

Contribution ID: 61

Type: Oral Presentation

Wear and oxidation behavior of cast high-speed steels used for work rolls in hot rolling mills

Wednesday 8 October 2025 11:10 (20 minutes)

Cast high-speed steel (HSS) work rolls are used in roughing and finishing stands of hot rolling mills, as they possess high hardness and wear resistance, which is responsible for their great durability in service. During the rolling process, depending on the operating conditions in the respective stand, the degradation of the work rolls is caused by a combination of thermal fatigue, rolling contact fatigue, adhesive wear, abrasive wear, and corrosion. Furthermore, wear-protective tribolayers may form because of the oxidation behavior, which significantly impacts the wear of the rolls.

A customized wear test rig was used to investigate the wear behavior of HSS under different hot rolling conditions. This test rig enables the simulation of rolling conditions between the work roll, the back-up roll, and the hot-rolled steel. The test parameters were systematically varied to ensure that the wear behavior was assessed under conditions similar to those experienced in the R2, F1, and F2 stands at Tata Steel's Direct Sheet Plant in the Netherlands. Additionally, high-temperature oxidation tests were carried out at different temperatures to investigate the oxidation behavior of HSS. The degradation mechanisms and the oxide formation were analyzed using light optical microscopy (LOM) and scanning electron microscopy (SEM).

The results of this study demonstrate the impact of parameters such as temperature, rotational speed, and slip on the wear and oxidation of specific HSS grades. Additionally, correlations between the carbide content, the carbide types and the wear behavior of HSS are highlighted. The experimental methods only enabled reproducing the surface degradation of the rolls after use at Tata Steel's Direct Sheet Plant to a limited extent. However, the combination of wear and oxidation tests helps explaining the wear and oxidation behavior of HSS rolls under industrial hot rolling conditions.

Primary author: REITER, Maximilian (Eisenwerk Sulzau-Werfen R. & E. Weinberger AG, Tenneck, Austria)

Co-authors: Mr AIGNER, Michael (Eisenwerk Sulzau-Werfen R. & E. Weinberger AG, Tenneck, Austria); Mr KREMSMAIR, Niko (Eisenwerk Sulzau-Werfen R. & E. Weinberger AG, Tenneck, Austria); Mr TRICKL, Thomas (Eisenwerk Sulzau-Werfen R. & E. Weinberger AG, Tenneck, Austria); Mr PAAR, Armin (Eisenwerk Sulzau-Werfen R. & E. Weinberger AG, Tenneck, Austria); Mr PELLIZZARI, Massimo (University of Trento, Trento, Italy); Mr DOMITNER, Josef (Graz University of Technology, Graz, Austria); Mr BEENTJES, Danny (Tata Steel, IJmuiden, Netherlands); Mr BOLT, Henk (Tata Steel, IJmuiden, Netherlands)

Presenter: REITER, Maximilian (Eisenwerk Sulzau-Werfen R. & E. Weinberger AG, Tenneck, Austria)

Session Classification: Roll Technology & Maintenance

Track Classification: Rolling of long and flat product