Experimental and Numerical Study of Dissimilar Sheet Metal Clinching

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Abstract. Clinching a is joining technique for similar or dissimilar sheet (metallic or non-metallic) parts that is realized with a mechanical interlock due to local severe plastic deformation. Nowadays it has an ever growing popularity due to its simplicity and speed. Clinching is suitable to connect dissimilar materials providing a freedom to designers. Lightweight materials such as aluminium can be joined with advanced high strength steels (AHSS) effortlessly. Costly joints like bolted connections or spot welds can be replaced, increasing efficiency and reducing production time. Joining dissimilar materials shows a number of challenges (e.g. differences in chemical and mechanical properties, etc.). This paper deals with the clinch joining of dual phase (DP) steel sheets with aluminium alloy sheets. The aim of the investigation was to determine the strength of the clinched joint. In this article numerical studies were set up to find out the ideal manufacturing process and to identify the main influencers of the joints. 2D axisymmetric FE simulations were performed both in ANSYS and in DEFORM to study the joining process and experimental investigation was performed to show the static strength of the joints. The measured static strength values were compared to determine the better assembly sequence (whether the upper or the lower sheet should be steel). The FE results were compared to each other and to the actually clinched sections.