

# Design and Optimization of Friction Stir Welding Tool

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**Abstract:** In Friction stir welding, the tool geometry plays a fundamental role to obtain suited microstructures in the weld and the heat affected zone. In this work, for obtaining an excellent weld appearance without void, cracking, or distortion, an attempt was made to select proper FSW tool for aluminium alloy. So, we have included in the tool a safety system aimed at avoiding premature damage, and allowing the measure of applied pressure. The improved tool was tested on AA2024-T4 and AA7075-T6 aluminum alloys sheets. The weld quality has been evaluated by means of a microstructure analysis and micro-hardness measurements. The capacity to increase the welding speed, the changes of the crystalline plans orientation in the mixed part of thermo-mechanically affected zone and grains sizes observed in micrographics underlines the effect of the pin geometry and its displacement. The micro-hardness curve shows good mechanical properties. Finally, obtained results show welds of very good qualities. This study opens new interesting perspectives.

**Keywords :** Aluminium, Design, Friction Stir Welding, Metallography, Micro-hardness