



Effect of Milling Parameters on Surface Quality of AA6063-T6 Aluminium Alloy During High Speed CNC Face Milling

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Abstract : This paper aims to carry out analytical and experimental study on the effects of high speed face milling parameters like cutting speed, feed rate and depth of cut on the surface quality of AA6063-T6 aluminium alloy components. The experiments were conducted based on full factorial design ($3^3=27$) of experiments and surface roughness was measured with profilometer on the components milled by a high speed CNC vertical machining centre. A mathematical model was developed using non-linear regression analysis with the help of MINITAB software. The face milling parameters were optimized for better surface quality of the milled components by employing Taguchi method and genetic algorithm. The optimum parametric conditions obtained from the analytical study have been confirmed with the experimental results.

Keywords : High speed machining, AA6063-T6 aluminium alloy, face milling, Taguchi method, Surface roughness.

1. Introduction

The surface quality has always been one of the most important responses in machining operations. In view of the present economical and dynamic market situation, the continuous improvement in surface quality has become a major priority in the industries[1-4]. The numerous technologies involved in the machining sectors continues to grow with the introduction of improved equipment and tools in order to produce high degree surface quality with specific characteristics such as dimensional accuracy, surface roughness, etc[5-8].

One of the most promising advanced manufacturing technologies in the last decade is the high speed machining because of its benefits like faster production rates with improved surface quality, reduced costs and shorter lead times. Since this technique combines high spindle speeds with increased feed rates results in lower cutting forces and high chip-forming rate, producing an improved surface quality and tighter tolerances[9-15].

In recent days, aluminum alloys have developed as the precursor for a variety of applications due to their desired properties such as high wear resistance, great thermal conductivity, more strength, less weight, and short thermal expansion[16-20]. From analyzing the literature, it has been observed that numerous research activities were carried out regarding high speed machining on the various aluminium alloys like AA7075,