

**CHARACTERIZATION AND OPTIMIZATION OF MACHINING
PARAMETERS OF Al7075/SiC MMCS DURING TURNING
PROCESS**

*A major project report submitted in partial fulfillment of the requirements
for the award of the degree of*

BACHELOR OF TECHNOLOGY

in


MECHANICAL ENGINEERING

by

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ABSTRACT

Aluminium 7075 is used as base alloy and it is reinforced with silicon carbide particles. In this investigation the tensile strength, hardness and micro structure is analysed. The behaviour of Aluminum metal matrix composites with different silicon carbide combinations (i.e., of 3% 6% 9% SiC) were compared with base alloy. From the experimentation the AL7075+9% SiC having the best Tensile strength and hardness properties compared to the rest of the combinations. Due to presence of 9% SiC there were strong inter molecular bonds between the base alloy and reinforcement particles. Due to this reason the resistance to plastic deformation was increased. The feed rate plays important role when compared with speed, depth of cut and nose radius.

CONCLUSION

- The behaviour of Aluminium metal matrix Composites with different silicon carbide combinations (i.e., of 3% 6% 9% SiC) were compared with base alloy.
- From the experimentation the Al7075+9%SiC having thebest Hardness properties compared to the rest of the combinations.
- Due to presence of 9%SiC there were strong inter molecular bonds between the base alloy and reinforcement, because of this reason resistance to plastic deformation increased.
- As the intermolecular bond in 9% SiC composite is more compared to remaining composite combinations, due to this the tensile strength is high in this composite.
- The feed is the most dominate factor for better surface finish. The feed rate plays important role when compared to speed, nose radius, and depth of cut.



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MECHANICAL PROPERTIES AND MICROSTRUCTURE ANALYSIS OF Al7050-B₄C METAL MATRIX COMPOSITE

A major project report submitted in partial fulfillment of the requirements
for the award of the degree of

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in

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ABSTRACT

The applications of metal matrix composites are keep on growing day by day. Everyone requires a material which can fulfill the required designed strength criteria but it is mostly preferred to have a lighter material. Aluminium matrix composites (AMMCs) are demanded more likely than the other conventional materials due to their high strength to weight ratio, high corrosion resistance, high yield strength, high wear resistance and low economic value. In the present study, an effort has been made to develop and study the mechanical properties of Al 7050-B4 C metal matrix composites. The composites were prepared by induction stir casting (liquid metallurgical technique) in which amount of reinforcement with B4C is varied from 1%wt, 2%wt, 4%wt and 5%wt. Various tests have been conducted on AMMC material to know the various properties such as tensile strength, hardness was absorbed. The microstructure of the component was investigated by scanning electron microscope (SEM) and it validates the good distribution of B4C particles in the metal matrix. In this metal matrix composites are extensively used in automobile industries and aerospace applications. The wear rate of the Al7050-B4C composites depend on the percentage of dispersion. The wear rate was found to decrease with the increase in B4C content.

Key words: AA7050-B₄C composite, Electromagnetic stir casting, Tensile test, Hardness test, SEM analysis


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CHAPTER-5 CONCLUSION

The significant conclusions of the studies on Al7050- Boron Carbide metal matrix composite are as follows.

- The Al7050- Boron Carbide composite was prepared successfully using stir casting method technique on the reinforcing particulates.
- It has been observed that the tensile strength of sample 2 is marginally higher than the other 3 samples (1%, 4% & 5%).
- Brinell's Hardness test concludes that sample 2 has higher hardness value when compared to sample 1,3 & 4.
- Finally it is observed that the fabrication of Aluminum with 2% of the Boron Carbide content within the matrix material, resulted for the improvement in mechanical properties like, Ultimate tensile strength, Yield strength and Hardness of the material.
- With the advancement in mechanical properties this Al 7050 alloy – Boron Carbide Composite can be widely used in various areas such as automotive industries ,aero space applications.



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**“MECHANICAL CHARACTERIZATION OF GLASS FIBRE -
GRAPHITE REINFORCED COMPOSITES MADE WITH HAND LAY
UP”**

A Major project report submitted in partial fulfilment of the requirements
for the award of the degree of

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ABSTRACT

There quest for new and useful materials is going on imense from time immemorial, many material composites have been evolving since 1950. Fibre reinforced plastics (FRP) have replaced steel in Aerospace, Chemical, Mine and Transport industries. Fibre reinforced plastics have gained recognition as structural materials. The largest user of FRP is the Aerospace industry where the opposites unite i.e., highest strength and maximum lightness is the primary requirement. Epoxy resin is the most commonly used polymer matrix with reinforcing different fibers and fillers for advanced composites applications. Epoxy is used as structural material matrix which is then reinforced by glass fibre, this results in composites that are strong, light in weight, corrosion resistant and dimensionally stable. Here the glass fibre laminates have been prepared by using hand lay-up method using ASTM standards and tests have been conducted on them. Tensile, Flexural , Impact test values have been compared for Glass fibre laminate composites of three different concentrations using (graphite) powder to resin bath. The graphite concentration varies from 3%, 6% and 9% on the weight of the prepared material. Mechanical properties have been studied with different combinations of Glass fiberand (graphite) as reinforced into epoxy matrix. The mechanical properties optimally improved by taking 6%(graphite) concentration.


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CHAPTER 4

RESULTS

The obtained specimens are finished by using emery paper. The tensile, flexural and impact specimens from the laminates are subjected to uni-axial load using 30KN capacity Universal Testing machine with the surrounding room temperature of 32⁰C. The load was applied till fracture with a grip displacement rate was maintained at 5 mm/min. Test was done 2 times for each silicon fibre and graphite concentration and the tensile, flexural and impact properties of composite laminates with varying silicon fibre and graphite concentration are calculated and tabulated. Table 1,2,3,4 shows the tabulated values Tensile , Flexural and impact Test results of different concentrations of silicon fibre and graphite respectively.



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AUTOMATIC BREAKING SYSTEM AND MECHANICAL ANALYSIS

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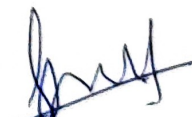
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ABSTRACT

I.C Engines have been advanced a lot such that its speed is becoming a major catastrophe. Advanced automatic braking system improves braking techniques in vehicles. It changes complete braking systems in an automotive and deals with the concept of Automatic Braking System giving the solution.

This project is designed with ultrasonic transmitter, ultrasonic receiver, Arduino UNO R3 board with PIC microcontroller, DC gear motor, Servomotor and mechanical braking arrangement. The Ultrasonic Sensor generates (0.020-20)KHZ frequency signal. It is transmitted through ultrasonic transmitter.

The ultrasonic receiver is used to receive the reflected wave present in front of the vehicle, then the reflected waves is given to the ultrasonic wave generator unit in which the incoming wave is amplified and compared with reference signals to maintain a constant ratio and this signal is given to microcontroller and through which the working of DC gear motor and Servomotor may takes place, which results in application of brakes.

The prototype has been prepared depicting the technology and tested as per the simulated conditions. In future the actual model may be developed depending on its feasibility.


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CONCLUSION

We have successfully completed the fabrication of automatic braking system model prototype and this project presents the implementation of an Automatic Braking System for Forward Collision Avoidance, intended to use in vehicles where the drivers may not brake manually, but the speed of the vehicle can be reduced automatically due to the sensing of the obstacles. It reduces the accident levels and tends to save the lives of so many people. By doing this project practically we gained the knowledge about working of automatic braking system and with this future study and research, we hope to develop the system into an even more advanced speed control system for automobile safety, while realizing that this certainly requires tons of work and learning, like the programming and operation of microcontrollers and the automobile structure. Hence we believe that the incorporation of all components in Automatic Braking System will maximize safety and also give such system a bigger market space and a competitive market.



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**“OPTIMIZATION OF PROCESS PARAMETERS IN EDM PROCESS
USING TAGUCHI DESIGN OF EXPERIMENTS”**

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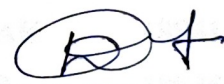
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ABSTRACT

This paper presents investigation and optimization of electric discharge machining (EDM) parameters using taguchi method .Three process parameters chosen were pulse on-time, flushing, pressure and peak current. An L9 orthogonal array was selected to study the effect of main factors and interaction between factors on the response variable i.e. surface roughness. Signal to Noise (N/S) ratios of the response variable for all experiments were calculated. The contribution of the main factors and interaction between them to the optimal surface roughness were determined by using Analysis of variance(ANOVA).The experimental results revealed that Pulse on time, Flushing pressure and peak current of a yielded the optimal i.e. minimum surface roughness Further, results of ANOVA indicated that out of three main factors , peak current as well as interaction between pulse on- time and flushing pressure contributed significantly in minimizing the surface roughness.




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CHAPTER-6

6.1 CONCLUSION

- The objective of the present work is to investigate the effects of the various EDM process parameters on the machining quality and obtain the optimal sets of process parameters so that the quality of machined parts can be optimized.
- Experiments are conducted on the pieces varying parameters. The materials used for machining are EN31.
- The process parameters considered are Pulse Time on, Pulse Time off, and peak current. The range of values varied are Time on -7,8 and 9 , Input power -15amp, 20amp, 25amp and flushing pressure-20, 35 and 50
- The optimization is done by using ANOVA technique by considering L9 orthogonal array. Optimization is done using Minitab software.
- We can conclude that at Time on -7, and Peak current-15amp and flushing pressure-15 to get better surface finish values.


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