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Additional scrap melting capacity with dual-flow post-combustion lance at ArcelorMittal Dunkerque

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Increasing the energy source in BOF process and transferring it to the bath is a potential solution for fostering scrap melting, decreasing Hot Metal Ratio and thus global CO2 emissions.
Post-combustion at BOF converter is usually around 10-12%. Many developments have been done in steelmaking industry to use this potential energy, either for the management of BOF mouth opening and skull removal or for low Hot Metal Ratio operation, but challenging issues are often reported: limited increase of the achieved post-combustion rate, or with low effectiveness for scrap melting, or excessive thermal stress for refractories and fume system.
ArcelorMittal R&D investigated several possible oxygen lance tip designs to identify promising candidate solutions with additional oxygen ports for post-combustion, changing the distance to the tip, angles, tuyeres characteristics and oxygen flow rate.
Selected designs have then been tested industrially in ArcelorMittal Dunkerque after modification of the existing single-flow oxygen lance for a double-flow control and after implementing dedicated sensors and dynamic descriptive model to evaluate and monitor the energy efficiency in real-time. The current design allows from 8 to 15 kg of extra Fe molten per ton of hot metal, with equivalent reduction of the hot metal ratio. No issue was observed for fume system or refractory wear. Ongoing work is now focusing on lance tip lifespan and reliability.

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