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Benefits of Molybdenum to produce heavy steel plates via the direct quenching process

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For economic and environmental reasons, quenched as well as quenched and tempered steel plates are nowadays produced using direct quenching (DQ) if feasible, as one process step can be omitted compared to conventional quenching. However, the DQ process has significantly higher demands on process control. This requires precise matching of the alloy concept with the process parameters. Molybdenum is ideally suited to meet all the requirements of the DQ process. EBSD measurements show that molybdenum can delay recrystallization to such an extent that a pronounced pancaking of the austenite can be achieved during finishing rolling. At the same time, molybdenum shifts the ferrite nose in the CTT diagram to slower cooling rates. This delay of the phase transformation during quenching ensures a fully martensitic microstructure over the complete plate thickness. A precise understanding of the effects of molybdenum during the entire production process allows the microstructure to be adjusted in a targeted manner. With the knowledge of how the microstructure is related to the product properties, the alloy concept can be adapted precisely to customer requirements. This enables the production of ultra-high strength steel plates with excellent toughness properties for a wide range of plate thicknesses.

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