Application of Hot Rolling Lubricants to the Backup Rolls on Çolakoğlu Finishing Mill and the Comparison With General Work Roll Gap Lubrication Method

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Çolakoğlu's hot strip mill (C HSM), which started up production in 2010, was capable of producing approximately 3.0 million tons per year of hot-rolled coil. Since one-third of its production is materials less than 2 mm thick and steel market quality needs are getting higher consistently, C HSM has extended the rolling lubrication system, which was previously installed in F2–6 rolling stands in the first installation of the facility to all (F1–7) of the rolling stands in the first phase. Following that, C HSM has carried out backup lubrication experiments in accordance with many targets such as stability during rolling, improving product surface and profile quality, reducing energy consumption, increasing roller life, reducing roll consumption, and reducing roller change stops. Çolakoğlu HSM has made a specific design for the backup roll lubrication and successfully applied it in both the early and late stands of the finishing mill (F1–7) and has achieved significant gains through implementation.

Introduction

The hot strip mill established by SMS group for production capacity of 3.0 mtons/year (with a two-slab-furnace project in 2023, production capacity of the mill increased to 4.5 mtons/year) was commissioned at June 2010. The mill contains two slab walking beam reheating furnaces, primary high-pressure water descaler, a single reversing roughing mill stand with edger, one mandrel-less type coilbox, one crop shear, finishing mill high-pressure water descaler, seven finishing mill stand with CVC-plus, shifting and bending system, runout roller table with laminar cooling, and two downcoilers (Fig. 1).

The mill produces plain carbon structure steels, high-quality carbon structure steels, ultralow-carbon steels, high-strength low-alloy structure steels, medium-carbon alloy steels, automobile structure steels, boiler steels, pressure vessel steels, ship plate structure steels, bridge steels, pipeline steels, dual-phase steels and stainless steels within a thickness range of 1.1–25.4 mm and strip width of 800–1,650 mm. One-third of the annual production in tonnage is under 2 mm strip thickness gauge.

Çolakoğlu HSM began to search for different ways to reduce energy consumption costs, especially with the energy crisis just after the COVID-19 pandemic. Additionally, changes in environmental protection politics, developments in green steel and the higher quality demands from customers were also factors. Rolling is the second highest energy-consuming process in the rolling mill just after reheating of the slabs in the furnace. In the rolling operation, minimizing the friction forces in the roll gap and maximizing the cooling process for work rolls lowers the rolling forces and results in lower power consumption by finishing mill motors and significantly reduce roll wears, which are important items in conversion costs in an HSM. Rolling lubricant usage in the HSM decreases rolling forces and power consumption by 15–30% and extends roll lifetime 20–40%. Rolling of the lubricants is a very efficient and economically profitable application.