


Giuseppe DELL'AVVOCATO

University of L'Aquila

Department of Industrial and Information Engineering and Economy (DIIE)

Piazzale Ernesto Pontieri 1

I-67 100 Monteluco di Roio (AQ)

Italy

e-mail: giuseppe.dellavvocato@univaq.it

QIRT-2024-068



ABSTRACT



PRESENTATION



PAPER



Giuseppe Dell'Avvocato is a post-doc researcher in mechanical engineering at the University of L'Aquila in Monteluco di Roio near L'Aquila, Italy.

Mariia RASHKOVETS

Polytechnic University of Bari, Department of Mechanics, Mathematics and Management (DMMM), Bari, Italy

Darya VOLOSEVICH

State Marine Technical University, World-Class Research Center, Saint Petersburg, Russia

Nicola CONTUZZI

Polytechnic University of Bari, Department of Mechanics, Mathematics and Management (DMMM), Bari, Italy

Davide PALUMBO

Polytechnic University of Bari, Department of Mechanics, Mathematics and Management (DMMM), Bari, Italy

Giuseppe CASALINO

Polytechnic University of Bari, Department of Mechanics, Mathematics and Management (DMMM), Bari, Italy

Umberto GALIETTI

Polytechnic University of Bari, Department of Mechanics, Mathematics and Management (DMMM), Bari, Italy

TOWARDS COMPREHENSIVE QUANTIFICATION: PRELIMINARY LASER THERMOGRAPHY PROCEDURE IN PROBELESS FRICTION STIR SPOT (P-FSSW) ALUMINIUM WELDING

In the realm of contemporary industrial research within the transportation sector, a paramount objective revolves around the substantial reduction of environmental impact through the pursuit of vehicle lightweighting, ultimately leading to noteworthy reductions in fuel consumption. At the forefront of achieving this goal lies the implementation of innovative joining technologies, with a particular emphasis on lightweight alloys, most notably aluminium, which assumes a pivotal role in this transformative process. However, this role is not without its inherent challenges, primarily rooted in the complexities and intricacies of the welding process [1-3].

The intricate task of assessing the quality of welded joints and seamlessly integrating them into complex designs poses considerable challenges in mechanical engineering. These welded joints, being critical components, necessitate meticulous examination through advanced non-destructive testing methodologies. Among the prevailing non-destructive testing methods, X-rays and ultrasonic inspections emerge as stalwarts, offering the ability to detect internal defects without compromising the structural integrity of the welded joints.

Despite the effectiveness of X-rays and ultrasonic inspections, they are not exempt from limitations. Ultrasonic inspections, in particular, may encounter challenges on joints with such thin profiles and are restricted by the need for perfect surface planarity. Constraints on inspection time-

frames and the imperative need for direct contact with the component's surface are notable limitations. Stimulated thermography emerges as a technique to address and surmount these challenges. This promising method presents several advantages, including the capability for full-field measurements, eliminating the need for direct contact with the component, and providing inspection times more seamlessly aligned with the demanding industrial production and maintenance schedules.

Within the framework of the present study, two plates composed of distinct aluminium alloys (AA2024-T3 and AA6082-T6) possessing varying thicknesses of 0.8 mm and 1.4 mm, respectively, underwent welding. This process was executed through the innovative Probeless Friction Stir Spot Welding (P-FSSW) technique, widely acclaimed for its cost-effectiveness within the automotive industry. In order to assess the capability of the thermographic technique in distinguishing between a suitable and an unsuitable specimen, specimens were fabricated using distinct process parameters for the two joints. In one case, parameters previously found insufficient in prior studies for achieving complete joint formation were employed, while in the second case, parameters enabling joint formation were utilized. Applying this process resulted in the creation of two lap-welded joints, one successfully meeting the predetermined criteria and the other falling short.