

Investigation of the Effects of Process Parameters for Friction Stir Spot Welding of Thin Al 6061 Sheet

Serkan Gündoğdu¹, Onur Ertuğrul¹, Ege Anıl Diler²

¹Department of Materials Science and Engineering, Izmir Katip Celebi University,
35620 Izmir, Turkey

serkangndgdu3@gmail.com; onur.ertugrul@ikc.edu.tr

²Department of Mechanical Engineering, Ege University

35100 Izmir, Turkey
ege.anil.diler@ege.edu.tr

Extended Abstract

Friction Stir Spot Welding (FSSW) is an effective method of welding aluminum sheet that is utilized in a variety of applications [1]. Because of its numerous advantages, such as a high strength-to-weight ratio, aluminium alloys are widely utilized in the automotive and aerospace industries. However, when the aluminum sheet is thin, several difficulties may arise, such as the need for low heat input during welding to avoid sheet warping [2]. In such cases, the FSSW method outperforms other welding processes for welding thin sheets. These gains of the FSSW method are dependent on the process parameters. The most effective parameters in the welding of sheets using the FSSW method are rotational speed, weld plunge distance, and stirrer tip profile, and high-quality welded sheets can be produced by combining these parameters appropriately. Most studies on this issue in the literature have used aluminum sheets with a thickness of 2 mm or greater [3]. There have been few studies on the welding of thinner plates through using FSSW method [4]. For this reason, the welding of thin aluminum alloy sheets with a thickness of less than 2 mm using the FSSW method were investigated in this study. The effects of the different effective process parameters which including tool geometries, tool rotation, and plunge speed on the quality of welded aluminum sheets were evaluated. The most cost-effective method in welding studies is modelling or simulation, and the goal of simulation studies is to reach the most suitable temperature values and to determine suitable tool geometries [5]. For this purpose, simulation studies were performed in addition to experimental studies utilizing simulation software. The results obtained in this study aim to minimize the problems encountered during the welding of thin-section metallic materials used in the welding of AA6061 T4 alloy with the FSSW method and they will benefit the welding and other relevant industries in a variety of ways, including cost reduction, reliability, and quality.

References

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