

Robust design of ring rolling process for titanium alloy using the Taguchi method and the finite element method

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Abstract

To obtain the required plastic strain and desired tolerance values in the ring rolling process, it is necessary to control many factors. Major factors include the mandrel width, the rotation speed of driver roll, the feed ratio of mandrel, and the workpiece temperature. This study uses rigid-plastic finite element (FE) software to investigate the plastic deformation behavior of a titanium alloy (Ti-6Al-4V) workpiece under ring rolling. This study analyzes the damage factor distribution, the effective strain, the effective stress and the die radius load in the workpiece under various ring rolling conditions. We used the Taguchi method to determine the optimum design parameters. Results confirm the suitability of the proposed design process, which allows a ring rolling die to achieve a perfect design during finite element method.

Key words: Finite Element Method Education; Optimisation Design;
Ring Rolling Process