

Thermal Simulation and Experimental Characterizations of Aeronautic Stainless Steel Welded by TIG process.

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Abstract: In order to study the thermal behaviour of aeronautic stainless steel welded by TIG process, we have improved the energetic distribution formulation by adapting the geometric configuration into a bi-elliptic form with Gaussian surface heat flow distributions of the welding source. The Thermal transient fields and thermal cycles are evaluated to determine dimensions of the risky zones (Heat Affected Zone and Fusion Zone) and the welded joint is characterized by tension tests, micro-hardness (Hv) and micrographics. A metallographic analysis is prepared to differentiate all zones as well as the grain sizes, and to confirm their widths. Computations are carried out by finite volume method, where thermo-physic's properties and boundary conditions are in function of temperature. The reliability of the model is evaluated by the comparison of the simulated results with those obtained by thermal cycle recordings to evaluate the size of the risky zones. Both, theoretical and experimental approaches have good agreement and give an enhancement of a previous work.

Keywords : Aeronautic stainless steel, Mechanical and metallurgical characterization, TIG welding, Thermal simulation