

Ref.: IId40-016

Characterization of the spot welding of water quenched 22MnB5 steel using tensile tests and Digital Image Correlation (DIC)

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Resumo:

In recent years we identify the utilization of ultra high strength steels in the body in white stage of automobile manufacturing for the enhancement of passengers safety. During the body in white stage of manufacturing the automobile frame is joined together usually by means of welding and the major part of them are electric spot welds. This paper presents a study of the evolution of the strain field on the surface of tensile test specimens previously subjected to spot welding. A set of non standard tensile specimens out of 22MnB5 steel consisting of a longer blade specimen main body and a smaller short plate backing plate. All parts were water quenched after heating to 950 °C. The backing plates were spot welded to the center of the main body blades. The specimens surfaces were prepared for digital image correlation analysis and the specimens were tensile tested on a Instron universal testing machine. Results clearly show that a high strain annular region develop around the spot-welded region exactly on the heat affected zone. The specimen cracking started in that annular zone and than expanded diagonally to the borders of the main blade. The authors concluded that the control of the size of the heat affected zone around the spot weld may be a key factor for the design of the automobile body in white manufacturing process.