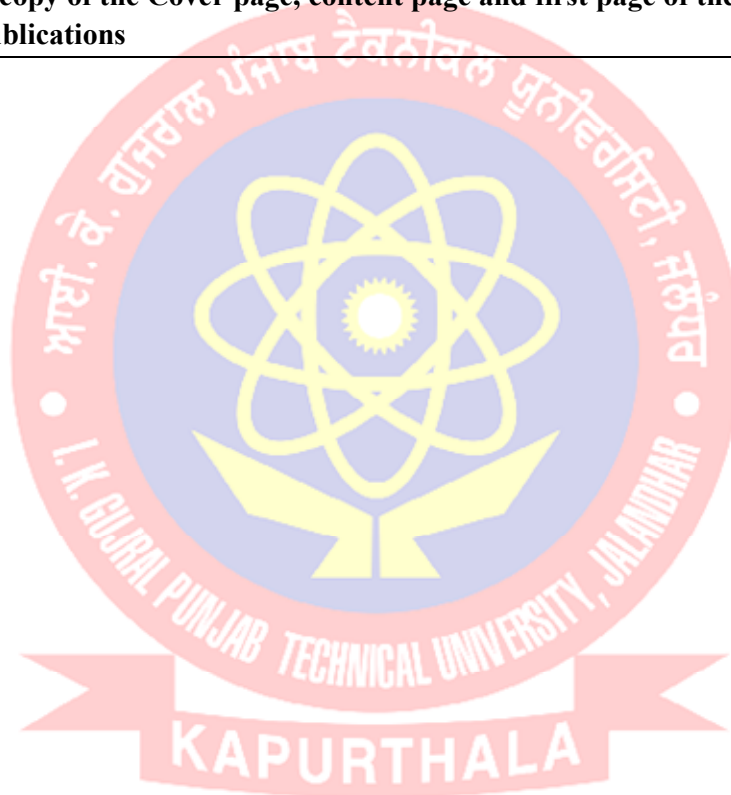


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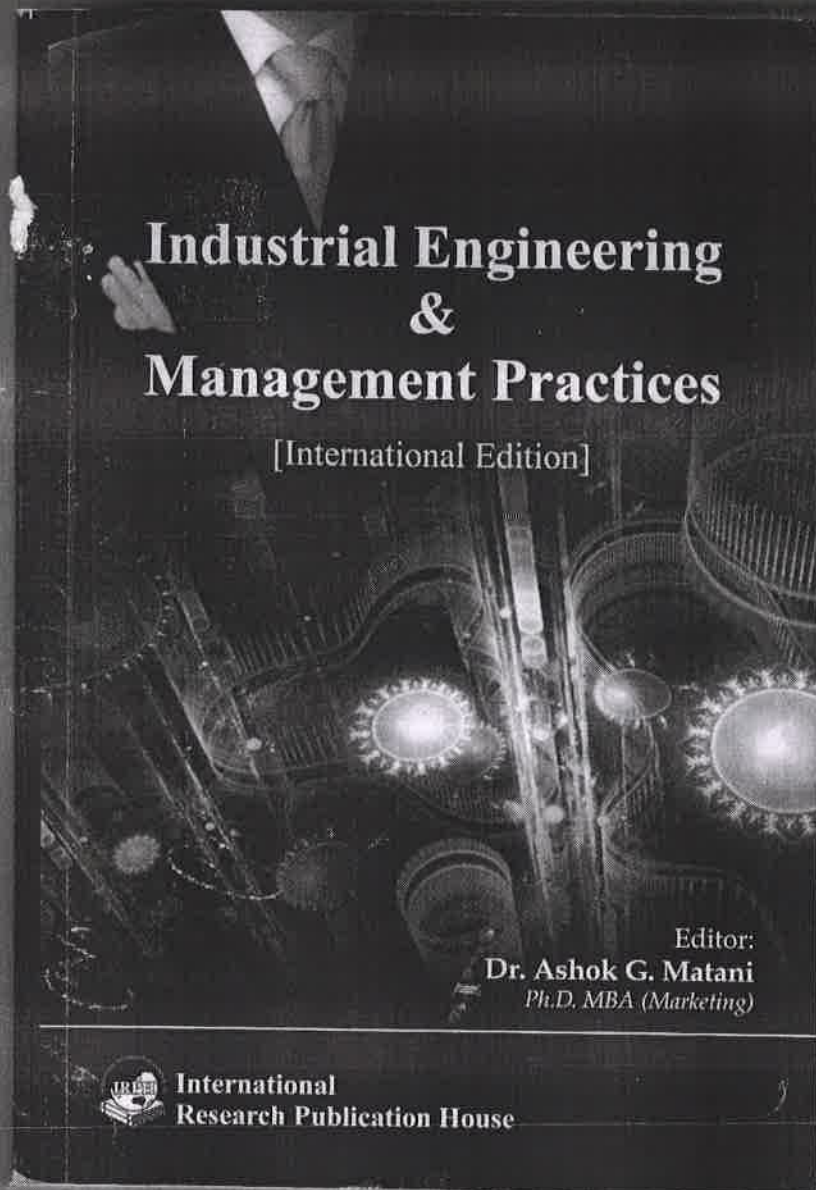
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Industrial Engi
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Initially the scope & applicability of industrial engineering was limited to the manufacturing industry. Later as construction & transportation, public utilities, Government & who is concerned with the systems of people, materials, specialized knowledge and together with the principles of industrial engineering has developed psychology, philosophy, and machines, materials and information aspect of their field it would be the total elimination of waste. Industrial engineering not only systems relating to management drivers for linking the need. Employers want industrial improvement in quality. Efficient personal relations with the utilizing industrial engineer and improve the wants of both.

Today, industrial engineering organization. With the involvement of industrial engineering has recalled at any time and develop models and simulations. Can analyze and optimize complex most significant changes in

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CHAPTER - 1

Droplet Vaporization in Subcritical and Supercritical Environments; High vs Low Pressure Modeling

N. K. Grover

*S. B.S College Engineering & Technology
Ferozepur, Punjab-152004, India.*

Abstract

Droplet vaporization under high-pressure stagnant conditions has been studied numerically. Computations have been performed using both a high pressure (HP) and a low pressure (LP) model. Results are presented for an n-heptane droplet evaporating into a nitrogen environment, for initial temperature of 300 K, and various ambient pressures and temperatures. It is predicted that at higher pressures the droplet surface temperature keeps rising until the end of the droplet lifetime. Compared to the HP model, the LP model over predicts the droplet lifetime, the deviation increasing with pressure. The predictions show that the droplet lifetime decreases monotonically with increase in ambient temperature at all the ambient pressures. At subcritical ambient temperatures, the droplet lifetime increases as the ambient pressure is increased and at supercritical ambient temperatures, the droplet lifetime decreases with increase in pressure.

1. INTRODUCTION

In diesel and spark-ignited direct injection combustion engines and gas turbine combustors, fuel is introduced in the combustion chamber by spray injection, which, for a given injector and operating conditions, produces droplets. These droplets break-up into smaller droplets and the liquid fuel is vaporized, producing local regions of stoichiometric mixtures of vaporized fuel and air. The

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CHAPTER - 4

SIMULATION OF N-HEPTANE DROPLET EVAPORATION AND IGNITION IN AT HIGH PRESSURE

Neel Kanth Grover¹

¹ Dept of Mechanical Engineering, S.B.S College of Engineering & Technology, Ferozepur, India
E-mail: neelkanthgrover@rediffmail.com

Abstract

This work presents a mathematical model for the droplet evaporation and ignition process of a single droplet of a pure hydrocarbon fuel at high pressure. The model solves the full transient equations of continuity, species and energy in the vapor phase and species and energy in liquid phase using finite difference method. The vapor-liquid equilibrium has been described by Peng-Robinson equation of state. In this model, the high pressure transient effects, variable thermo-physical properties and inert species solubility in the liquid-phase are considered. The evaporation model has been extensively validated with experimental results available in literature. The ignition model has been tested for ambient temperature of 1000 K. The ambient pressure varies in the range from 5 bar to 80 bar. The range of diameter was varied from 0.5 mm to 2.0 mm. The ignition delay was found to be strong functions of temperature, pressure and diameter. The ignition time decreases monotonically with increase in ambient pressure and temperature. At each pressure there existed a minimum diameter below which ignition does not takes place and this minimum diameter decreases with increase in pressure.

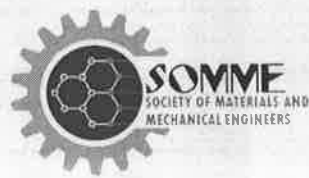
1. INTRODUCTION

Droplet vaporization and ignition at high pressure is of great importance in the development of high pressure combustion systems such as diesel engines, gas turbines etc. The physical mechanisms occurring under high pressure conditions are different from that of low pressure conditions. Thus the conventional low pressure theories are not able to describe the high pressure characteristics. In

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Parallel Session 5 (M5)		
02:20 PM	03:40 PM	SOMME sessions
03:40 PM	04:10 PM	High tea and research poster sessions
04:10 PM	05:10 PM	SOMME sessions
07:00 PM	10:00 PM	Conference Dinner

Day 3: 07, December, 2019 (Saturday)

08:50 AM	09:00 AM	Introductory Note
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10:10 AM	10:30 AM	Keynote talk by Dr. Mukesh Kumar
10:30 AM	10:42 AM	35-A: Experimental investigation on the heat transfer performance of solar boiler using graphene coating
10:42 AM	10:54 AM	36-A: Comparative high temperature oxidation studies of HVOF in 625 coating on T22 boiler steel at 900°C and 700°C
10:54 AM	11:06 AM	37-A: A review- nano-fluids on the performance enhancement of solar desalination systems
11:06 AM	11:18 AM	38-A: Graphene: An ideal coating for durable corrosion resistance
11:18 AM	11:30 AM	39-A: Modal analysis of self-aligning ball bearing using finite element method
11:30 AM	11:42 AM	40-A: Thermo-mechanical analysis of the gas turbine blade measurement of joint angle for physical therapy using a wearable carbon nanotube based sensor
11:42 AM	11:54 AM	41-A: Effect of fused deposition modeling machine parameters and post processing parameters by solvent dipping on surface finish and coating of acrylonitrile butadiene styrene sample
11:54 AM	12:07 PM	42-A: Topographical modification of Ti-6Al-4V surface by Laser Ablation
12:07 PM	12:19 PM	43-A: A Numerical investigation of S819 aerofoil for wind turbine blade aerodynamics performance
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10:30 AM	10:42 AM	35-B: Influence of spot welding in adhesive bonded steel sheets on formability and spring back
10:42 AM	10:54 AM	36-B: Statistical technique to model relation for weld bead characteristics in submerged arc welding of API 5L x70 steel
10:54 AM	11:06 AM	37-B: Investigation of thermo-hydraulic performance for different arrangement of turbulent geometries in rectangular fluid flow channel
11:06 AM	11:18 AM	38-B: Production and thermal characterization of advanced aluminium matrix composites by two-step stir casting process
11:18 AM	11:30 AM	39-B: Turning parameters optimization to obtain best fit surface roughness and material removal rate for AISI 1030 steel
11:30 AM	11:42 AM	40-B: Learning & selection guidelines of mechanical seal flush plan for pumps in a typical plant
11:42 AM	11:54 AM	41-B: Design optimization of process parameters of power plant

^aDepartment of Mechanical Engineering, M. Kumarasamy College of Engineering Karur India

^bDepartment of Mechanical Engineering,, Selvam College of Technology Namakkal, India

Abstract:

This paper aims to in script new-fangled challenges like agglomeration and non-uniform dispersion in stir casting by attempting two step stir casting method. This research cares much on defect and porous free composites which further investigates about Microstructural characterization and Thermal behaviour of Aluminium Matrix Composites (AMCs) prepared using Al6061 alloy (AA 6061) as a base metal (matrix), Aluminium Oxide (Al₂O₃) and Graphite (C) as reinforcement particles. Uniform dispersion of particles was observed through Scanning Electron (SEM) photomicrographs. The prepared composites were measured using Pin-Fin apparatus and Xe-Flash Laser Apparatus for thermal characterization. The thermal properties were increased by adding ceramic fillers with varying composition (Al₂O₃, C & Hybrid (Al₂O₃+C)) in standard weight percentage (5 wt. %). This comparative study of composites with Al6061 shows efficient thermal conductivity of the 5 wt. % hybrid aluminium matrix composite (HAMC) was better than that of the base alloy.

39-B: Turning parameters optimization to obtain best fit surface roughness and material removal rate for AISI 1030 steel

Gurpreet Singh^a, Subhash Chander^a, Vikas Chawla^b

^aDepartment of Mechanical Engg., MIMIT Malout, India

^bDepartment of Mechanical Engg., IKG PTU Campus Hoshiarpur, India

Abstract:

The influence of depth of cut, cutting speed, feed rate and kind of cutting fluid (synthetic vs organic) on the surface roughness (SR) and material removal rate (MRR) during turning process of AISI 1030 Steel using CNC lathe machine was investigated in this research paper. In order to minimize the SR and maximize the MRR, Taguchi Optimization method in MINITAB software was used for optimization of turning parameters. The L18 orthogonal array, signal to noise ratio and analysis of variance (ANOVA) has been employed to study the performance characteristics in turning of AISI 1030 Steel using carbide insert (TNMG 160408-TN2000). The optimal values of four parameters namely cutting speed, feed, depth of cut and kind of cutting fluid (Conventional Cutting Oil or Organic Neem Seed Oil) to obtain the best fit of minimum SR and maximum MRR. The main turning parameters that affect turning performance were also evaluated. The minimum SR was found to be 0.66µm at spindle speed (1500RPM), feed rate (0.1 mm/rev), depth of cut (0.2mm) and The maximum MRR is found to be at a depth of cut (0.6mm), feed rate (0.3mm/rev), spindle speed (1500 RPM). All four parameters are found to be significant, but feed is the most significant parameter for surface roughness followed by spindle speed, depth of cut and cutting fluid. Three parameters are found to be significant, but D.O.C is the most significant parameter for the material removal rate followed by feed rate, spindle speed.

40-B: Learnings & selection guidelines of mechanical seal flush plan for pumps in a typical plant

Satinder Pal Singh^a, Neel Kanth Grover^a, Amresh Kumar^a

^aDepartment of Mechanical Engineering, I.K. Gujral Punjab Technical University, India

Abstract:

Pump mechanical seal failure incidents outnumber any other rotating component of a pump in a typical OG&C Plant. This is also well-known fact that up to 70% of pump maintenance expenditure is responsible for seal repair/maintenance or replacements. This arises the need for accurate selection of mechanical seal for given pump & particular service conditions. As a

standard industry practice, Pump Buyer usually follows Pump/Seal Vendor recommendation for final selection of Seal Plan. Although the onus of deciding the seal plan and material selection is fairly & squarely on the Pump/Seal Vendor, however it is recommended that Buyer shall also validate/verify the seal selection during bid evaluation stage himself (based on seal selection guidelines). This will help in avoiding changes in seal plan during detailed engineering (after award) which otherwise led to cost/schedule impact. Before selecting the seal material, type of seal the designer or pump manufacturer either needs to go through exhaustively complete scope of API 682 and their field experience (operational experience of using Seal Type X in Pump Type Y with process parameters Z). This paper will illustrate the selection guidelines based on seal vendor recommendations, feedback from Plant Owner (Plant O&M personals) and in-house lesson learnt. This paper will also discuss the work process diagram for the mechanical seal selection/coordination for OG&C plant along with brief information on various Seal types for Pumps per API 682. There is no doubt that the marginally higher cost for the better-quality seals will probably be recovered during the first year of operation of pumps itself. Although this seal selection guideline is applicable for new installations/Procurement of Pumps, however this may be extended for upgrading seals of Pumps in existing OG&C installations where frequent maintenance is encountered.

41-B: Design optimization of process parameters of power plant

Satinder Pal Singh^a, Neel Kanth Grover^a, H.S. Bains^a

^aDepartment of Mechanical Engineering, I. K. Gujral Punjab Technical University, India.

Abstract:

Thermal Power plants are the major source of generation of electricity for any developing country. Around 60% of electricity generation in our country is met by thermal power plants. The thermal power plant engineers take approximately 10000 hours for reviewing and designing the thermal power plant in the industry. With the lack of professional software available, a lot of man-hours are continuously consumed for the designing of power plant every time. Till today, very little research work was done to integrate the model of power plant for various capacities and thereafter testing that model with the case study in power plant to evaluate the results. This paper will illustrate the Power Plant model which will help in designing the capacities of various equipment's coming in the power plant and only the basic parameters like Coal quality (% content like Carbon, Sulphur, Hydrogen, Oxygen, moisture content etc.), power output required, HBD (Heat & Balance Diagram), ambient conditions and the water quality, temperature etc. will be used to get the output which will be the sizes of the various equipment's. This software is made in Microsoft excel and the results are cross checked with the existing power plant in India. Case studies are also done in the power plant to test, validate the model and evaluate the performance of the software. The effects of economic strategies and design parameters on the plant optimization is also studied in this paper. Exergo economic analysis is conducted in order to determine the cost of electricity and cost of exergy destruction. In addition, a comprehensive optimization study is also performed to determine the optimal design parameters of the power plant. This paper will also discuss the model additional features, suggestions for integration of clean technologies in conventional power plants, retrofitting and its direct impact on the environment as compared to the earlier design.

42-B: Electro Discharge Drilling (EDD) of rice husk ash reinforced aluminium matrix composite using different electrode shapes

Partha Sarathi Mallick^a, Shankar Singh^a

^a Department of Mechanical Engineering, Sant Longowal Institute of Engg. & Tech. Longowal, India

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Parallel Technical Session- XV February 14, 2020; Time: 10:00-11:00 am; Conference Room, 1 st Floor, IT Building		
Paper ID	Title of Paper	Authors
A540	Mechanical properties of sustainable concrete using binary pozzolanic material	Tripti Sonker, Rakesh Kumar, Anupam Rawat
A558	Treatment of greywater by free water surface constructed wetland with water hyacinth plant in batch mode operation- a lab scale study	Anudeep Nema, Rajnikant Prasad, K. D. Yadav, R. A. Christian
A564	Effect of Mn loading and preparation method on catalytic activity of MnOx/Al ₂ O ₃ for CO oxidation.	Gaurav Rattan
A566	Role of eichhornia crassipes in treatment of greywater in continuous process	Rajnikant Prasad, Anudeep Nema, Kunwar D Yadav
A598	The impact of microorganism for remediation of toxic heavy metals	Bashir A A, S.N Halliru, I.I Abdullahi
A640	Optimum Dose of Fly Ash in Self Compacting Concrete	Anjali Singh, P.K.Mehta, Rakesh Kumar, Abhishek Rajput

Parallel Technical Session XVI February 14, 2020; Time: 11:30-01:00 pm; Venue: Video Conferencing Hall, IT Building		
Paper ID	Title of Paper	Authors
P117	Biodegradation and kinetic analysis of phenol using Low-density polyethylene immobilized <i>Bacillus flexus</i> GS1 IIT (BHU) in a packed bed bioreactor	Ganesh Swain, R.K. Sonwani, Pankaj Nagar, B.S. Giri, R.P. Jaiswal, R.S. Singh, B.N. Rai
P110	Degradation of 4-Amino pyridine onto cuprous oxide nanoparticles synthesized from <i>tabernaemontana divaricate</i> extract	Pratibha, Sangeeta Garg, Jatinder Kumar Ratan
P160	Acute and sub-chronic toxicity of titanium dioxide nanoparticles synthesized by microwave-irradiation-assisted hybrid chemical approach	Shivendu Ranjan, Nandita Dasgupta, Chidambaram Ramalingam
P119	WEDM process parameter optimization for newly developed hybrid Al/SiC + Gr + [Fe] 2 O 3)-MMC	Neel Kanth Grover, Amresh Kumar

Parallel Technical Session- XVII February 14, 2020; Time: 11:30-01:00 pm; Venue: NKN, 2 nd Floor, IT Building		
Paper ID	Title of Paper	Authors
A588	Enhancement of drying rate of polyurethane coatings using dibutyltin dilaurate (DBTDL) for commercial applications	Amitendra Singh, D. Giribabu, Jaspreet Kaur, Jatinder Kumar Ratan
A641	Rheology of fly and bottom ash slurry at higher concentration	Satish Kumar, Varinder Singh, Gurmeet Singh, Manikanwar Singh, Satish Chandra Ragti, Kaushal Kumar
A518	A review of Indian current scenario of biodiesel Production and Adoption in vehicular diesel engines	Wagh Yogesh Kailas
A514	Groundwater arsenic remediation using a synthesized graphene oxide enabled membrane in a novel flat-sheet cross-flow membrane module	Madhubonti Pal, Mrinal Kanti Mandal, Tapan Kanti Paine, Parimal Pal
A511	Study of road traffic noise in tier-II city, India	Dipeshkumar R. Sonaviya, Manoj M. Yadav, Bhaven N. Tandel
A549	Utilization potential of metal sorbed biochars in soil amelioration and as solid fuel	Sandeep Kumar, Garima Kaushik, R. Ebbin Masto
A650	Surface charge doping induced carrier type reversal in sol-gel processed CdS/rGO layered nanohybrid films	Vanasundaram N. Praveen Kumar Sharma



a packed bed bioreactor (PBBR) for biodegradation of phenol using bacterial strain *Bacillus flexus* GS1 IIT (BHU). Low density polyethylene (LDPE) was used as packing material in a laboratory scale PBBR. Process variables such as pH, temperature were optimized and found to be 7.0 and 30 °C, respectively. Phenol biodegradation efficiency in PBBR was analyzed at optimum condition by varying substrate concentration between 25 - 700 mg/L. At optimum conditions, the maximum removal of phenol was observed to be 99.45 % at 300 mg/L of initial phenol concentration. The kinetic constants were calculated from Monod and Andrew-Haldane model and found to be μ_{max} : 0.215 h⁻¹; K_s : 80 mg/L and μ_{max} : 0.27 h⁻¹; K_s : 66 mg/L; K_i : 300 mg/L, respectively.

Keywords: PBBR; Phenol; Kinetic variables; *Bacillus flexus*; COD removal

Paper Id: P-119

WEDM process parameter optimization for newly developed hybrid Al/(SiC + Gr + Fe₂O₃) – MMC

Neel Kanth Grover^{1*}, Amresh Kumar²

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Abstract

The particulate reinforced metal matrix composites have unparalleled properties which find their applications in various fields such as aerospace, automotive, defense amongst others. The poor machinability of MMCs hinders the potential use of such materials in the industries. Therefore, an experimental study is conducted to explore the wire electrical discharge machining (WEDM) of a fabricated hybrid Al/ (SiC + Gr + Fe₂O₃) – MMC and reported in this research article. The various parameters having marked effect on surface roughness (SR) of machined surface such as peak current, pulse-on-time, pulse-off time, wire tension, and feed rate have been investigated. The experimental design is based on the techniques of Taguchi. L₂₇(3¹³) orthogonal array, ANOVA and S/N Ratios (dB) were employed to identify the significant parameters. The WEDM parameters have been optimized subject to minimum

Sunpreet Singh
Chander Prakash
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Advances in Materials Processing

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Experimental Investigations on Heat Generation and Surface Roughness During Orthogonal Machining of Stainless Steel Using Bio-based Oil MQL



Gurpreet Singh, Vivek Aggarwal, Jujhar Singh, Amoljit Singh Gill, and Shubham Sharma

1 Introduction

Mass production of steel parts generates high cutting zone temperature. Such a hot temperature affects both the tool and the workpiece. Higher cutting temperature ends up in fast tool wear, loss of type stability, poor surface finish, dimensional quality deviation, and microstructure changes. These issues will be decreased by using lubricants in numerous ways like wet and flooded conditions. However, this way of lubrication typically creates a range of issues like environmental pollution health hazards, wastage disposal, and ultimately proves to become uneconomical [1]. The work of cutting liquid decreases the cutting temperature, device wear, and surface unpleasantness, whenever connected in an ideal amount and is the best technique. The quality of cutting fluid and the nature of selected lubricators put an imperative job in decreasing ecological contamination and upgrading the machining execution. Anyway today flood cooling strategy has turned out to be tricky, because of exacting principles associated with the bar of ecological contamination. In this procedure, a high progression of cutting liquids brings about ecological debasement like soil contamination, well-being risks and the most critical wastage transfer of cutting liquids [2]. Ointment volume, if there should be an occurrence of flood grease conjointly, needs optional set up that includes the cooling estimation of flood oil. Many creating nations have denied the work of flood grease and hence dry machining is of

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Mahendra Rai *Editor*

Nanotechnology in Skin, Soft Tissue, and Bone Infections

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Chapter 12

Additive Manufacturing and Nanotherapeutics: Present Status and Future Perspectives in Wound Healing



Parneet Kaur Deol, Amoljit Singh Gill, Sushant Prajapati, and Indu Pal Kaur

Abstract In the past decades, additive manufacturing had emerged as a cost-effective and clinically acceptable means for fabrication of diverse and biologically compatible materials of complex geometrical structure. This technology can use an array of materials (mainly biopolymers) as carriers, which can print the incorporated cells, drug, or even nanoparticles in desired shape with high accuracy and precision.

In this chapter, we have highlighted the current status and the future scope of fabricating the tailor-made nanotherapeutics and additive manufacturing techniques for effective wound healing. Current market demand of the tailor-made wound dressings/implants has contributed positively towards the use of additive manufacturing in their fabrication as it can address specific problems associated with various phases (namely hemostasis, inflammation, proliferation, and remodeling) of wound healing phenomenon. Additive manufacturing fabricated materials can either work as carriers for nanostructured therapeutic agents like silver nanoparticles, nanoparticle loaded antibiotics and antioxidants or they can print biomaterials (with or without drug) in complex nanoporous scaffolds.

Keywords Nanotherapeutics · Additive manufacturing · Wound healing · Nanomaterials · 3D scaffolds

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Effect of Powder Metallurgy Parameters on the Performance of EDM Tool Electrodes

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Abstract

Powder metallurgy (PM) process has emerged as an effective method for manufacturing Electrical Discharge Machining tool because of its economic and fast processing capability as well as its versatility in providing any desired composition. Tool electrodes manufactured by PM have also been used effectively for surface modification purposes in EDM. The present study investigates the effect of PM process parameters on the sintered density and shrinkage of tool electrodes and their performance in EDM. The surface morphology of the machined surface has been studied using Scanning Electron Microscopy. It can be concluded that the PM tool electrode manufactured using 325 mesh powders, 200 MPa compaction pressure and sintering temperature of 650 °C gives the best surface properties after EDM. This tool is also suitable for alloying purpose in EDM since it has lower shrinkage after sintering and high density required for better discharge during the machining process.

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Reliability Analysis of Sheet Manufacturing Unit of a Steel Industry



Munish Mehta[✉], Jujhar Singh[✉] and Manpreet Singh[✉]

Abstract This paper deals with reliability-availability-maintainability (RAM) of the sheet manufacturing system of a steel industry. The system comprises of various subsystems viz. conveyors, extractor, furnace, de-scaling unit, roughing mill, Steckel mill, down coiler, and strapping machine. State transition diagram has been developed which depicts various states (fully operational/reduced capacity/failed) of the system. Chapman-Kolmogorov differential equations have been developed from this diagram using mnemonic rule. Mathematical analysis has been carried out using supplementary variable technique. Repair rate has been varied whereas failure rate has been kept constant. Meantime between failure and transient state availability of the system has been calculated using Simpson's 3/8 rule and Runge-Kutta fourth order method (using MATLAB), respectively. The conclusions drawn may be helpful to the plant management in enhancing system performance by taking accurate and timely maintenance decisions.

Keywords Steel industry · Supplementary variable technique · Runge-Kutta · MATLAB

1 Introduction

Reliability engineering is defined as an approach adopted by the industry to achieve optimum product performance. It deals with every area of corporate activity which can influence ultimate reliability of a product. Reliability engineering focuses on systematic study of failures of engineering components and systems during the specified time and under the specified operational and environmental conditions and their remedies thereof. It differs from traditional engineering approach in the sense that

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Analysis of Transient Thermal Temperature Distribution Over Service Life of Taper Roller Bearing Using FEA



Rajeev Kumar, Manpreet Singh, Jujhar Singh, and Siddique Khan

Abstract Single row taper roller bearings are basically designed to withstand the radial load, axial load, and torque which results in generation of contact stresses. Generation of contact stresses will take place due to high speeds and heavy loads on bearing that can lead to failure of machine. Bearing life is limited by some of the common phenomena like wearing, smearing, flaking, etc. Bearing life can be enhanced by proper lubrication which separates roller with inner and outer rings. As prediction and validation of contact stresses experimentally is an arduous task, many researchers calculate theoretical method for approximate distribution of contact stresses on bearing race. Some of the methods are numerical method, finite element analysis (FEA) software, traditional method, and Hertz contact stress theory. In this paper, temperature behavior distribution in the bearing, contact stress, deformation of bearing rollers, and heat flux is analyzed by FEA tool. Inner race bearing surface and ball surface contact in bearings can cause an increase in temperature which may result in evaporation of lubricant due to improper heat dissipation and effect the service life of the bearing. FEA results is compared with results obtained by Hertz theory to inspect the feasibility of bearing problem and its life. It is found that temperature distribution is 55 °C (maximum) at the inner ring, von Mises stress is 220.23 MPa, and heat flux is 0.61399 W/mm², whereas result obtained by Hertz theory is 195.2821 MPa. Comparison of FEA and analytical result, the error is found to be 12.77% analysis of increase in temperature through FEA is a useful tool for estimating the service life of bearings.

Keywords Contact stresses · Heat flux · FEA

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Experimental Investigations on Heat Generation and Surface Roughness During Orthogonal Machining of Stainless Steel Using Bio-based Oil MQL

Gurpreet Singh, Vivek Aggarwal, Jujhar Singh, Amoljit Singh Gill, and Shubham Sharma

1 Introduction

Mass production of steel parts generates high cutting zone temperature. Such a hot temperature affects both the tool and the workpiece. Higher cutting temperature ends up in fast tool wear, loss of type stability, poor surface finish, dimensional quality deviation, and microstructure changes. These issues will be decreased by using lubricants in numerous ways like wet and flooded conditions. However, this way of lubrication typically creates a range of issues like environmental pollution health hazards, wastage disposal, and ultimately proves to become uneconomical [1]. The work of cutting liquid decreases the cutting temperature, device wear, and surface unpleasantness, whenever connected in an ideal amount and is the best technique. The quality of cutting fluid and the nature of selected lubricators put an imperative job in decreasing ecological contamination and upgrading the machining execution. Anyway today flood cooling strategy has turned out to be tricky, because of exacting principles associated with the bar of ecological contamination. In this procedure, a high progression of cutting liquids brings about ecological debasement like soil contamination, well-being risks and the most critical wastage transfer of cutting liquids [2]. Ointment volume, if there should be an occurrence of flood grease conjointly, needs optional set up that includes the cooling estimation of flood oil. Many creating nations have denied the work of flood grease and hence dry machining is of

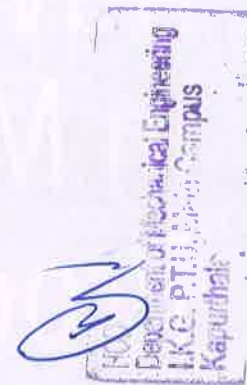
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S. Magibalan

SURFACE ROUGHNESS TESTING OF DRY GRINDING

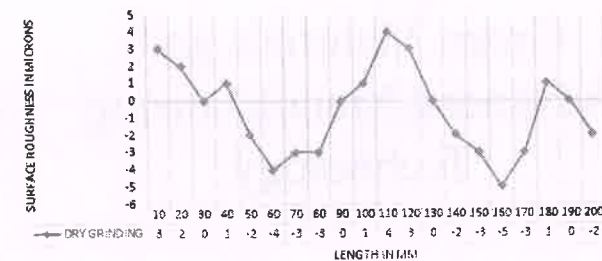


FIGURE 1.13 Dry grinding operation with DOC 20 μ m and grinding-wheel speed of 2800

SURFACE ROUGHNESS OF FLOOD GRINDING

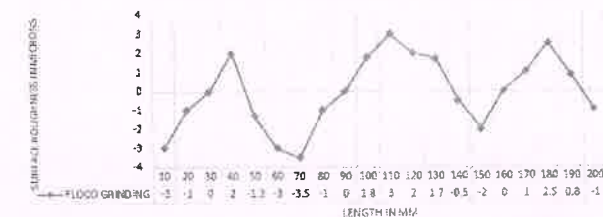


FIGURE 1.14 Flood grinding operation with 15 μ m and grinding-wheel speed of 2800 rpm.

low wear of the tool along with continuous emulsion surface contact at the tool chip and interfaces of the tool workpiece. The low tool wear was an influencing factor for the lower surface roughness found in the cryogenic machining (Hong et al. 2002). Therefore, flood grinding operation gives better surface roughness than dry grinding operation.

1.3.6.3 Surface Roughness in Various MQL Grinding Operations

In the MQL grinding operation, experiments use three lubrication methods: SN, BNSS and BNOS. The combined graph of surface roughness from starting point to end point is illustrated in Figure 1.15. The surface-roughness variation is seen by 5 μ m during the single nozzle cooling method. Moreover, there is 6 μ m surface roughness variation seen in BNSS, which is greater than the SN method by 1 μ m. During the third experiment of MQL grinding operation (BNOS) a large surface

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5 Optimization of Machining Parameters during the Drilling of Natural Fibre-Reinforced Polymer Composites A Critical Review

Jai Inder Preet Singh, Sehijpal Singh,
Vikas Dhawan, Piyush Gulati, Rajeev Kumar,
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5.1 INTRODUCTION

It is often observed that humanity strives for betterment and growth. With every development in the field of science and engineering, humans' needs and demands increase. In order to meet society's endless needs, engineers, researchers and scientists work tirelessly to develop new products and improve the performance of existing ones. Modern day applications, especially in aerospace, automotive and chemical industries, require materials with peculiar and unusual properties that are not met by ceramics, metals and polymers alone. In order to overcome the need for new materials

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1 Parametric Optimization of Surface Roughness and Surface Temperature during Minimum Quantity Lubrication (MQL) and Conventional Flood Lubrication Techniques in Surface Grinding of Mild Steel: A Performance Comparison and Analysis

*Gursharan Singh, Jujhar Singh, Shubham Sharma,
Amoljit Singh Gill, Munish Mehta and
Suresh Mayilswamy*

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Empirical modeling of machining parameters during WEDM of Inconel 690 using response surface methodology

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Empirical Modeling of Machining Parameters during WEDM of Inconel 690 using Response Surface Methodology

Vivek Aggarwal, Jujhar Singh^{1, a)}, Shubham Sharma^{1, b)}, Abhinav Sharma¹, Gursharan Singh¹ and Jwala Parshad¹

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Abstract. Machining of superalloy is an active research area due to extensive use of these materials. Inconel 690 is a high-chromium nickel superalloy that offers high hardness and outstanding resistance to corrosion at elevated temperatures, good creep-rupture strength, excellent resistance to oxidizing chemicals and stress-corrosion cracking. This current alloy's protection from gases containing sulfur content makes it ideal material for various applications viz. coal-gasification units, petrochemical processing furnaces, equipment for radioactive waste disposal, recuperators and monomers. Thus, this alloy is extensively used in tubes for steam generator, and equipment in nuclear applications, however, the intrinsic issues experienced during processing of superalloys using traditional methods demand the application of alternative processing techniques. Wire electrical discharge machining (WEDM) process is taken as one of the potential alternatives to traditional processing techniques, however there is inadequate information and appropriate models to foresee the WEDM process performance specifically for Inconel 690. In the present research, experimental modeling of the WEDM input factors was performed for Inconel 690 using response surface methodology (RSM). Input factors viz. pulse-on time (Ton), pulse-off time (Toff), peak-current (IP) and spark-gap voltage (SV) have been considered as process factors keeping other factors constant. The output parameters taken into consideration are cutting rate (CR) and surface roughness (SR). The research findings, and data generated for Inconel 690 will really be beneficial for the industry.

Keywords. WEDM, Superalloy, Inconel 690, cutting rate, surface roughness, response surface methodology

1. INTRODUCTION

Jet engine, gas turbines, rocket and atomic applications regularly require materials which have high quality and strength, creep resistance, oxidation and corrosion resistance and high fatigue bearing limit at temperatures up to and above of 1100°C (2000°F). One class of materials which offer these properties is the superalloys. A superalloy has remarkable strength and shows creep resistance at raised temperatures. Therefore, they are also otherwise called heat-resistance alloys. The capacity of superalloys to hold the mechanical properties at raised temperatures seriously hampers their machinability. Hence, they are regularly called as hard-to-cut alloys.^{1,2} Super alloys are mostly classified into iron, cobalt, and nickel-based super alloys. In contrast with iron-based and cobalt-based super alloys, the nickel-based super alloys are tougher because of their exceptional mechanical and yield strength and resistance to creep especially at elevated temperatures. Attributable to these factors, nickel-based super alloys are the highly appropriate and commonly utilized in industry.³ Among nickel-based super alloys, Inconel 690 is an exceptionally well known high-chromium nickel-based super alloy. The high chromium substance of the compound makes it especially impervious to corrosion that happens from salts, oxidizing acids and different elements regularly found in aqueous environment. Inconel 690 can persevere through the sulfidation that happens at

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Process optimization and thermomechanical simulation of residual stresses and temperature distribution in the laser-beam penetration welds of 61Ni-21Cr-9Mo alloy and 99.3Fe-0.45Mn-0.2C steel joints

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Shubham Sharma, Jujhar Singh, Vivek Aggarwal, Abhinav Sharma, Gursharan Singh, Shalab Sharma, and Munish Mehta



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Process Optimization and Thermomechanical Simulation of Residual Stresses and Temperature Distribution in the Laser-Beam Penetration Welds of 61Ni-21Cr-9Mo Alloy and 99.3Fe-0.45Mn-0.2C Steel Joints

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Abstract. Laser welding is one of the important welding processes in industries for joining similar or different metals. Demand of dissimilar metal welding has increased now a days from high performance, cost saving and efficiency point of view. Various parameters like speed, beam power, spot diameter affect the quality, strength and cost of welding process. In this paper the influence of speed, beam power and spot diameter over strength of welded specimen is studied using Taguchi orthogonal array method. Two dissimilar metals such as 61Ni-21Cr-9Mo alloy and 99.3Fe-0.45Mn-0.2C steel is welded using laser beam. The experiments are carried out as per Taguchi orthogonal array design matrix to predict optimum process parameters. Analysis of variance (ANOVA) is carried out to determine significantly affecting parameters and the mathematical model to estimate ultimate tensile strength has been developed using Regression method. The simulation of welding process to predict temperature distribution and residual stresses is predicted.

Keywords. Laser-beam welding; 61Ni-21Cr-9Mo alloy; 99.3Fe-0.45Mn-0.2C steel; Taguchi orthogonal array; Residual stresses

1. INTRODUCTION

Laser welding is a welding process used to join two metals by the use of a laser source. The laser source provides a concentrated and high-density heat source. The process is mostly used in high rate production industries, such as in the automotive industry. The implementation of dissimilar metal combination provides flexibility of design so that both metals can be used in efficient way. Laser welding is most efficient way of fusing dissimilar metals. Among all the conventional method laser welding has its own advantages over quality and durability of welded joint.

61Ni-21Cr-9Mo alloy has high strength and has high oxidation and corrosion resistance. It has wide application in high temperature and pressure zone like gas turbines. 61Ni-21Cr-9Mo alloy also has application in automotive exhaust, nuclear plant and high-pressure vessels.

Process optimization is important technique for saving manufacturing time, cost of process and obtaining high strength welded parts. Thus, Taguchi method is one of important process optimization technique which can be implemented for laser parameters. The greatest advantages are saving experimental efforts, time, and cost and finding significant factors very quickly.

Occupational safety is very important for organisations to develop and to gain competitive edge. Occupational safety and health programs protect co-workers, family members, employers, customers, and others who might be affected by the environment of workplace. Safety compliance is the core safety related activities which needs to be performed by workers to maintain workplace safety. Safety participation is the involvement of workers in safety related activities like attending safety meetings that are not compulsory but helpful to maintain overall safety of the organisation. Welfare of the worker is a vital matter for the business organisations. Job-related accidents could be a prime factor for the undying families or deaths and financial losses or both. The objective of this study is to find out the current status of safety in small scale manufacturing industry and find out the impact of various factors on worker safety.



The author is working as an Assistant Professor, Department of Mech. Engg., I.K. Gujral Punjab Technical University, Kapurthala. Author has more than 20 years of teaching experience, authored many books & published several research papers in International Journals. Moreover, he has delivered several invited talks in the Institutes of national repute.



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Importance of occupational safety and health programs for organisations to gain competitive edge and to protect workers

Vivek Aggarwal
Ravinder Kumar
Gurpreet Singh Sidhu

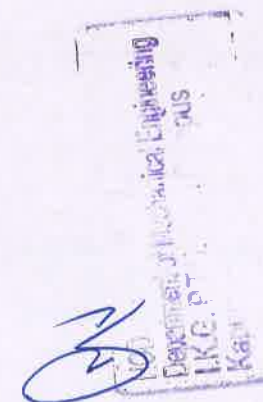
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CHAPTER 1 INTRODUCTION

In overall world, welfare of the worker is a vital matter for the businesses to convert a world class contestant. Job-related accidents could be a prime factor to undying frailties or deaths and/or financial losses or both. Work-related misfortunes can be lessened through active preventive measures like by hazard measurement, improved safety culture, good housekeeping, training, and better personal protective equipment. In order to develop a decent safety culture, the approaches of the workforces require to be reoriented by implementing superlative practices, upright housekeeping, also alterations in work culture and the way of doing work. Job-related calamities are common in India. Predication of numerous kinds of risks placed in workplace, accidents helps managers to develop policies to improve safety of workers.

According to the ILO, occupational accidents and injuries cost around 4 percent of the world GDP. Conventionally safety research has concentrated on detecting specific points like, behavior qualities that are linked with job related accident proneness. But major calamities, like Piper Alpha and Chernobyl, have exemplified the significance of work climates and management behavior towards safety of worker's as reasons to the system failures (Reason, 1990). Employer has the duty towards every employee to confirm their safety to the extent that sensibly practicable. Employee's perception about the importance given to safety and well-being of workers and the overall priority given to safety over other issues like production is very important. Top management of the organization is responsible for the development and implementation of proper safety related policies and practices. Further, they found that training and implementation of safety policies can change the behavior of worker positively. They concluded that safety assessment is important for proper implementation of safety policies.

EMPIRICAL INVESTIGATIONS ON INCONEL 601 USING WIRE ELECTRIC DISCHARGE MACHINE

Vivek Aggarwal
Jujhar Singh
Shubham Sharma
Bhaskar Goel



MANUFACTURING TECHNOLOGY RESEARCH

EMPIRICAL INVESTIGATIONS ON INCONEL 601 USING WIRE ELECTRIC DISCHARGE MACHINE

Vivek Aggarwal
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Shubham Sharma
Bhaskar Goel



Empirical Investigations on Inconel 601 Using Wire Electric Discharge Machine • Aggarwal et al.

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Preface

We would like to thank the authors for taking their precious time to submit manuscript as per the quality parameters required in this book, *Advances in Production and Industrial Engineering*.

All the accepted manuscripts were presented in ICETMIE 2019. ICETMIE is a biennial International conference which aims to provide a platform for academicians and practitioners to explore emerging technologies in the field of Mechanical and Industrial Engineering and further to contribute and disseminate their experience and research work for the purpose of exploring solutions to the global challenges. This conference provided an opportunity for researchers to learn about the latest developments and emerging trends in mechanical and industrial engineering through scientific information interchange between researchers, developers, engineers, students and practitioners in this field.

The purpose of this book is to provide the details of the latest advancements in research and developments of various advanced machining processes such as additive manufacturing processes, application of alloys/composite techniques, composites, ceramics, and polymers/processing. This book will be useful for industrial experts, entrepreneurs, university professors, and research scholars.

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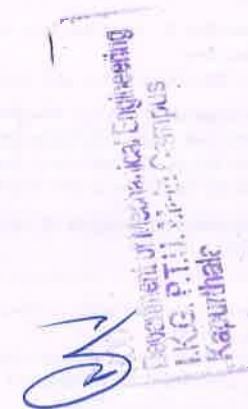
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Influence of Nozzle Distance on Tool–Chip Interface Temperature Using Minimum Quantity Lubrication

Gurpreet Singh, Vivek Aggarwal, Sehijpal Singh, and Ajay Kumar

Abstract In Manufacturing Science machining play a very important role in making the finished product. There are several metal cutting operations like, turning, milling, drilling, shaping, grinding, etc., by which the product can be machined. During machining operation heat is produced due to rubbing of sharp edge tool and work material. As the cutting speed increases, the amount of heat at different rubbing sections increases. The foremost objective of coolant is to reduce the emission of heat using different cooling methods. Traditionally, cutting fluids and lubricants were applied in abundance to reduce heat with the aid of flood lubrication system. Undoubtedly, this approach of lubrication reduces the temperature while machining, contrary to this, it has a negative impact on the worker, environment and most importantly costlier in the present era of machining. Therefore it was essential to find an alternative to stated muddle that should be safer for the worker, environmental, and economical too. So, as to keep these facts in mind the minimum quantity lubrication was applied in turning operation, which uses a very smaller extent of cutting fluid along with air to contribute cooling and lubrication action. In the present investigation, minimum quantity lubrication containing very low quantity of vegetable-based lubricant and air pressurized stream was utilized to cater heat generation in orthogonal machining. The outcomes of thermal reading at insert chip articulation were compared in dry and least coolant conditions. From experimental observations, it was revealed that MQL had significantly reduced the heat generation by 10–30% contrary to the dry turning of EN-31 steel. The maximum cutting temperature was recorded during dry machining when the nozzle was positioned at 55 mm gap from the cutting zone. It was evaluated that the nozzle distance of 30 mm gap was proved significant as compared to other distance. Furthermore, it was reported that the process capability of turning

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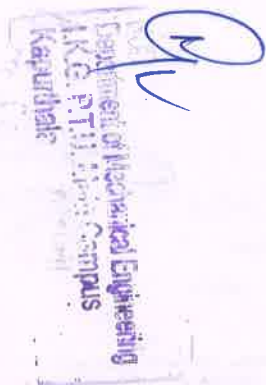
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Experimental Investigations on Heat Generation and Surface Roughness During Orthogonal Machining of Stainless Steel Using Bio-based Oil MQL

Gurpreet Singh, Vivek Aggarwal, Jujhar Singh, Amoljit Singh Gill, and Shubham Sharma

1 Introduction

Mass production of steel parts generates high cutting zone temperature. Such a hot temperature affects both the tool and the workpiece. Higher cutting temperature ends up in fast tool wear, loss of type stability, poor surface finish, dimensional quality deviation, and microstructure changes. These issues will be decreased by using lubricants in numerous ways like wet and flooded conditions. However, this way of lubrication typically creates a range of issues like environmental pollution health hazards, wastage disposal, and ultimately proves to become uneconomical [1]. The work of cutting liquid decreases the cutting temperature, device wear, and surface unpleasantness, whenever connected in an ideal amount and is the best technique. The quality of cutting fluid and the nature of selected lubricators put an imperative job in decreasing ecological contamination and upgrading the machining execution. Anyway today flood cooling strategy has turned out to be tricky, because of exacting principles associated with the bar of ecological contamination. In this procedure, a high progression of cutting liquids brings about ecological debasement like soil contamination, well-being risks and the most critical wastage transfer of cutting liquids [2]. Ointment volume, if there should be an occurrence of flood grease conjointly, needs optional set up that includes the cooling estimation of flood oil. Many creating nations have denied the work of flood grease and hence dry machining is of

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In this work, a simulation model for Low Pressure Gas Dynamic Spray (LPGDS) process was developed. The development of ANSYS based 2-D FEM model problem was considered as 2-D Plane. The ANSYS model was developed using FLUENT module of the ANSYS 12.0 software. After the geometrical model had been developed in this software, the analysis was also done using this software to calculate the velocity, temperature and pressure contours inside the nozzle. The graphs and contours for the velocity, temperature and pressure had been drawn using the Computational Fluid Dynamics (CFD) post to compare the different nozzle geometries to find an optimal design.

Optimal design of cold spray nozzle



Tarun Goyal

Modeling & analysis of cold spray process nozzles for optimal design



Dr. Tarun Goyal is working as Assistant Professor, Mechanical Engineering Department with IKGPTU, Kapurthala. He is having more than 50 research papers in International and National Journals and conferences to his credit. His research interests include Surface Engineering, Materials Science and Advanced Manufacturing Processes.



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Goyal

Modeling & analysis of cold spray process nozzles for optimal design

Tarun Goyal



Tarun Goyal

Modeling & analysis of cold spray process nozzles for optimal design


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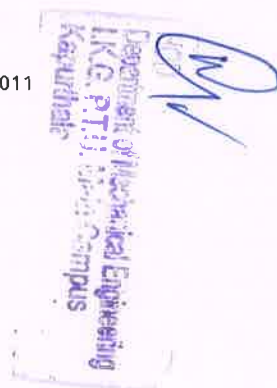
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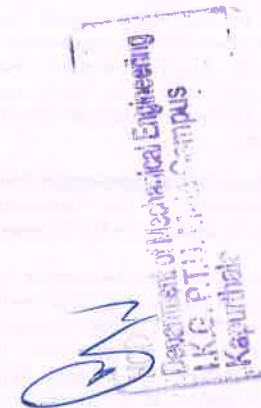
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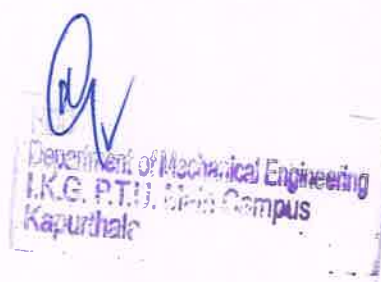
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Number of books and chapters in edited volumes / books published, and papers in national/international conference

Name of the Teacher	Title of the book/chapters published	Title of the paper	Title of the proceedings of the conference	Name of the conference	National / International	Year of publication	ISBN/ISSN number of the proceeding	Affiliating Institute at the time of publication	Name of the publisher
Neel Kanth Grover	Engineering & Technology: Recent Innovation and Research	Simulation of the n-heptane droplet evaporation and ignition at high pressure	Book Chapter	NA	International	2016	978-93-86138-06-4	IKG Punjab Technical University, Kapurthala	International Research Publishers House, delhi
Neel Kanth Grover	Industrial Engineering & Management Practices	Droplet vaporization in subcritical and supercritical environments : High vs Low Pressure Modelling	Book Chapter	NA	International	2017	978-93-84443-56-6	IKG Punjab Technical University, Kapurthala	International Research Publishers House, delhi
Neel Kanth Grover	NA	Learnings & selection guidelines of mechanical seal flush plan for pumps in a typical plant	7th International and 9th Conference on Advancements and Futuristic Trends in Mechanical and Materials Engineering	AFTMME-2019	International	2019	NA	IKG Punjab Technical University, Kapurthala	NA
Neel Kanth Grover	NA	WEDM process parameter optimization for newly developed hybrid Al/(SiC + Gr + $[\text{Fe}]_2\text{O}_3$)-MMC	International Conference on Chemical, Bio and Environmental Engineering	CHEMBIOEN-2020	International	2020	NA	IKG Punjab Technical University, Kapurthala	NA

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Dr. Deepak Kumar Goyal	NA	Erosion Behaviour of Thermal Spray Coatings: A Review	International Conference on Advancements in Science and Technology, 2017	ICAST 2017	International	2017	978-93-5260-650-4	IKG Punjab Technical University, Kapurthala	McGraw Hill
Dr. Deepak Kumar Goyal	Proceedings ICAST-2017	Application of Laser Cladding Technique to Control Wear of Materials: An Overview	International Conference on Advancements in Science and Technology, 2017	ICAST 2017	International	2017	978-93-8617-142-9	IKG Punjab Technical University, Kapurthala	NA
Dr Jujhar Singh	Advances in Industrial and Production Engineering	Reliability Analysis of Sheet Manufacturing Unit of a Steel Industry	Part of the Lecture Notes in Mechanical Engineering book series (LNME)		International	2019	978-981-13-6412-9	I.K. Gujral Punjab Technical University, Kapurthala	Springer Nature Singapore Pte Ltd, Singapore
Dr Jujhar Singh	Advances in Metrology and Measurement of Engineering Surfaces	Analysis of Transient Thermal Temperature Distribution Over Service Life of Taper Roller Bearing Using FEA	Part of the Lecture Notes in Mechanical Engineering book series (LNME)		international	2020	978-981-15-5151-2	I.K. Gujral Punjab Technical University, Kapurthala	Springer Nature Singapore Pte Ltd, Singapore

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Dr Jujhar Singh	Advances in Metrology and Measurement of Engineering Surfaces	Parametric optimization of surface roughness and surface temperature during Minimum Quantity Lubrication (MQL) and conventional flood lubrication techniques in surface grinding of mild steel: A performance comparison and analysis	Part of the Lecture Notes in Mechanical Engineering book series (LNME)	ICFMMP 2019	International	2020	978-981-15-5151-2	I.K. Gujral Punjab Technical University, Kapurthala	Springer Nature Singapore Pte Ltd, Singapore
Dr Jujhar Singh	Green Materials and Advanced Manufacturing Technology	Influence of Nickel-Based Cladding on the Hardness and Wear Behaviour of Hard-Faced Mild Steel Using E-7014 Electrode Using Shielded Metal Arc Welding		Book Chapter	International	2020	978-100-305-6546	I.K. Gujral Punjab Technical University, Kapurthala	CRC Press, Taylor and Francis
Dr Jujhar Singh	Green Materials and advanced manufacturing Technology:	“Optimization of machining parameters during the drilling of natural		Book Chapter	International	2020	978-100-305-6546	I.K. Gujral Punjab Technical	CRC Press, Taylor and Francis

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	Concepts and Applications,	fiber reinforced polymer composites: A Critical Review”						University, Kapurthala	
Dr Jujhar Singh	Green Materials and Advanced Manufacturing Technology	Parametric Optimization of Surface Roughness and Surface Temperature during Minimum Quantity Lubrication (MQL) and Conventional Flood Lubrication Techniques in Surface Grinding of Mild Steel		Book Chapter	International	2020	978-0-367-52106-6	I.K. Gujral Punjab Technical University, Kapurthala	CRC Press, Taylor and Francis
Dr Jujhar Singh	Advances in Materials Processing	Validation and Multi-response Optimization of Topological and Geometrical Parameters of Stainless Steel Cantilever Beam with Finite Element Analysis Subjected to Point Load Using Taguchi L9	Part of the Lecture Notes in Mechanical Engineering book series (LNME)	Book Chapter	International	2020	978-981-15-4747-8	I.K. Gujral Punjab Technical University, Kapurthala	Springer Nature Singapore Pte Ltd, Singapore

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		Orthogonal Array Integrated with Utility Methodology							
Dr Jujhar Singh	AIP Conference Proceedings	Empirical modeling of machining parameters during WEDM of Inconel 690 using response surface methodology	AIP Conference Proceedings	conference paper	International	2020	978-0-7354-4011-1	I.K. Gujral Punjab Technical University, Kapurthala	AIP
Dr Jujhar Singh	AIP Conference Proceedings	“Process optimization, and thermomechanical simulation of residual stresses and temperature distribution in the laser-beam penetration welds of 61Ni-21Cr-9Mo alloy and 99.3Fe-0.45Mn-0.2C steel joints”	AIP Conference Proceedings	Conference paper	International	2020	978-0-7354-4011-1	I.K. Gujral Punjab Technical University, Kapurthala	AIP

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Dr Amoljit Singh Gill	Advances in Materials Processing, Lecture Notes in Mechanical Engineering	Experimental Investigations on Heat Generation and Surface Roughness During Orthogonal Machining of Stainless Steel Using Bio-based Oil MQL			International	2020	978-981-15-4748-5	IKGPTU	Springer
Dr Amoljit Singh Gill	Nanotechnology in Skin, Soft Tissue, and Bone Infections	Additive Manufacturing and Nanotherapeutics: Present Status and Future Perspectives in Wound Healing			International	2020	978-3-030-35147-2	IKGPTU	Springer
Dr Amoljit Singh Gill	Advances in Transdisciplinary Engineering, Volume 3: Advances in Manufacturing Technology XXX	Effect of Powder Metallurgy Parameters on the Performance of EDM Tool Electrodes			International	2016	2352-7528	PEC	IOS Press
Tarun Goyal	Modeling & analysis of cold spray process nozzles for optimal design,	—	—	—	International	2017	978-3-330-04360-2	—	LAP Lambert Academic Publishing, LATVIA

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Tarun Goyal	Dry machining of stainless steel (316L) using coated carbide inserts	—	—	—	International	2017	978-3-330-04488-3	—	LAP Lambert Academic Publishing, LATVIA
Tarun Goyal	Near dry machining of stainless steel AISI-202	—	—	—	International	2017	978-3-659-64436-8	—	LAP Lambert Academic Publishing, LATVIA
Tarun Goyal	Optimum milling for H-13 die steel	—	—	—	International	2017	978-3-330-05319-9	—	LAP Lambert Academic Publishing, LATVIA
Tarun Goyal	Optimization of AlSi9Cu3 alloy using High pressure die casting	—	—	—	International	2018	978-3-330-05505-6	—	LAP Lambert Academic Publishing, LATVIA
Tarun Goyal	Performance of EN-24 steel under Minimum Quantity Lubrication (MQL)	—	—	—	International	2018	978-3-330-05862-0	—	LAP Lambert Academic Publishing, LATVIA
Tarun Goyal	Machining of die steel- H11 using EDM electrode	—	—	—	International	2018	978-613-8-38787-9	—	LAP Lambert Academic

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									Publishing, LATVIA
Tarun Goyal	Solar Air Pre-heater Design, Vol. I	—	—	—	International	2019	978-613-9-88283-0	—	LAP Lambert Academic Publishing, LATVIA
Tarun Goyal	Solar Air Pre-heater Design, Vol. II	—	—	—	International	2019	978-613-9-88511-4	—	LAP Lambert Academic Publishing, LATVIA
—	—	—	—	—	—	—	—	—	—
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Tarun Goyal	—	“Advancements in Surface Engineering”	Advancements and Futuristic Trends in Mechanical and Materials Engineering (AFTMME’17)	Advancements and Futuristic Trends in Mechanical and Materials Engineering (AFTMME’17)	International	2017	—	SUS, Tangori and SOMME	SOMME

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Tarun Goyal	—	“Fabricating the magnetic abrasive finishing setup on lathe”	Proceedings of 10th International Conference on Recent Development in Engineering Science, Humanities and Management	International Conference on Recent Development in Engineering Science, Humanities and Management	International	2018	ISBN: 978-93-86171-89-4	Punjab University Campus, Chandigarh (India)	PU, Chd.
Tarun Goyal	—	“Investigation on multiple parametric optimization of cold sprayed coatings process"	Proceedings of M S & T 18 Conference	M S & T 18 Conference	International	2018	9781510874763	Columbus, Ohio, US.	ASM
Tarun Goyal	—	“Characterization of cold sprayed copper coatings on Brass”	Proceedings of International Conference on Advancements and Futuristic Trends in Mechanical and Materials Engineering (AFTMME'18), pp. 49.	International Conference on Advancements and Futuristic Trends in Mechanical and Materials Engineering (AFTMME'18)	International	2018	—	Punjab University SSG Regional Centre (PUSSGRC), Hoshiarpur, Punjab, India	SOMME

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Tarun Goyal	—	“Parameter optimization during dry turning of stainless steel (316L)”	Proceedings of International Conference on Materials, Manufacturing & Decision Making (ICMMDM 2019), pp. 10.	International Conference on Materials, Manufacturing & Decision Making (ICMMDM 2019)	International	2019	—	Beant College of Engg. & Technology, Gurdaspur, Punjab	BCET, Gurdaspur
Tarun Goyal	—	“Advancements in Surface Engineering”	Advancements and Futuristic Trends in Mechanical and Materials Engineering (AFTMME’17)	Advancements and Futuristic Trends in Mechanical and Materials Engineering (AFTMME’17)	International	2017	—	SUS, Tangori and SOMME	SOMME
Sufiyan Sajid, Abid Haleem, Shashi Bahl, Mohd Javaid, Tarun Goyal, Manoj Mittal,	—	“Data science applications for predictive maintenance and materials science in context to Industry 4.0”	Proceedings of 2nd International Conference on Aspects of Materials Science and Engineering (ICAMSE2021)	2nd International Conference on Aspects of Materials Science and Engineering (ICAMSE2021)	International	2021	ISSN: 2214-7853	Punjab University, Chandigarh	Materials Today Proceedings

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Rohit Rampal, Tarun Goyal, Deepam Goyal, Manoj Mittal, Rajeev Kumar Dang, Shashi Bahl,	—	“Magneto-rheological abrasive finishing (MAF) of soft material using abrasives”	Proceedings of 2nd International Conference on Aspects of Materials Science and Engineering (ICAMSE2021)	2nd International Conference on Aspects of Materials Science and Engineering (ICAMSE2021)	International	2021	ISSN: 2214-7853	Punjab University, Chandigarh	Materials Today Proceedings
Vijay Kumar, Manoj Mittal, , Deepam Goyal, Tarun Goyal, Rajeev Kumar Dang, Shashi Bahl,	—	“Mechanical and microstructural behaviour of weldment of two low alloy steels using MIG	Proceedings of 2nd International Conference on Aspects of Materials Science and Engineering (ICAMSE2021)	2nd International Conference on Aspects of Materials Science and Engineering (ICAMSE2021)	International	2021	ISSN: 2214-7853	Punjab University, Chandigarh	Materials Today Proceedings
Sufiyan Sajid, Abid Haleem, Shashi Bahl, Mohd Javaid, Tarun Goyal, Manoj Mittal,	—	“Data science applications for predictive maintenance and materials science in context to Industry 4.0”	Proceedings of 2nd International Conference on Aspects of Materials Science and Engineering (ICAMSE2021)	2nd International Conference on Aspects of Materials Science and Engineering (ICAMSE2021)	International	2021	ISSN: 2214-7853	IKGPTU	Elsevier, Materials Today Proceedings

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Rohit Rampal, Tarun Goyal, Deepam Goyal, Manoj Mittal, Rajeev Kumar Dang, Shashi Bahl,	—	<u>“Magneto-rheological abrasive finishing (MAF) of soft material using abrasives”</u>	Proceedings of 2nd International Conference on Aspects of Materials Science and Engineering (ICAMSE2021)	2nd International Conference on Aspects of Materials Science and Engineering (ICAMSE2021)	International	2021	ISSN: 2214-7853	IKGPTU	Elsevier, Materials Today Proceedings
Vijay Kumar, Manoj Mittal, , Deepam Goyal, Tarun Goyal, Rajeev Kumar Dang, Shashi Bahl,	—	<u>“Mechanical and microstructural behaviour of weldment of two low alloy steels using MIG</u>	Proceedings of 2nd International Conference on Aspects of Materials Science and Engineering (ICAMSE2021)	2nd International Conference on Aspects of Materials Science and Engineering (ICAMSE2021)	International	2021	ISSN: 2214-7853	IKGPTU	Elsevier, Materials Today Proceedings
Manoj Mittal	Chapter: Wear Measuring Devices for Biomaterials in BOOK entitled: Characterization on Testing, Measurement and Metrology 1st Ed				International	2020	9780429298073	IKGPTU	Taylor and Francis, CRC Press

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Manoj Mittal	Chapter: Biomaterials in Book Functional Materials and Advanced Manufacturing: 3-Volume Set				International	2021	9781000193206	IKGPTU	Taylor and Francis, CRC Press
Manoj Mittal	Book: Tube Failures in Pulverised Coal Fired Boilers: An Investigation				International	2016	973659789304	IKGPTU	Lambert Academic Publishing
Manoj Mittal, Vijay Garg	Book: Effect of PWHT on Weldment of Two Different Metals Joined by MIG				International	2016	9783659631214	IKGPTU	Lambert Academic Publishing
Manoj Mittal	Book: Coating Prepared from Synthetic and Egg shell Driven HA: Effect of PCHT				International	2016	9783330049406	IKGPTU	Lambert Academic Publishing

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Manoj Mittal, Yogita Sharma	Book: Characterisation of Polypropylene based Composites reinforced Rice Husk				International	2016	9786139815685	IKGPTU	Lambert Academic Publishing
Vivek Aggarwal	Health and Safety Issues in Small Scale Manufacturing Industries				International	2020	978-620-2-56426-7	I.K Gujral Punjab Technical University, Main Campus, Kapurthala	LAP Lambert Academic Publishing, Mauritius
Vivek Aggarwal	Empirical Investigations on Inconel 601 using Wire Electric Discharge Machine				International	2020	978-1-53618-760-1	I.K Gujral Punjab Technical University, Main Campus, Kapurthala	Nova Science Publishers
Vivek Aggarwal	Influence of Nozzle Distance on Tool–Chip Interface Temperature Using Minimum		Advances in Production and Industrial Engineering/Select Proceedings of ICETMIE 2019		International	2019	978-981-15-5518-3	I.K Gujral Punjab Technical University, Main Campus, Kapurthala	Springer Nature Singapore Pte Ltd./ Springer Nature Singapore Pte Ltd. 2021

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	Quantity Lubrication								
Vivek Aggarwal	Experimental Investigations on Heat Generation and Surface Roughness During Orthogonal Machining of Stainless Steel Using Bio-based Oil MQL		Advances in Materials Processing/ Select Proceedings of ICFMMP 2019		International	2019	978-981-15-4747-8	I.K Gujral Punjab Technical University, Main Campus, Kapurthala	Springer Nature Singapore Pte Ltd./ Springer Nature Singapore Pte Ltd. 2020
Dr Amit Bansal		Mechanical and microstructural behaviour of wear resistant coatings on cast iron lathe machine beds and slides.			Inernational	2018	0023432X	IK Gujral Punjab Techncial University	Institute of Materials and Machine Mechanics, Slovak Academy of Sciences, Bratislava, Slovak Republi

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									(Kvove Materialy Metallic Materials).
Dr Amit Bansal		High temperature oxidation and erosion behaviour of HVOF sprayed bilayer Alloy-718/NiCrAlY coating			Inernational	2019	2578972	IK Gujral Punjab Techncial University	Elsevier (Surface and Coatings Technology)
Dr Amit Bansal		Investigation on the effect of post weld heat treatment on microwave joining of the Alloy-718 weldment			Inernational	2019		IK Gujral Punjab Techncial University	Institute of Physics (Materials Research Express)
Dr Amit Bansal		Microwave heating and its applications in surface engineering: a review			Inernational	2019		IK Gujral Punjab Techncial University	Institute of Physics (Materials Research Express)
Dr Amit Bansal		Microwave cladding of Inconel-625 on mild steel substrate for corrosion protection			Inernational	2020		IK Gujral Punjab Techncial University	Institute of Physics (Materials Research Express)

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Dr Amit Bansal		Microwave heating and its applications in surface engineering: a review			Inernational	2020		IK Gujral Punjab Techncial University	Institute of Physics (Materials Research Express)
Dr Amit Bansal		Mechanical and microstructural characterization of microwave post processed Alloy-718 coating			Inernational	2020		IK Gujral Punjab Techncial University	Institute of Physics (Materials Research Express)
Dr Amit Bansal		A study on processing and hot corrosion behaviour of HVOF sprayed Inconel718-nano Al2O3 coatings			Inernational	2020		IK Gujral Punjab Techncial University	Elsevier (Material Today Communication)
Dr Amit Bansal		An investigation on oxidation behaviour of high velocity oxy-fuel sprayed Inconel718-Al2O3 composite coatings, Surface and Coatings Technology			Inernational	2020		IK Gujral Punjab Techncial University	Elsevier (Surface and Coatings Technology)

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Dr Amit Bansal		Parametric optimization in die-sinking EDM of Nimonic 90 alloy using Taguchi-based GRA approach			Inernational	2020		IK Gujral Punjab Technclal University	Emerald (World Journal Of Engineering)
Dr Amit Bansal		Optimization of machining characteristics for EDM of different nickel-based alloys by embodying of fuzzy, grey relational and Taguchi technique			Inernational	2020		IK Gujral Punjab Technclal University	Emerald (World Journal Of Engineering)
Dr Amit Bansal		Electrochemical Corrosion Behavior and Microstructural Characterization of HVOF Sprayed Inconel-718 Coating on Gray Cast Iron			Inernational	2020		IK Gujral Punjab Technclal University	Springer (Journal Of Failure Analysis and Prevention)
Dr Amit Bansal		Parametric optimization in wire EDM of D2 tool steel using Taguchi method			Inernational	2020		IK Gujral Punjab Technclal University	Elsevier (Material Today Communication)

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Dr Amit Bansal		Microwave heating: Fundamentals and application in surface modification of metallic materials – A review			International	2021		IK Gujral Punjab Technicial University	Elsevier (Material Today Communication)
Dr Amit Bansal		Application of microwave in welding of metallic materials – A review			International	2021		IK Gujral Punjab Technicial University	Elsevier (Material Today Communication)
Dr Amit Bansal		Comparative study of hot corrosion behavior of bare and plasma sprayed Al ₂ O ₃ -40%TiO ₂ coated T-91, A-1 boiler steel and Superfer800H superalloy in Na ₂ SO ₄ -60%V ₂ O ₅ salt environment			International	2021		IK Gujral Punjab Technicial University	IOP (Surface Topogrpahy Metrology and Properties)

Number of books and chapters in edited volumes / books published, and papers in national/international conference

Name of the Teacher	Title of the book/chapters published	Title of the paper	Title of the proceedings of the conference	Name of the conference	National / International	Year of publication	ISBN/ISSN number of the proceeding	Affiliating Institute at the time of publication	Name of the publisher
Dr Amit Bansal		Microstructural characterization and electrochemical corrosion behaviour of HVOF sprayed Alloy718-nanoAl ₂ O ₃ composite coatings			Inernational	2021		IK Gujral Punjab Technclal University	IOP (Surface Topogrpahy Metrology and Properties)
Dr Amit Bansal		Influence of heat treatment on the microstructure and corrosion properties of the Inconel-625 clad deposited by microwave heating			Inernational	2021		IK Gujral Punjab Technclal University	IOP (Surface Topogrpahy Metrology and Properties)