Investigation of Mechanical Properties of Aluminum Tailor Welded Blanks

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Dario Basile, Manuela De Maddis, Raffaella Sesana, Pasquale Russo Spena, Roberto Maiorano

***Abstract*—** Nowadays, the reduction of CO2 emissions and the decrease in energy consumption are the main aims of several industries, especially in the automotive sector. To comply with the increasingly restrictive regulations, the automotive industry is constantly looking for innovative techniques to produce lighter, more efficient, and less polluting vehicles. One of the latest technologies, and still developing, is based on the fabrication of the body-in-white and car parts through the stamping of aluminum Tailor Welded Blanks. Tailor Welded Blanks (TWBs) are generally the combination of two/three metal sheets with different thicknesses and/or mechanical strengths, which are commonly butt-welded together by laser sources. The use of aluminum TWBs has several advantages such as low density and corrosion resistance adequate. However, their use is still limited by the lower formability with respect to the parent materials and the more intrinsic difficulty of laser welding of aluminum sheets (i.e., internal porosity) that, although its use in automated industries is constantly growing, remains a process to be further developed and improved. This study has investigated the effect of the main laser welding process parameters (laser power, welding speed, and focal distance) on the mechanical properties of aluminum TWBs made of 6xxx series. The research results show that a narrow weldability window can be found to ensure welded joints with high strength and limited or no porosity.

***Keywords*—** aluminum sheets; automotive industry; laser welding; mechanical properties; tailor welded blanks;

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