



Dissemination of the heating technology research results for emission minimization and process optimization towards today's fossil-free heating agenda

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Dissemination level: Public

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1 Abstracts submitted to the 14th INFUB conference

Two conference proceeding abstracts have been submitted for the 14th conference on industrial furnaces and boilers (INFUB) conference in Algarve, Portugal April 2-5 2024. Both abstracts are approved by the organizing committee.

The INFUB conference is a technical conference where the main objective of the conference is to provide an improved up-to-date understanding of the fundamentals, principles and practices associated with the design and operation of industrial furnaces and boilers and, from a broader perspective, of industrial systems and processes generating, transforming or using thermal energy from combustion.

The Conference provides the opportunity to disseminate information on recent research and development activities in the field of furnace and boiler technology and related areas, such as process and combustion control, efficiency optimisation of high-temperature energy application, and reduction of pollutant emissions. Carbon-neutral fuels like i.e. biomass, hydrogen and ammonia and alternative fuels, like refuse derived fuels and production residues are represented in the conference. It provides a space for delegates involved in research, development, design and operation of furnace and boiler systems, and also to those working in nearby areas such as combustion science, fuel technology, energy management and air pollution control.

1.1 Abstract nr 1

INFUB-14

Algarve, Portugal, 2 - 5 April 2024

Electrification of reheating furnaces: state of the art and future research needs

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Abstract

Downstream industrial furnaces on the metalworking side must be de-fossilized to achieve the target of CO₂-neutral steel production. This work aims to promote measures to reduce the carbon footprint of reheating furnaces gathered from the literature, EU/RFCS/ECSC projects and EU-BAT documents and promote state-of-the-art technology to a wider audience, and finally develop a roadmap for future research activities. This paper aims at promoting measures that improve the efficiency and productivity of reheating furnaces, electrical heating, or carbon-neutral fuels.

The work comprises a critical review of relevant EU-projects and literature from the last 25 years, which was compiled and tabulated based on key performance indicators related to efficiency, productivity, heat transfer, heat recovery and scope 1 and 2 greenhouse gas emissions. The findings were disseminated to stakeholders from the steel industry, technology providers, policymakers, and researchers through workshops and webinars. This provided feedback and insights to formulate a roadmap

for technological development, research activities and priorities. In this work, findings relevant for electrification was considered and elucidated.

Recent developments of electric heating technologies, inductive heating or radiative resistive heating are better suited to provide efficient, carbon-neutral heating in reheating furnaces. However, the cost of electrical heating presents a major hurdle for large-scale implementation due to the requirement of greenfield installations, larger retrofits and basic electric infrastructure, and a supply of fossil-free power production.

Due to the long lifespan of reheating furnaces, research into low CO₂ technologies applicable in existing furnaces can be applied and is required in the short and mid-term. This includes indirect electrification through hydrogen and other electrofuels together with direct electrification through resistance and induction heating. Long term, further development is needed towards electrification, electric heating technologies and hybrid heating. We also identified research opportunities for new integration possibilities within steel mills, and potential synergies with other industries.

1.2 Abstract nr 2

INFUB-14

Algarve, Portugal, 2 - 5 April 2024

Dissemination and future research road map on heating and burner technology in industrial heating in the European steel industry

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Abstract

This article deals with the analysis of research conducted in Europe on industrial heating in the steel industry and future research needs for fossil free heating. The European steel industry consumes enormous amounts of fossil fuels for the production and processing of steel and is therefore responsible for a large share of industrial CO₂ emissions. The steel industry has therefore taken measures under the European Green Deal to reduce these emissions. However, the focus of new developments has so far been on steel production due to the particularly high demand for fossil fuels for pig iron production.

Almost half of the industrial energy demand in Europe is required for thermal processing equipment such as industrial furnaces, whose energy consumption

amounts to 1,650 TWh/a [6]. Industrial furnaces for metal processing in Europe are responsible for about 8 % of the total consumption of all European industrial furnaces, accounting for 99 to 132 TWh/a [6].

In the dissemination project „dissHEAT“, funded by the Research Fund for Coal and Steel (RFCS), research projects and international research of the last 25 years, the State of the Art (SoA) and best available technologies, on industrial heating in steel industry, were analysed, classified and evaluated. The CO₂ reduction potentials of the SoA and new technologies as well as their readiness for implementation for current industrial furnaces and in particular reheating furnaces in rolling mills were determined and evaluated. Based on these findings and results, a future research roadmap was developed in cooperation with stakeholders from research, plant operators and suppliers. Therein the future research needs in the topic of heating and burner technology for a CO₂ free industrial heating on the pathway to green steel have been defined.

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