Evaluation of Surface Roughness and Power Consumption in Machining FCD 450 Cast Iron using Coated and Uncoated Irregular Milling Tools

Ahmad Razlan Yusoff[1] and Fitriyanti Arsyad

Faculty of Manufacturing Engineering, University Malaysia Pahang, 26600 Pekan, Pahang

Email: razlan@ump.edu.my

Abstract. In this project, the effects of different cutting parameters on surface roughness and power consumption when machining FCD450 cast iron were studied using coated and uncoated irregular milling tool geometry of variable helix and pitch. Their responses on roughness and power consumption were evaluated based on the spindle speed, feed rate, and depth of cut, machining length and machining time. Results showed that except spindle speed and machining length, other parameters such as feed rate, axial and radial depth of cut and also machining time proportionate with surface roughness. The power consumption proportionately increase for all cutting parameters except feedrate. It is showed that the average decrement 27.92 percent for surface roughness and average decrement 9.32 percent for power consumption by using coated compared to uncoated tool. Optimum cutting parameters for both minimum surface roughness and power consumption can be determined. The coated tools performed better than uncoated milling tools for responses of surface roughness and power consumption to increase machining productivity and profit.

1. Introduction

Machining can be considered as the most essential process in manufacturing processes to manufacture with high quality product and low cost production. One of the most important elements in machining is the tools and cost of each tool can be varied and expensive according to their function and endurance. A new cutting tool performance behaviour test can be applied to help businesses gain a competitive edge and it's also describe all the tool characteristics'. Performance of machining process depends on the surface smoothness, and power consumption so that it is become the major topics in process planning and machining optimization in industry to increase the productivity of the product and lowering tooling cost. Cutting process parameters such as depth of cut, feed and speed most popular influence factors in achieving high quality product with less cost and time [1].

In machining process that targeting minimum cost, it should be considered total power consumption used in making the machined product. Kant and Sangwan [2] predict power consumption before further optimized multi objective of power consumption and surface roughness using grey relation coupled with principle component analysis and response surface methodology in [3]. Machining of 27 turning data collected from cutting speed and feed and depth cut machining parameters with three levels for each parameters. Brushan [4] considered to maximize tool life and minimize power consumption in machining composites by optimizing cutting speed, feed, depth of cut and nose radius.