

The Study of Effects of Cutting Parameters and PVD-Coatings on Tool Life of Micro End Drill by Using Taguchi Method

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Abstract

In this study, a serial of dry milling experiments of 6061 aluminium alloy using single edge rhombus micro end mills were performed. The purpose is to examine the influences of various control factors on tool wear. Control factors under investigation include coating layer, side clearance angle, feed rate, and spindle speed. We applied Taguchi method to design the experiment in order to derive an optimum combination of cutting parameters quickly. During the milling test, we fixed depth of cut at 0.2 mm and width of cut at 0.50 mm to investigate the correlation among side clearance angle, feed rate, spindle speed and coating layer. Upon completion of each milling test, the cutting-edge wear and flank wear were measured in offline by the aforementioned tool microscope. The experimental results show that among the four control factors, side clearance turns out to be the most important one. By using TiCN-coating and setting side clearance angle at 10 degree, spindle speed at 6000 rpm, and feed rate at 0.0125 mm/rev, the micro end mills generate least wear and thus have longer tool life.

Keyword : Taguchi method, Micro-end-milling, Flank Wear, PVD-Coatings.