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Temperature distributions influencing lateral spread in industrial hot rolling

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ABSTRACT

The lateral deformation of billets is one of several key factors affecting the efficiency of hot rolling. Most previous investigations of the lateral deformation deal with the experiments or simulations in laboratorial scales and indicate that the lateral spread has a rather weak dependence of material flow stress. However, the lateral deformation in industrial hot rolling is usually relevant to deformation temperatures and grades of alloys. This discrepancy may be due to the different sizes of workpieces employed in the laboratorial and industrial hot rolling. Temperature distributions are usually unavoidable in industrial productions. Their influences on the lateral deformation should be investigated in order to clarify the discrepancy between the laboratory experiments and industrial experiences. The lateral spread of hot rolling is simulated with finite element method under different sizes of billets, reductions, and temperature distributions. The maximum spread is determined dominantly on the size and shape of billets and the reduction of rolling, and influenced by the temperature distributions. The influence of temperature distributions can be ascribed to the stress distributions on the cross-section of billets. The calculation of the maximum width of billets has been validated with the measurements in the hot rolling plant at Bohler Special Steel. This calculation has been successfully implemented in the online monitoring system to improve the quality and efficiency of hot rolling productions.

KEYWORDS: hot rolling, deformation, finite element method, simulation, steel