Taguchi Analysis of Milling Wear Automatic Monitoring System Based on Machine Vision Technique

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Abstract

This study proposes a tool wear monitoring system based on machine vision technique. The tool wear of single edge rhombus micro-end-mills with mill parameters (Side Clearance Angle, different coating layer, feed rate and spindle speed) in milling 6061 aluminum alloy was experimentally investigated in this study. A L 9(34) orthogonal array, analysis of variance (ANOVA) and signal-to-noise (S/N) were determined to know the level of importance of the machining parameters. Using Taguchi method for design of a robust experiment, the interactions among factors are also investigated. The experimental results indicate that Side Clearance Angle and coating layer are recognized to make the most significant contribution to the overall performance. The correlation was obtained by multi-variable nonlinear regression and compared with the experimental results. The experimental results showed that Using TiCN-coated micro-end-mill and setting side clearance angle at 12 degrees, spindle speed at 6000 rpm and feed rate at 0.0125 mm/rev minimized the wear on micro-end mills and maximized tool life. The confirmation tests demonstrated a feasible and an effective method for the evaluation of tool wear in milling of 6061 aluminum alloy.