FSSW feasibility and properties in DP600 steel.

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The main goal of this work was to evaluate the FSSW technique to weld DP600 steel in lap joints configuration. The feasibility was an important point due to limitations of equipment and tools. The FSSW joints were performed in a CNC lathe using a tool made of WC-Co hard metal. The CNC lathe (Fig.1) experienced some problems with the high normal load when high plunge depth and/or high plunge rate were used. And the hard metal tool, in addition of its difficult fabrication, also presented a considerable wear, due the severe abrasive and temperature conditions. Despite of these limitations, the material was welded in lap joints configuration using the following parameters: tool rotational speed of 4000 RPM, plunge rate of 2 mm/s, plunge depth of 2.2 mm and dwell time of 2 s. The DP600 steel sheets thickness was 1.3 mm and were welded in two specimens configurations to evaluate the cross tension and the tensile lap shear strength (with 2 weld points). The average peak loads obtained were 7.0 kN, in the tensile shear test, and 0.75 kN in the cross tension test. For the tensile shear test the strength was similar to the literature, but in the cross tension tests, the peak load was lower than expected. This fact could be explained by the small area of effective joining (approximately 0.5 mm around a 4 mm diameter circumference). This small area did not affect the tensile shear test in the same way, because the mechanical anchorage also provides some resistance in this kind of loading. The failure modes were observed by SEM and for both tests the shear mode was identified (Fig.2).
Keywords: FSSW, DP600 steel, lap shear strength, cross tension strength

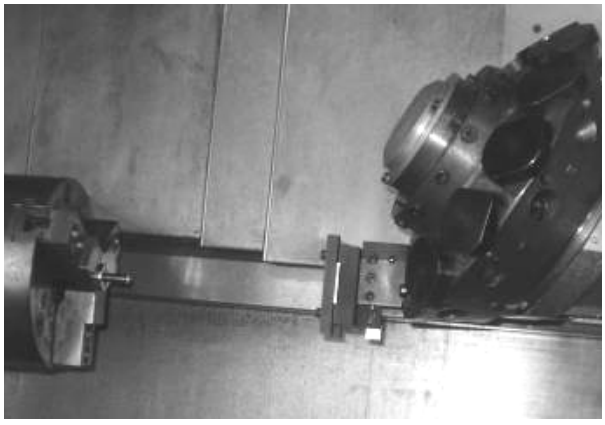

Fig.1. CNC lathe configuration

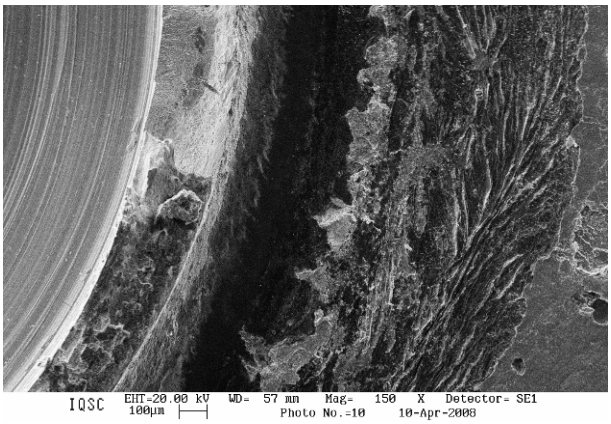

Fig.2. Fracture SEM observation

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