

ABSTRACT

2D Ultrasonic Vibration Assisted Turning (2D UVAT) is a technology applied to turning process that can reduce the sound and vibration of the process, and also can reduce the surface roughness of the workpiece so it has smoother surface. The main aspects that influence the result of turning process are input parameters, which are spindle speed, depth of cut, feed rate, and frequency. In getting the optimal result of turning process, it will need optimum input parameters. Taguchi method is a method used to control the quality of a product. By using the data of four factors with three levels each, the experiment was conducted 27 times. But, Taguchi Method can only optimize a single response data. Hence, Grey-Relational Analysis will be used to optimize the problem with multi responses because the simulation result will be analyzed based on two aspects, which are stress and thermal. In the calculation of S/N Ratio and Grey Relational Analysis, "Smaller is Better" defined as quality characteristic because the simulation responses are stress and thermal. From the research is obtained combination in optimal conditions of cutting parameters for stress aspect are 300 rpm spindle speed; 0,001 mm depth of cut; 0,075 m/min feed rate; dan 18.000 Hz frequency. Optimal conditions of cutting parameters for stress aspect are 250 rpm spindle speed; 0,00075 mm depth of cut; 0,075 m/min feed rate; and 18.000 Hz frequency. Optimal conditions of cutting parameters for both aspects (stress and thermal) are 300 rpm spindle speed; 0,001 mm depth of cut; 0,075 m/min feed rate; and 18.000 Hz frequency. Based on ANOVA test result, it is known that the factors that are significantly affect the stress and thermal values are depth of cut and frequency with P-Value 0,001 and 0,028.

Keywords: Taguchi Method, Grey-Relational Analysis, Orthogonal array, Signal-to-Noise Ratio, ANOVA, 2D UVAT