The Wear Analysis of Milling Tool － Using Taguchi Method

陳振益、李佳言

E-mail: 9706749@mail.dyu.edu.tw

ABSTRACT

Due to the high growth rate of manufacturing industry for 3C products, automobile application and tools, the complexity and process precision of components have been required. During the process, the surface precision, time of process and efficiency are strongly influenced by cutting tool wear and coating. Therefore, it is important to study the surface coating on the cutting tool. Firstly, in order to discover the differences between cutting parameters and flank wear, an end mill without coating treatment has been using in a changing circumstances of cutting speed, feed rate and depth of cut during process. After discovering the influence of cutting parameters and flank wear, based on Taguchi method end mills with variety of coating treatment were used for an experiment and the main purpose of this experiment is to show the ability of anti-flank wear by using different coated end mills. According to an observation from SEM, by using the coated end mills with different processing conditions of coating, the different thickness of coat on those mills has no significant influence on flank wear. Finally, based on the result of hardness test, the direct ratio of cutting hardness to thickness is shown.

Keywords : Taguchi Method;flank wear;coating

Table of Contents

REFERENCES

[1] Hsyi-En Cheng, Min-Hsiung Hon“ Influence of TiN coating thickness on the wear of Si3N4-based cutting tools, ” Surface and Coating Technology 81 (1996) 256-261.

[2] 朱惠生,「銑刀經 PVD 蒸鍍陶瓷膜後之耐磨耗性研究」, 國立成功大學，碩士論文，1996。

[3] 魏正松,「TiN-TiCN 多層披覆銑刀之耐磨耗性研究」，國立 成功大學，碩士論文，1997。

[4] 呂鴻彬,「披覆類鑽碳膜於銑刀之耐磨耗及切削性能研究」, 國立成功大學，碩士論文，2000。

[5] 陳耀明,「TiN 鍍膜微結構與性質之研究」，國立清華大學, 博士論文，2001。

[6] 鄭忠賢,「不同鍍膜端銑刀對 SUS304 銑削特性之探討」, 國立成功大學，碩士論文，2002。

[7] 鍾永文、傅兆章,「物理蒸鍍碳化鉻鍍膜於碳化鎢基材高溫氧 化之性能研究」，國立高雄第一科技大學，碩士論文，2003。

[8] D.L. Coats, A.D. Krawitz“ Effect of particle size on thermal residual stress in WC-Co composites, ” Materials and Engineering A359(2003)338-342.

[9] K. Liu, X.P. Li, M.Rahman, X.D. Liu“ CBN tool wear in ductile cutting of tungsten carbide, ” Wear 255 (2003) 1344-1351.

[10] K.-D. B ouzakis, S. Hadjiyiannis, G. Skordaris, I. Mirisidis, N.Michailidis, G. Ekens“ Wear development on cemented carbide inserts, coated with cariable film thickness in the cutting wedge region, ” Surface & Coatings Technology 188-189(2004) 363-643.

[11] Li Zheng, Yun Shun Chiou, Steven Y. Liang“ Three dimensional cutting force analysis in end milling, ” Int.J Mech.Sci.Vol.38 No.3.pp 259、269,1996 .

[12] X.P.Li, A.Y.C. Nee, Y.S. Wong, H.Q.Zheng“ Theoretical modeling and simulation of milling force, ” Journal of Materials Processing Technology 89-90(1999) 266-272.

[13] P.L.B Oxley, Mechanics of Machining, Ellis Horwood, Chichester,1989.

[14] S.K. Choudhury, Subhashashree Rath“ In-process tool wear estimation in milling using cutting force midel, ” Journal of Materials Processing Technilogy 99 (2000) 113-119.
[15] H.Z. Li, W.B. Zhang, X.P. Li“ Modeling of cutting forces in helical end milling using a predictive machining theory, ” International Journal of Mechanical Sciences 43 (2001) 1711- 1730.
[16] H.Z. Li, X.P. Li“ Milling force prediction using a dynamic shear length model, ” International Journal of Machine Tools & Manufcture 42 (2002) 277-286.
[17] C.K. Toh“ Static and dynamic cutting force analysis when high speed rough milling hardened steel, ” Materials and Design 25 (2004) 41-50.
[18] Tugrul Ozel, Taylan Altan“ Process simulation using finite element mothod-prediction of cutting forces, tool stresses and temperatures in high speed flat end milling, ” International Journal of Machine Tools & Manufacture 40 (2000) 713-738 .
[19] B.K. Hinds, G.M.Treanor“ Analysis of stresses in micro-drills using the finite element method, ” International Journal of Manufacture 40 (2000) 1443-1456.
[20] 王俊志，「以有限元素法探討薄葉片銑削加工之穩定性分 析」，國立成功大學，碩士論文，2000。
[21] 鍾清章，「品質工程-田口方法」，中華民國品質學會，2000。
[22] 莊水清，「端銑刀刀具磨耗研究」，元智大學，碩士論文， 2005。