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Mathematical model of hot-rolled strip's camber formation

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ABSTRACT

A mathematical model of hot-rolled strip's camber formation at non-uniform reduction across the width based on transversal displacements of metal in the hearth of plastic deformation is developed. Transversal displacements of metal reduce unevenness of elongations across strip width, wherein the camber curvature becomes smaller, and its radius is larger than that calculated on the assumption of plane deformation scheme.

A mathematical model is developed with the help of the variational principle of possible changes in strain state (principle Jourdain). It is assumed that the input velocities' unevenness of the metal flow in the hearth of deformation across the strip width passes into an output one proportionally to reductions. Furthermore, velocities of deformation and displacements of metal in the hearth of deformation during rolling and corresponding powers are calculated.

The power of turning of the output cross-section of the hot rolled strip during the formation of camber is separately considered.

Solving Euler–Poisson's equation and submitting input unevenness the row of Fourier, we receive expression for coefficients, which take into account influence of the transversal displacements of metal on decreasing of output unevenness, for every harmonic.

KEYWORDS: hot-rolled strip's camber, non-uniform reduction across the width, metal transverse displacements, Jourdain variational principle, Euler–Poisson's equation, output cross-section of the hot rolled strip