

Contribution ID: 245

Type: Oral

## Problem solving with modeling support: evaluation with a numerical fluid dynamic model of the different configurations of the slag-cutting deflector for oxygen jet lance tips in the BOF

Thursday 9 October 2025 11:00 (20 minutes)

In the primary steel production, hot metal produced in the blast furnace (BF) is fed via a ladle to the Basic Oxygen Furnace (BOF), where it is converted to liquid steel. During the metallurgical operations, slag can form and solidify on the refractory walls during tapping. These oxide deposits must be periodically removed, to ensure the regularity of BOF operations over time.

Cleaning operations slow the process, as they require dedicated plant operations. For this reason, a collaboration between RINA-CSM and ADI was set up to find a solution to shorten the BOF 'cleaning times', by managing the injected oxygen flow.

The investigated solution (slag-cutting baffle) is based on two countermeasures: an operational one, jet 'upstream'flow management, and one 'downstream', thanks to an appropriately designed baffle, adaptable to the heads of the oxygen lances, to properly guide the jet.

To comply with the required effects without impacting on internal lining safety, the oxygen jet blown must meet certain requirements. First, it must be oriented and concentrated within a 'blade' shape, for a 'compact' stream. Furthermore, the jet in the BOF must be fast enough to provide for slag melting, but without local velocity 'hot spots', harmful to internal lining integrity. Therefore, different configurations were designed for the deflecting system (walls, slits), based on the geometric characteristics of the oxygen lances tips.

The study presented hereinafter shows the approach to the problem, the configurations designed, the evaluation criteria of the expected performance, and the results of the computational fluid dynamics (CFD) simulations carried out to verify jet performance. This study made it possible to identify critical issues in the initial configurations, and then to fix them, with solutions considered reliable and industrially applied.

Primary authors: Mr DELL'UOMO, Alessandro; RESSEGOTTI, Davide

**Co-authors:** Mr CRISTALLINI, Alessandro; Mr ESPOSITO, Domenico; Mr CASSONE, Egidio; DE SANTIS, Michele (Rina Consulting - Centro Sviluppo Materiali SpA)

Presenter: Mr DELL'UOMO, Alessandro

Session Classification: Conversion and refining process

Track Classification: Steelmaking - Oxygen steelmaking