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High End Steel Grade Production with Advanced Cooling Technologies - possibilities for AHSS

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Power Cooling offers significant advantages in hot strip mills, particularly for producing modern steel grades with superior mechanical properties. This innovative cooling system features scalable water impact pressure and flow rates, ensuring high cooling rates coupled with precise temperature control far beyond the usual coiling temperature ranges for conventional steel grades. This is especially true for low coiling temperatures where the Leidenfrost effect becomes important. Additionally, it offers a quasi-laminar mode that provides all the advantages of classical cooling sections.

This unique flexibility, combined with highly accurate temperature control, forms the basis for the reliable production of sophisticated steel grades requiring multi-stage cooling, such as bainitic, complex phase, or martensitic grades where self-tempering is necessary, and the length of the cooling section is critical. The precise temperature control available in both the longitudinal and transverse directions of the strip within the bainite start temperature region makes the production of Quenched and Partitioned (Q&P) steels as hot-rolled achievable. This simplifies the production route for the most promising candidates for the third generation of High-Strength Steels (AHSS), characterized by an ECO-index (tensile strength x elongation) above 20000MPa%, significantly reducing downstream processing and production costs.

For conventional steel grades, the high cooling rates achievable offer significant alloy savings via grain refinement, the Hall-Petch effect, and improvements in formability, mechanical properties, and welding properties. For multi-stage cooling, the high cooling rates yield high ferrite nucleation rates, fine cementite precipitates, and short lengths until the holding/quenching temperature is reached, allowing for increased holding times compared to (quasi-)laminar cooling.

Thus, Power Cooling technology not only meets current market requirements for high-strength materials but also positions steel producers to capitalize on future metallurgical demands. This advanced technology is crucial for producing high-quality steel that adheres to the stringent standards of today's industries.

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