

8th International Conference on Physical and Numerical Simulation of Materials Processing (ICPNS)

14–17 October 2016

Seattle, Washington | Hosted by Purdue University

SESSION 3: DEFORMING AND RECRYSTALLIZATION, SALON C

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SUNDAY, OCTOBER 16, 2016

Effect of the die-roll height of the fine-blanked spur gear on the meshing capability

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ABSTRACT

The fine-blanking process as an advanced forming process has been widely applied in the industry area. However, the die-roll is the inherent feature of the cutting surface of the fine-blanked parts, which will decrease the performance of the parts. The effect of the die-roll height of the fine-blanked spur gear on the meshing capability was investigated in this paper with the theoretical analysis and finite element simulation methods. The tooth root bending stress and contact stress of the fine-blanked spur gear and standard spur gear were analyzed with the commercial finite element code of ANSYS. The simulation results were verified by comparing with the theoretical calculation results. The research result shows that tooth root bending stress and contact stress of fine-blanking spur gear was obviously higher than that of standard spur gear. Moreover, the influences of die-roll height on tooth root bending stress and contact stress were investigated, and the fitting curve of equivalent tooth width of fine-blanking spur gear is obtained by analyzing the effect of die-roll on the meshing capability of fine-blanking spur gears with different tooth width. The research result is meaningful for the fine-blanking process design to eliminate the die-roll height.

KEYWORDS: fine-blanking, spur gear, die-roll, tooth root bending stress, contact stress