ADVANCED MACHINING TOWARDS IMPROVED MACHINABILITY OF DIFFICULT-TO-CUT MATERIALS

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Chapter 34

PCD Inserts in End Milling of Aluminum Silicon Carbide (AlSiC)

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1. INTRODUCTION

Metal matrix composites (MMC) falls under the category of potential engineering materials applicable to the automotive and aerospace industries. This is become their excellent properties, such as the capability to resist elevated temperature, improved strength, higher stiffness, low density, improved wears and creep resistance and higher elastic modulus. Among these materials aluminum alloys reinforced with silicon carbide found most attentions [1]. AlSiC is preferred over ceramics materials because of their higher combination of properties such as high strength, ductility and high temperature resistance, compared to ceramics [2]. Li et al [3] found that aluminum alloys reinforced with silicon carbide particles are almost three times more efficient than the un-reinforced aluminum alloys in destroying tungsten projectiles at 1.2 km/sec. AlSiC has been considered for use in automobile brake discs and various components in internal combustion engines. Aluminum silicon carbide (AlSiC) is also being widely used in the electronic packaging industries. Though the properties of this new engineering material are quite attractive, the machinability of AlSiC is very poor. Poor machinability is associated with abrasive wear, which make it a class of difficult-to-machine advanced materials [4]. The hardness in the range the silicon carbide phase is comparable with that of tungsten carbide (WC), and is mainly responsible for the high abrasive wear of the tool. Consequently the cutting edge of the tool which in course due to abrasion wear results in the formation of poor surface finish during turning [5].