



Contribution ID: 410

Type: **Oral Presentation**

Pathways for Sustainable Hot Metal Production from DRI to Support Green Steel Production

Wednesday 8 October 2025 16:50 (20 minutes)

Gas-based direct reduction (DR) is a key process in low-emission steelmaking due to its flexibility to utilize a variety of reducing agents with lower GHG emissions compared to blast furnace (BF) ironmaking. While direct reduced iron (DRI) and hot-briquetted iron (HBI) produced from low-gangue iron ore are commonly used in electric arc furnaces (EAFs), efficient processing of DRI made from widely available high-gangue iron ore is more challenging. This is a barrier to the widespread adoption of DR process to reduce steel industry emissions.

This study explores the merits of converting high-gangue DRI into hot metal (HM) in BFs to supply high quality iron units for steelmaking. The authors believe that DRI production offers considerable value to integrated steel producers as i) an incremental emissions reduction measure without extensive changes to existing operation; ii) a boost to HM production; and iii) a precursor to future deep, transformational decarbonization flowsheets such as electric smelting furnace (ESF) ironmaking. Process, emissions, and economic drivers are analyzed through physics-based modelling to identify practical scenarios for incorporating DRI in the integrated steelmaking value chain.

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Session Classification: Alternative Fuels & Decarbonization

Track Classification: Ironmaking - Blast furnace ironmaking