

The Effect of Main Factors on Forces during FSJ Processing of AA2024 Aluminum

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Abstract : An attempt is made here to measure the forces of three directions, under conditions of different feed speeds, different tilt angles of tool and without or with the pin on the tool, by using octagonal ring dynamometer in the AA2024 aluminum FSJ (Friction Stir Joining) process, and investigate how four main factors influence forces in the FSJ process. It is found that, high feed speed lead to small feed force and small lateral force, but high feed speed leads to large feed force in the stable joining stage of process. As the rotational speed increasing, the time of axial force drop from the maximum to the minimum required increased in the push-up process. In the stable joining stage, the rotational speed has little effect on the feed force; large rotational speed leads to small lateral force and axial force. The maximum axial force increases as the tilt angle of tool increases at the downward movement stage. At the moment of start feeding, as tilt angle of tool increases, the amplitudes of the axial force increasing become large. In the stable joining stage, with the increase of tilt angle of tool, the axial force is increased, the lateral force is decreased, and the feed force almost unchanged. The tool with pin will decrease axial force in the downward movement stage. The feed force and lateral force will increase, but the axial force will reduced in the stable joining stage by using the tool with pin compare to by using the tool without pin.

Keywords : FSJ, force factor, AA2024 aluminum, friction stir joining

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