iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH
IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 Issue: III Month of publication: March 2022

DOI: https://doi.org/10.22214/ijraset.2022.41052

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue III Mar 2022- Available at www.ijraset.com

Simulation of Cutting Parameters in the Turning of Aluminium Metal Matrix Nanocomposite Using Constitutive Models

Madduleti. M[1], P. Venkata Ramaiah[2]
[1]Research Scholar, Department of Mechanical Engineering, Sri Venkateswara University, Tirupati, India-517502
[2]Professor, Department of Mechanical Engineering, Sri Venkateswara University, Tirupati, India-517502

Abstract: The present research looks upon metal matrix composites, namely Aluminum Metal Matrix Composites (AMMCs), as well as modelling and simulation of the orthogonal metal cutting process. A fundamental component of AMMCs is aluminum alloy, which creates a percolating network and acts as the matrix stage. Multiwall nano carbon tubes are another non-metallic component used as reinforcement in the aluminum alloy matrix (CNT). Some of the primary advantages of AMMNCs over unreinforced products are higher strength, high stiffness, decreased weight, improved heat properties, controlled thermal development coefficient, and thermal/heat monitoring. The SHPB test at high stain rates is commonly used to establish the Johnson cook constants for AMMNC work piece material.The Johnson-Cook constitutive model, which estimates flow stress as the product of strain, strain rate, and temperature effects, is used to determine work hardening, strain-rate hardening, and thermal softening. FEM simulations were carried out using 2D-Deform software. When the results of the 2D-Deform software-derived flow stressandtemperature are compared to the findings of the analytical model, the results are satisfactory.
Keywords: Dynamic parameters, AMMNC, JC model, FEM.

I. INTRODUCTION

The finite element technique is a strong numerical tool for finding solutions to difficult problems because it discretizes the domain into finite elements. The nodes in each element are subjected to boundary conditions and loads. The global stiffness matrix is generated by determining the stiffness matrix for each element in the domain using mathematical methods. The solutions are calculated using the global stiffness matrix and the applied load data. Several scholars have developed finite element codes to solve massive problems, and businesses all around the globe are recognising the significance of such codes in dealing with numerical challenges. FE codes like as Deform, Abacus, Advant Edge, and Third Wave are used to model manufacturing processes (Halil et al 2004). "Deform" is a phrase that is commonly used.

Erol Zeren, Turulzel [1] Cutting processes can be simulated using finite element analysis techniques, which have a number of benefits, including tool force prediction, stress and temperature distribution, tool wear and residual stresses on machined surfaces estimation, and cutting tool geometry and cutting conditions optimization. Under different cutting regimes, the work material flow stress and friction characteristics are not always available. To characterise work material flow stress and friction at primary and secondary deformation zones around the cutting edge, this study uses an Oxley-developed metal cutting model and orthogonal cutting experiments.

Hashem F El-Labban et al. [2] Squeeze casting was used to explore the metallurgical and mechanical characteristics of Al/Al2O3/Ni MMC. They discovered that increasing the Ni content to 10% boosted the composite substance's (UTS), and that combining 2 wt.% nano-Al2O3 with 5 wt.% Ni provided the highest achievable UTS. With the addition of Al2O3 bits and Ni to the base metal, ductility was improved while costs were kept low.

Umbrello, D. [3] D. Umbrello [3] Due to a number of inherent features and their strong reactivity with cutting tools with restricted heat conductivity, titanium alloys are known for being difficult to process, particularly at high cutting speeds. A finite element analysis (FEA) of TiAl6V4 machining for both conventional and high-speed cutting regimes is presented in this paper. Cutting force, chip form, and segmentation are all taken into account when machining these metals since they have such a big impact on machinability and tool wear.

Fang Shao, Zhanqiang Liu, Yi Wan & Zhenyu Shi et al. [4Titanium alloys are characterised as difficult-to-machine materials, especially at higher cutting speeds, due to several intrinsic properties such as limited heat conductivity and significant reactivity with cutting tool materials with low thermal conductivity.

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue III Mar 2022- Available at www.ijraset.com

This paper describes a machining finite element analysis (FEA) for Ti-6Al-4V. For both the workpiece and the tool material, the thermodynamical constitutive equation is applied in FEA. It is possible to forecast the temperature of the cutting blade and the depth of tool wear. Differences in cutting temperature and tool wear depth between expected and experimental cutting temperatures and tool wear depth are shown and discussed.

Lee and Lin [5] used regression analysis to identify the parameters for the JC model for Ti6Al4V material from SHPB data. Gray et al (1994) used a computer program based on the optimization routine to fit experimental data to identify material parameters of the JC model..

According to the literature, SHPB data is the most often utilised approach for identifying and optimising flow stress model parameters. The nature of the tests determines flow stress, which is sensitive to material model parameters. The flow stress data for machining must precisely map the deforming material in machining settings, which necessitates either identifying flow stress as a function of the machining process itself or using FEM to modify current parameters to match the deformation processes. Although numerous ways have been utilised to fine tune and improve material properties, most of the models are time intensive and need advanced mathematical abilities.

A. Research Gaps

1) Little work has been done on use of Johnson cook model and Spit Hopkinson Pressure Bar test in turning of AMMNCs.
2) No researcher had reported on simulation of Dynamic parameters of AMMNCs.

B. Objectives

1) To develop the AL7075/CNT metal matrix composites.
2) To conduct turning experiment on developed composites.
3) To determine the JC constants using SHPB test of composites for prediction of Dynamic parameters.
4) To determine the flow stress values of composites using JC model and FEA.

II. MATERIAL SELECTION AND METHODS

A. Material

In this study, the Al/ MWCNT composite is used as the workpiece material to investigate its machinability. The workpieces employed in this experiment were diameter of 36 mm and length of 200 mm. Physical and mechanical features of multi-walled carbon nanotube reinforcement, chemical composition of aluminum 7075 alloys are shown in Tables 1 and 2.

Table 1. Chemical composition (wt. %) of Al

Aluminum 7075	Zn	Mg	Cr	Ti	Mn	Si	Fe	Ti	others	Al
Wt.% of composition	5.64	2.2	0.2	0.045	0.04	0.054	0.21	0.043	0.027	Reminder

Table 2. Properties of multi-walled carbon nanotube

Reinforcement Material	Young's modulus (GPa)	Thermal expansion (10^{-6}/K)	Thermal conductivity (W/m K)	Density (g/cc)	Melting Point temp(^{0}C)
MWCNT	450	6.0	3000	1.9	2800

B. Fabrication Of Metal Matrix Nanocomposites

The most recent fabrication procedures for MMNCs have been developed in the last few years. The development of composite component processing leads to a cost-effective method. Despite the fact that MMNCs may be manufactured using a variety of ways. All of these approaches are dependent on the reinforcement and matrix materials chosen.

1) *Stir Casting:* The best and most cost-effective method of fabricating AMMNCs is to simply swirl and blend molten metal with ceramic solid particles before allowing the combination solution to solidify. This method of processing is now in use in industry for Al-Al2O3, CNT composites. It's also known as slurry casting or combination casting. Aluminum compound 7075 was softened in an electric heater at 7500°C, then warmed fortifications (7500°C) and 1% magnesium were gradually added to the molten metal to increase holding. The metal combination was mixed for around 15 minutes. The heater's temperature was then lowered while the composite mix blending activity was finished, till the temperature level reached roughly 5900C. The composite mix was dipped for 10 minutes at 5900°C, then warmed to 7500°C and mixed with 1 percent weight CNT for 2 minutes (semi-strong mixing). After that, a warmed metallic pass was used to fill the fluid slurry, forming an Aluminum network composite.

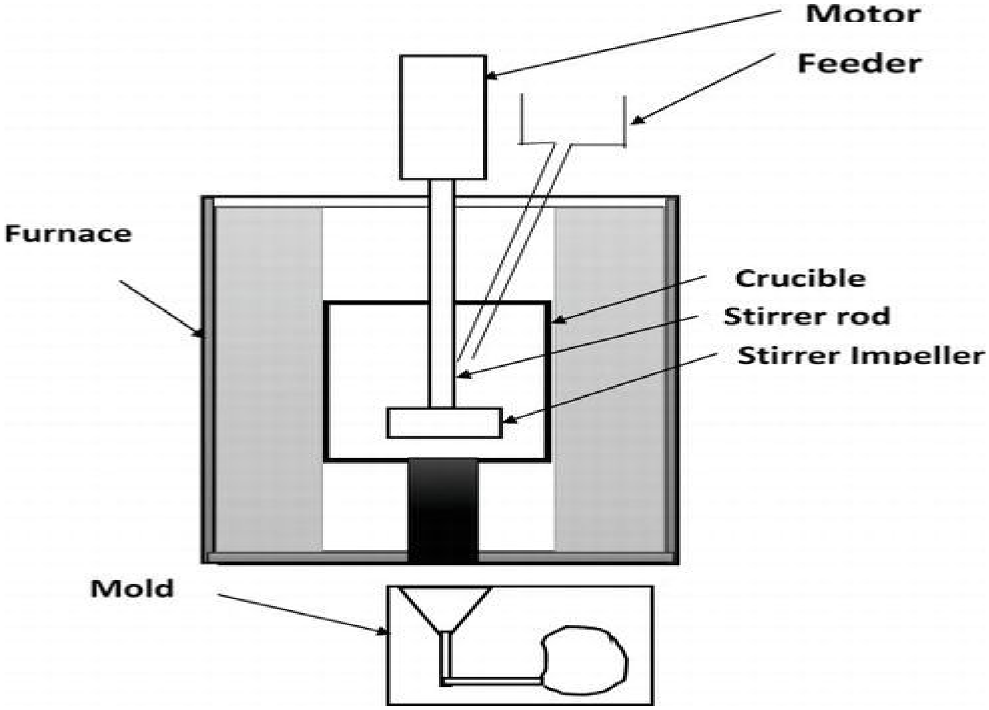


Fig 1. Stir casting setup.

III. METALCUTTING

Metal cutting is a common occurrence in the manufacturing business, as material processing accounts for the majority of a product's cost. In the recent century, there has been a revolution in the processes and techniques used to machine a wide range of materials. Material behaviour at the microscopic and macroscopic levels are important determinants in machining ease. Because materials' metallurgical properties vary, a detailed examination of their machining characteristics is required to optimise cutting conditions, tools, and production processes. Analytically, experimentally, and numerically, machining characteristics can be determined. Analytical and experimental approaches have mostly been used to determine cutting conditions and material machinability.Due of the increased expense and time involved in these trials, the finite element (FE) approach was developed, which has since transformed the manufacturing sector. It has aided in the understanding of the machining behaviour of a variety of materials as well as the micro-level understanding of the complicated metal cutting process.

Experimental and analytical models are good at predicting cutting forces and chip shape at the global level, but they can't assess or forecast local phenomena like stress, strain, strain rate, and temperature distribution in the cutting process. To examine the machining process in depth and propose answers to problems related to design optimization and failure analysis, FE tools are necessary. There has been a surge in its use in machining simulations in the recent decade, but it has been fraught with challenges. Despite the apparent benefits of the FE tool, there remain challenges in critical areas of machining process modelling.Selecting the appropriate material flow stress model to represent the machining deformation behaviour of the material being machined, modelling the correct friction and fracture conditions and criteria as applicable to machining, and applying the appropriate chip separation criterion for the chip formation process are the key aspects. The goal of this research is to improve the accuracy of FE predictions by optimising the flow stress data input.

A. Turning Experiment

Turning experiments were conducted on AMMNC cylindrical work piece having a diameter of 36 mm according to Taguchi orthogonal array L16. The cutting conditions employed for turning of AMMNC material are cutting speed, feed and depth of cut at four different levels.

Figure: 2 Experimental setupfor turning of cylindrical work piece

The responses cutting force, thrust force are measured using lathe tool dynamometer and temperature is measured with temperature gun. Orthogonal cutting test output values are recorded for different speeds, feeds and depth of cuts as in the Table 3.

Table: 3 orthogonal cutting test values

S.NO	Speed (rpm)	Depth of cut (mm)	Feed (mm)	Cutting force (N)	Thrust force. (N)	Temperature (^{O}C)
1	280	0.2	0.2	39.24	9.81	36.8
2	280	0.4	25	88.29	19.62	37.2
3	280	0.6	0.32	137.34	29.43	39.2
4	280	0.8	0.36	176.58	39.24	39.6
5	450	0.2	0.2	39.24	9.81	36.8
6	450	0.4	25	68.67	9.81	38.8
7	450	0.6	0.32	78.48	19.62	37
8	450	0.8	0.36	137.34	19.62	36.5
9	710	0.2	0.2	49.05	9.81	36.8
10	710	0.4	25	78.48	9.81	37.4
11	710	0.6	0.32	137.34	19.62	39
12	710	0.8	0.36	186.39	39.24	39.8
13	1120	0.2	0.2	39.24	9.81	36.7
14	1120	0.4	25	88.29	19.62	36.8
15	1120	0.6	0.32	127.53	19.62	37
16	1120	0.8	0.36	166.77	29.43	38.3

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue III Mar 2022- Available at www.ijraset.com

IV. JOHNSON COOK MODEL

The Johnson-Cook constitutive model Eq. (1), which produces the flow stress as the product of strain, strain rate, and temperature, results in work hardening, strain-rate hardening, and thermal softening.

$$\sigma = [A+B\varepsilon^n]\,[1+C\ln(\dot{\varepsilon}/\varepsilon_0)]\,\{1-[(T-T_0)/(Tm-T_0)]^m\} \quad (1)$$

In the equation above, A represents the material's initial yield strength at room temperature. To standardise the similar plastic strain rate, a reference strain rate of 0 is employed. Tm is the melting temperature of the material, and T0 is ambient temperature. Parameter n considers the strain hardening effect, parameter m considers the thermal softening impact, and parameter C considers strain rate sensitivity.

A. Split Hopkinson Pressure Bar Test

Typically, the SHPB test (Figure.2) is used to estimate the Johnson cook constant for AMMNC work piece material at high stain rates. Between the event and transmission bars, the work sample is put. Gas pressure propels the incident bar towards the transmission bar. The compression wave propagates through the sample towards the transmission bar as a result of the effect of the incidence bar on the sample, and signals are transferred to the amplifier, where the JC constants are derived using these signals from the PC. The numbers are listed in a table.

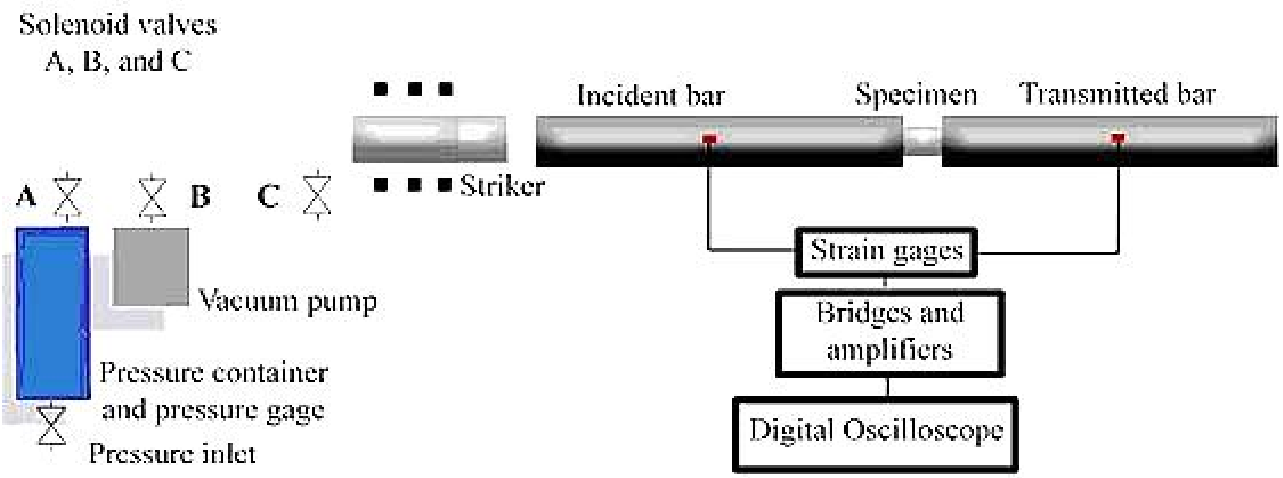


Figure: 3-line diagram Split Hopkinson Pressure Bar Test

Figure: 4 Split Hopkinson Pressure Bar Test

Table: 5 JC Constants for AMMNC from SHPB test

JC Constants	A[MPa]	B[MPa]	C	n	M	Tm[K]
AMMNC	535	579	0.018	0.74	1.64	900

Table 7. Flow stress values at different speed, feed and depth of cut

S.No	Speed (rpm)	Depth of cut (mm)	Feed (mm)	Flow stress (N/mm^2)
1	280	0.2	0.2	1365.95
2	280	0.4	0.25	1209.63
3	280	0.6	0.32	884.35
4	280	0.8	0.36	980.84
5	450	0.2	0.2	752.07
6	450	0.4	0.25	893.06
7	450	0.6	0.32	530.32
8	450	0.8	0.36	696.63
9	710	0.2	0.2	696.34
10	710	0.4	0.25	721.43
11	710	0.6	0.32	862.37
12	710	0.8	0.36	742.96
13	1120	0.2	0.2	467.09
14	1120	0.4	0.25	407.44
15	1120	0.6	0.32	844.30
16	1120	0.8	0.36	630.41

V. SIMULATION IN DEFORM

To perform a simulation, a database containing the process data and simulation controls is prepared. The database is created using the above preprocessor inputs. The control, material, object and inter-object options of the preprocessor allow for interactive input of the simulation parameters. The specified database is executed as simulation steps are generated. The output is written back into the database file. The basic equation of equilibrium, constitutive relationship and boundary conditions are converted to non-linear algebraic equations. All the input and output data are stored in binary form and are accessed through the post processor. The results of the simulation are displayed in graphical and alphanumeric form. It is important to note that this module only reads the results of the database file and no modifications can be executedhere.

A. DEFORM- Model

DEFORM- is a Finite Element Method-based three-dimensional (2D) metal cutting process simulation system (FEM). It provides critical material and heat flow information throughout the cutting process, making product design and tooling easier.

DEFORM 2D- has been utilised by companies all around the world to investigate turning, milling, drilling, finishing, and a range of other metal cutting processes.

DEFORM 2D offers state-of-the-art process simulation technology. Its powerful simulation engine can examine complicated interactions of several deforming objects with varying material properties throughout the metal cutting process.

This makes it possible to simulate the metal cutting process in a real-world context in a realistic and exact manner. Its clever mesh generator creates an optimal mesh system automatically as needed. By evaluating the solution behaviour, the mesh generator develops finer components in regions where improved solution accuracy is required, reducing the total problem size and processing requirements. It offers a comprehensive and adaptable graphical user interface that makes preparing input data and analysing output data a snap.

B. StepBy Step Procedure of Analysis Performed on 2-Deform

1) Operation Setup

a) The name of the operation, the machining type, process setup, and process condition are all specified at the operation setup stage of the analysis.

b) Turning, Milling, Boring, Drilling, and Grooving procedures are among the machining types offered.

c) Cutting speed, rotating speed, depth of cut, and Feed rate are all parameters that may be specified under the Process setup settings.

d) Temperature, Shear friction factor, and Heat transfer coefficient are assigned under the Process condition choice.

2) Insert Setup Tool setup

a) Geometry, Meshing, Boundary Conditions, and Material Selection are all part of this configuration.

b) The geometry stage is critical because we must design the tool to the desired dimensions.

c) The created tool's meshing is based on the geometry's size. Set the tool's Boundary Conditions.

d) Load the correct material for the tool.

3) Work Piece Setup: Steps involving work piece setup resembles same as tool setup. At final work piece material loaded from material library available.

4) Position: The work piece and tool positioned according to the depth of cut required as shown in the figure 6.1.

5) Simulator: Simulator is the major keys for generated data base, simulator work carry out after completion of preprocess. At simulator window by switching the run simulator, the simulation process begins. It will take minimum of 2 to 3 hours' time for generating the animation.

6) Post process: This post process controls the generated output animation. The output animation, tool and work piece positioning as shown in figure 5.

C. Simulation For Ammnc With Tungsten Carbide Tool

Simulations have been performed using 2D-Deform software at different cutting conditions on work piece material as in the following sections.

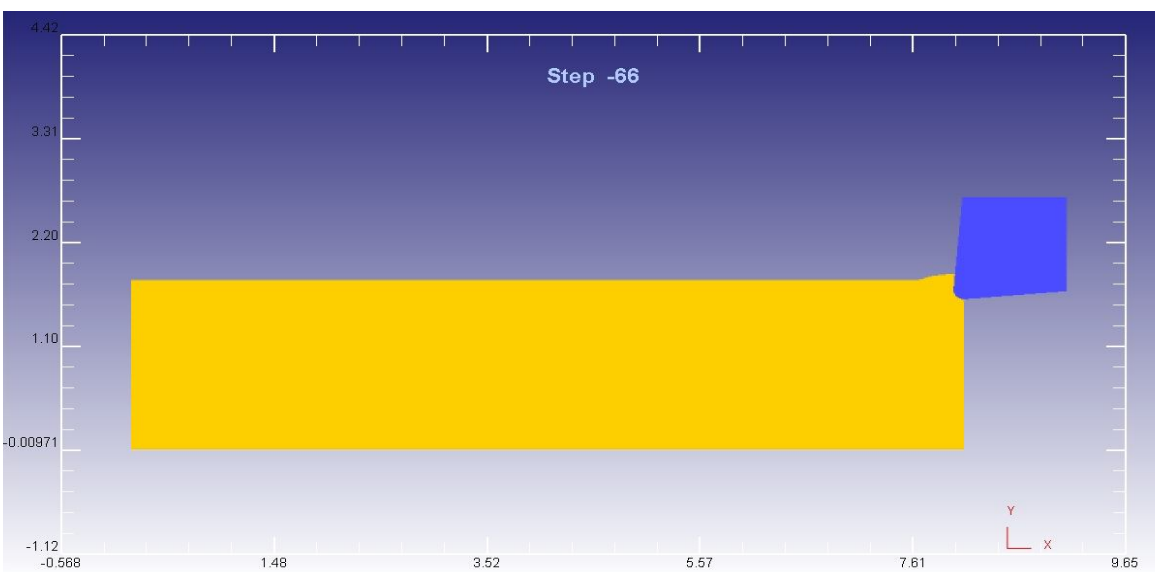


Figure 5 tool and work piece positioning

1) Simulation on Turning 1%CNT of AMMNC work Piece

In this paper, FEA Simulations have been performed using 2-Deform software at different cutting conditions on workpiece material as in the following.

a) Input Conditions

Machining type : Turning
Speed : 280 rpm
Feed : 0.2mm
Depth of cut : 0.2mm
Tool material : Tungsten Carbide
Work piece Material : AMMNC

b) Output

Friction range : 0.000 to 1.46
Effective Stress : 0.000 to 127 (N/mm2)
Temperature : 20.0 to 63.5 0C

The 2D-Deform software at different cutting conditions on work piece material are shown in Fig (6 and7).

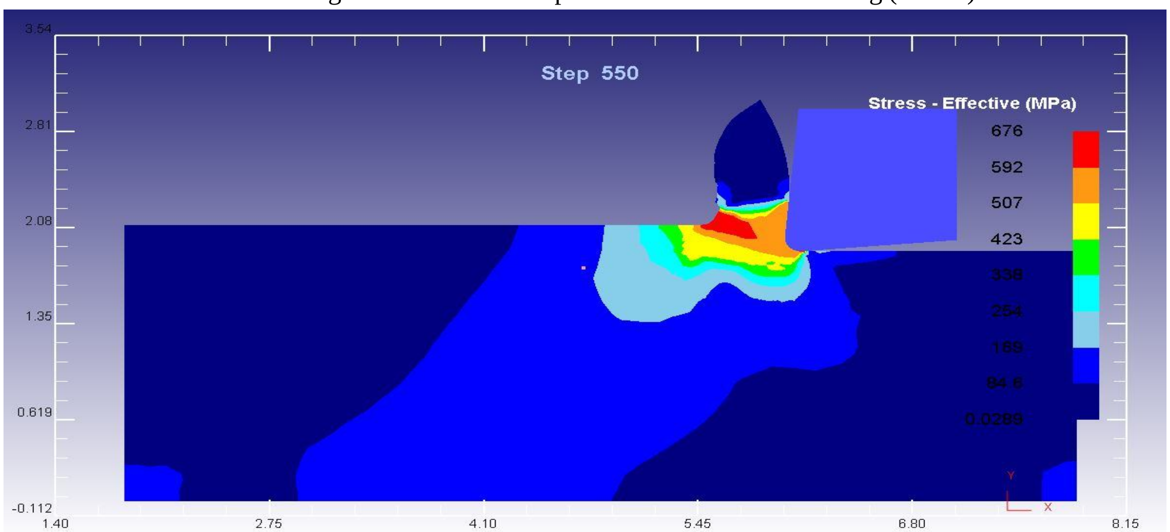


Fig 6 Flow stress distribution

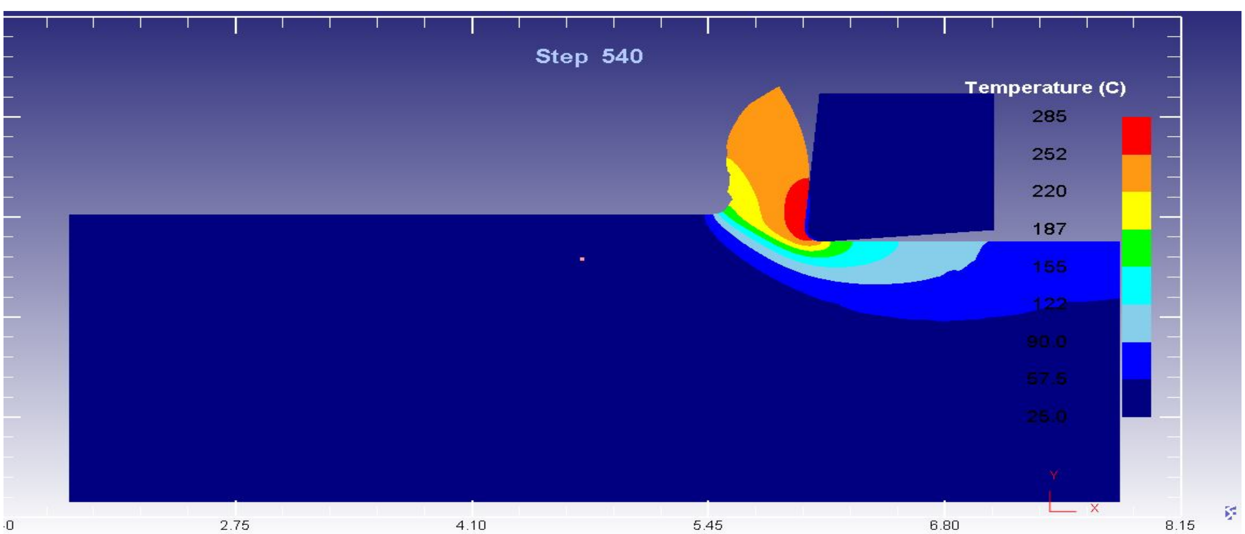


Fig 7 Temperature distribution

The results obtained from 2D-Deform softwareis shown in Table 6.3

Table.6.3 Results obtained from -Deform software

Test No	Speed (RPM)	Feed (mm)	Depth of cut (mm)	Flow stress (N/mm^2)	Temperature (^0C)
1	280	0.2	0.2	1125	37.64
2	280	0.25	0.4	1095	35.80
3	280	0.32	0.6	1050	34.54
4	280	0.36	0.8	1025	32.65
5	450	0.2	0.2	985	38.45
6	450	0.25	0.4	920	37.62
7	450	0.32	0.6	885	36.45
8	450	0.36	0.8	835	35.25
9	710	0.2	0.2	812	38.80
10	710	0.25	0.4	785	37.62
11	710	0.32	0.6	865	36.54
12	710	0.36	0.8	785	34.48
13	1120	0.2	0.2	954	38.95
14	1120	0.25	0.4	845	36.75
15	1120	0.32	0.6	654	36.20
16	1120	0.36	0.8	642	35.84

The output responses flow stress, temperature and tool chip interfacial friction are recorded from 2D-Deform simulation.

VI. RESULTS

By conducting the orthogonal cutting process, the machining responses are taken.Johnson cook constants are substituted in the Johnson cook model, to determine the flow stresses values.
The output responses flow stress and temperature are recorded from 2D Deform simulation.
Comparison of constitutive model values and 2D- deform model values as following

A. *Flow Stress and Temperature*

Comparing the flow stress values obtained from the Johnson cook model and 2D- Deform software model are given in Table 9 and 10.

Table 9 Flow stress obtained from Johnson cook model and 2D-Deform software

Test No	Speed (RPM)	Depth of cut (mm)	Flow Stress (N/mm^2)	
			JC model	2D-Deform
1	280	0.2	1365.95	1297
2	280	0.4	1409.63	1234
3	280	0.6	884.35	1125
4	280	0.8	980.84	1024
5	450	0.2	752.07	856
6	450	0.4	893.06	784
7	450	0.6	530.32	641
8	450	0.8	696.63	638
9	710	0.2	696.34	658
10	710	0.4	721.43	645
11	710	0.6	862.37	625
12	710	0.8	742.96	621
13	1120	0.2	467.09	645
14	1120	0.4	407.44	634
15	1120	0.6	844.30	628
16	1120	0.8	630.41	615

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue III Mar 2022- Available at www.ijraset.com

Table 10 Temperature obtained from Johnson cook model and 2D-Deform software

Test No	Speed (RPM)	Depth of cut (mm)	Temperature (^{0}C)	
			JC model	2D-Deform
1	280	0.2	42.67	39.6
2	280	0.4	43.19	38.8
3	280	0.6	40.78	38.3
4	280	0.8	41.10	37.6
5	450	0.2	39.52	38.5
6	450	0.4	39.09	37.8
7	450	0.6	37.51	36.4
8	450	0.8	38.74	35.8
9	710	0.2	37.62	37.9
10	710	0.4	39.04	36.8
11	710	0.6	40.02	35.4
12	710	0.8	38.57	35.6
13	1120	0.2	38.49	38.6
14	1120	0.4	37.33	37.7
15	1120	0.6	40.37	36.8
16	1120	0.8	39.02	35.4

B. Comparison of Flow Stress and Temperature obtained from constitutive models and 2d- Deform software

The machining reactions are obtained by using the orthogonal cutting method. The output parameters are determined using these values instead of Oxley's model. To obtain the flow stresses values, the Oxley's output values and Johnson cook constants are inserted in the Johnson cook model. The output responses of the 2D Deform simulation are flow stress and temperature.

1) Flow Stress

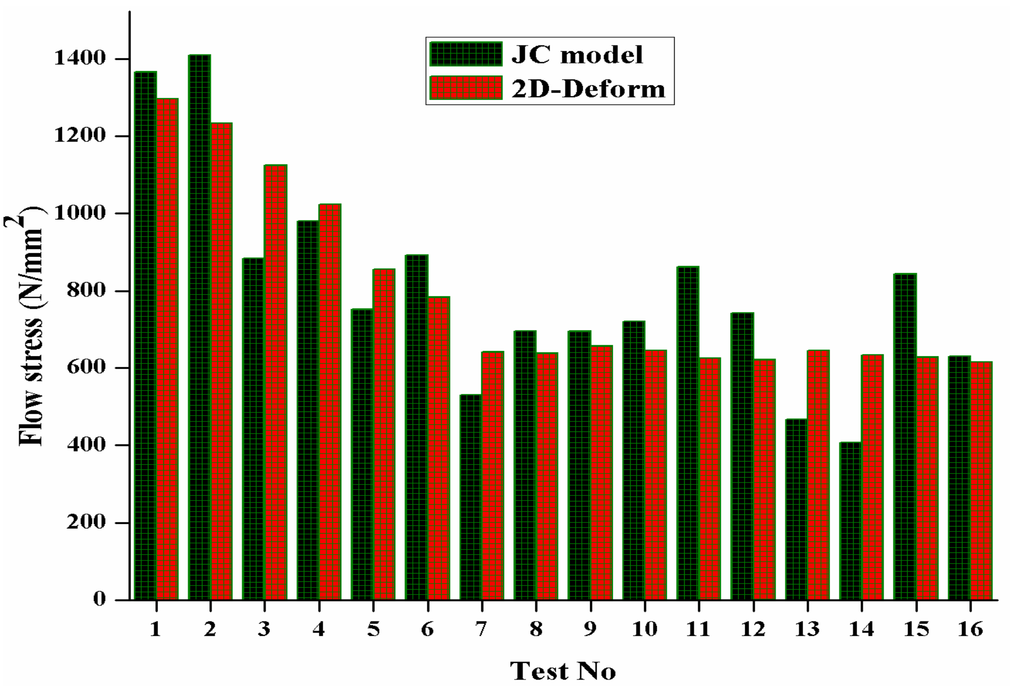


Fig 6 Flow stress obtained from Johnson and 2D-Deform

2) Temperature

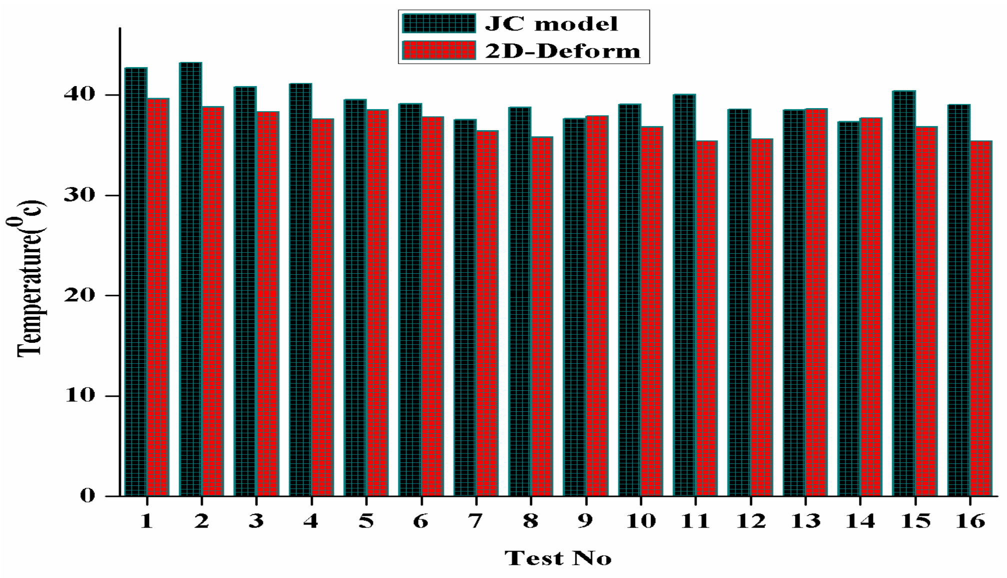


Fig 7 Temperature obtained from Johnson and 2D-Deform

Fig (6-7) shows predicted, flow stress andtemperature at secondary zone values for aluminum nanocomposite material are compared with the results obtained from Johnson cook model and 2D-Deform software, and comparison is satisfactory.

VII. CONCLUSIONS

The current research makes use of an enlarged metal cutting model developed by Oxley and colleagues, as well as a novel method for expanding the Johnson-Cook material model's applicability to cutting situations. Using constitutive models, the dynamic parameters Flow stress and Temperature distribution are predicted in this study. To acquire dynamic parameters, the orthogonal test values of speed, feed, and depth of cut are fed into the 2D-Deform software. The findings of the 2D-Deform software are compared to the predicted Flow stress and Temperature values for AMMNC, and the comparison is satisfactory.

A. CRediT authorship contribution statement

M. Madduleti: preparation of work material, turning operation, numerical modeling, investigation and validation, original draft preparation.

P. Venkataramaiah: Conceptualization, Data curation, Formal analysis, Project administration, Writing - review & editing, Supervision.

B. Declaration of Competing Interest

The authors declare no conflict of interest.

C. Acknowledgement

Authors acknowledge support from MrDhanunjay, Research scholar, SVU College of Engineering. Dr. S. Suresh acknowledges the support from the Department of Mechanical Engineering, SIETK, Puttur, India.

D. Current Funding Sources

Funding information is not applicable / No funding was received**.**

E. Data Availability

The raw/processed data needed to replicate these findings is not available at this time because it is part of a current investigation.

F. Ethical Approval

No animals were used in any of the studies.

G. Consent to Participate

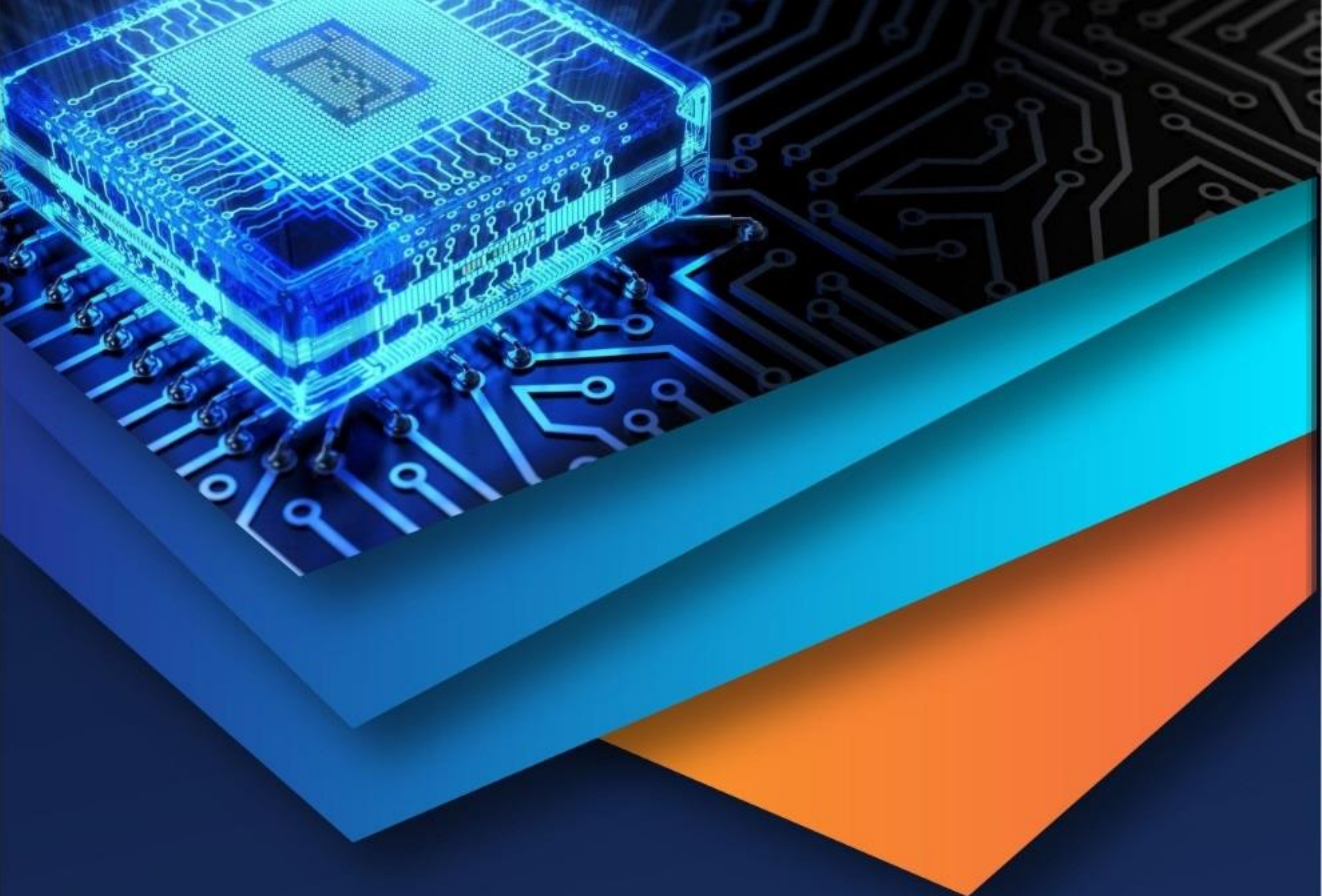
No humans have been used in any experiments.

H. Consent to Publish

The author certifies that the work described has not been published before (except as an abstract or as part of a published lecture, review, or thesis); that it is not under consideration for publication elsewhere; that it has been approved for publication by all co-authors, if any; and that it has been approved (tacitly or explicitly) by the responsible authorities at the institution where the work is performed.

REFERENCES

[1] Özel, Tuğrul& Zeren, Erol. (2005). Finite Element Modeling Of Stresses Induced By High Speed Machining With Round Edge Cutting Tools.
[2] El-Labban, Hashem & Abdelaziz, M. &Yakout, Mostafa &Elkhatib, Ahmed. (2013). Prediction of Mechanical Properties of Nano-Composites Using Vibration Modal Analysis: Application to Aluminum Piston Alloys. 2. 454-467. 10.1520/MPC20130006.
[3] Umbrello, Domenico. (2008). Finite element simulation of conventional and high speed machining of Ti6Al4V alloy. Journal of Materials Processing Technology. 196. 79-87. 10.1016/j.jmatprotec.2007.05.007.
[4] Fang, S., Zhanqiang, L., Yi, W. and Zhenyu, S. (2009) "Finite element simulation of machining of Ti-6Al-4V alloy with thermo dynamical constitutive equation", International Journal of Advanced Manufacturing Technology, pp.1- 9 .
[5] Lee, W. S., Lin, C. F. High-temperature deformation behavior of Ti6Al4V alloy evaluated by high strain-rate compression tests. J. Mater. Process. Technol., 1998, 75. 127–136.
[6] Guo, Y.B (2003). "An integral method to determine the mechanical behavior of materials in metal cutting", Journal of Materials Processing Technology, Vol. 142 pp. 72-81.
[7] Shi, B., Attia, H. and Tounsi, N. (2010). "Identification of Material Constitutive Laws for Machining-Part I: An Analytical Model Describing the Stress, Strain, Strain Rate, and Temperature Fields in the Primary Shear Zone in Orthogonal Metal Cutting", Journal of Manufacturing Science and Engineering, Vol.132, 051008, pp. 1 – 11
[8] T.H.C. Childs, (1998),Material property needs in modeling metal machining, in Proceedings of the CIRP International Workshop on Modeling of Machining Operations, Atlanta, Georgia, USA, 19 May 193–202.
[9] T. Özel, T. Altan, (2000) Determination of workpiece flow stress and friction at the chip-tool contact for high-speed cutting, Int. J. Machine Tools Manuf. 40 (1) 133–152.
[10] H.W. Meyer Jr., D.S. Kleponis, (2001) Modeling the high strain rate behavior of titanium undergoing ballistic impact and penetration, Int. J. Impact Eng. 26 509–521.
[11] M. Shatla, C. Kerk, T. Altan, (2001) Process modeling in machining. Part I: Determination of flow stress data, Int. J. Machine Tools Manuf.41 1511–1534.
[12] Dusunceli, N.; Colak, O. U.; Filiz, C. (2010). Determination of material parameters of a viscoplastic model by genetic algorithm, Materials, and Design, Vol. 31, No. 3, 1250- 1255,doi:10.1016/j.matdes.2009.09.023
[13] Ozel, T.; Karpat, Y. (2007). Identification of constitutive material model parameters for high strain rate metal cutting conditions using evolutionary computational algorithms, Materials and Manufacturing Processes, Vol. 22, No. 5, 659-667,doi:10.1080/10426910701323631
[14] MousaviAnijdan, S. H.; Madaah-Hosseini, H. R.; Bahrami, A. (2007). Flow stress optimization for 304 stainless steel under cold and warm compression by artificial neural network and genetic algorithm, Materials, and Design, Vol. 28, No. 2, 609-615,doi:10.1016/j.matdes.2005.07.018
[15] Lee, W. S.; Lin, C. F. (1998). High-temperature deformation behavior of Ti6Al4V alloy evaluated by high strain rate compression tests, Journal of Materials Processing Technology, Vol. 75, No. 1-3, 127-136, DOI:10.1016/S0924-0136(97)00302-6
[16] Khan, A. S.; Suh, Y. S.; Kazmi, R. (2004). Quasi-static and dynamic loading responses and constitutive modelling of titanium alloys, International Journal of Plasticity, Vol. 20, No. 12, 2233-2248,doi:10.1016/j.ijplas.2003.06.005
[17] Lesuer, D. R. (2000). Experimental investigations of material models for Ti-6Al-4V titanium and 2024-T3aluminum.Final Report,DOT/FAA/AR-00/25,USDepartmentofTransportation, Federal Aviation Administration
[18] Motorcu, A. R. (2010). The Optimization of Machining Parameters Using the Taguchi Method for Surface Roughness of AISI 8660 Hardened Alloy Steel, Strojniškivestnik Journal of Mechanical Engineering, Vol. 56, No. 6,391-401
[19] Ghose, J.; Sharma, V.; Kumar, N.; Krishnamurthy, A.; Kumar, S.; Botak, Z. (2011). Taguchifuzzy-based mapping of EDM-machinability of aluminum foam, Technical Gazette, Vol. 18, No. 4,595-600
[20] Gurbuz, H.; Kurt, A.; Ciftci, I.; Seker, U. (2011). The Influence of Chip Breaker Geometry on Tool Stresses in Turning, Strojniškivestnik– Journal of Mechanical Engineering, Vol. 57, No. 2, 91-99,doi:10.5545/sv-jme.(2009).



10.22214/IJRASET

INDEX COPERNICUS
45.98

IMPACT FACTOR:
7.129

TOGETHER WE REACH THE GOAL

IMPACT FACTOR:
7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)