Optimization of Drilling Parameters of Untreated JFRP Polyurethane Foam Sandwich Structures by Taguchi Method

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Abstract
Many researchers have worked on composites materials fabrications, mechanical and thermo-mechanical properties, and their applications. On the other hand, limited work in the field of machining of composites materials has been reported in the literature. The aim of this work is to optimize the drilling parameters such as speed, feed rate, and drill diameter using High-Speed Steel (HSS) twist drill and Titanium Aluminium Nitrate (TAN) coated carbide twist drill angle 118°. The present experimental work has been carried out by Taguchi design analysis of L_{27} orthogonal array. The Coordinate Measuring Machine was used to measure the drilled hole diameter to optimize the quality of the drilled hole with the combination of drilling parameters. Minitab-16 was used to investigate the variance (ANOVA) of the test and led to regulating the significance of each parameter on drilling. From the results, it was clearly shown that HSS twist drilled hole exhibited minimum thrust force was 90N at 3 mm diameter the hole with a feed of 80 mm/min, speed of 1500 rpm and torque of 0.14 N-m. Whereas in case of TAN coated carbide drilled hole exhibited a thrust force of 88 N at 3 mm diameter hole with a feed rate of 80 mm/min, speed of 1500 rpm with a torque of 0.13 N-m. Using regression analysis it evidently shows that drill diameter having highest significant, feed rate having marginal significant and speed don't have any significant on minimizing the thrust force both HSS and TAN drilled holes. However, the influence of torque having marginally lesser variation in TAN as compared to HSS. The speed and drill diameters having highest significant on delamination both entrance and exit of hole using HSS tool. Whereas delamination of TAN twist drilled hole both in entrance and exit, the drill diameter having highest significant factor compared to speed and feed.

Keyword

Thermo-mechanical, High-Speed Steel (HSS), Titanium Aluminium Nitrate (TAN)

Citation

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