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ABSTRACT OF DOCTORAL DISSERTATION

Analysis of the influence of using an additional deformable element on the formation and load capacity of a clinched joint

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Abstract:

This diploma thesis contain issues related to the forming process, tensile strength, deformation of the connection area, and the moment of loss of torsional load capacity for joints made by the *CR* (*ClinchRivet*) technology.

For connection joints constructed with *CL* (*clinching*) and *CR* (*ClinchRivet*) technology the formability of joints was observed. Research were made for two and three layers of material with different arrangements, both type of material and thickness of the joined layers. Next, the effect of rivet insertion depth on selected joint properties, was analyzed. It was also demonstrated that the position of the joint, measured relative to the edge, can affect the joint's load capacity.

The work analyzed the influence of the rivet properties for the ability to making the connection. In order to conduct the research, the new rivets with varying degrees of hardness were manufactured. Additionally the study included modifications of the shape of commercial rivets. The effect of changing certain geometric features of the die on selected joint properties was demonstrated by creating a new die assembly. With the aim of conduct the precise analysis the modification of die bottom geometry were made. Moreover for selected case the investigation contain samples with different value of die height. Subsequent phase of research comprise shear strength analysis of selected connections according to ISO 12996.

The one of the most important part of this thesis was carrying out an analysis of torsional strength of joints made with *CR* technology. Especially for this study, the testing station for measuring the torque were designed and manufactured. During the tests there were observed the moment of loss of torsional load capacity and the critical values of torque were determined. The final stage of this dissertation was the validation of the numerical model of forming process.