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Decreasing Hot Metal Ratio with dual-flow post-combustion lance at ArcelorMittal Dunkerque

Wednesday, 21 May 2025 12:00 (20 minutes)

ArcelorMittal Dunkerque is experimenting a new BOF oxygen lance equipped with secondary holes located above the lance tip and fed by a dedicated oxygen circuit. The aim is to promote post-combustion, developing additional energy inside the BOF, transferring it to the bath, fostering scrap melting and thus decreasing Hot Metal Ratio and thus global CO2 emissions.
A first step of this study was based on CFD simulation describing oxygen jet and combustion inside the BOF vessel. We investigated the effect of distance to the tip from 15 to 100 cm, several angles with vertical line and several oxygen flow rates. Expected post-combustion rate and temperature conditions in the vessel were checked for selecting the candidate designs to be tested industrially.
A dynamic model describing the evolution of the blow was also developed. It describes kinetics of oxidation reactions, scrap melting and fluxes dissolution. The model relies on gas analysis and flow rate measurements to assess oxygen and carbon balance evolution. The model is installed in the plant to analyze the performances of the Post Combustion with and without the lance.
Various campaigns of industrial trials were performed with selected designs, varying distance to the tip from 15 to 75 cm, angles from 15 to 25° with vertical line and with dedicated oxygen flow rates between 80 and 135 Nm3/min.
Performances were proven to be around 8 – 15 kg of extra Fe molten per ton of hot metal (= Hot Metal Ratio).
The next phase of the project will focus on the lifespan of the lance. Further research will be conducted to develop solutions to ensure that the lance meets the expected reliability standards, thus avoiding premature wear and possible water leakages.

Speaker Country

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No

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