

Contribution ID: 30

Type: Oral Presentation

Boron alloyed free cutting steel: a new candidate for Pb steel substitution

Wednesday 8 October 2025 09:00 (20 minutes)

Boron in steel might form boron nitrides and/or boron oxides. Hexagonal boron nitride is a solid lubricant and as a second phase in steel it improves machinability (tool lifetimes as well as chip breaking). In addition, boron in oxides lowers the melting point (or glass transition temperature). B2O3 is known as a low melting phase with similar properties than Pb inclusions. Unfortunately, the formation of a significant amount of B2O3 in steel is difficult and expensive. The present investigation shows that under regular industrial conditions and with moderate boron additions a well-designed balance between nitride and oxide formation leads to optimum machinability behavior. Longitudinal turning and grooving tests of this new boron steel result in longer tool lifetimes in comparison with leaded steels. The optimum operation zone in drilling is comparable with the Pb alloyed steel. Chip breakage diagrams were evaluated. The chip breakage behavior is better than that of standard steel without Pb but is not quite as good as that of Pb-alloyed steels.

Primary authors: Dr ROELOFS, Hans (Steeltec AG); UNIFANTOWICZ, Paulina (Steeltec AG)
Co-author: Dr HAUPT, Heiko (Steeltec AG)
Presenters: Dr ROELOFS, Hans (Steeltec AG); UNIFANTOWICZ, Paulina (Steeltec AG)
Session Classification: Alloy Design & Microstructure Control

Track Classification: Steel materials and their application