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Multi-functional Simulation System for Continuous Hot Bar Rolling: Development and Industrial Application

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Multi-pass hot caliber rolling technology has significant advantages in producing continuous bars, which can be used as structural and connecting parts with essential applications. The efficient production of high-quality bars is of great importance. Simulation is an important tool for reproducing production processes. With the improvement of product quality requirements, people also put forward higher requirements for simulation technology. The simulation model must show the thermal state, microstructure, and hot workability during the bar's high-temperature deformation process. However, such a multifunctional simulation model, especially one that can be applied to a multi-pass hot-forming process, has not yet been reported. Here, a finite element simulation system for hot bar rolling is presented. It is based on the DEFORM-3D software and has been further developed. Based on the embedding of the material model, the simulation model can realize the coupled simulation of temperature, deformation, microstructure, and hot workability. It is worth noting that the model calculation considers the characteristics of multi-pass continuous deformation. We demonstrate the multifunctionality and application of the simulation system based on industrial production processes. The simulation system can be applied to the hot bar rolling process and other multi-pass hot forming technologies. This is important for optimizing the production process and improving product quality.

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