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RECENT END MILLING OPERATION ON METAL MATRIX COMPOSITES: A REVIEW

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ABSTRACT
In the current global competition, nonconventional machining process is having specific interest. The different machining characteristics developed over conventional milling operation are focused basically on quality of the product. The demand of high performance parts in various field of industrial or academic application attracts the modification in milling process. The improvement in surface finish, material removal rate (MRR), stress free surface, burr free textures, tool life enhancement, multi operational system by optimizing the production time, tool replacement time CNC end milling has a significant role. As in the field of smart material revolution, metal matrix composites (MMCs) are widely appreciated for its light weight and good functional property, mostly used in aerospace, automobile field. This article significantly focused on study of critical parameters on end milling operations of MMCs. The influence of milling process parameters i.e. spindle speed/Cutting speed, feed rate, cutting thickness, surface roughness, tool wear, chatter stability, tool and work piece interface temperatures are well described. The optimization of burr formation in end milling of MMCs still requires more attention in the field of research. The micro structural studies of MMCs develop the surface quality including robust mechanical performance after the end milling operation. This review presents the overall study of governing parameters in end milling operation of MMCs.

Keywords: Milling machining, CNC machining, cutting parameter, chatter stability, metal matrix composite material, micro-structural studies.

1. INTRODUCTION

The significant objective of this paper is to represent the manufacturing of MMCs with its convenient composition and demand in the field of milling operation. It is focused about the performance enhancement by controlling significant factors, i.e. MRR, surface roughness, machining time. These output responses depend on the input factors such as spindle speed, feed rate, cutting thickness. The most predominant factors concentrate on desired superior quality of surface roughness, machining time and machining cost.

As in the current scenario, MMCs are having specific interest due to its good physical and chemical property with excellent development of mechanical property also. Composite is a versatile product amidst high strength to weight ratio, lightweight, fire resistance, electrical properties, chemical and weathering resistance, translucency, design flexibility, low thermal conductivity and manufacturing economy. MMC's high strength, fracture toughness and stiffness are offered by metal matrices than those offered by their polymer counterparts. Most metals like Titanium, Aluminium and Magnesium are the popular matrix metals currently in vogue, which are particularly useful for aircraft applications being its light weight.

2. END MILLING

In the end milling, the cutter is thin as compared to the work piece width. Most of cases this type of milling operation is used for slot operation. The slot operation is done on the work piece. The surface roughness is elaborately defined by Alauddin et al. [1] with the mathematical model in end milling operation. The highly automated CNC end milling machine requires to model for prediction of tool flank wear. Here machining occurs on LM25 Al/SiC_p alloy as explained by Arkiadass et al. [2]. Sammy et al. [3] described the AA6351-B4C composite material has been manufactured by the stir casting method and subjected to end milling machining operation. Here it is analyzed the parameter of the milling operation as the chip thickness, surface roughness, temperature rises and critically studied tool flank wear. In the experiment the titanium nitride (TiN) coated solid carbide tool with four flute end mill [3]. The surface integrity of particle metal matrix composite material is affected by the parameter or surface formation by the MMCs. Reddy et al. [4] used Al/Sic as work piece and TiN/Al coated carbide tool inserts. The performance characteristics of S545C