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An experimental and modelling approach for improving utilization rate of the cold roll forming production line

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ABSTRACT

This paper presents theoretical approach and complex experimental research which was conducted within the real production conditions of cold roll forming channel sections. The experimental investigation was focused on forming forces measuring on the rolls and the deflections of roll stands due to the forming loads. The comparison and analysis of the obtained experimental results was performed for the majority roll stands. Based on the experimental results mathematical modelling of the forming a force-roll load was performed by response surface methodology for different values of the input parameters of the process: material properties, sheet thickness, and sheet width. The defined force model and experimental research show insufficient energetic and technological utilization of the existing production line. After the conducted research in the production process a sheet thickness of up to 1.40 mm is used instead of 0.70 mm, and the utilization of the installed energy has increased from 20 % to 75 %. This is confirmed by the measured deformations of the roll stands and the energy consumption of the powered electric motor. Through realized modernization of the cold roll forming production line, 30 % higher productivity is achieved, which is a result of optimal number planning of roll forming stations and approximately the same load of all roll stands, as well as the higher flow rate of the profile sheet.

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