

Contribution ID: 111

Type: Oral Presentation

Hot DRI Material Gate –A smart product for green steelmaking in a digitalized future

Tuesday 7 October 2025 15:10 (20 minutes)

This paper presents the development and implementation of a new material gate for charging of hot DRI bulk material in melters downstream of direct reduction plants or hot pellet materials in shaft furnaces or smelters. Developed and tested over a two-year period, this material gate displays innovative solutions regarding mechanical design, serviceability, and condition monitoring, creating a future-proof solution for green steelmaking.

The material gate's mechanical design enables low-effort maintenance, resulting in an important downtime reduction. Compared to existing solutions, a threefold size reduction enables a more flexible plant integration and lower plant height, resulting in significant cost savings. Thermal simulations and materials research ensure thermal resistance, efficiency, reduced wear, and, most importantly, worker safety. Extensive particle flow simulations enabled a data-based decision making process regarding key dimensional parameters of the DN400 gate, improving overall material throughput and enhancing the understanding of the material flow behavior.

Its condition monitoring concept makes this equipment an intelligent and future-proof product in our portfolio. A multitude of sensors is keeping track of its current state, functionalities, and potential need for maintenance. This supervision reduces plant downtime significantly and makes the equipment a smart solution for digitalized plants.

Several tests ensure great customer experience from the first project on. Small-scale experiments allowed analyzing the sticking and flowing behavior of DRI pellets. A full-scale prototype was successfully tested under realistic conditions with hot DRI pellets at 700 °C, confirming the design choices and collecting valuable data to validate the simulations.

After the extensive developing and testing process, the gained experience allowed further optimizations of the material gate, before launching the first series production for a customer direct reduction plant. This device is perfectly suited for the next generation of green steelmaking plants producing hot DRI, given its unique combination of reliability, maintainability, and condition monitoring.

Primary author: Mr DE MATTEIS, Jérôme (SMS group)

Co-author: Mr KRÄMER, Philipp (SMS group)

Presenter: Mr DE MATTEIS, Jérôme (SMS group)

Session Classification: Direct Reduction Process Optimization

Track Classification: Ironmaking - Direct reduction and smelting reduction