REINFORCEMENT OF SUGARCANE BAGASSE USING POLYURETHENE RESINE

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ABSTRACT

Natural fiber composites are nowadays being used in various engineering applications to increase the strength and to optimize the weight and the cost of the product . The review of paper is to represent a general study of composite plate.The results are compared for different loading conditions and a suitable composite is selected for the research of sugarcane bagasse fiber with polyurethane composite using plate. The study of mechanical properties of the composites was also investigated .Sugarcane bagasse have a natural and bio-degradable features so that it attains as high potential and cost-wise comparatively low with ferrous metals. And by using this sugarcane bagasse new composites are prepared . This composite is attempted to analysis and optimize the sugarcane bagasse for a new composite material using polyurethane . Hence the surface roughness is improved by optimizing the composite material. We accomplish to compile the strength of the material and what are the factors influencing the surface roughness using taguchi method.

Keyword: *sugarcane bagasse, polyurethane resin, impact test, composite material.*

1.0 INTRODUCTION

A composite material can be defined as a combination of two or more materials that results in better properties than those of the individual components used alone. In contrast to metallic alloys, each material retains its separate chemical, physical, and mechanical properties.

In the sugarcane bagasse 85% of wastage will be burnt, it makes the atmosphere get polluted , 9% of wastage should be used for extracting ethanol and it is not effective while comparing with fossil fuels ,so we can change the application to produce natural fibers. It results in reduction of wastage and is also used in many other industrial purpose.

1. Optimization Of Cutting Parameters In Turning Of En 8 Steel Using Response Surface Method And Genetic Algorithm VKCSKB Ganesh .N, Udaya Kumar. M International Journal of mechanical Engineering and Robotics Research 3, 75-86 In this report the ANOVA analysis are refered for our improvision of the surface roughness of our composite material

2. Experimental Investigation To Minimize Travel Time Of Line Follower Robot By Optimization Of Design Parameters Using Genetic Algorithm DSNG D. Elayaraja, S. Ramabalan International Journal of Applied Engineering Research 10, 638 – 642

3. Mechanical Properties of Sisal Fibre Reinforced Polymer Matrix Composite
BA A. Francis, S. Rajaram, A. Mohanakrishnan JOURNAL OF MECHANICS AND MECHANICAL ENGINEERING 22 (No. 1 (2018)), 289–294

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2.0 MATERIALS AND METHODS

In this work we choosen natural fibers using SUGARCANE BAGGASE WITH POLYURETHANE RESIN

2.1 MARERIAL SELECTION

This chapter describes the details of processing of the composites and the experimental procedures followed for their mechanical characterization. The materials used in this work are

- Sugarcane Bagasse (SCB)fiber
- polyurethane resin

2.1.1 SUGARCANE BAGASSE (SCB) FIBER

Bagasse is the fibrous residue which remains after sugarcane stalks are crushed to extract their juice. It is mainly used as a burning raw material in the sugar mill furnaces. The low caloric power of bagasse makes this a low efficiency process. Also, the sugarcane mill management encounters problems regarding regulations of clean air from the Environmental Protection Agency, due to the quality of the smoke released in the atmosphere. Presently 85% of bagasse production is burnt. Even so, there is an excess of bagasse. Usually this excess is deposited on empty fields altering the landscape.

SCB wastes are chosen as an ideal raw material in manufacturing new products because of its low fabricating costs and high quality green end material. It is ideal due to the fact that it is easily obtainable given the extensive sugar cane cultivation making its supply constant and stable. When appropriate modifications and manufacturing procedures are applied, bagasse displays improved mechanical properties such as tensile strength, flexural strength, flexural modulus, hardness, and impact strength. Bagasse is also found to be easily treated and modified with chemicals besides blending well with other materials to form new types of composite materials. It also satisfies the greening requirements by being biodegradable, recyclable and reusable. The compression and injection molding processes were performed in order to evaluate which is the better mixing method for fibers (sugarcane bagasse, bagasse cellulose and benzylated bagasse) and Polymer matrixes.

2.1.2 PROPERTIES OF SUGARCANE BAGASSE (SCB) FIBER:

TABLE NO:1

STANDARD	**VALUES**
Density [g/cm3]	1.25
Tensile strength	290MPa
Young's modulus	17 Gpa

2.1.3 POLYURETHANERESIN:

Polyurethane Resins have been commercially available since the early 1950's and are now used in a wide range of industries and applications .Epoxies are classified in the plastics industry as thermosetting resins and they achieve the thermoset state by means of an addition reaction with a suitable curing agent.

2.1.4 PROPERTIES OF POLYURETHANE RESIN:

TABLE NO:2

PROPERTIES	VALUE
Flexural modulus of elasticity	3,250 MPa
Flexural strength	36 MPa
Tensile strength	22 MPa
Compressive yield strength	57 MPa

he curing agent used will determine whether the polyurethane cures at ambient or elevated temperatures and also influence physical properties such as toughness and flexibility

3.0 EXPERIMENTAL PROCEDURE

3.1 MAKING PROCESS:

Sugarcane bagasse fiber knitted fabric with polyurethane are used in this study. Hardener used is polyamide hardener. The polyurethane resin and hardener are mixed in the ratio of 2:1 and stirred thoroughly. Release agent used was mansion polish. Experimental methods Most mentioned method to clean fibers found in literature is distilled water cleaning and then alkaline treatment (NaOH). The concentration of NaOH used is 5%. The fibers are washed with fresh water thoroughly. The fibers are then soaked in NaOH solution for 8 hours. The fibres were then washed several times with fresh water to remove the residual NaOH sticking to the fibre surface and neutralized by Acetic acid finally washed again with water. The fibers were then dried at room temperature for 10 hours.

3.2 MIXING PROCESS

Two part polyurethane compounds are normally supplied in separate A - B containers, either both full or in a pre-measured kit. Under the Resin lab designation; Part A is the polyurethane resin and the Part B is the polyamine hardener, with some systems the Part B may be an anhydride. Polyurethane resins are normally clear to slightly amber, high viscosity liquids which may be filled with mineral fillers to improve performance and lower cost. These sometimes can settle to the bottom of the container and must be stirred to a homogeneous consistency before adding the hardener. Polyurethane resins can cause mild skin irritation and a form of dermatitis upon repeated contact.

3.3 PREPARATION PROCESS:

The process undergoes 5 stages. At first the sugarcane bagasse is been collected and it is soaked into a solution of concentrated NAOH solution of about 0.5% for 8 hours**.** Now the soaked bagasse is been taken from the concentrated NAOH solution ,it is been converted as a film sheet of fibre. Hence the fibres are washed several times with fresh water to remove the residual concentrated NaOH sticking in the fibre surface then it is been neutralized by acidic acid .Finally the fibre is been washed again with water ,hence the fibre is been dried and maintained in room temperature for 10 hours .The gel-coat is applied in the film sheet and the polyurethane resin is been coated in the sheet by an applying brush. After completion of 30-35 layer the plate is compressed with the hard compression machine . Finally the composite plate is obtained.

4.0 MECHANICAL TESTING:

4.1 TENSILE TEST:

TABLE NO:3

THICK (mm)	WIDTH (mm)	CSA (mm2)	YL (KN)	YS (N/mm)	TL (KN)	TS (N/mm2)	IGL (mm)	FGL (mm)	%E
9-10	31	310	6.26	226.09	12.50	377	100.65	105.21	4.53

4.2 HARDNESS TEST:

TABLE NO:4

IDENTIFICATION	IMPRESSION (HRB)
1	34,35.2&35.5

4.3CHARPY OR IMPACT TEST:

TABLE NO:5

IDENTIFICATION	IMPACT VALUES IN JOULES
1	6.5

5.0 SELECTION OF MACHINING PARAMETERS FOR ANOVA ANALYSIS:

TABLE NO : 6 Machine parameters

Process Parameter	Values
Spindle speed (rpm)	1000
Feed (mm/rev)	0.3
Depth of cut (mm)	0.5

TABLE NO:7 Levels of drilling input parameters

Parameters	Level 1	Level 2
Spindle speed(rpm)	375	1000
Feed(mm/rev)	0.1	0.3
Depth of cut(mm)	0.5	1.5

The table 7 shows the Experimentation values of input parameters based on the L9 Taguchi orthogonal array method and the output response of drilling strength were tabulated.

TABLE NO :8 Experimental values

Experiment No.	Spindle speed (rpm)	feed (mm)	Depth of cut (mm/rev)
1.	375	0.1	0.5
2.	375	0.2	1
3.	375	0.3	1.5
4.	700	0.1	1
5.	700	0.2	1.5
6.	700	0.3	0.5
7.	1000	0.1	1.5
8.	1000	0.2	0.5
9.	1000	0.3	1

5.1 EXPERIMENTAL DESIGN:
TABLE NO:9

SPEED	FEED	DOC	SURFACE ROUGHNESS	MRR
375	0.1	0.5	0.28	0.000076
375	0.2	1	0.33	0.00022
375	0.3	1.5	0.41	0.000065
700	0.1	1	0.23	0.000032
700	0.2	1.5	0.3	0.00078
700	0.3	0.5	0.33	0.00085
1000	0.1	1.5	0.19	0.0009
1000	0.2	0.5	0.25	0.000058
1000	0.3	1	0.29	0.0013

6.0 RESULT AND DISCUSSION

6.1 Regression Equation:

SURFACE ROUGHNESS = 0.2737 - 0.000155 SPEED + 0.5500 FEED + 0.01333 DOC

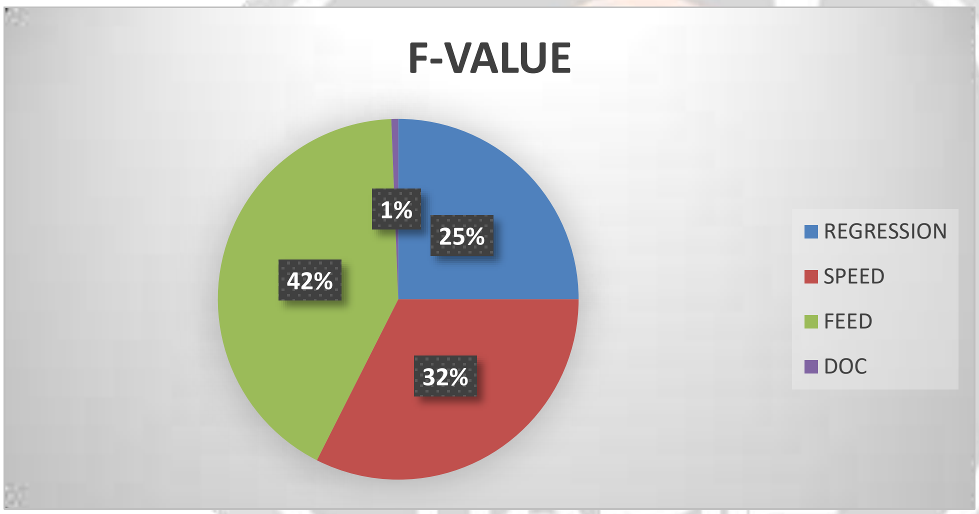
6.2 ANALYSIS OF VARIANCE:

TABLE NO :10

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	0.032465	0.010822	101.05	0
SPEED	1	0.014048	0.014048	131.17	0
FEED	1	0.01815	0.01815	169.48	0
DOC	1	0.000267	0.000267	2.49	0.175
Error	5	0.000535	0.000107		
Total	8	0.033			

The analysis of f-value's speed and feed is influencing the surface roughness but the depth of cut is not influencing the surface roughness

PIE CHART: 1



6.3 MODEL SUMMARY:

TABLE NO: 12

S	R-sq	R-sq(adj)	R-sq(pred)
0.010349	98.38%	97.40%	94.09%

6.3.1 Analysis of variance for S/N ratios:

TABLE NO: 13

Source	DF	Seq SS	Adj SS	Adj MS	F	P
SPEED	2	12.8696	12.8696	6.43479	34.31	0.028
FEED	2	17.3217	17.3217	8.66084	46.18	0.021
DOC	2	0.0508	0.0508	0.02538	0.14	0.881

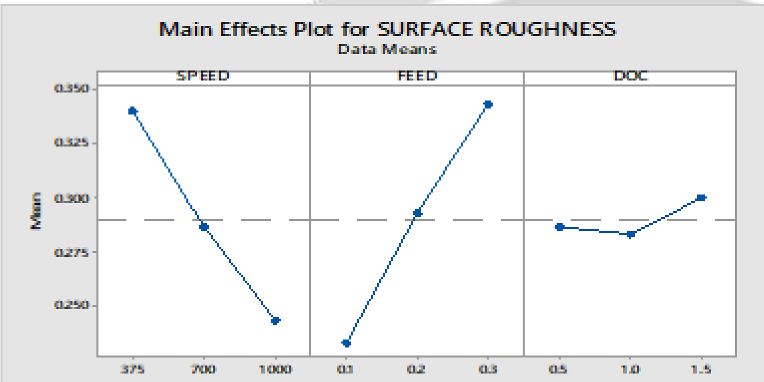
Residual Error	2	0.3751	0.3751	0.18756		
Total	8	30.6171				

TABLE NO: 14

S	**R-Sq**	**R-Sq(adj)**
0.4331	98.80%	95.10%

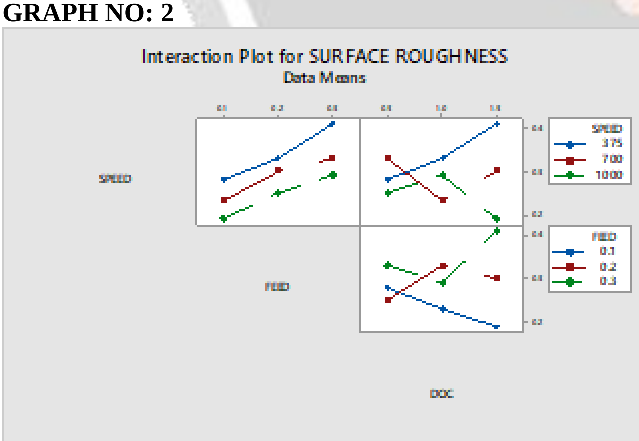
In this table the R-sq value should be the suitable factor its value is 98.80% so the material should be acceptable for good surface roughness.

GRAPH NO: 1



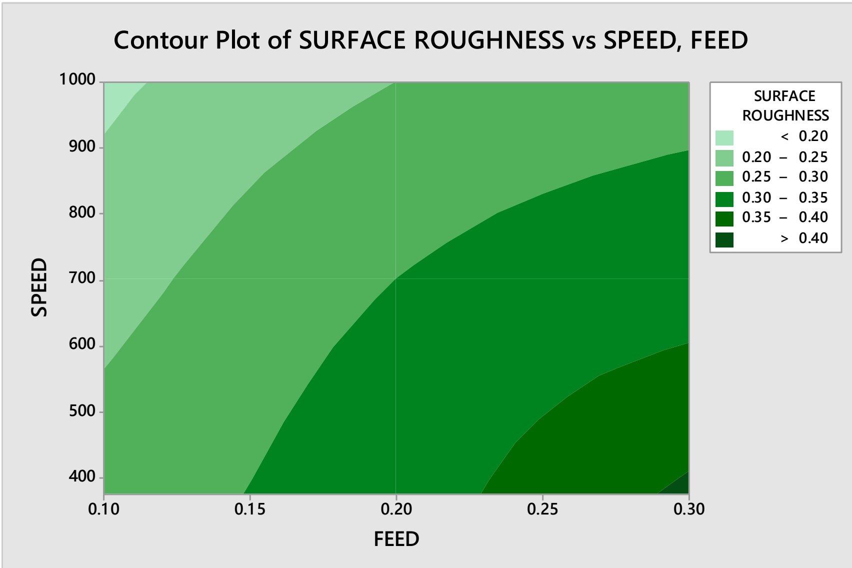
The above graph is clearly explaining that the speed and feed factors are only influencing the surface roughness. Then this depth of cut may not influencing the surface roughness

GRAPH NO: 2



From the above this graph ,at first when the speed is only applied there is no interaction and it is independent ,now when the speed and doc is applied there is an interaction and it is dependent with each other, now when the feed and doc is applied there is an interaction and is also dependent on each other .

GRAPH NO: 3



By analyzing this graph , the feed is kept constant by eventually increasing the speed at a certain point of rpm the minimum surface roughness is obtained

FIG NO: 1

FIG NO: 2

7.0 CONCLUSION:

From this experimental analysed and optimize to find the strength of the sugarcane fiber and to find the what are the factors influencing surface roughness and we conclude that the material have good mechanical strength and the feed and speed will be influencing the surface roughness of the composite material.

8.0 REFERENCE:

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