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Abstract:

Modern enterprises of hot-rolled steel section products require ever greater technological and economic efficiency from the operation of rolling mills. This can only be achieved based on deep analysis using modern methods of mathematical modeling and experimental research. But roll pass design calculated using existing software products needs a development test. Thus, the metallurgical enterprise has additional financial costs. In this case, the economic benefit of using own programs for developing and improving roll pass designs becomes clear. The aim of this work is to develop computer program based on universal mathematical model of metal shape continuous rolling in «oval-circle» system. The variation principles of continuum mechanics were used in deriving the mathematical model, based on the minimal properties of the actual velocity field. It is proposed to replace the billet profile with an equivalent rectangular section using the corresponding strip method to ensure the universalism of the proposed model for determining the metal forming in the oval and circle calibers. And the shape of the round or oval caliber is replaced by the «smooth barrel» also by rules of the corresponding strip method. Continuous rolling conditions are considered by calculating the reduced dimensions of the billet under the action of tensile forces between the rolling mill stands. The filling of the caliber is determined by the inverse transformation from the corresponding rectangular section into the area limited by the caliber contour and the side surface line described by the radius. The program has been developed for determining the change in the shape of the strip during continuous rolling in round and oval calibers. Users can see the actual outline of the billet and the degree of caliber filling in the program's graphic window. The developed mathematical model can be used to study the metal shape change during continuous rolling on section mills in the calibers «oval–circle» system.

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