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A Study on GFRP Drilling Composites Using SPSS Statistical Analysis

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Abstract. To study the effect of drilling variables working current, spindle speed, feed rate and drill size on drilling GFRP composites. Mach inability parameters include surface roughness, and delamination factor with drilling processes, which in structural applications may be the most limiting factor for composite materials. Drilling-induced damage in polymer-matrix composites (BMC). Engineering is an important field of research. To reduce damage caused by drilling various approaches have been tried around the world. In this study, an automated drilling operation was investigated. In PMCs and conventional materials Used for the dynamic phenomenon of drilling various mathematical modeling methods. Drilling of fiber-reinforced plastic composites Empirical techniques such as neural network/busy-logic and Transfer function can be modeled using modeling methods
Keywords: Drilling Composites, SPSS,

1. Introduction

Drilling is used in composite structures and is very important for compounds, often practiced and this is inevitable mechanical action. With a greater degree of complexity in structures, it is essential to create holes to facilitate the assembly process. Drilling process when solving a control problem Mixed materials pose additional difficulties. Variation of geometrical parameters drilling Converting into A complex mechanical process. Drill and Chisel edges have unfavorable geometric parameters. The rake angle of the chisel edge has large negative values. This makes the cutting process difficult and necessary for drilling sharply increasing feed strength. Drilling of CFRP composites some metal objects have particularly long filaments not as easy as drilling for multi-directional composites. CFRP composites are anisotropic and are a multidimensional trait, Method of elimination of compound Different from metal. By PCD (Polycrystalline Diamond) tool in machining GFRP composites between the two have established a relationship. Recently, Latha and Senthilkumar In drilling GFRP composites, predict delamination a fuzzy logic rule-based model was used successfully. Spindle speed, feed rate, drill diameter etc and clearance factors between drilling parameters they established a definite relationship.

2. Drilling GFRP Composites

A composite is a substance made of two or more different substances. Drilling is done using a rotary cutting tool it is the process of cutting holes in solid material. Indentation is the drilling holes' starting point. Drilling is a cutting process, this includes cutting or enlarging a hole in a solid a drill is used. Drilling is done using a rotary cutting tool it is the process of cutting holes in solid material. At higher levels of process parameters, Drilling reduced delamination in conditions of Long product life compared to dry drilling they found that performance increased. In a joint venture, this is the largest division. Compared to carbon and other metallic fibre composites, GFRP composite material is relatively a low-cost composite product. Khanna et al. [25] on cryogenic drilling in CFRP composites He gave a trial hearing. Conditions reduce delamination, Long production reduced durability and compared to dry drilling they found that performance increased. [28] Drilling of CFRP/Ti slabs Experimental analysis. With cryogenic drilling Compared to wet drilling, the Author's shear force and Reported reduction in torque. Cryogenic apparatus Enables drilling at high cutting speeds, hence reducing machining time. Ogawa et al. [12] In Small Diameter Drilling for GFRP Conducted drilling tests to investigate the cutting mechanism. Then the surface roughness of cutting speed Feed rate is very influential they decided. Enough et al. [13] are delamination-free in epoxy composites and for creating good surface finish pores High speed and less drilling showed that the feed rate is recommended. GFRP composites analyzed for deformation in drilling. In drilling GFRP composites Feed rate, cutting speed and material thickness they concluded that Significant process parameters. GFRP drilling studies most studies have focused on reduction delamination perforation shows that it is a difficult task. Size and to know the dimension characteristics of the ablation, for predictive purposes, It is necessary to use theoretical models. Spin speed, feed rate and such as overall diameter in perforated GFRP composites to study the influence of drilling variables in the present work. Two different cutting tools were tested. In drilling GFRP composites Empirical models were developed to predict delamination. Main effect and using correlation effect diagrams Analysis of test results is carried out.

TABLE 1. Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.960	.960	2

Table 1 shows Cronbach's Alpha Reliability result. The overall Cronbah's Alpha based on standardized items for the model is 0.960 which indicates 96% reliability. The above 50% Cronbach's Alpha value model can be considered for analysis.

TABLE 2. Descriptive Statistics

	N	Range	Minimum	Maximum	Sum	Mean		Std. Deviation	Variance	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic	Statistic	Std.Error
Spindle speed	20	2000	500	2500	30000	1500.00	102.598	458.831	2.105E5	.000	.512
Feed Rate	20	200	10	300	4000	200.00	10.260	454.883	2.105E5	.000	.512
Drill Diameter	20	8	2	10	120	6.00	.410	1.835	3.368	.000	.512
Delamination Factor	20	4.5600	2.9500	7.5100	1.0509E2	5.254500E0	.2582415	1.1548911	1.334	.346	.512
Surface roughness	20	4.5600	2.9500	7.5100	1.0400E2	5.200000E0	.2631889	1.1770167	1.385	.417	.512

Table 2 Descriptive Statistical Analysis of Spindle speed, Feed Rate, Drill Diameter, Delamination Factor, Surface roughness, Raw N, range, minimum, maximum, sum, mean, standard deviation variance curve values are given.

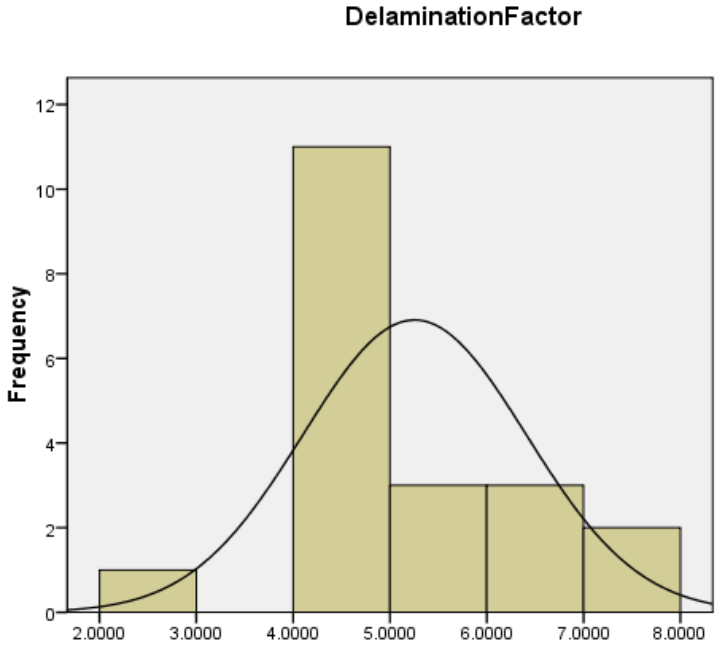

FIGURE 1. Frequency for Delamination factor histogram plots

Figure 1 shows the histogram plot for Delamination factor as the data is skewed due to values for 2.0000-8.0000, while all other values are under the normal curve, the sample is significant. Follows a normal distribution.

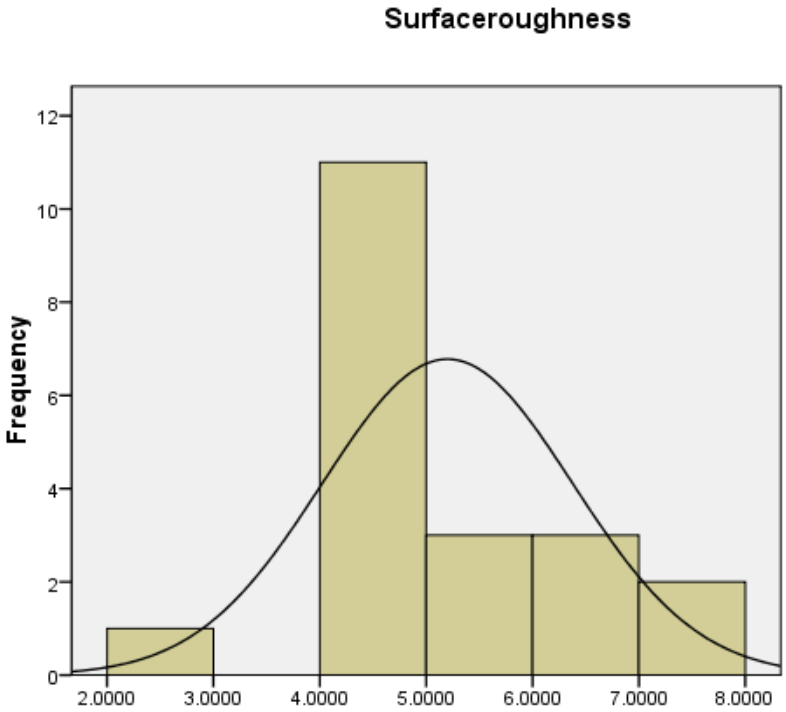

Figure 2 shows the histogram plot for Surface Roughness as the data is skewed due to values for 2.0000-8.0000, while all other values are under the normal curve, the sample is significant. Follows a normal distribution.

TABLE 3. Correlations

		Spindle speed	Feed rate	Drill diameter	Delamination Factor	Surface roughness
Spindle speed	Pearson Correlation	1	.000	.000	-.128	-.269
Feed rate	Pearson Correlation	.000	1	.000	.846**	.864**
Drill diameter	Pearson Correlation	.000	.000	1	-.039	-.004
Delamination Factor	Pearson Correlation	-.128	.846**	-.039	1	.923**
Surface roughness	Pearson Correlation	-.269	.864**	-.004	.923**	1
**. Correlation is significant at the 0.01 level (2-tailed).						

Table 4 shows the correlation between the stimulus parameters for Spindle speed. Line plotting has the highest value of 1.0 so it has a high correlation with Spindle speed and the lowest value is -.269 so it has a low correlation with Surface roughness. Next is the correlation between Feed rate parameters. Line plotting maximum value is 1.0 so it has high correlation with Feed rate and minimum value is 0.000 so it has low correlation with two parameters Spindle speed and Drill diameter. Next is the correlation between Drill diameter parameters. Line plotting maximum value is 1.0 so it has high correlation with Drill diameter and minimum value is 0.000 so it has low correlation with two parameters Feed rate and Spindle speed. Next is the correlation between Delamination Factor parameters. Line plotting maximum value is 1.0 so it has high correlation with Delamination Factor and minimum value is -.128 so it has low correlation with two parameters Spindle speed. Next is the correlation between Surface roughness parameters. Line plotting maximum value is 1.0 so it has high correlation with Surface roughness and minimum value is -.269 so it has low correlation with two parameters Spindle speed.

TABLE 4. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Sum of Squares	F	Sig.
Delamination factor	.857[a]	.734	.684	.6490399	18.602	14.719	.000[a]
Surface roughness	.905[a]	.820	.786	.5447462	21.574	24.234	.000[a]

Table 2 shows the result of R, R squared, adjusted R squared, sum of squares, df, F, significance. The overall R squared value for the model is above 0.8, so this is reliable data. R value above 0.9 can be considered to analyze the model. The sum of squares value for the model is greater than 10.0, so this is reliability data. The value of Sum of Squares above 10 can be considered to analyze the model. The overall F value for the model is above 15.0, so this is reliability data. a value above 10 can be considered to analyze the model. The overall identity value for the model is 0.000, so this is reliability data.

3. Conclusion

Experiments are conducted to analyze Spindle speed, feed rate, whole diameter; the delamination factor in drilling GFRP composites is surface roughness. Drilling-induced damage of perforated UD-GFRP laminates. A perforated unidirectional of reinforced epoxy composites of Glass fiber residual tensile strength is Manages punctured damage It is reasonable to believe that all parameters are affected. Such as feed rate, spindle speed and drill type achieved by optimizing drilling parameters. So, using different drill types Glass fiber reinforced On Drilling Polymer Composites (GFRP) Notable researchers have conducted various studies. In drilling GFRP composites, feed rate is an important factor driving force, It has been reported that removal and surface roughness are closely related, At the same time the spin is faster In drilling GFRP composites has only a minor effect. Carbide and Compared to coated drill bits Drilling GFRP composites with HSS bit Drilling GFRP composites with HSS bit resulting in delamination factor. Similarly, solid carbide drill bit, while drilling Glass fiber reinforced Polypropylene composites surface roughness, In terms of torque stability Exhibits excellent performance.

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