Numerical Analysis of the Skew Lateral Contention Effect on the Superficial Shear Strain of Cross-Roll Pierced Tubes

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Abstract. In this paper, the effect of the lateral Diescher discs on the seamless tube forming in a cross-roll piercing mill is analysed. To this aim, a FE model of the process, which has been validated by means of industrial experimental data, is used. The lateral Diescher discs contain the lateral expansion of the tube during the combined action of rolling and piercing to which the material is subjected. In their usual position, this leads to the development of undesired superficial shear strains and frictional power losses. In this study, an alternative configuration is proposed, in which the Diescher discs rotational axis is given a skew angle of 5º, keeping the rotational axis of the discs parallel to the billet advance axis. Then, the validated FE model is used to analyse the impact of the proposed modification on the material processing. This leads to a better understanding of the impact that the lateral Diescher discs position have on the development of the superficial shear strain and to improve the efficiency of the process. The piercing performance, the frictional power losses and the material deformation have been measured. From the numerical results, it is concluded that a positive skew angle deviation with respect to the rotational direction of the material leads to a better piercing performance, a reduction in the frictional power losses and a reduction in the superficial shear strain developed during the piercing operation.