

عنوان مقاله:

Experimental and Numerical Investigation of Warm Deep Drawing Process of AA5052 Aluminum Alloy

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خلاصه مقاله:

Aluminum alloys have a high strength-to-weight ratio and proper anti-corrosion properties that are used in the automotive, shipbuilding and aerospace industries. The major problem with forming aluminum sheets is the low formability of aluminum sheets at room temperature. Therefore, in the present study, warm deep drawing (WDD) of AA5052-O aluminum alloy sheets with a thickness of 1mm was investigated at the different forming temperatures of 25, 80, 160, and 240°C (in the two isothermal and nonisothermal conditions) and punch speeds of 260, 560 and 1950 mm min⁻¹ using experimental tests and finite elements simulation. The finite element simulation predictions show a good agreement with the experimental data. The results showed that an increase in forming temperature and a decrease in forming speed led to a decrease in forming force and an increase in cup height. Additionally, a microstructural and experimental investigation showed that the fracture of the cup corner radii occurs in the early stages of drawing at forming temperature of 25°C whereas, by increasing the forming temperature to higher than 160°C, the drawability of aluminum sheets increases due to dynamic recovery that takes place during the WDD process.

کلمات کلیدی:

Warm deep drawing (WDD), Forming temperature, Microstructure, Force–displacement diagram, AA5052 aluminum sheet, Dynamic recovery

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