

TECHYUVA

SHRI
JAIN VIDYA
PRASARAK MANDAL'S

RASIKLAL M. DHARIWAL
INSTITUTE OF
TECHNOLOGY

ACADEMIC YEAR:2023-24

Mechanical Engineering Department

Year: 2nd Vol: 4th

Shri Jain Vidya Prasarak Mandal's
RASIKLAL M. DHARIWAL
INSTITUTE OF TECHNOLOGY Manikchand
Chinchwad, Pune - 411033.

ABOUT DEPARTMENT

Welcome to the Fourth issue of our newsletter "TechYuva". It is an opportunity for us to share relevant activities conducted by Mechanical Engineering Department of rmdiot. The "TechYuva" is distributed electronically through the electronic media (Institute Website, Facebook and WhatsApp). It will provide departmental news and activities

Institute Vision and Mission

Vision :

A lead provider of quality and affordable technical education to serve the Society

समाजाची सेवा करण्यासाठी दर्जेदार आणि परवडणारे तांत्रिक शिक्षण देणारे आघाडीचे प्रदाता

Mission :

M1: To Develop the ideal working attitude and values of the students.

विद्यार्थ्यांची आदर्श कार्य वृत्ती आणि मूल्ये विकसित करणे

M2: To maintain the quality of Teaching learning Process

शिकविण्याच्या व शिक्षण घेण्याच्या प्रक्रियेची गुणवत्ता राखणे

M3: To bridge the gap between industry and institute.

उद्योग आणि संस्था यांच्यातील दरी कमी करणे.

M4: To enhance the multidisciplinary skills of the faculty and students.

प्राध्यापक आणि विद्यार्थ्यांची बहु-विषय कौशल्ये वाढवणे.

Mechanical Engineering Department

Vision:

Provide quality technical environment to produce skilled technicians

कुशल तंत्रज्ञ तयार करण्यासाठी दर्जेदार तांत्रिक वातावरण उपलब्ध करून देणे

Mission

M1: To create value based education

मूल्यावर आधारित शिक्षणाची निर्मिती करणे

M2: To educate students about their professional and ethical responsibilities

विद्यार्थ्यांना त्यांच्या व्यावसायिक आणि नैतिक जबाबदाऱ्यांबद्दल शिक्षित करणे

M3: To prepare students to be lifelong learners

विद्यार्थ्यांना आजीवन शिकण्यासाठी तयार करणे

M4: To prepare students to meet the latest trends in the industry

उद्योगातील नवीनतम तंत्रज्ञान पूर्ण करण्यासाठी विद्यार्थ्यांना तयार करणे

Results :- Summer-2024

FY MECHANICAL

- 1) SALUNKE PANKAJ NARSING - 82.22 %
- 2) MUJAWAR REHAN SAMEER - 80.44%
- 3) SHLOK SHAILESH RANADE - 76.67%

SY MECHANICAL

- 1) DOLARE SAYONI NAGESH - 80.00%
- 2) JAGTAP SHRUTI VIJAY - 77.13%
- 3) PALANDE MAITHILI DEEPAK - 72.50%

TY MECHANICAL

- 1) VARMA TEJAS VIJAY - 84.33%
- 2) JAMDAR SHREENATH MANOJ - 82.44%
- 3) GAIKWAD ARJUN SANJAY - 80.44%

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RASIKLAL M. DHARIWAL INSTITUTE OF TECHNOLOGY**

Shri Jain Vidya Prasarak Mandal's

Rasiklal M. Dhariwal Institute of Technology

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MESSAGE FROM PRINCIPAL DESK



In this global competitive world excellence in education & Research is our prime objective. To meet the need of Industries and IT sectors we have involved ourselves to build the carrier of our students, Industrial-Institute Interaction, Industrial visits & training, guest lectures from renowned personalities of various sectors. In addition to the theoretical knowledge to build an ideal engineer is our main objective. Soft skill development, communication skill enhancement, training on extra-curricular courses is our proud. We expect our student will be developed with an extra ordinary skills with excellent personality. We communicate ourselves to build our student not only engineer but also all-rounder good human being by arranging Meditation Camps, Cultural and Sports Activities.

Institute Vision and Mission

Vision

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समाजाची सेवा करण्यासाठी दर्जेदार आणि परवडणारे तांत्रिक शिक्षण देणारे आघाडीचे प्रदाता

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M2: To maintain the quality of Teaching learning Process
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M3: To bridge the gap between industry and institute.
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M4: To enhance the multidisciplinary skills of the faculty and students.
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INDUSTRIAL VISIT

In an enriching experience aimed at bridging the gap between theoretical knowledge and practical application, mechanical engineering students from RMDIOT visited Kolte Pressing Works on February 7, 2024. The visit was organized to provide students with insights into the manufacturing processes and operational practices of a leading industry in the mechanical sector. Purpose of the visit was to enhance student's understanding of real-world engineering applications.



Students were escorted through various production lines, observing the intricate processes involved in metal pressing and fabrication.

Then the Industry experts conducted demonstrations showcasing the latest machinery and techniques used in the pressing process, emphasizing efficiency and safety.

Students were also engaged in a question-and-answer session with engineers and management, discussing career opportunities and industry trends.

The industrial visit to Kolte Pressing Works was a significant step in the students' educational journey, equipping them with valuable insights and experiences that will aid in their future careers in mechanical engineering.



EXPERT LECTURE



On September 8, 2023, RMDIOT organized expert lectures for mechanical engineering students. The event aimed to enhance the students' understanding of contemporary issues and advancements in the field of mechanical engineering. Purpose of the event was to provide students with the insights from industry professionals and academic experts. And to discuss the latest trends, technologies, and challenges in mechanical engineering. The lecture covered a wide range of subjects, including advanced manufacturing techniques, renewable energy systems, and the role of automation in mechanical engineering. Then each session included interactive discussions, allowing students to engage with the speakers, ask questions, and gain deeper insights into the topics presented.

SPORTS DAY 2023-24

- 27 JANUARY 2024



Shri Jain Vidya Prasarak Mandal's Rasiklal M. Dhariwal Institute of Technology, Chinchwad have organized the sports day on 27 January 2024, to recharge the students with energy and enthusiasm. It include indoor games varying from chess, carrom to outdoor games like cricket. The objective of the sports day is to enhance the personality of individuals by imparting various traits in them, also to boost alertness, discipline, team spirit, mental ability, trust, confidence and concentration and the skill of time management of a student. There are active participation by the students and teaching and non teaching staff

ALUMINI MEET

- 30 JANUARY 24



SJVPM'S Rasiklal M. Dhariwal Institute of Technology, Chinchwad have conducted the Alumni meet on 30th January 2024 in this alumni meet , the ex-students of the college talk about their experience in the outside world and have they are managing their professional lives. This alumni meet provide students and institutions a variety of benefits and services. This meet gives ex-students the chance to gel with the people whom they have not met in years. This meets alumni make feel nostalgic, rekindle friendships, and foster a sense of community. It also helps them to share their experience and skills with current students. They can share their achievements and lessons learned in their careers and provide guidance for students. They also can also host alumni meetups to raise funds for your college making them beneficial for everyone involved. we also appreciate the students by giving bouquet and flowers for their achievements and contribution. The ultimate goal of our alumni association was to build a strong network that can support and complement the wider aims of institution. The Alumni meet was successful with the guidance and support of principle, HOD, and teaching and non-teaching staffs.

CULTURAL PROGRAM & NEWSLETTER INAUGURATION

- 03 FEBRUARY 2024



SJVPM'S Rasiklal M. Dhariwal Institute of Technology, Chinchwad have organized the cultural program and inauguration of newsletter on 03 February 2024 . Cultural programs was organised to promote and celebrate the arts, culture, and heritage of a community or organization. These programs included a wide range of activities such as instrumental music, flock arts and songs, dance performances, theater productions, fine arts, and drama. They provide opportunities for people to come together, share their experiences, and learn about different cultures. It also help them to understand, inculcate and share their skills among themselves, and boosts the confidence level of students, It also develop skills like presentation, leadership, and interpersonal communication, identify themselves, get refreshed , rejuvenate themselves and faculty members. The college inaugurated the third edition of its newsletter by the hands of Mr. Shantilalji Lunkard - chairman SJVPM, Adv. Mr. Rajendrakumarji Mutha - Honorable general secretary SJVPM, Mr. Rajendrakumarji Sakla - Joint secretary, SJVPM and Mr. K. B. Khilari - Development officer SJVP. The program was made successful by the support of principal Mr. Anil Thite Sir and the efforts of Prof. Shriram Khadake, all department heads, teachers, and non-teaching staff of the institute.

A REVIEW ON EFFECT OF VARIOUS PARAMETERS ON CUTTING TOOL IN ORTHOGONAL METAL CUTTING PROCESS

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Abstract

In recent years there is great progress in the field of tool design. Tool is an important factor for machinability process. In the metal cutting process various cutting parameters affecting on the cutting tool. The various parameters include as cutting speed, feed rate, depth of cut, rake angle. The effect of these parameters on the cutting forces, tool temperature, and surface roughness studied. This helps in evaluating the tool life and tool wear. This effect of parameters on tool is important for efficient machining and machining conditions. The paper also covers the effect of cutting parameters on the chip formation and residual stresses produced during cutting process.

Keywords: Cutting parameters, orthogonal, cutting process, cutting tool.

1. INTRODUCTION

There are two types of metal cutting as orthogonal cutting and oblique cutting. In orthogonal cutting, the cutting edge of the tool is at right angles to the direction of the relative motion between the tool and the workpiece. In oblique cutting, the cutting edge is inclined but not perpendicular to the direction of the relative motion between the tool and workpiece. During the cutting process the various forces acting on the tool. The study of effect of these forces is necessary for the qualitative analysis. The cutting parameters include the cutting speed, feed and depth of cut.

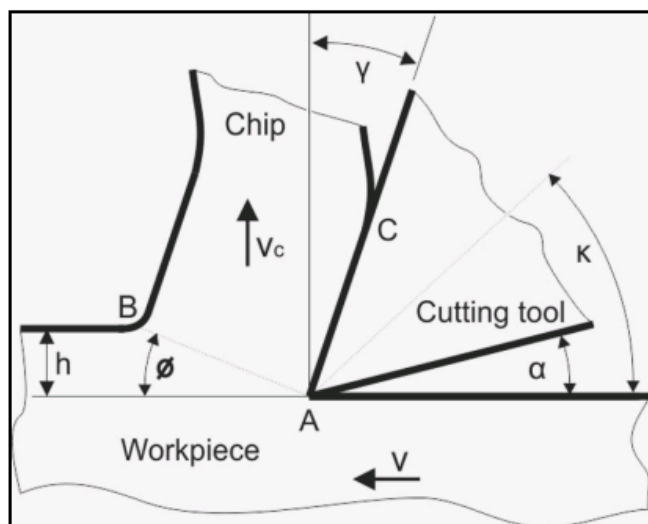


Fig. 1 The classical orthogonal cutting model [7]

The machinability is influenced by the tool variables, machine variables, cutting conditions and work material

variables. These parameters may create failure of tool, poor surface finish, sudden increase in forces, increase in temperature and stresses. The tool life and tool wear also depends on these parameters. For the optimum machining, these parameters should be in proper consideration like nature of cut to be made, feed, depth of cut, speed. [16]

2. LITERATURE REVIEW

Lei Wan et al. [1], investigated the effect of different cutting tool edge geometries by using finite element simulation method. The P20 used as a workpiece material for orthogonal machining and carbide tool with different angles and lengths with different cutting speeds. The arbitrary Lagrangian-Eulerian (ALE) approach was used for simulation in ABAQUS/Explicit. The results show that the tool edge geometries influence on the chip removal process with less significantly and little effect on the machining force when the cutting speed reaches a very high level. The cutting forces increases with increase in chamfer angle and decreases with increase in cutting speed.

Awadhesh Pal et al. [2], experimentally investigated the effect of workpiece hardness and cutting parameters on the different responses which was analyzed by performing analysis of variance (ANOVA) technique. The AISI 4340 steel used as a material and TiC mixed alumina ceramic tool used for soft and hard turning. From the experiment they observed that all the components of cutting forces increases with the increase in depth of cut and the magnitude of the cutting forces increases with the increase in workpiece hardness. The results also show that surface roughness decreases with increase in hardness level of workpiece and average value of the chip-tool interface temperature increases with increase in cutting speed.

Sudhansu Ranjan Das et al. [3], experimentally investigated the effect of cutting speed, feed and depth of cut on the cutting force and surface roughness. The AISI 52100 bearing steel used as a material and CNB tool used for an experiment. The analysis of variance (ANOVA) technique was used for identifying the factors significantly affecting the cutting force and surface roughness. Their results show that the feed rate and cutting speed strongly influence on the surface roughness. Also the cutting force increases with the increase in feed rate and depth of cut and decreases with cutting speed.

Atul P. Kulkarni et al. [4], experimentally investigated the effects of machining parameters on the surface finish, cutting force, tool wear, chip thickness and tool life. The AISI 304 austenitic stainless steel used as a workpiece and AlTiCrN coated insert produced by High Power Pulsed Magnetron Sputtering (HPPMS) used for dry turning. The experiment was carried out at different cutting speed and feed with constant depth of cut. The results show that the surface roughness value increases with increase in feed and low at the high cutting speed. The flank wear was prominently affected by cutting speed and feed.

H Aouici et al. [5], experimentally investigated the effect of cutting conditions on surface roughness and cutting forces in hard turning of X38CrMoV5-1 with CBN tool. The results shows that the effects of cutting speed on surface roughness and on cutting forces at various feed rates and also show that the analysis of variance(ANOVA) of the data with the surface roughness parameters and cutting forces components. They concluded that the depth of cut has a maximum effect on the cutting force component as compared to the feed rate and cutting speed.

K. Khalili and M. Danesh [6], investigated the effect of cutting tool geometry on morphology of flank wear land in turning of low carbon steel. The image processing technique and Response Surface Method used for investigation this effect. For experiment the cutting speed, feed rate and depth of cut kept constant. The results show that the area of flank wear land decreases with an increase of both relief angle and the rake angle and increases with the increase of cutting edge angle for lower values of the rake angle.

M. Cebon et al. [7], experimentally find out the effect of cutting on surface hardness and residual stresses for 12Mn austenitic steel. The results show the material hardening and residual stresses induced during machining for highly-hardening 12Mn austenitic steel. As the feed rate increases it lowers the hardness of the material on the contact face of the chip. The residual stresses increases with increase in feed rate and cutting speed.

Nicoleta Lungu and Marian BORZAN [8], performed the finite element simulation to study the effect of cutting speed and feed rate on tool geometry, temperature and cutting forces. The AISI 1045 carbon steel used as a workpiece material and tungsten carbide coated with a TiCN layer used as a tool. The Deform 2D machining software used for finite

element simulation. The results shows that the temperature value increases with the increase in cutting speed but at that time the value of cutting forces decreases and cutting forces increases with increase in feed rate.

Rodrigues L. L. R. et al. [9], conducted experiment to investigate the effect of cutting parameters on surface roughness and cutting force in turning mild steel by using high speed steel cutting tool. The analysis of variance (ANOVA) was used for the effect of cutting parameters. The results shows that the cutting force increases linearly with the increase in depth of cut and surface roughness was influenced by feed rate and the interaction between speed and feed. They concluded that the feed and depth of cut has significant effect on cutting force but cutting speed and depth of cut had no significant effect on surface roughness.

S. Ben Salem et al. [10], investigated the effect of cutting parameters on chip formation in orthogonal cutting. The high alloyed steel (type EN X160CrMoV12, AISI D2) used as a material. The experiment was performed at different cutting speed and feed rate. As the feed rate increased the chip gets shape of the saw-tooth chip. As the cutting speed increases the chip becomes relatively ductile.

Irfan Uzun et al. [11], developed a finite element based computational model to determine the effect of tool geometry on the cutting force and temperature. The AISI 1045 carbon steel were used as a material with ceramic insert having different edge geometry for an experiment. They compared the results obtained by experiments and finite element simulation of the cutting forces at different cutting speed and feed rate. The results shows that the effect of the chamfer angle and feed rate on cutting forces also effect of the chamfer length and feed rate on cutting forces. They concluded that the increase in cutting force and thrust force depends on increasing chamfer angle and chamfer length. They also concluded that the chamfer angle has more significant effect on the cutting temperature depending on the increase at the cutting speed and the maximum temperature occurring on the cutting tool occurs at different points in line with the variation at the chamfer length.

Satyanarayana Kosaraju et al. [12], experimentally investigated the effect of rake angle and feed rate on cutting forces in an orthogonal turning process. The high speed steel cutting tools were used for machining EN8 hollow cylindrical workpiece. An experiment were performed at different rake angles and feed rate with constant speed and depth of cut. The experimental result shows that the feed force was greater than the tangential force and the longitudinal force was least in magnitude irrespective of the tool rake angle. From an experiment they conclude that the cutting forces decreases with increase in rake angle and the cutting forces increases continuously with an increase in feed for all rake angles.

Wan Masrurah Bt Hairudin and Mokhtar B Awang [13], developed a fully coupled thermo mechanical finite element model for simulating the orthogonal cutting in cutting

process. The simulation was performed at three different tool rake angles and tool edge radius. An Arbitrary Lagrangian-Eulerian method was used for thermo mechanical modelling. The results show that with increase in rake angle the stress on the workpiece decreased also temperature significantly increased when tool rake angle was decreased.

E. D. Derakhshan and A. A. Akbari [14], investigated the effects of workpiece hardness and cutting speed on surface roughness of steel bars of AISI 4140. The experiment was conducted on hard turning of hardened alloyed steel AISI 4140 with hardness of 45-65 HRC at various cutting speeds. They concluded that the best surface quality in hard turning of 55 HRC workpiece with CB50 tool at 2500 rpm speed. They also concluded that the increase in cutting speed had a tremendous effect of resulting surface roughness.

Jaharah A. G. et al. [15], presented the simulation work of turning process of AISI 1045 and carbide tool by using finite element method. The Deform-3D software was used for simulation of orthogonal metal cutting process. The simulation process was carried out by changing the rake angle, clearance angle and cutting speed parameters. The results shows that the effect of tool geometries on the effective stress and temperature at various combinations of rake angle and clearance angle. By this analysis it was found that the temperature increases when the negative rake angle tool used. They also shows that the effect of increasing of cutting speed on the effective stress and temperature. The authors concluded that if cutting speed increases then the effective stress reduced.

3. SUMMARY

In this paper, the review on effect of various parameters on orthogonal metal cutting process studied. It is observed that the cutting parameters have effect on the cutting tool. The cutting geometries have effect on the chip removal process. The cutting parameters have directly effect on the efficient machining process. The cutting parameters have effect on the cutting forces, tool temperature, surface roughness, residual stresses, tool life and tool wear.

The cutting forces increases with the increase in chamfer angle, feed rate, depth of cut and decreases with increase in cutting speed, rake angle of the tool. The surface roughness value decreases with increase in cutting speed, hardness level of workpiece and increases with increase in feed. The temperature value of tool increases with increase in cutting speed. It is observed that the most of the existing researchers not considered all parameters effecting on the cutting tool. Hence in order to fill this gap future research studies may be conducted on the effect of all these parameters on the cutting tool.

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