

Public Abstract

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Finite Element Analysis of Residual Stress Generation during Spot Welding and Its effects on Fatigue Behavior of Spot Welded Joint

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This dissertation presents the finite element based prediction of residual stress generation in a spot welded joint during the spot welding process and the effects of residual stress on fatigue behavior of a spot welded joint. It has been found that in the spot nugget, the highest tensile residual stress occurs at the center of the nugget and the residual stress decreases significantly at the edge of the nugget. Furthermore, spot welded advanced high strength steels, namely dual phase DP600 GI and transformation induced plasticity TRIP600 steels were investigated for their fatigue life, microstructure changes and fatigue fracture mechanisms to develop design data for possible application in future light weight and more fuel efficiency automobiles. The effect of post-heating on the microstructure (mainly dislocation morphology) is that more dislocations are generated during fatigue testing for both high and low loads. Post-heating results in strength decrease of spot welded joint while it releases the residual stress in it, which makes the fatigue life of welded sheet decrease under low fatigue loading condition.