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Optimization of the Process Parameters to Minimize the Thrust Force in Drilling of CFRP Composites by Taguchi Method and RSM

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ABSTRACT

Carbon Fiber Reinforced Polymer (CFRP) composites are finding wide application in all fields as they offer an excellent combination of strength, low weight and high modulus. The tensile strength of carbon fiber is equal to glass fiber while its modulus is about three to four times higher than glass fiber. Drilling is the most common machining operation performed on composites for the fabrication and the quality of hole has an important influence on its applications. In the present work, experiments were conducted to check the effect of drill point angle, spindle speed, feed rate and drill diameter on the thrust force generated during drilling of hole. The Carbon Fiber Reinforced Polymer (CFRP) test specimen is prepared by hand-layup method. Design of Experiments (DOE) technique is used to design the drilling experiment procedure. The results have indicated that among the variables considered for study, drill point angle has maximum influence on the thrust force followed by the spindle speed. Feed rate has minimum influence on the quality of drilled hole. The research has also resulted in the listing of the optimum combination of process parameters using Response Surface Methodology (RSM) and Taguchi Method.

Keywords: CFRP composite drilling, Thrust force, DOE, RSM, Taguchi method.