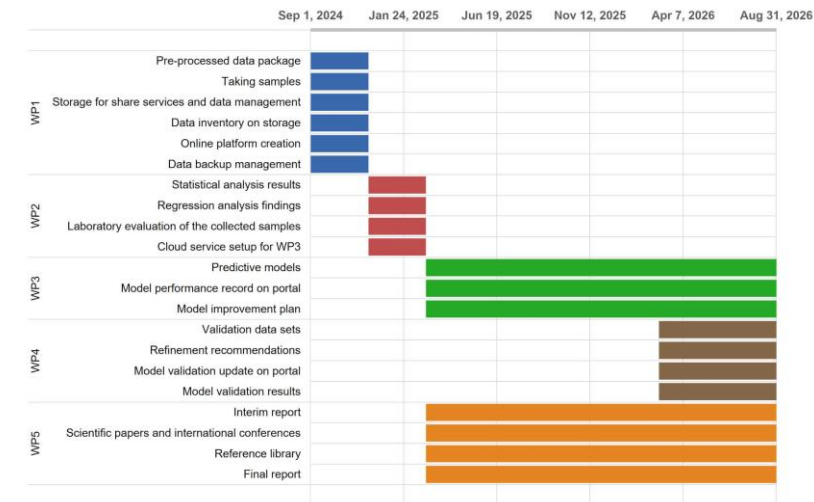
Nitrogen content is currently determined through laboratory analysis, which is time-consuming and only performed for high-quality steel grades. This delayed information hinders timely decision-making and can lead to increased nitrogen levels, negatively impacting steel properties. This project aims to address these issues by developing predictive models for nitrogen content in molten pig iron and steel. By analyzing real-time data and employing advanced statistical and analytical techniques, the models will enable accurate and timely predictions. This will significantly improve production efficiency, reduce costs, and enhance the quality of the final product. Furthermore, by aligning with the European Research Area's focus on scientific advancement and collaboration, this project contributes to the overall goal of fostering innovation and competitiveness within the steelmaking industry.

IMPACT

Predictive models are valuable tools for optimizing steelmaking processes. This project aims to develop and apply an analytical model to predict nitrogen content in molten pig iron and metal. While ambitious, the project's goals are achievable within the given timeframe.

PROJECT PLAN:

The overall structure of the submitted project plan is scheduled for 24 months. Implementation starting on 1.9.2024 and ending on 31.8.2026. Time frame for the implementation of given work packages are listed in Gantt diagram below.



For more information about this project and actual state of the solution, please log on to site:

www.nitrogen-prediction.eu



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