

ABSTRACT

The use of curves in the fabrication of components, particularly in the industrial sector, has become a common practice, as exemplified by the production of moulds. With the increasing demand for more diverse geometric shapes in industrial applications, mould design have also become more varied, requiring more complex combinations of curve geometries. Different types of curves can result in varying outcomes, therefore, it is important to understand the characteristic of each curve type and the resulting surface quality after the manufacturing process.

To explore the characteristic of various curves, this study examines three representative types of polynomial curves specifically degree 2, 3, and 4. This research involves an empirical experiments using Aluminium 6061 and machined using CNC Milling machine with a ballnose mill for curve generation. The experiment utilized a full factorial design with 54 replications, varying 3 types of curve degree design parameters, and 2 machining parameters which are feedrate with 3 levels and spindle speed with 6 levels.

The resulting machined surfaces were then measured for roughness on three sides which are curve peak side (top side), the upper right side, and the lower right side,, with four measurement points taken on each side. The collected data was subsequently analyzed for trends.

Experimental result indicate a trend emerged showing the lowest Ra values at degree two, followed by degree four, and the highest Ra values occurring at degree three. From the aspect of measurement side, the Ra trend tended to increase from the top side to the upper right side with the highest trend observed on the lower right measurement side. The changes of curve degree with the main coefficient of a_n between 0 until under 1 ,Spindle speed and feedrate were found to have no statistically significant effect because, in the analysis, there was a large contribution from “other factors” arising from the interaction of these two machining parameters.

Keyword : *Surface Roughness, Polynomial Curve, Curve Degree, Feedrate, Spindle speed, CNC Milling, Aluminium 6061*