Contribution ID: **93** Type: **Oral Presentation**

Ecologic and Economic Evaluation of COG Injection and Comparison with other Fuel Gas Injection Systems

Wednesday 8 October 2025 16:30 (20 minutes)

The injection of alternative reducing agents into blast furnaces is recognized for its potential to enhance both the carbon footprint and operational costs. Specifically, the use of hydrogen-bearing gases can shift the reduction of iron oxide from carbon to hydrogen, resulting in significant environmental benefits. Recent projects and experiences from the authors' company highlight a changing economic landscape that increasingly supports COG (Coke Oven Gas) injection. The context of CO2 mitigation, advancements in injection technologies, and evolving cost structures make COG injection a viable and cost-effective retrofit option compared to other green technologies with similar effects.

This paper provides a comprehensive summary of recent evaluations and findings, comparing the ecological and economic advantages of the injection of hydrogen-bearing gases. The objective is to assess the impact of fuel gas injection on blast furnace operation, CO2 emission reduction potential, and operational costs (OPEX) compared to a generic reference case without any fuel gas injection. In the initial phase, several combinations of fuel injections with various gas injection rates are simulated and analysed for their impact on blast furnace operation. All impacted changes in the blast furnace operation are analysed with respect to potential changes in CO2 footprint and OPEX. The OPEX analysis takes into account different regions, considering the variations in utility costs and CO2 taxes.

This paper presents the detailed methodology, simulation results, and practical implications of implementing fuel gas injection systems in blast furnace operations, contributing to the ongoing efforts to reduce industrial CO2 emissions and enhance operational efficiency. Additionally, it provides an outlook on the potential uses of the injected gases to further enhance CO2 reduction potential.

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Session Classification: Alternative Fuels & Decarbonization

Track Classification: Ironmaking - Blast furnace ironmaking