



EDITOR

ERRY YULIAN TRIBLAS ADESTA

HIGH SPEED CUTTING

An Approach towards Improved Machining Performance



Manufacturing and Materials Department

Kulliyyah of Engineering
International Islamic University Malaysia

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EDITORS

ERRY YULIAN TRIBLAS ADESTA

AMIR AKRAMIN SHAFIE

AGUS GETER EDY SUTJIPTO

WAN AHMAD YUSMAWIZA



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EMAIL: iiumprinting@yahoo.com

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Erry Yulian Triblas Adesta¹ and Muataz Al Hazza²
 1, 2. Faculty of Engineering – International Islamic University Malaysia
 ✉ : eadesta@iium.edu.my / ✉ : mutaz_hazaa@yahoo.com

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Mohammad Yuhan Suprianto¹ and Erry Yulian Triblas Adesta²
 1, 2. Faculty of Engineering – International Islamic University Malaysia
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 1, 2. Faculty of Engineering – International Islamic University Malaysia
 ✉ : yuhan.suprianto@gmail.com / ✉ : eadesta@iium.edu.my

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Afifah Mohd Ali¹ and Muhammad Riza²
 1,2, Kulliyah of Engineering, International Islamic University Malaysia
 ✉ : sakisakura@gmail.com / ✉ : muhammadriza@yahoo.com

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A.G.E. Sutjipto¹, A. Kaderi²

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✉ : agus@iium.edu.my

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Muataz Al Hazza¹ and Erry Yulian Triblas Adesta²
 1, 2. Faculty of Engineering – International Islamic University Malaysia

✉ : mutaz_hazaa@yahoo.com /✉ : eadesta@iium.edu.my

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Suryanto
 Kulliyah of Engineering, International Islamic University Malaysia

✉ : surya@iium.edu.my

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 1, 2. Faculty of Engineering – International Islamic University Malaysia
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Coating For High Speed Cutting Tools

Suryanto
Kulliyah of Engineering, International Islamic University Malaysia
✉ : surya@iium.edu.my

8.1 Introduction

Cutting tool is the key factor for many manufacturing industries as cutting is still the major shaping process used in the production of engineering components. Engineering component nowadays is more complex in shape and made of various materials from soft materials to very hard materials. Since cutting tool should be harder than the metal to be cut, proper cutting tool is essential.

Cutting tool can be manufactured from various materials such as high speed steel and ceramics. To produce good quality cutting tool, cutting tools should have the following characteristics: firstly, hardness of the cutting tool must be maintained high at the highest operating temperature. Secondly, toughness of cutting tools is needed so that tools do not chip or fracture. Finally, wear resistance of cutting tools should be high to attain acceptable tool life before tools need to be replaced. To meet the above criteria cutting tool should be modified. One of the techniques to modify cutting tool is by coating the cutting tools.

Along with the development of the tool materials, the protective coatings have been developed as well. Their common feature is the protection of the tool by their high adhesion, wear resistant, hardness and chemical stability. The combination of bulk material and the coating ensures optimal tool properties. The galvanic processes techniques have been used for some time to coat the tools, and many other techniques are known today, such as chemical vapor deposition (CVD) and physical vapor deposition (PVD).

Development of hard protective coatings started with electrodeposition technique and followed by chemical vapor deposition and physical vapour deposition techniques. Nowadays, there are many variants of physical vapor deposition techniques in use such as magnetron sputtering, evaporation by cathode arc, laser and electron beam. Their common feature is the vacuum environment, the