QnM 6.3.2

PERCENTAGE OF TEACHERS PROVIDED WITH FINANCIAL SUPPORT TO ATTEND CONFERENCES/WORKSHOPS AND TOWARDS MEMBERSHIP FEE OF PROFESSIONAL BODIES DURING THE LAST FIVE YEARS

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6.3.2.1. Number of teachers provided with financial support to attend conferences/workshops and towards membership fee of professional bodies year wise during the last five years

Year	2022-23	2021-22	2020-21	2019-20	2018-19
Number	14	7	0	0	0

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Year 2022-23

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QnM 6.3.2 Financial Support to Faculties

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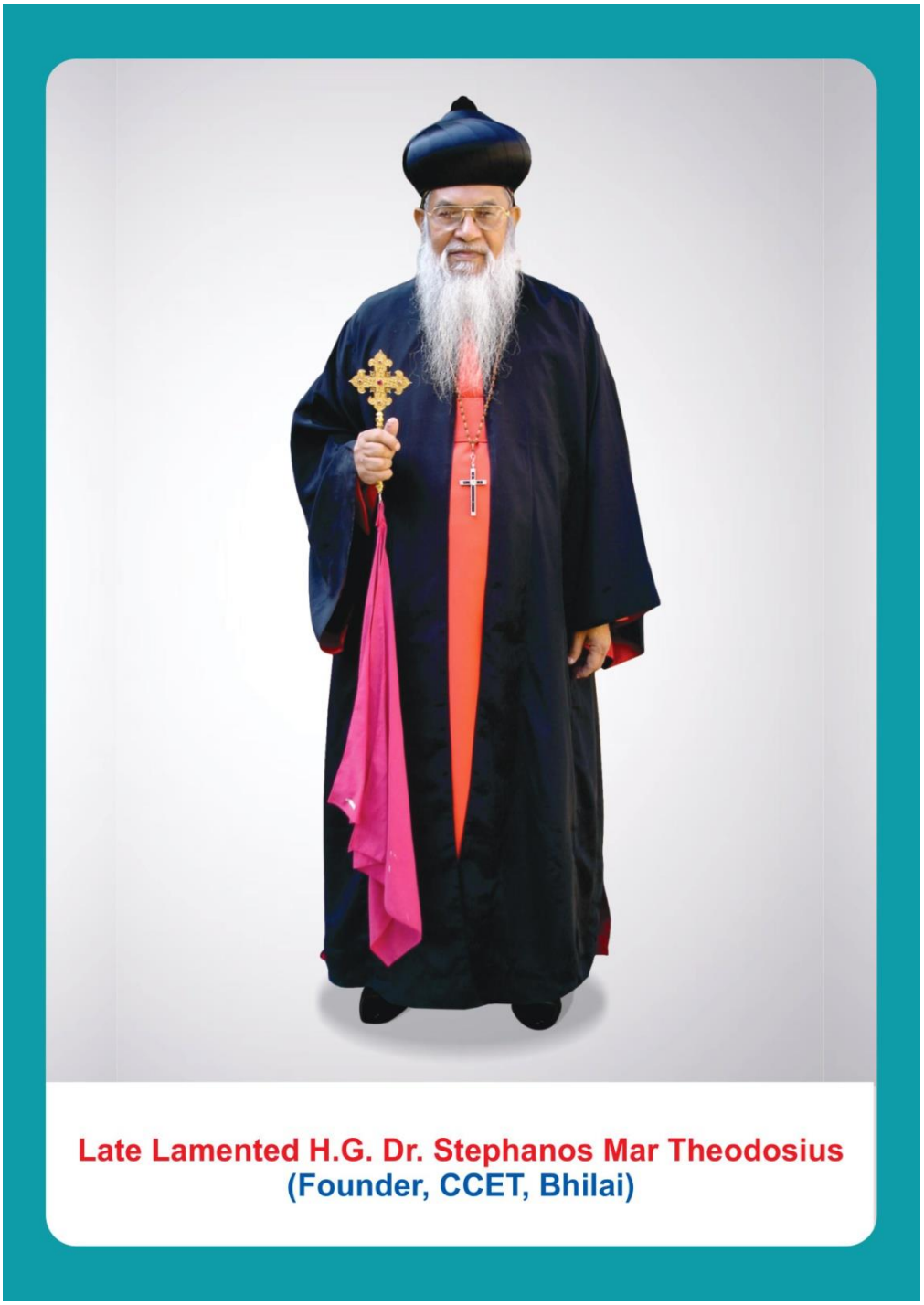
QnM 6.3.2 Financial Support to Faculties



Late Lamented H.G. Dr. Stephanos Mar Theodosius
(Founder, CCET, Bhilai)

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First Printing Edition, 2023. Volume 2

This is the Abstract book of the International Conference on Recent Advances in Mechanical Engineering and Nanomaterials (ICRAMEN 2023) held on 12-13 May 2023 was organized by Christian College of Engineering and Technology, Bhilai in association with Research Association of Masters of Engineering, India.

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This edition can be exported from India only by the publisher.

RAME Publishers, India

ISBN - 978-81-954945-1-4

ISBN is issued by Raja Rammohan Roy National Agency of ISBN, Department of Higher Education, Ministry of Human Resource Development, Government of India

Publisher and Editorial Service – Dr Manoj A Kumbhalkar and Dr Radheshyam H Gajghat

D I S C L A I M E R

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Printed by CCET, Bhilai

Typeset and Printed at Christian College of Engineering and Technology, Bhilai, Chhattisgarh, India.

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QnM 6.3.2 Financial Support to Faculties

Message from Pro Vice Chancellor

CSVTU, Bhilai

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI
छत्तीसगढ़ स्वामी विवेकानंद तकनीकी विश्वविद्यालय, भिलाई

It is heart-warming to note that Christian College of Engineering and Technology is marking its**19th Technologia- International Conference on Recent Advances in Mechanical Engineering and Nano materials (ICRAMEN 2023)** on 12th and 13thMay 2023 in Hybrid Mode.

As we all know that the next technological revolution will be of nano materials with the application of mechanical engineering, nano technology with mechanical engineering is extremely beneficial to the industry. Nano technology has the potential to improve a wide range of materials. Nano materials have distinct physical and chemical features that improve manmade materials. There are improvements in magnetic characteristics, mechanical activity and optical properties. Improvements are being made to improve the properties of the materials and to develop alternative precursors that can give the materials suitable features. Nano technology entails the ability to observe and control individual atoms and molecules; atoms make up everything on Earth.

I am trusting that this conference will provide a great platform for the scholars and research professionals to discuss about the recent advances in the field of nano materials along with its application in mechanical engineering. I believe that this conference will be beneficial for every professional.

May the conference be enriching, fruitful and memorable.

I convey my best wishes to the organizers and participants of the conference.

Prof. Sanjay Agrawal
Pro Vice Chancellor

Newai, P.O. Newai, Bhilai, Distt. Durg (Chhattisgarh) - 491107
Ph. No. : 0788 - 2200062, Fax : 0788-2445020, Website : www.csvtu.ac.in, E-mail : registrar@csvtu.ac.in

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Message from the Chairman

CCET, Bhilai

Message from the Chairman

I am extremely happy to know that Christian College of Engineering & Technology, Bhilai is organising its first International Conference on 12th and 13th of May, 2023.

Till last year, '**Technologia**' was conducted only at the National level. In the changing global scenario, where globalisation is the buzz word, to think and act globally is the need of the hour. Conferences are the perfect way to stay up-to-date with the latest technological developments, and to be at the vanguard of innovation.

INTERNATIONAL CONFERENCE ON RECENT ADVANCES IN MECHANICAL ENGINEERING AND NANOMATERIALS (TECHNOLOGIA: ICRAMEN-2023) is a two day International event that aims to showcase state-of-the-art methodologies and technologies in Mechanical Engineering and Nanomaterials. It focuses on new ideas and paves the way to disseminate the latest innovations and practices. It facilitates opportunities to connect, collaborate and exchange ideas with renowned leaders, scientists and researchers in Mechanical Engineering and Nanomaterials. It acts as a crucial platform for industry and academia to foster innovative ideas, theories, frameworks, and applications.

Further, **ICRAMEN-2023** will encourage recent and futuristic advancements, challenges, and new strategies in the frontiers of Mechanical Engineering and Nanomaterials. It provides a physical and virtual platform for researchers and budding engineers to share their research findings, learn about emerging trends and gain new perspectives and broaden their horizons.

This two days International conference is the vision and outcome of the untiring efforts of the innovative faculty of CCET.

Organizing such a conference is a fine example of the college's commitment towards moulding efficient engineers to meet the needs of the country and the challenges of the world.

I sincerely appreciate and congratulate the organisers, researchers and participants of **ICRAMEN-2023** and wish them all the best. My best wishes for the success of the conference!

Alexios Mar Eusebios Metropolitan
Chairman
CCET, Bhilai.

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From the Desk of Executive Vice Chairman

I am overwhelmingly glad to share the good news that Christian College of Engineering & Technology(CCET), Bhilai will host its first international conference ICAMEREN-2023 on the 12th and 13th of May, 2023. I take this opportunity to congratulate the Principal, Convener, Co-convener, HODs of all Departments, Organising Committee Members, Faculties, Participants and Students for their active participation and support for this program.

Memories are eternal. Despite the fact that Covid-19 obliterated many of our pleasurable memories and the lockdown essentially imprisoned us in a bizarre world for over two years. However, it taught us how to properly and profoundly combine knowledge and technology.

It gives me great pleasure to share that the current international conference will be conducted in hybrid mode. The international conference in hybrid mode will provide new opportunities for students, teachers, faculties, research scholars and engineers. This will undoubtedly improve academics as a whole. Additionally, it will add another gem to our crown.

This abstract book contains 52 research papers. This conference will yield a plethora of innovative ideas and scientific innovations that will enhance the beauty and creativity of the event. The capacity of international conferences to function as a catalyst for new research and learning makes me confident that this conference will do the same. I am convinced that this conference will assist many entrepreneurs and innovators to launch start up and innovate.

As we publish all proceedings of this event, I hope all researchers will benefit greatly from it. A mere word of appreciation is insufficient for the organizers' enormous and ongoing efforts. I want to express my gratitude to each and every one of you and extend my best wishes to the entire team behind ICAMEREN-2023.

Fr Dr P S Varghese
Executive Vice Chairman

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Message from Principal

Warm and Happy greeting to all.

It is a matter of great pleasure for me to welcome you all to the "**Technologia 2023 - International Conference on Recent Advances in Mechanical Engineering and Nanomaterials (ICRAMEN 2023)**" organizing by Christian College of Engineering & Technology, Bhilai in association with Research Association of Masters of Engineering (RAME) on **12th & 13th May 2023** in Hybrid mode, a sequel of Technologia since 2002.

Education is always a sign of development and learning. To help the society by creating something new education should be research-oriented. Innovative way of thinking is significant to cope with technological changes. As an educational institution, encouragement and support to research is provided by establishing a suitable platform for the research community, to interact with each other and to share the knowledge. Having this objective, "International Conference Technologia - 2023" is organized which received an overwhelming response and is going to present a collection of various technical papers in the proceedings.

I sincerely offer my earnest gratitude to those who have contributed their research papers at the conference. It is also encouraging to note that a couple of authors of International repute in the field are going to deliver invited lectures and presenting research papers in this International Conference. I am sure that the conference would achieve its objective by providing a suitable platform for learning and experiencing the latest advancement in the field of Mechanical Engineering and Nanomaterials. Sessions on different domains, key note addresses from eminent professors and opportunity to network with the researchers will help the participants immensely in their research career.

On behalf of the entire CCET family and also on my personal behalf I would like to thank the organizers of Technologia - 2023 for their untiring efforts and constant endeavor to make the conference scale new heights. It is a great achievement on the part of the organizers to arrange the publication of the Proceedings of the Conference with ISBN number.

I extend my sincere thanks to all eminent keynote speakers and session chairs for their support and guidance. It is heartening to acknowledge the fact that RAME has been associated with us in publication of selected papers in reputed journals like SCOPUS, Web of Science, UGC Care & other indexed journals.

I also congratulate Convener, Co-convener, Heads of all the departments, faculty, reviewers, all the staff members, students and participants for their contribution in organizing and participating in this conference. With great pleasure and pride, I welcome all the participants and convey my best wishes for **ICRAMEN 2023**.

I wish **Technologia --2023** a grand success!!

Dr (Mrs) Dipali Soren
Principal

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Message from President

Research Association of Masters of Engineering, India

I am very happy to share that Christian College of Engineering and Technology, Bhilai in association with Research Association of Masters of Engineering is organizing an International Conference on Recent Advances in Mechanical Engineering and Nanomaterials (ICRAMEN 2023) during May 12-13, 2023.

The fast advancements in technology make the promotion of technical competence in the workforce highly essential nowadays. One of the main problems for scientists is the implementation of their highly specialized research in many domains of human knowledge and interdisciplinary study. This problem must be seen as an opportunity for human resources development in a variety of areas. The other significant problem is to discover how these material advancements may be utilized to better the everyday job and the common person's surroundings. In these recent years there has been a lot of focus to promoting cross-disciplinary research with specific issues in nanoscience and nanotechnology.

I am confident there will be many intellectually engaging contacts and the presentation of constructive ideas which would benefit a broad spectrum of participants in the conference on current achievements in mechanical engineering and nanomaterials.

I congratulate the team of CCET, Bhilai and extend my best wishes for its success.

Dr M A Kumbhalkar
President and Publisher
Research Association of Masters of Engineering, India
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Message from Convener

It's a great moment for me to become a part of this international conference as a Convener. This is a 19th Conference Event '**Technologia – International Conference on Recent Advances in Mechanical Engineering and Nanomaterials. (TECHNOLOGIA: ICRAMEN 2023)** organized by Christian College of Engineering & Technology (CCET), Bhilai in association with Research Association of Masters of Engineering (RAME), Pune.

This year the conference 'Technologia' has been organised in hybrid mode. During the last 2-3 years we have experienced great loss due to the pandemic 'COVID 19'. But it has also given different thought of organising the events virtually. Nowadays most of the conferences are being organised in hybrid mode which provide better opportunities to the international researchers to present and exchange their latest findings of their research work, innovative ideas and applications with the research fraternity from Academia and Industry in the field of Science, Engineering and Technology.

All the accepted papers will be recommended for publication in SCOPUS/Web of Science/UGC Care indexed Journals of Trans Tech Publication Ltd., Switzerland. We have had publication agreement with this publication house. Best Paper Awards will be given to the participants from each technical session.

I welcome all the researchers and participants and anticipating their active participation and support for this international conference.

Dr Radheshyam H Gajghat
Professor & HOD (Mech Engg)
Convener, TECHNOLOGIA: ICRAMEN 2023

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Message from Co-convener

It is a great pleasure that Christian College of Engineering and Technology is organizing a two days National Conference "**Technologia – International Conference on Recent Advances in Mechanical Engineering and Nanomaterials (TECHNOLOGIA: ICRAMEN 2023)**" on 12th – 13th May 2023 in hybrid mode.

It is landmark event for the Institute. The conference aims to be a key national forum for the exchange and dissemination of technical information on "**Recent Advances in Mechanical Engineering and Nanomaterials**" among academicians and practicing engineers, scientists in the domain of interest around the nation.

The enlisted topics shall set up a platform of spreading light of the recent technologies and enable us to grow by way of learning from knowledge reserves and absorbing expertise from treasury of learned academicians.

I would like to thank the organizing committee members who have put so much effort in making this event a successful conference. My sincere thanks to participants of this conference whose keen interest in the various field help to build a powerful future through technology innovation!

Ms Richa Sahu
Co-convener, Technologia: ICRAMEN-2023

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ABSTRACT OF SELECTED PAPERS

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Material Science and Nanomaterials

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MATERIAL SCIENCE & NANOMATERIALS

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TECHNOLOGIA: ICRAMEN 2023 *12th & 13th May 2023*

PAPER ID: 02

Fabrication and Characterization of Jute/Human Hair Reinforced Polyester Hybrid Composite

Raghvendra Kumar Mishra[1]

[1]*School of Mechanical Engineering, Shri Mata Vaishno Devi University, Jammu & Kashmir, India*

Abstract

Fibre reinforced composites are used in automotive, defense and structural applications because of their economic and ecological advantage but they have limitation of lower mechanical strength. To balance this limitation of mechanical properties, hybrid composites are being manufactured. In this paper jute and human hair was selected for preparation of jute /human hair reinforced polyester hybrid composite. Human hair was selected because it is non-biodegradable and has high tensile strength. A single human hair can bear 1.5 Newton load. Recently various researcher started work towards development of bio-composites. It has been found that a mechanical property increases after adding hair in hybrid composites. Mechanical properties such as tensile strength, young modulus, and flexural strength were also compared with the already published jute composite results. To understand the fracture behaviour of composite morphology of the fractured surface was done by scanning electron microscope (SEM). The composite application is in environmental conditions addition and thus it is subjected to moisture presence, therefore study of water absorption behaviour of fabricated composite was also studied.

Keywords: Hybrid Composites, Jute, Human Hair, Impact Properties

PAPER ID: 10

Comparative Analysis of the Bulk and Electronic Properties of Boron/Indium/Nitrogen Doped Armchair Grapheme Nanoribbon for Sensing Dimethyl Disulphide: A DFT Study

Jaskaran Singh Phull[1], **HarmandarKaur**[2], **Manjit Singh**[1], **Butta Singh**[1], **Himali Sarangal**[1]

[1]*Department of Engineering & Technology, GNDU Regional Campus, Jalandhar, India*
[2]*Department of Electronics & Technology, GNDU Amritsar, India*

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Abstract

Studies have revealed that sulphur compounds from dimethyl disulphide, an essential semi chemical, support a number of crucial plant growth processes, including protein synthesis, nitrogen metabolism, and enzyme activity. Dimethyl disulphide is a crucial fertiliser that aids in the growth and promotion of diverse plant species, according to numerous research. Sensing the presence or level of sulphur can fundamentally help in managing the inputs that are delivered in the field, leading to the success of environmentally friendly agricultural practises. The availability of this crucial voc affects the vigour and longevity of plant species. In this article, we use the density functional theory approach to analyse the adsorption behaviour of a dimethyl disulphide molecule on a grapheme Nano ribbon doped with boron. The analysis of the Nano ribbon's bulk, electrical, and transport properties demonstrates its potential for the detection of this crucial volatile organic molecule.

Keywords: Adsorption, DFT, Armchair, Graphene, Nano ribbon, Sensing, Plant VOC

PAPER ID: 35

High Entropy Alloys: Recent Research and Works

Kapil Dev Panchal[1], Shreshth Rajput[1], Rithik Bindal[1], Yatharth Singh Chandrool[1], Saurabh Shukla[1]

[1]*Department of Mechanical Engineering, JSSATE, Noida*

Abstract

High Entropy Alloys are that class of elements which possess remarkable properties in many aspects as compare to Conventional Alloys. These elements have high resistance towards corrosion, heat. In the given specimen the elements which are used for preparing High entropy alloy are Magnesium, Iron, Aluminum, Silicon and Nickel. It is a low-density alloy with each element having varying composition in the range of 5 to 35% depending upon the calculation done by high Entropy Alloys are that class of elements which possess remarkable properties in many aspects as compare to Conventional Alloys. These elements have high resistance towards corrosion, heat. In the given specimen the elements which are used for preparing High Entropy Alloy are Magnesium, Iron, Aluminium, Silicon and Nickel. It is a low-density alloy with each element having varying composition in the range of 5 to 35% w/v. The process used for preparing High Entropy Alloy is Mechanical Alloying followed by Sintering and Heat Treatment. These HEA's are of great application in power plants and rocket launching materials where those materials are needed which can withstand high temperature. Among the recent years these High Entropy Alloys have got great interest of researchers. These are generally present in FCC lattice structure as this lattice structure exhibits greater hardness and toughness properties in their specimen therefore phase identification and fine microstructural features plays a vital role in the characterization of High Entropy Alloys.

Keywords: Low Density High Entropy Alloy, Mechanical Alloying, Sintering, Lattice Structure in Phase, Thermal Stability

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PAPER ID: 43

Assessing the Suitability of Different Materials for Manufacturing Connecting Rod: A Comparative Study

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Abstract

The connecting rod is the intermediate part between the piston and the Crankshaft. Its primary function is to transmit the push and pull from the piston pin to the crank pin, thus converting the reciprocating motion of the piston into the rotary motion of the crank. In an IC engine maximum stressed component is connecting rod. A connecting rod acts as a lever arm by transmitting motion from the piston to the crankshaft. In this, we studied the failure and strain analysis of the connecting rod beneath extraordinary loading situations by way of the usage of various materials, in order to get better material and update the same old material, which is used to make connecting rod in every engine. With the intention to give an explanation for that in regular loading circumstances, an advanced stress and deformation evaluation is completed through ANSYS. For this reason, this study targets to carry out for the deformation, and stress analysis of the connecting rod of various materials. Based on this we can get a better material for the manufacturing of connecting rod. For a good way to get the solution the geometric model of the connecting rod had been created in the software program (CATIA V5) and Dynamic analysis is carried out for determining equivalent stress, maximum and minimum principal stress, and total deformation calculated under loading conditions of compression at the big end and small end of the connecting rod.

Keywords: Connecting Rod, Analysis of Connecting Rod, CATIA, ANSYS

PAPER ID: 48

Preparation and Characterization of Nano composite Thin Films of Cadmium Sulphide & Zinc Sulphide

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Abstract

In this study, nano composite thin film of cadmium sulphide and zinc sulphide has been prepared by chemical bath deposition method. The ratio of cadmium sulphide and zinc

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sulphide was different for each deposited layer. The thin film was kept at room temperature overnight after deposition of each layer. The next layer was deposited on the thin film prepared one day earlier. Finally three layers of film are obtained. Cadmium acetate and zinc acetate are mixed in a proper proportion for the preparation of composite thin film. The synthesized films will be characterized by different techniques and properties will be studied. For the Investigation of surface morphology and micro structural features of film, SEM has been used. The elemental compositional analysis of materials has been identified by EDAX (energy dispersive X-ray analysis) also referred as EDX and EDS. Absorbance spectral study provided by UV-visible spectroscopy, which gives a measure of absorbance as a nature of band gap of semiconductor nano material and the value of band gap and particle size. X- ray diffraction will reveal the structural properties of the prepared films. SEM micrograph of the single, double and multilayer films at 50K magnification matches with the standard images. The particles are seen to be spherical and asymmetrical. The particles have seen to be spherical and asymmetrical. XRD have confirmed the polycrystalline growth for various arrangements of single layer, double layer and as-deposited multilayer thin film of CdS and CdZnS. All films found cubic and hexagonal structures. The EDS studies showed the presence of cadmium zinc and sulphur along with some impurities. It can be clearly seen that during the deposition of films, the impurities such as carbon, oxygen, and nitrogen found due to the presence of air. The thicknesses of the films were measured by optical interference method (multiple beam interferometers). The Band gap of thin films has investigated by Tauc's Plot. In this investigation, band gap for CdS thin film was 2.52 eV, for CdS- (Cd0.8 Zn0.2) S thin film was 2.65 eV and for CdS- (Cd0.8 Zn0.2)S- (Cd0.5 Zn0.5)S thin film was 2.75 eV.

Keywords: Nano Composite, Thin films, Structural, Morphology, Band gap

PAPER ID: 49

Green Synthesis and Characterisation of Zno Nanoparticles

Suman Gajbhiye[1], Anju Singh[1], Preeti Nandkumar[1], Abid Khan[1]

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Abstract

In this study, Zinc Oxide nanoparticles have prepared by Sol Gel method using green synthesis technique with MK leaf extract which was calcined at three different temperatures like 2000C, 3000C and 5000C. The NPs were characterized by XRD, SEM, and EDX. X-ray diffraction (XRD) result confirmed that the synthesized ZnO nanoparticles have wurtzite hexagonal structure without any impurities. Lattice constants, d spacing and relative intensity have also been studied at different temperatures. It also observed that all the values decreases with increases the temperature. We also compared the interplaner spacing and relative peak intensities with their standard values at different angles. The scanning electron microscope

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(SEM) image confirmed the size and shape of these nanoparticles. SEM micrographs show spherical particles along with formation of clusters. At higher calcinations temperature, Non-uniform distributions of spherical particles with clusters are seen in the case of the ZnO nanoparticles which synthesized in the presence of MK extract. At 2000C smaller particles with a more uniform distribution have seen. EDX studies confirm the chemical composition of the nanoparticles.

Keywords: Nanoparticles, Zinc Oxide, Semiconductor, Optical, Nanotechnology

PAPER ID: 52

A Review on s Materials during Heap Formation

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[2]University in Srnta Rose, Argentina

Abstract

Segregation is an important process mainly used in industries during the flow of granular materials. A granular medium is repeatedly collected particles that have different properties like size, shape, and density. Heap formation in the industry occurs if particles with various sizes, forms, material densities or surface properties are made of bulk materials, then they spatially separate during formation of the heap. In this paper, we review the flow of granular materials in detail, mixing, and segregation of granular materials, effects of particle characteristics on segregation, and methodology.

Keywords: Granular Materials, Heap flow, Chute Flow, Segregation

PAPER ID: 59

A Review on Green Synthesis of Metal Oxide Nanoparticles by Leaf Extract for Biomedical Applications in Various Field

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Abstract

Now a day, metallic oxide nanoparticles (NPs) have appeared as having essential business application. In these nanoparticles, the toxicity has also been an important subject of area of research studies. In this context, for decrease the toxicity levels and facilitating an unhindered application in human consumer products the most important solution is the green synthesis of

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these particles. The biological synthesis of metal oxide nanoparticles by the usage of microorganisms and plant extraction opens up massive possibilities for the manufacturing of biocompatible and cost effective particles with potential applications in the healthcare sector. The most critical area that requires attention is cancer therapy. So the nanotechnology has used to intervention of improve the existing present therapeutic practices. Nanoparticles of Metal oxide have been identified as therapeutic agents with an extended half-life and therapeutic index. In These metal oxide nanoparticles has been found lesser immunogenic properties. At present, Nanoparticles of metal oxide synthesized by green synthesis method are the subject of considerable research and analysis for the early detection and treatment of tumours. But their performance in the clinical experiments is yet to be determined now. This review paper provides a detailed description of recent research on the green synthesis of metal oxide nanoparticles. In this area of research, the scientific reports have been specially highlighted on the properties and applications of nanoparticles of oxide of titanium, cerium, selenium, zinc, iron, and copper. This review gives the detailed discussion of the importance of green synthesis of metal oxide nanoparticles. This study will also gives new insight of new methods that are cost effective and free from pollution.

Keywords: Green synthesis, Nanoparticles, Metal Oxide, Cost effective, Nanomaterial

PAPER ID: 71

Effect of Rice Husk Ash on Mechanical and Microstructural Properties of Al-Cu-Si Alloy Matrix Composites

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Abstract

Rice husk is widely accessible all over the world. In actuality, the entire world produces 500–600 million tonnes of rice annually, with over 20% of the paddy being husk. One of the industrial waste byproducts that is widely available worldwide is rice husk ash (RHA). The RHA particles are attempted to be incorporated into the molten Al-Cu-Si alloy in the current work. With the use of a mechanical stirrer, the RHA particles were incorporated into the matrix melt while keeping the melt temperature between 800 and 8500 C. At room temperature, investigations on dry sliding wear were conducted against a disc made of chromium steel. The wear properties of the Al-Cu-Si RHA composites and the unreinforced Al alloy are investigated using scanning electron microscopy. According to the results of the experiments, the composites are harder and more resistant to wear than unreinforced aluminium alloy.

Keywords: Rice husk ash, Al-Cu-Si, Aluminium alloy, Wear

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Application of the Multiple Regression Analysis for Prediction of Tensile Strength of A518 Alloy

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Abstract

A study on green sand moulding to determine green compression strength using regression analysis has been carried out. Coefficient of correlation, determination, and multiple determinations were used to establish the relationship existing between the two independent variables Al−2.5Ti−0.25C, SiC, and pouring temperature and tensile strength as the dependent variable. It was found that the coefficient of determination for Ys: X1 was 0.51 while the coefficient of correlation was 0.72, the coefficient of determination for Ys: X2 was 0.44 while the coefficient of correlation was 0.64 and the coefficient of multiple determination was 0.74; these coefficients assisted tremendously in the tensile strength. A mathematical model was developed for the prediction of the tensile strength of A518 alloy. It was tested and proved to be a valid estimation tool for estimating the tensile strength of A518 alloy on the foundry shop floor.

Keywords: Regression Analysis, A518 Alloy, Tensile strength

PAPER ID: 73

Effect of Ferro Niobium (FeNb) Grain Refinement on Fluidity of Thin Cross Sections and Multi-Objective optimization of Sand Casting Process parameters of A206 Alloy

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Abstract

Grain refinement is an essential and important feature in aluminium alloy castings. In the present investigation, the grain refiners, i.e. Al-2.5FeNb- 0.5 wt.% Ti, and their effect on the fluidity of the A206 alloy was examined at altered pouring temperatures, 700 °C, 750 °C, and 780 °C. It was observed that the combined addition of grain refiners enhanced the fluidity length by 41.97%, especially, at minimum pouring temperature of 700 °C. The

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correlation between the microstructure and mechanical properties has been observed quantitatively by optical and SEM microstructural analysis. Moreover, the effect of green sand casting process parameters i.e. GFN, molasses, scrap, Al-4Ni, Al-2.5FeNb-0.5C, and pouring temperature on the enhancement of performance characteristics i.e. fluidity and mechanical properties of the A206 alloy were optimized by Taguchi based grey relational analysis (GRA) and technique for order preference by similarity to ideal solution method (TOPSIS). It was observed that optimized parameters obtained from TOPSIS produced a casting with improved properties. Further, Analysis of variance shows the pouring temperature has the significant influence by 27.27%, while grain refiner has an effect of 16.67%, molasses at 16.29%, GFN at 11.70% and on the performance characteristics. Confirmation experiments were performed at the optimal parametric combination. The metallurgical characterizations of optimized casting A206 alloy were also studied using SEM and correlated with XRD analysis.

Keywords: Green sand, Fluidity,A206 alloy, Thin-wall castings, Scrap, Grain refinement, Mechanical properties, GRA,TOPSIS

PAPER ID: 74

Effects of Processing Parameters and Mould Coating to Moulding Sand on the Microstructure and Fluidity of Sand-cast Al-5Mg Alloy

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Abstract

Al-Mg alloys are extensively used structural materials due to their excellent mechanical properties and low corrosion exposure. In the present investigation, the effects of processing parameters such as pouring temperature and mold pre-heating temperature and mold coating on the microstructure and fluidity of sand-cast magnesium (Mg) alloy Al-5Mg alloy were systematically investigated. It was found that the increase of pouring temperature leads to coarsened microstructure and decreased fluidity of sand-cast A518 alloy. Increase of mold pre-heating temperature incurs coarsening of as-cast microstructure and increase of fluidity. The addition of mold coatings such as soap stone powder and Graphite powder to the molding sand has a significant impact on the microstructure of sand-cast Al-5Mg alloy. With the increase in Pouring temperature, the fluidity of the alloy initially increases and then decreases. The optimized process parameters of green sand mold and mold coatings were obtained to be pouring temperature of 780 ℃, mold temperature of 110 ℃, and soapstone powder mold coating.

Keywords: Magnesium alloy, Fluidity, Microstructure, Mold Coating, Mold preheating

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THERMAL ENGINEERING & FLUID MECHANICS

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PAPER ID: 07

Thermal Investigation of Nano spheres and Nano Whiskers of $CuInS_2$

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Abstract

The Nano spheres and Nano whiskers of ternary $CuInS_2$ are synthesized by so no chemical and hydrothermal techniques, respectively. The energy dispersive X-rays showed the samples to be stoichiometric. The tetragonal unit cell structure of synthesized samples are characterized by X-ray diffraction. The corresponding morphology of the synthesized samples are studied by electron microscopy in scanning and transmission modes. The thermal investigation of the synthesized Nano spheres and Nano whiskers are carried out by recording thermo gravimetric (TG) and differential thermal analysis (DTA) curves. These simultaneous thermo-curves are recorded in temperature range of ambient to 1253 K in an inert nitrogen atmosphere for three heating rates of 10, 15 and 20 $K \cdot min^{-1}$. The thermal study showed Nano spheres to decompose by five steps and Nano whiskers to decompose in a single step. The kinetic parameters like activation energy, phonon frequency factor, activation enthalpy, activation entropy and Gibbs free energy change are determined for both samples. The kinetic parameters are evaluated from the thermo-curves data using model-free is conversion methods like Kissinger-Akahira-Sunose (KAS), Flynn-Wall-Ozawa (FWO) and Friedman (FR). All the obtained outcomes are investigated in details.

Keywords: $CuInS_2$, Nano Spheres, Nano Whiskers, Hydrothermal Sonochemical, Kinetic Parameters

PAPER ID: 09

A Review on Control of Hybrid AC/DC Microgrid Involving Energy Storage, Renewable Energy and Pulsed Loads

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Abstract

Electricity is the greatest gift of science to humanity which has led to a civilization where electricity is used for all purposes. However, in recent times a paradigm shift is developing in the generation of electrical energy from the concept of using small generating units to major generating plants connected to distribution systems in the form of microgrid's with alternative energy sources called renewable energy. Worldwide, the use of renewable energy is increasing and these alternative energy sources can generate pollution-free electrical energy for the society. Although these are new hubs and decreasing cost units, there are still many challenges in the operation and control of island and grid-connected microgrid's configured in both AC and DC. Thus, it is relatively imperative to investigate the strategies of optimal sizing, stability control and economic efficiency operation of microgrid's. Therefore in this paper a great review was presented on optimal shaping methods, stability control and energy management strategies using various iterative and intelligence techniques published in different articles proposed by many authors.

Keywords: Renewable Energy Sources, Hybrid AC/DC Microgrid, Energy Management System

PAPER ID: 11

Microscopy in Fluid

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Abstract

Papain is an enzyme with an exceptional stability. To make use of the property, papain enzymes have been widely used in the industry. The extreme stability of the enzymes allows it to be used at broad temperatures, which is beneficial as it often results in efficient reaction. However, the reason why the papain enzymes have such a high stability is not clearly understood. Hence, uncovering the reasons is quite vital in order to maximize the utility and efficiency of the enzymes. Although numerous studies relating to papain's structure at high temperatures, such as X-ray crystallography have been reported, to our knowledge, studies investigating papain's structure while changing the surrounding temperatures has not yet been performed .Thus, in this work, we investigated the structural change of papain molecules at three temperatures: 25, 37 and 60 ℃ using atomic force microscopy (AFM) in fluid.

***Keywords*:** Atomic Force Microscopy in Fluid, Papain Enzymes, Structural Change, High Temperatures

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Comparison of Conventional and Vibration Assisted Fluidized Bed Dryer for Drying High Moisture Sub Bituminous Coal Used in Thermal Power Plant

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Abstract

Low Calorific Value (CV) coal is used in large quantities as compared to High Calorific Value coal in Cogeneration Power Plant (CPP) at Gayatrishakti Paper & Board Limited Unit-1, Vapi. But the moisture content in Low CV coal is very high about 35% - 45% ARB which is not acceptable due to the sticky property of coal, hence leading to an increase in operation and maintenance costs attributed to handling of wet coal. So drying of coal is necessary to use Low CV. The drying performance of Low CV coal particles in a laboratory scale with and without vibration-assisted fluidized bed dryer was investigated under various operating conditions: Inlet air temperature (90 - 110°C), superficial air velocity (0.14 – 0.43 m/s), bed height (40-80 mm), particle size (1--5 mm), frequency (110 - 310 Hz). The drying results show that the moisture content with respect to time decreases with an increase in temperature, air velocity, and vibration frequency, and also increases with an increase in bed height and particle size.

Keywords: Fluidized Bed Dryer, Bituminous Coal, Thermal Power Plant

PAPER ID: 24

Characterization and Development of MR Fluids Having High Yield Stress

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Abstract

This paper aims to determine the stress of MR fluids in an on-state condition. Different MR fluids samples were made and tested inside the laboratory. The equipment was made to test the fluid. In the experimentation, it was found that MR fluids have high stress and can be used in military design and fabrication. This paper paves away for any researcher to develop

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MR fluids at very less cost. The MR fluids have very high yield stress which depends on the particles being used in their formulation. It can be concluded that MR fluids yield stress can be found in an economical manner using a set up and can be used in various engineering ventures. It is also evident that yield stress of MR fluid depends upon the magnetic flux density produced by fluid particles. The amount of fluid particles is responsible for increase in shear stress produced by MR fluid. However the amount of fluid particles should not increase 60% otherwise the sedimentation problem is encountered.

Keywords: MR Fluids, Relative permeability, Electromagnet, Yield Stress, Magnetic Flux Density

PAPER ID: 30

Comparative Analysis of Heat Transfer of Engine Fins with Different Materials in Steady State Condition

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Abstract

The engine of an automobile is exposed to elevated temperature variations and thermal stresses, which can lead to overheating and reduced performance. To mitigate this, fins of various materials and geometries are mounted on the engine cylinder surface to enhance heat transfer and reduce thermal stress. In this study, the thermal behavior of different fin geometries made of aluminum nitride, aluminum alloy 6063, and aluminum alloy 356 with varying thermal conductivity was analyzed using ANSYS. Three-dimensional models of the geometries were created using SOLIDWORKS 2020 and analyzed with ANSYS Workbench 2023 R1 to determine the optimal material and geometry for the fins. The results were compared with a conventional aluminum A204 material to identify the maximum heat transfer. The zigzag-type fins were used in this study. The analysis revealed that the material with the highest thermal conductivity produced the best heat transfer, and certain fin geometries were more effective than others. This study demonstrates the importance of selecting the right material and geometry for engine fins to improve thermal management and enhance engine performance.

***Keywords*:** Thermal conductivity, Heat Transfer, Aluminum Nitride, Zigzag Fins, ANSYS2023 R1, Heat flux

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PAPER ID: 32

Analysis of Thermal Performance of Polylactic Acid Nano Composite by Using T-History Method

Devraj Banjare[1], Jyotish Verma[1], Rohan Chouhan[1], Richa Dewangan[1], Govind Sahu[1], Chandra Prakash Dewangan[1]

[1]Department of Mechanical Engineering, Government Engineering College, Raipur, Chhattisgarh, India

Abstract

In this experimental study, we perceived the thermo-physical boundary and the thermal efficiency of zinc oxide for volume fraction in polylactic acid based on heat energy storage system was examined by using T-history method. The use of T-history method for the assessment of thermo-physical boundary describes the specific heat capacity and thermal conductivity enhance in solid as well as liquid phases of the mixture until the addition of 0 to 0.025% of volume part of zinc oxide in polylactic acid Nano composite. After the addition of the zinc oxide, the heat of fusion falls and polylactic acid have high rate of fusion related to 0.025% volume part of zinc oxide mixed polylactic acid. Further zinc oxide based polylactic acid Nano composite 31.30% and 13.5% higher solid as well as liquid thermal conductivity in comparison with polylactic acid. Moreover, raise the particle size and analysis as well as distributions finding by dynamic light dispersing method for different volume part of zinc oxide mixed on polylactic acid. In contrast of the thermal efficiency analysis of 0.025% of volume fraction zinc oxide in polylactic acid Nano composite has 30.6% high heat transfer rate related to pure polylactic acid along the stage of 4 minute. Further the adding of zinc oxide above 0.025% volume fraction in polylactic acid, rise the particle settlement rate freely. Whatever can become to end that 0.025% volume fraction of zinc oxide in polylactic acid mixed thermal energy storage arrangement outcome of maximum thermo physical property and thermal efficiency.

Keywords: Polylactic Acid, Zinc Oxide, Thermal Conductivity, Thermal Efficiency, Nano Composite

PAPER ID: 39

Analysis of Fuel Cell Integrated topologies of High Gain Cuk Converter

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[1]Geetanjali Institute of Technical Studies, Udaipur, India
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Abstract.

The most potential renewable energy sources (RES's) are solar photovoltaic and fuel cells, both of which are ostensibly accessible on earth. In MATLAB, three different topologies based on a non-isolated high gain Cuk converter with switched inductor and capacitor have been studied with fuel cell as energy source. These Cuk converter topologies are capable of more boosting capability than typical Cuk & boost converters and can also lessen the voltage load on the primary switch. As a result, using a low voltage rating and high Rds.-on will result in greater efficiency. The three topologies' capacity to enhance voltage may be contrasted with one another and with traditional Cuk converters. At a duty cycle of 0.75, the third topology of converter improves the voltage level by 11 times. These converters do not make use of coupled inductors and transformers

Keywords: Fuel-Cell, Voltage Gain, DC-DC Converter, Cuk Converter, Switched Capacitor, Switched Inductor.

PAPER ID: 45

Numerical Simulation of Conjugate Heat Transfer in Micro Channel Heat Exchangers to be Used for Electronic Circuit Cooling Application

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Abstract

The utilization of sophisticated heat transfer technologies is essential to remove extremely high heat flux, also known as hot spots, typically found in electronic packages or circuits. The challenges for electronic circuit cooling systems are due to the rise in power densities and advancements in technologies leading to a reduction in the sizes of electronic packages. The requirements of the high cooling efficiency of micro-cooling systems make them complex compared to other traditional cooling systems. The cooling system technologies since then are evolving from conventional air-cooling systems to sophisticated fluid-based heat transfer technology. Micro channel cooling is found to be a very effective and efficient way where cooling is achieved by circulating a liquid coolant through a network of very small channels etched into a substrate material. The liquid coolant flows through the channels, absorbing heat from the device being cooled as it flows. The efficiency of micro channel cooling is subjected to factors such as thermal conductivity, airflow, ambient temperature, design of the microchip and its packaging. However, a few parameters, such as chip heat loading, could not be controlled, and therefore simulating such scenarios will provide the essential flow physics. Hence in this paper, the numerical

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model of conjugate heat transfer is built using COMSOL Multiphasic software and the thermal modeling is performed to analyze the effects of the two input parameters: heat flux density and contact pressure. The heat flux values range from 10-100 w/m3. The model is prepared using Alumina ceramic, Aluminum 6063-T83 and ethylene glycol is selected as a coolant for the circuit. Based on the numerical simulation, it has been found that liquid-based cooling is an effective way of circuit cooling.

Keywords: Microfluidic Devices, Micro Channel Heat Exchangers, Numerical Simulation, COMSOL, Liquid Cooling, Electronics Circuit Cooling

PAPER ID: 47

Activation Energy Analysis of Thermal Degradation of Bamboo Fiber as a Reinforcing Material in Bio-Composites

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Abstract

To study the behavior of thermal degradation of bamboo fiber at single heating rate Boride's method is used. Bamboo is easily available & cheapest material in world wide. It is ecofriendly in nature, renewable & biodegradable. It require low investment cost & high growth rate. It is used as reinforcement material for preparation o composites material. It is suitable for construction industry. TGA analysis is done for thermal degradation behavior. Activation energy is calculated with the help of Boride's method at single heating rate.

***Keywords*:** Bamboo Fiber, Thermal Degradation, Activation Energy, Boride's Method

PAPER ID: 58

Blood Flow Analysis in Coronary Arteries Case Study

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Abstract

Blood vessels (veins and arteries) are the super highways that circulate blood throughout the body with the muscular pumps. Any obstruction in the circulatory path by clot (or) plague inside the blood vessels, disturb the constant flow of blood thereby disturbing the hemodynamic of blood. This leads to fatal condition. The hemodynamic mechanism of a single segment of stiffened coronary artery due to sudden blockage (or) stagnant blood flow and the relation between mechanical and rheological parameters in vascular occlusion. The

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changes in oscillating pressure, pressure profile, velocity, and skin friction coefficient and wall shear stress are studied and analyzed for various dimension of vascular occlusion and for two case studies of blockages. Modeling and analysis of the blood vessel with various dimension of vascular occlusion will be done using the ANSYS Design Modeler Software and Computational Fluid Dynamics (CFD) methodology. The Computational Fluid Dynamics simulation of blood vessel gives relevant information for the diagnosis of the circulatory barricade.

Keywords: Computational Fluid Dynamic Analysis, Blood Flow through Blockages, Veins and Arteries

PAPER ID: 62

Solar Energy: A Sustainable Solution for a Brighter Future

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Abstract

This paper discusses the use of solar energy as a renewable and sustainable source of electricity. The benefits and challenges of solar energy are explored, including its potential to reduce carbon emissions and dependence on fossil fuels. Various types of solar technologies are described, including photovoltaic cells, concentrated solar power, and solar thermal systems. The paper also discusses the economic and policy factors affecting the adoption of solar energy, such as government incentives and market trends. Finally, the future prospects for solar energy are analyzed, with a focus on technological advancements and the potential for increased efficiency and affordability. Overall, this paper provides a comprehensive overview of solar energy as a promising solution to the global energy crisis.

Keywords: Solar Rediation,Solar Power Generation, Solar Power Plants, Renewable Energy

PAPER ID: 64

Study on Transverse Velocity of Incompressible Dusty Fluid in Electric Field

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Abstract

In this paper we study the Transverse velocity of incompressible dusty fluid in a Electric filed. Here the flow characteristics and their properties of the dusty particle in a Electric filed is observed. The presence of dust particles in a homogeneous fluid makes flow problems quite complicated. Here we are assuming the weak electric filed, a perturbation method has been employed to linearize the equation those have been solved by using Henkel's Transformation technique. The effect of electric field is so poor that e effect in the incompressible flows. It shows the magnitude of transverse perturbation fluid velocity reduced continuously.

Keywords: Dusty Fluid, Electric Field, Transverse Velocity, Incompressible Flow

PAPER ID: 69

Smart Irrigation Pump

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Abstract

The Objective behind creating this project is to solve the problems faced by small and medium farmers in their farming life while dealing with irrigation and proper water management. The world is facing different problems regarding scarcity of water on different fronts. Agricultural field is one of the highly affected areas. To increase the productivity, the farmers have to ensure the availability of proper resources without spoiling them. This Project combines the internet of things to ensure the management of such problems in a proper manner. Irrigation is very important factor in agriculture sector and this project is completely focused on it. However, it is an important factor but for proper irrigation, different factors like temperature of the surrounding, humidity and content of moisture in soil are also considered because these factors decide the proper growth of plants. If temperature is high then generally evening is preferred for irrigation, Excess of moisture content can damage the roots of plants and so many other problems can arise when these factors are not considered .Generally farmers use their experience to decide whether to irrigate the plants or not. However, this project will help them a lot because it uses humidity sensor, soil, soil moisture sensor to collect the data of surrounding. These sensors are linked with Node MCU, which will allow the user to remotely monitor the condition. This system is controlled by Smartphone by using the Blink application, which uses IOT.

Keywords: *Irrigation, Pump, IOT, Agricultural*

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SOLID MECHANICS & MODELING

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PAPER ID: 06

Multi-hole Probe for Subsonic Wind Tunnel Calibration: A Review

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Abstract

When testing models in a wind tunnel, the flow angularity in the test section is crucial, especially when testing them at varying flow velocities. Typically, a regular Pitot tube is used to calibrate subsonic wind tunnels, while high-efficiency probes are used for supersonic wind tunnels. During calibration, the Mach number range and pressure range in the test section is determined for different operating velocities. Multi-hole probes are utilized to identify wind tunnel test section parameters such as flow angularity, Pitot pressures, static pressures, wave angles, and the presence of test section noise. In this paper, a review of different probes and their application has been studied.

Keywords: Pressure Probes, Calibration, Wind Tunnel

PAPER ID: 18

Design & Development of Pre-Shape Guide Wire Technology for Trans Catheter Aortic Valve Implantation

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Abstract

In the current study, we present a guide wire that is configured for insertion into the heart of a patient during a procedure such as a Trans catheter aortic valve replacement procedure. A guide wire device has a core with a tapered distal section and a proximal section. The medical guide wire in the current invention has better torque transfer from the guide wire's proximal end to its distal end. To increase the safety of Trans catheter aortic valve implantation (TAVI) procedures, a new tool called the Pre-Shape TAVI Guide wire was developed. Guide wire entanglement risk and other procedure-related issues are intended to be decreased by the device. The single-wire device is pre-shaped to fit the aortic annulus, making the valve implantation process simpler and more effective. The device significantly speeds up

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procedures and lowers the possibility of paravalvular leak. The Pre-Shape TAVI Guide wire is anticipated to enhance patient outcomes while lowering procedure risks.

Keywords: Wire Technology, Pre-Shape, Catheter, Valve Implantation

PAPER ID: 20

Redesigning and Topology Optimization of the Fixed Platen for the Injection Molding Machine

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Abstract

The fixed platen is an integral part of an injection molding machine. The force applied on the platen's face during mold clamping leads to its concave deformation, as well as uneven loading due to tie bars at its corners, causing reliability issues for injection machine manufacturers. In the current research, this problem was solved by redesigning the fixed platen of the 110-tonnage injection molding machine using topology optimization and fatigue analysis. In this work, Creo software is used to perform the 3D modeling of the fixed platen of an injection molding machine and then analysis for stress, deformation, and fatigue life of the fixed platen is done using ANSYS workbench 2021 R1. The static analysis was carried out, and the results were compared with the maximum principal stress and the permitted limit. The results from the fatigue analysis are used to identify the fatigue life and safety factor. Topology optimization was conducted to reduce the weight of the platen and, hence, the cost of the machine, as the clamp unit constitutes 70% of the machine's weight. The design was changed within the allowed ranges based on the results of the static analysis, fatigue analysis, and topology optimization. With all the modifications weight of the fixed platen is reduced by 12%.

Keywords: Static Structure Analysis, Fixed Platen, Injection Molding Machine, Fatigue Analysis, Weight Reduction, Topology Optimization

PAPER ID: 27

Methodology for Wall Thickness Validation with Stress Analysis of Clo2 Generator Piping System

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Abstract

Piping system design and analysis is an essential field in the process and power industries. The piping system is comparable to the blood circulation system in the human body and is required for the plant's survival. The focus of this research is to optimize and verify the wall thickness of a ClO2 generator pipe system using stress analysis. The study presents a calculation and analysis-based approach to determine the minimum required pipe wall thickness using the ASME B31.3 Power Piping Code and EES software. The methodology covers various load calculations, including static, occasional, and thermal loads, and the occasional load includes seismic and wind loads. The calculated wall thickness for header pipes was found to be 0.414 mm and 0.936 mm, respectively, when considering the internal operating pressure. This is significantly less than the standard thicknesses of 3.733 mm and 5.08 mm used in the piping procedure, providing potential cost savings. The research also validates the calculated results by comparing them to the ASME Power Piping Code B31.3 and performing a static structural analysis using ANSYS software. Overall, the study demonstrates the importance of optimizing wall thickness design to improve project budgets while maintaining safety standards.

Keywords: Pipe Wall Thickness, Clo_2 Generator, Piping System, Stress Analysis, Pipe Wall Thickness Validation.

PAPER ID: 28

Optimum Slat and Flap Configuration for Maximizing Lift on NACA-4412 Airfoil at Various Angle of Attack, Using XFOIL at a Reynolds Number of One Million

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Abstract

In this research paper, we have investigated the optimal configuration of slats and flaps for maximizing lift on the NACA-4412 airfoil at different angles of attack, at a Reynolds number of 1 million. We used XFOIL and Python for the simulations and obtained lift, drag, and lift-to-drag ratio for different slat and flap configurations. The slat and flap configuration used was standard, and both the slat and flap angles were varied in the range of 5-15 degrees, resulting in a total of 121 configurations. Additionally, the angle of attack was varied in the range of -5 to 20 degrees with an interval of 0.5 degrees. Through our study, we have

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identified the best slat and flap configuration for achieving maximum lift or maximum lift-to-drag ratio for the NACA-4412 airfoil. To validate our results, we used XFLR5 to compare the data generated from XFOIL. This type of study and simulation is highly relevant for designing flaps and slats, as the lift and drag requirements vary during takeoff and landing of aircraft. By determining the optimal slat and flap configuration, we can improve the performance of aircraft and make them safer and more efficient.

Keywords: Flap, Lift, NACA4412, RANS, Slat, XFOIL, XFLR5

PAPER ID: 40

Design Optimization of Adaptive MacPherson Strut using ANSYS Simulation: A Study

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Abstract

The MacPherson strut is a widely used suspension system in the automotive industry due to its simplicity and effectiveness. In recent years, the development of adaptive MacPherson struts has gained significant attention to improve handling, stability, and ride comfort. The optimization of the design parameters of adaptive MacPherson struts is crucial to achieve the desired performance characteristics. In this study, we present a comprehensive review of the design optimization of adaptive MacPherson struts using ANSYS simulation software. We discuss the various design parameters, simulation techniques, and optimization algorithms used in recent studies. The study aims to provide insights into the design and optimization of adaptive MacPherson struts using ANSYS simulation software.

Keywords: MacPherson strut, ANSYS, Adaptive Suspension, Optimization, Simulation

PAPER ID: 44

Static Structural Analysis on Robot Chassis for Structural Steel and Aluminum Alloy Material

Avadhoot Rajurkar[1], Kunal Dangra[1], Aryan Deshpande[1], Madhav Gosavi[1], Tejas Phadtare[1], Gajanan Gambhire[1]

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Abstract

In this report we have done static structural analysis and thermal analysis on 3-wheeler robot chassis. The modeling of the chassis was done in Solid Works based on 2-D drawing with dimensioning. The CAD file generated was then imported in Ansys and then the analysis was performed. Analysis was performed to calculate values of total deformation, equivalent stress, equivalent elastic strain and thermal strain. Two materials were taken into consideration for analysis: Aluminum Alloy and Structural Steel. A load (force) of 500 N was distributed on the chassis uniformly and the acceleration of 5 mm/sec^2 was given. Thermal conditions were added by raising the temperature from 22^{0}C to 50^{0}C in 1 sec. The analysis performed was majorly divided into three parts: a) Only considering force, b) Considering force as well as acceleration, c) Considering force, acceleration and thermal conditions. Total deformation in aluminum alloy was more as compared to structural steel in all the cases. Equivalent Stress is almost the same for both aluminum alloy as well as structural steel without application of thermal condition. Equivalent Elastic Strain is more in aluminum alloy as compared to structural steel in all the cases. Thermal Strain is constant throughout the chassis for both the materials. Thermal strain is less in structural steel as compared to aluminum alloy. These types of analysis helps in evaluating the current design and decide whether it will sustain the required load and acceleration under given thermal conditions.

Keywords: Robot Chassis, Static Structural, Thermal, CAD/CAE, Structural Steel, Aluminum Alloy

PAPER ID: 50

A Comprehensive Study of Efficient Design of Pressure Vessels for Improved Boiler Performance

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Abstract

The design and optimization of pressure vessels in boiler applications play a crucial role in the efficient performance of boilers. This paper presents a comprehensive study of the efficient design of pressure vessels for improved boiler performance. The study includes an analysis of the current design trends, materials, and manufacturing techniques used in pressure vessel design for boiler applications. Additionally, the study explores the various optimization techniques and software tools available for improving the design of pressure vessels. The optimization techniques studied include Taguchi method, response surface methodology, and genetic algorithms. The software tools analyzed include ANSYS, ABAQUS, and COMSOL Multi physics. The study concludes with a summary of the best practices for designing and

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optimizing pressure vessels for improved boiler performance. The results of this study will be useful to design engineers, researchers, and manufacturers involved in the design and optimization of pressure vessels for boilers.

Keywords: Pressure Vessel, Boiler Performance, Design Optimization, Taguchi Method, Response Surface Methodology, Genetic Algorithm

PAPER ID: 51

A Study of Finite Element Analysis and Topology Optimization of Upper Arm of Double Wishbone Suspension

Rishabh Tamrakar[1], Amit Sarda[1], Sumit Kumar Shrivastava[1], Praveen Chandrakar[1]

[1]Department of Mechanical Engineering, Christian College of Engineering and Technology, Bhilai, India

Abstract

The double wishbone suspension system is widely used in vehicles due to its superior handling and ride quality. However, optimizing the design of suspension components, such as the upper arm, is still a challenging task. Finite element analysis (FEA) and topology optimization (TO) techniques have been widely used to optimize the design of the upper arm of a double wishbone suspension system. This study presents a comprehensive review of fifteen research papers that focus on the use of FEA and TO techniques for optimizing the design of the upper arm. The results of the reviewed papers demonstrate the effectiveness of FEA and TO techniques in achieving weight reduction while improving the performance and durability of the suspension system. Different optimization algorithms and design constraints were used in the reviewed studies, leading to different optimized designs. This study provides valuable insights into the use of FEA and TO techniques for optimizing the design of the upper arm of a double wishbone suspension system.

Keywords: Double Wishbone Suspension System, Finite Element Analysis, Topology Optimization, Optimization Algorithms, Performance Improvement, Weight Reduction

PAPER ID: 53

Design & Optimization of Garbage Picker Machine with Future Scope of ML for Efficient Garbage Detection

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Abstract

This paper presents the design and optimization of a garbage picker machine for efficient waste management. The machine is designed pick up garbage from various locations, such as streets and parks, and stores it in a designated container. The amount of waste generated by the growing population has led to the development of various technologies to handle it. One such technology is the garbage picker machine, which is used to pick up waste from the ground and deposit it into a container. The optimization of the machine's parameters is carried out using a combination of simulation and experimental techniques, with the aim of improving its performance and reducing energy consumption. This paper also discussed the various ML algorithms for object detection and recognition. Overall, the integration of machine learning into the design and optimization of the garbage picker machine provides a promising approach to enhance waste management practices and contribute to a sustainable environment. The use of machine learning in the garbage picker machine presents a future scope for the development of smart waste management systems.

Keywords: Garbage Picker Mechanism, Electric Powered, Manual Machine, Conveyor, Machine Learning Algorithm, Computer Vision.

PAPER ID: 54

Finite Element Analysis of Paddle Sludge Dryer for Its Structural Integrity under Different Loading Conditions

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Abstract

Assembly of paddle sludge dryer is analyzed using finite element analysis (FEA) under different loading conditions like structural and thermal loads. Modal analysis of the assembly is performed to evaluate the natural frequency of the structure to check it for the resonance condition. The stresses induced in the assembly under structural and thermal loads are within the allowable stress limits whereas the natural frequencies of vibrations for assembly are far away from the excitation frequency of motor hence resonance condition is not expected to occur during motor running condition. From the results of FEA analysis, the assembly of paddle sludge dryer is safe under given operating conditions.

Keywords: Finite element analysis, Structural analysis, Thermal analysis, Modal analysis, Paddle sludge dryer.

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PAPER ID: 56

Design and Optimization of the Bracket Connected with Actuator and Valve

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Abstract

In the real world, all designs are affected by some sort of uncertainty either in terms of dimensions or in terms of load levels applied to them. Traditionally often the products are over-designed to take these uncertainties into account. There is always a demand for optimized designs with high quality and reliability. This means that some sophisticated methods are required to be used to mitigate the weight, shape or process of the components. The aim of the project is to optimize the actuator side flange of the closed bracket that has been used for many years as standard practice for the G01 actuator. Hence, optimized flange thickness will reduce the weight of the bracket. In addition, raw materials and manufacturing costs will be improved by this technique. And this will be verified by a numerical method by using the Ansys tool. Open bracket design is an alternate design approach to replace the closed-type bracket that gives the same performance and saves material and manufacturing costs. This new alternate design will be verified by analytical and numerical tools such as the Ansys tool and experimental tests.

Keywords: Closed Bracket Design, Open Bracket, Optimization, Actuator, Valve, Oil, Gas.

PAPER ID: 57

Enhancing the Performance of Turbine Blades through CAD-Based Design Optimization and Finite Element Analysis: A Comprehensive Review

Bhupesh Sonkar[1], Amit Sarda[1], Robin Babu[1], P Srinivasa Rao[1]

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Abstract

Turbine blades play a critical role in the efficient operation of power generation systems, aircraft engines, and gas turbines. With the aim to enhance their performance, researchers have been utilizing computer-aided design (CAD) and finite element analysis (FEA) techniques to optimize the design of turbine blades. This paper presents a comprehensive review of the recent advancements in CAD-based design optimization and FEA techniques

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for improving the performance of turbine blades. The review covers various aspects of turbine blade optimization, including aerodynamic performance, structural strength, and vibration characteristics. Additionally, the review discusses the challenges and limitations of the current optimization techniques and suggests future research directions. Overall, this review aims to provide insights into the current state-of-the-art of turbine blade design optimization and to stimulate further research in this field.

Keywords: Turbine Blade, CAD, Finite Element Analysis, Design Optimization, Performance Enhancement.

PAPER ID: 60

A study for Optimization of Helical Gear Performance for Improved Energy Efficiency

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Abstract

This study focuses on the optimization of helical gear performance for improved energy efficiency. Helical gears are widely used in power transmission systems due to their high load capacity, smooth operation, and low noise characteristics. However, they are also associated with significant power losses, which affect the overall efficiency of the system. Therefore, this study aims to investigate various design and optimization techniques that can reduce power losses in helical gears and improve energy efficiency. The study includes a literature review of the current state of research on helical gears and their performance optimization. It also includes the development of a mathematical model to simulate the behaviour of helical gears and evaluate their efficiency. The model considers various design parameters such as gear tooth profile, pressure angle, helix angle, and number of teeth, and their impact on power losses and efficiency. The results of the study demonstrate that optimization of helical gear design

Keywords: Helical Gears, Power Transmission, Energy Efficiency, Optimization, Design Parameters, Power Losses.

PAPER ID: 61

Design and Fabrication of Multipurpose Agricultural Machine

Jawed Rafiq[1], Abhay Srivastava[1], Himanshu Singh[1], Devansh Awasthi[1], Harsh Pandey[1]

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Abstract

India is an agricultural nation where 70% of the people depend on successful agriculture. However, as the population grows, farms are distributed among families; as a result, the average Indian farmer holds just two acres of land.The system addresses the innovative idea of the Joystick based system in all farming systems. By implementing this project, we can eliminate many difficulties in agriculture. The system runs on solar energy, which is the cleanest energy in the world. Cultivators are very popular these days. The most common machines are used to trim soft grass. As part of our project, Joystick based solar cultivator, seeding and watering system is developed for use and construction. It is placed in a suitable machine structure. The motor has 1000 rpm and is connected to the power source by a coil of wire. The engine revolutions increased with the help of the gears. The electric switch controlled motor makes it easy to use. The machine is controlled by a smartphone. The system is like a mobile robot with four wheels and a cultivator attached to the back of the robot. The seeding system is installed on the robot. The water pump and water tank are installed in the system and can be controlled wirelessly. These characteristics make the system ideal for farming. The aim of the project is to design and develop a complete system that can be used as a cultivator, seeding, irrigation system and mower. The system cultivates the field, sows the seeds and also has an irrigation system for the crops. The entire system is solar powered and controlled by a Joystick smartphone.

Key Words: Agricultural Performance, Cultivator, Joystick, Solar Energy, Solar Cultivator

PAPER ID: 67

Sheet Metal Cutting and Bending by Pneumatic Actuator

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Abstract

Sheet metal cutting and bending by pneumatic actuator is a precise and efficient manufacturing process that involves the use of compressed air or gas to power cutting and bending tools. The process is used to create a wide range of metal components and products, and it has applications in various industries, including automotive, aerospace, construction, and manufacturing. The process involves preparing the metal sheet, cutting it to the desired shape using a cutting tool driven by a pneumatic actuator, and then bending it into the desired shape using a bending tool also driven by a pneumatic actuator. The accuracy and precision of the process depend on the calibration of the tools and the control of the pneumatic

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actuator. The future of sheet metal cutting and bending by pneumatic actuator is likely to see continued advancements in technology, including automation, the use of advanced materials, and integration with Industry 4.0 principles. The development of sustainable materials and energy-efficient processes will also become increasingly important. Overall, sheet metal cutting and bending by pneumatic actuator is a critical process for the manufacturing industry, and its importance is likely to continue growing in the future.

Keywords: Pneumatic Actuator, Sheet Metals, Air Compressor, Cutting Blades, Connecting Cables Manufacturing Technology

PAPER ID: 70

Smart Cart for Physically Challenged Person

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Abstract

Generally, a person with physical disabilities restricts his movement within a house or building due to his dependence on other people. People with disabilities are not only dependent on others for their movement but also for food . Devices available in the market only allow them to relocate but they have to put efforts which put them under stress. The purpose of this study is to investigate an alternative to those devices to provide a way of relocation as well as a method of earning for themselves. Designed battery operated vehicle motivates the person to become an entrepreneur and problem of unemployment of disabled section will also be solved simultaneously.

Keywords: Disabilities, Unemployment, Controller, Green Energy, Electric Energy.

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PRODUCTION ENGINEERING & MANUFACTURING PROCESSES

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Criterion 6

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PAPER ID: 03

Experimental Investigation for Minimization of Casting Defectsusing Taguchi Method

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Abstract

In this work, an attempt is made to reduce Molding defects using Taguchi Method. The input parameters used are Runner Lower Diameter, Runner Upper Diameter, Runner height, In gate height, and Pouring time. The response parameters selected as per the study of molding process requirements of the industry are Product yield (%). The L16 orthogonal array is used as the per Taguchi method. The experimentation is conducted and the responses are measured. Significant progress has been made in determining the appropriate values of molding process variables to expand molding quality using diverse techniques during the last few decades. The design of sand molding process variables has been recognized as one of the most critical aspects of molding quality. This research work focuses on improving the molding quality and yield percentage. The data analysis is made by S/N ratio and ANOVA. The result revealed the optimal setting to minimize the defect.

Keywords: Taguchi Method, Molding process, ANOVA, Optimization, Gray Cast Iron, Molding, Yield Percentag.

PAPER ID: 05

Recent Advances in Machining of Composite Materials by Electrical Discharge Machine

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Abstract

Composites are being used since decades and imparting excellent properties comparatively. It may be used in numerous industries because of its light weight and specific strength. Machinability of these materials is a concerned aspect. Conventional and The composites have been machined using unconventional machining techniques. Conventional methods are less suitable than non-conventional quoting the best surface finish and ability to machine complex parts. This article investigates the suitability of thermo-electric process for the

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machining of composites. It includes the study of different matrix based composites along with the variation of reinforcement. Electric Discharge Machining finds its suitability in machining of different metal matrix composites more than the Polymer Matrix Composite (PMC) and Ceramic Matrix Composites (CMC). Variation in input parameters listed as Pulse duration, Voltage, Peak Current and Polarity is studied to obtain the optimum resulting parameters as Material Removal Rate (MRR), Surface Roughness (SR), Electrode Wear Rate (EWR) and Kerf Width.

Keywords: Machinability, EDM, MRR, EWR, Kerf Width, Hybrid Composites

PAPER ID: 12

Direct Observation of Floating Single Silica Particles Using a 'Tumbled' Optical Microscope

Shinji Koide[1], Kazuo Umemura[1]

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Abstract

Reusability of enzymes after the enzymatic reactions has been researched for the fabrications of highly efficient enzymatic devices. For recovering the enzymes after the first use, attachment of enzymes to micron size particles so that it can be recovered by centrifuging. However, it may sink during the enzymatic reactions depending on the specific gravity of the carrier particles. If the carrier particles have rather small specific gravity, the enzyme activity might be more efficient. In this work, we evaluated floatability of two silica compounds, Silica-mesoporous MCM-48 (MCM-48) and sic star (SS), using our home made 'tumbled' optical microscope. MCM-48 are made from mesoporous silica powder with 15 μm particle size, while SS are made from silica particles suspension with 20 μm particle size. Furthermore, enzyme activity of the papain devices with the MCM-48 were examined by enzyme assay based on fluorescent spectroscopy.

Keywords: Optical Microscope, Floating, Mesoporous Silica, Papain Enzyme; Immobilization

PAPER ID: 14

A Review on Multiplicative Metric Spaces

Priyanka Rani[1], Dr Jagatveer Sehrawat[2]

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Abstract

The aim of this paper is to discuss the fixed point theorems under some contractive conditions in multiplicative spaces. We also give their appropriate examples.

Keywords: Multiplicative Metric Space, Fixed Point Theorem, Contraction Mapping

PAPER ID: 19

Study the Effect of Fluxes on Weld Penetration during Activated TIG Welding of SS304

Varun Sancheti[1], Darsh Patel[1], Nilesh Ghetiya[1]

[1]Institute of Technology, Nirma University, Ahmedabad, Gujarat, India

Abstract

Stainless steel is widely employed in a variety of industries, including aerospace, chemical processing, and transportation. It can be recycled indefinitely with no loss of property. The Gas Tungsten Arc Welding (GTAW) or Tungsten Inert Gas (TIG) technique is widely used for connecting thin pieces of stainless-steel. However, it is ineffective for combining heavy parts in a single pass. Activated TIG (A-TIG) dramatically enhances weld penetration up to 1.5- 4 times in a single pass. A-TIG is the center of investigation among researchers because of its deep penetrating capacity. This article discusses the effects of particular flux powders, such as NaF and Fe_2O_3, on surface appearance and geometric shape. Weld of satisfactory appearance is produced using NaF powder as a flux in TIG welding, whereas, Fe_2O_3 powder results in a substantial increase in both the joint-penetration and weld-aspect ratio.

Keywords: A-TIG Welding (Activated Tungsten Inert Gas Welding), 17Cr–10Ni–2Mo alloy, Flux Powder, NaF (Sodium Fluoride), Fe_2O_3 (Ferric Oxide), Oxide, Penetration.

PAPER ID: 25

Microwave-Assisted Extraction of Betulinic Acid from Syzygium Cumini L (Jamun Leaves) and Kinetic Modeling: Particle Size, Solid Loading, and Agitation Speed Effects

Aditya T. Batule[1], Sejal G. Ramteke[1], Suraj W. Ingawale[1], Shraddha V. Admane[1]

[1]School of Chemical Engineering, MIT Academy of Engineering, Alandi (D.), Pune University, Pune, India

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Abstract

Compounds are separated from their matrix by the process of extraction. Due to its benefits, such as a low time need and low solvent usage, the Microwave Assisted Extraction technology is regarded as a unique technique for extracting chemicals. Syzygies, cumin, sometimes referred to as the black plum, is utilised to extract betulinic acid via MAE. Pharmaceutical uses for betulinic acid include antibacterial, anti-malarial, and anti-cancer. The investigation of several parameters, including temperature, solid loading, and agitation speed, is included in the research report. Using Pele's mathematical model, the kinetic analysis was finished. FESEM analysis was used to examine the surface morphology of jamun leaves. The values computed using Pele's mathematical model and the actual experimental data were found to be in great agreement. The optimized results obtained at 2gm solid loading, 700 rpm agitation speed, 105micron particle size.

Keywords: Microwave Assisted Extraction, Novel Technique, Betulinic Acid, Kinetic Model, Extraction, Antibacterial

PAPER ID: 33

Role and Effect of Friction Stir Welding Tool Pin Profiles on Tensile Characteristics of Dissimilar Al6061-Al2014 Welded Joints

Bhanodaya Kiran[1], Babu Nadikudi[1]

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Abstract

Friction stir welding is a widely used welding process to join lightweight aluminium alloys. In this welding process, the tool pin geometry plays a crucial role for development of good quality welded joints. In this work, Al6061 and Al2014 aluminium alloy plates were welded with use of three different tool pin geometries such as straight square, straight hexagonal and taper threaded. Tensile properties and hardness of the welded joints were evaluated. From the results, the welded joints developed with straight square geometry tool tensile properties are better than the welded joint developed with straight hexagonal and taper threaded profiled tools. The better properties are due to pulsating action and higher dynamic volume to static volume ratio of the straight square geometry tool. A microstructural evaluation revealed that formation of more homogeneous distribution throughout the weld nugget for the welded joint made with straight square geometry pin tool.

Keywords: Aluminum Alloys, Welded Joints, Tensile Properties, Microstructures.

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PAPER ID: 36

Friction Stir Welding in between Similar and Dissimilar Metals: Recent Work and Research

Mohammad Shoaib Khan[1], Kunal Pratap Singh[1], Kartikey Singh[1], Pushkar Pratap Singh[1], Kapil Dev[1]

[1]*Department of Mechanical Engineering, JSS Academy of Technical Education, Noida*

Abstract

Friction stir welding (FSW)is a solid-state joining process that uses a non-consumable tool to joint facing work pieces without melting the work piece material. Heat is generated by friction between the rotating tool and the work piece material, which leads to as oftener region near the FSW tool. As a solid state welding process, FSW is a largely defect free joining method with no hot cracking, porosity or solidification cracks Due to the lower temperatures of Friction stir welding there is a reduction in shrinkage and distortion in the material being joined in the experiment which is to be performed. In FSW there are no filler materials, fluxor shielding gas required for aluminum alloys. FSW is environmentally friendly as it produces no fume, spatter, or UV radiation. It uses machine tool technology, making the process easy to automate, highly repeatable and reducing need for skilled welders and hence it is easy to performed. It's a work in any position with the setup .FSW joins the 'non wieldable' Aluminum alloy such as those from the 2xxx and7xxxseries.Overthep as two decades numerous research studies have been undertaken in order to characterize the process in terms of mechanical & metallurgical characterization and its effect on mechanical properties such as yield strength, tensile strength and percentage of elongation and fatigue properties, material flow, mechanical response by numerical simulation, thermo-mechanical model, tool process parameters & the corrosion behavior of a FSW joints. This is all discrete work & it is observed that there is no evidence of systematic work that leads to development of quality joint for similar as well as dissimilar metal welds based on systematic variation of tool geometry & measure process parameters .The objective of present research work aims to acquire the fundamental knowledge of the FSW process and to investigate the feasibility of incorporating this technology with existing resources to weld aluminum alloys in the abutting configuration.

Keywords: Aluminum, Copper, Friction Stir Welding, And Dissimilar Metals, Different FSW Methods Welding.

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PAPER ID: 68

Fabrication of Electric Foldable Scooter

Ved Prakash Pandey[1], Sumit Kumar[1], Janardan[1], Gaurav Kumar Shukla[1], Kamlakant Prasad[1], Khurshed Alam[1]

[1]*Buddha Institute of Technology, GIDA, Gorakhpur, Uttar Pradesh, India*

Abstract

An electric foldable scooter is a compact and convenient mode of transportation that has gained popularity in recent years. This scooter is powered by an electric motor and can be easily folded and stored, making it ideal for commuters who need to travel short distances. The scooter is designed to be lightweight and portable, with a range of up to several miles on a single charge. Its compact size also makes it easy to man oeuvre in tight spaces and navigate through traffic. Electric foldable scooters offer a sustainable and eco-friendly alternative to traditional modes of transportation and are becoming increasingly popular as people seek to reduce their carbon footprint and save on transportation costs.

Keywords: Sustainable, Eco-friendly, Portable, Foldable, Lightweight

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MESSAGE

I am happy to know that Christian College of Engineering & Technology, Bhilai is organising 18th National Conference '**Technologia**' on '**Advanced Research in Science, Engineering & Technology i.e. Technology: ARSET-2022**' and publishing its proceedings.

Technology: ARSET-2022 aims to provide a virtual platform to the researchers and budding engineers to share their research findings and promote intellectual interactions between them. This is one of the examples of our commitment to provide the students the best opportunity and environment to be the future-ready technocrats. I hope that this conference shall act as a catalyst in igniting the minds and also motivate the budding engineers to find new ideas and make new inventions to contribute to the development of our country.

I congratulate the organisers, researchers and participants of Technology: ARSET-2022 and wish all success in their endeavours.

Mar Dionysius Joseph

Dr. Joseph Mar Dionysius Metropolitan
Chairman
CCET, Bhilai

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From the Desk of Executive Vice Chairman

I am really very glad to know that after a gap of 2 years Christian College of Engineering & Technology, Bhilai is organizing a Two Days 18th National Virtual Conference '**Technologia 2022**' on the topic '**Advanced Research in Science, Engineering & Technology (TECHNOLOGIA: ARSET-2022)**' on 8th & 9th June 2022.

I take this opportunity to congratulate the Administrative Coordinator, Principal, Convener, Co-convener, HODs of all Departments, Organising Committee Members, Faculties, Participants and Students for their active participation and support for this program. I hope that this Virtual Conference will enrich various strata in our society and add another feather to our crown.

I hope that as we publish all the proceedings of this event, it would be of great help for all researchers.

I would like to thank one and all of you and wish all the best to the whole team working behind Technologia 2022.

Fr. Kurian John
Executive Vice Chairman

Dr. Stephanos Mar Theodosius Marg, Kailash Nagar, Near Industrial Estate, Bhilai 490026 C.G., India, Ph. No.: 0788 228 6662

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Message from the Administrative Coordinator

This edition of Technologia is very special for us at CCET. We have been through some very challenging times in the last few years - the COVID pandemic is only one of them - and for this reason we are all the more proud to bring out this edition. We were confident of the positive effect and value of doing this online, and we are happy to note that both our Faculty and Students have come out stronger than before and benefitted from the quality of the program and matter contained therein.

India, at 75, is opening itself up in the education field and this is evident from the National Education Policy and the vista of opportunities it is offering. Start-ups and patents are going to be the norm at undergraduate level, and CCET and Technologia are braced to ride on this technological edge which means we have to remain updated with the latest in the myriad fields of Engineering. We are also glad to see that our Alumni Association Members are stepping in with suggestions and support which will mean a higher quality of articles and lectures during the year.

I am personally glad that Metropolitan Dr Joseph Mar Dionysius has given me this opportunity to enter into this hallowed institution, and to play a small role in its future.

Congratulations to the Team for this wonderful venture!

Fr. Philip Kuruvilla
Administrative Coordinator

Dr. Stephanos Mar Theodosius Marg, Kailash Nagar, Near Industrial Estate, Bhilai 490026 C.G., India, Ph.No.: 0788 228 6662

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Message from Principal

Warm and Happy greeting to all. I am immensely happy that our college CCET is organizing **18th National Conference "Technologia 2022" on "Advanced Research in Science, Engineering and Technology (ARSET-2022)"**. The conference is being held in virtual (online) mode this time on 8th & 9th June amid of Covid 19 pandemic situation in the country.

Research activities across all the engineering fields pave the way for the industrial world to strive forward with huge advancements. As an educational institution, encouragement and support to research can be provided by establishing a suitable platform for the research community, to interact with each other and to share the knowledge. Having this objective, National Conference is organized every year which receives an overwhelming response.

Technologia- 2022 has been planned to provide the same benefits and learning experience to all the participants. The Conference aims to bring different ideologies under one roof and provide opportunities to exchange ideas face to face, to establish research relations and to find global partners for future collaboration. The themes and sub-themes for this conference are indicative of relevant research areas to give the prospective authors innovative prepositions about the ambit of discussion. Sessions on different domains, key note addresses from eminent professors and opportunity to network with the researchers help the participants immensely in their research career. This proceeding of the conference has been documented with utmost care. I believe strongly that, this will stand as a great source of knowledge for all. Extended versions of the paper will be published in renowned journals.

We welcome you all to CCET and hope that this conference will act as a medium for all of us to ponder upon the topic of discussion, challenge us to strive towards it and inspire us at the same time.

I extend my sincere thanks to all eminent keynote speakers and session chairs for their support and guidance. I also congratulate Convener, Co-convener, Heads of all the departments, faculty, reviewers, all the staff members, students and participants for their contribution in organizing and participating in this conference and wish the conference all the success.

Dr. (Mrs.) Dipali Soren
Principal

Dr. Stephanos Mar Theodosius Marg, Kailash Nagar, Near Industrial Estate, Bhilai 490026 C.G., India, Ph.No.: 0788 228 6662

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Message from Convener

It's a great moment for me to become a part of this virtual conference as a Convener. This is an 18th National Conference '**Technologia**' on '**Advanced Research in Science, Engineering & Technology. (Technology: ARSET-2022)** organized by Christian College of Engineering & Technology, Bhilai.

In the present COVID 19 pandemic scenario, though the situation is under control, it was somewhat difficult to organise a conference physically due to possible health risk. This conference is organised virtually to provide safe alternative to the researchers to present and exchange their latest findings of their research work, innovative ideas and applications with the research fraternity from Academia and Industry in the field of Science, Engineering and Technology.

All the accepted papers will be published in the referred Journals with no extra cost. Each paper will be assigned Digital Object Identifier (DOI) number from Cross Ref. Best Paper Awards will be given to the authors of the best paper from each technical session.

I welcome all the researchers and participants and anticipating their active support and participation in this virtual conference.

Dr. Radheshyam H. Gajghat
Convener, Technologia: ARSET-2022

Dr. Stephanos Mar Theodosius Marg, Kailash Nagar, Near Industrial Estate, Bhilai 490026 C.G., India, Ph. No.: 0788 228 6662

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Message from Co-convener

It is a great pleasure that Christian college of engineering and technology is organizing a two days National Conference 'TECHNOLOGIA' on "ADVANCE RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY (TECHNOLOGIA: ARSET-2022)" on 08th-09th June, 2022.

It is landmark event for the Institute. The conference aims to be a key national forum for the exchange and dissemination of technical information on "ADVANCE RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY" among academicians and practicing engineers, scientists in the domain of interest around the nation.

The enlisted topics shall set up a platform of spreading light of the recent technologies and enable us to grow by way of learning from knowledge reserves and absorbing expertise from treasury of learned academicians.

I would like to thank the organizing committee members who have put so much effort to make this a successful conference. My sincere thanks to participants of this conference whose keen interest in the various field help to build a powerful future through technology innovation!

Mrs. Shikha Agrawal
Co-convenor, Technologia: ARSET-2022

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ABSTRACT OF SELECTED PAPERS

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Technologia:ARSET-2022

Prediction of Joint Acceleration of 2 DOF Robot Manipulator using Supervised Learning

Tirthankar Roy[1], Sourabh Anand[1], Dr. M.K. Satyarthi[1]

[1]*University School of Information Communication and Technology, Guru Gobind Singh Indraprastha University, New Delhi*

Abstract

Robo-Analyzer is a open source software that uses a 3D representation of a robot manipulator to carry out various analytical studies. It was created primarily to assist instructors and students in getting started with robotics teaching and learning utilising framework based skeleton models or CAD designs of serial robots i.e., articulated robot. The Robo-Analyzer software is used in this work to simulate and examine a two-DOF robot with two link and Revolute Joints respectively. The joint length is kept constant at 0.2m, and the joint velocity is varied from 0 to 180 degrees per second. The two link manipulator is permitted to carry out forward kinematics after generating and establishing the input parameters for the simulation of the 2DOF model, which will result in simulating the Joint Acceleration value, and that is the primary prerequisite for the Machine Learning process. The model tends to deduce the relationship between the input and output parameters in this study, which further aids in the deduction of a linear relationship between the two parameters, especially input and output parameter i.e. link length coordinates , joint velocity, and joint acceleration. The experiment is then carried out on the basis of Robo-analyzer data to apply Linear Regression Machine Learning Technique, which will assist in the prediction of an output, namely joint acceleration. The model tends to pave way for future research which can be carried out for joint vibration which is solely based on the basis of the acceleration present at joint.

Keywords: Robot Manipulator, Forward kinematics, Supervised Learning, Linear Regression

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Technologia:ARSET-2022

Enhancement of Annual Profit of a Wind Farm Using Artificial Intelligence-based Meta-heuristic Methodology

Prasun Bhattacharjee[1], Rabin K. Jana[2], Somenath Bhattacharya[1]

[1]Department of Mechanical Engineering, Jadavpur University, Kolkata, India
[2]Operations and Quantitative Methods Area, Indian Institute of Management, Raipur, India

Abstract

Constant emission of Green House Gases (GHGs) is con- tributing to global climate change. Be- cause of the untrustworthy supply of hydrocarbon-based fu- els and GHG emission aftereffects, the electricity indus- tries are steadily endeavoring for efficient usage of re- new able energy resources. Wind power, vitally, is a significant and pragmatic tech-nique for electricity generation. The expenditure on generating electricity from wind has wilted markedly throughout the last few decades across many countries. Researchers have scrutinized and determined the reli- able locations for offshore wind energy generation in India. In another study, the offshore wind energy generation capacity in India was de- liberated through the OSCAT statistics.The offshore wind en- ergy generation capacity of India was valued and the genera- tin outlay was optimized As the method of wind farm design necessitates multi- faceted computing effort, traditional optimization techniques are incapable to maximize financial profitability. Artificial In- telligence (AI)-based meta-heuristic procedures have helped design engineers optimize objectives related to different technical fields. In this paper, an innovative AI-based method has been applied to maximize the yearly profit of an Indian near shore wind farm in Jafrabad, Gujarat. Parameter i.e., link length coordinates, joint velocity, and joint acceleration. The experiment is then carried out on the basis of roboanalyser data to apply Linear Regression Machine Learning Technique, which will assist in the prediction of an output, namely joint acceleration. The model tends to pave way for future research which can be carried out for joint vibration which is solely based on the basis of the acceleration present at joint.

Keywords: Artificial Intelligence, Genetic Algorithm, Layout Optimization, Profit Maximization, Wind Farm.

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Technologia:ARSET-2022

Natural Bamboo Fiber Composites, their Properties and its Applications: A Review

Roopesh Kumar[1], B. Laxshaman Rao[2], Dr. Abhijeet Ganguly[3], Dr. Rajesh Purohit[4]

[1,2]*Research Scholar, Department of Mechanical Engineering, CSIT, Durg*
[3]*Assistant Professor, Department of Mechanical Engineering, CSIT, Durg*
[4]*Professor, Department of Mechanical Engineering, MANIT, Bhopal*

Abstract

In the present situation, there has been a fast consideration in innovative work in the Bamboo fiber composite field because of its better formability, copious, sustainable, financially etc. Bamboo fiber is a natural fiber that is easily degraded by microbes and potentially becomes an alternative fiber in the future due to its availability, which is abundantly cheap, and grows throughout the year and also isn't affected by the season The application of bamboo fiber is a solution for environmental issues and a business prospect of synthetic fibers that are expected to decrease in line with petroleum. This study presents result of the studies of various types of bamboo, fiber extraction process both mechanically and chemically, composite fabrication based on various matrices, characterization carried out to reveal performance related to the requirements of various applications, weaknesses and improvements.

Keywords: Bamboo Fiber, Composite, Mechanical Strength, Composite Fabrication, Synthetic Fiber.

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Technologia:ARSET-2022

Design of Hydraulic Transportation System Using Positive Displacement Pump for Deep Sea Mining

Robin Babu[1]

[1]*Christian College of Engineering and Technology, Bhilai, India*

Abstract

Land mining operations are coping with decrease in the ore grades, increase in the demands and prices of the metal and with the accomplishments achieved by the offshore industry (oil & gas) market in mind; sea floor mining has once again become an attention-grabbing industry. This young market offers a lot of new prospects for the dredging and offshore industry, whose expertise will be required by the mining industry for operating offshore. In this paper the hydraulic transportation system using positive displacement pump for deep sea mining is designed as this type of system is undergoing a lot of research nowadays. This system is designed to vertically transport the mined manganese nodules present in Indian Ocean at a depth of 1500m. The nodules have varying diameter and the system is designed by considering the losses which occurs during the mining process and the factors involved in transportation process. This paper hopes to give an idea about the current design procedure for the hydraulic transportation for deep sea mining using the positive displacement pump system and the various other possibilities of designing this system. The opportunities for deep sea mining has just gained scope as a result of the depletion of the resources in land based mines and in future it may be the only option for the sustenance of human kind.

Keywords: Hydraulic Transportation System, Positive Displacement Pump, Deep Sea Mining.

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Experimental Study and Testing of Solar Operated Chaff Cutter

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Abstract

Solar energy is a renewable energy. Earth continuously intercepts solar power of about 1.78 x 1011 MW. By using solar energy converging devices solar energy may be converted into other form of energy. Use of solar energy in agricultural field is essential now-a-days. Solar photovoltaic system converts solar energy directly into electrical energy using solar photovoltaic cell. Increasing wind velocity improved the power generated by solar panel .The main aim of this paper is experimental study and testing of solar operated chaff cutter. A solar operated agricultural chaff cutter uses solar panel to absorb the spectrum of solar energy is quite wide and its intensity and that energy converted into electric energy via solar PV system. Experimental model of solar operated chaff cutter is taken into consideration in this investigation. In this paper we also considered losses in solar panel, angle of solar panel with horizontal, performance of cutter.

Keywords: Solar Energy, Agriculture, Chaff cutter.

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Design and Optimization of Forming Aluminum 2024 Alloy using ANSYS and Taguchi ANOVA Analysis

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Abstract

The aluminum association alloys designated 2XXX aluminum alloys have significant applications in automobile and aerospace industries because of their high fatigue resistance, high strength to weight ratio and wear resistance. Their hot working range is limited because their high temperature flow properties are relatively strong and the alloys are prone to developing melting at higher extrusion temperatures. The present investigation focuses on forming of aluminum A2024 alloy. The Effect of processing parameters such as solution temperature, solution zing time, age hardening temperature, age hardening time on material flow, formability and hardness of the alloy was studied in detail. Conventional press with movable punch was employed for sheet forming of aluminum alloy. Forming process involved cold working of aluminum 2024 during deep drawing (forming) operation. Cold work resulted in grain elongation and hardening of the alloy. Premature fracture occurred before reaching the desired depth. Tuning the process parameters facilitated the material flow, ultimately improving the formability of the alloy with current process. Finite element analysis was performed using ANSYS for predicting and augmenting forming behavior of the alloy.

Taguchi's L9 design is employed to simulate the experiments for each set of chosen forming process variables via Finite Element Analysis (FEA) solver. Analysis of variance (ANOVA) is adopted to check the significance of the input variables on the output responses. Then, the optimal process parameters are determined using Taguchi's method.

Keywords: 2024 Alloy, Forming Process, Cold Working, FEA Analysis, Taguchi Analysis.

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Simulation of Micro-Chip Heat Sink to Investigate the Thermo-Fluid Behavior and Temperature Distribution

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Abstract

The efficient cooling from heat sinks is important for the proper functioning and longevity of a central processing unit (CPU). In this Project, ANSYS simulation of a modified micro-fin heat sink was done and the results were analyzed to get an idea of the approximate rate of Heat transfer, Temperature distribution and Thermo fluid behavior of the heat sink mounted on the central processing unit. Air cooling methods by free convection and conduction are used for heat extraction. The simulation was based on the effects on inlet fluid velocity, design of fins and location of source on the performance of the Heat Sink. The Turbulent SST model is used. The Heat transfer rate, temperature and pressure distribution were obtained for different designs of fin. After complete analysis, an increased air flow velocity at inlet and thin sheet fins with source at the bottom of heat sink provides the most effective heat transfer rate.

Keywords: Micro-Chip Heat Sink, Heat Transfer, Temperature Distribution, ANSYS, Turbulent SST Model.

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FEM Analysis of Super Austenitic Stainless-Steel Flange

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Abstract

In this paper structural analysis and topological optimization of bolted joint Flange fitting using Super Austenitic Stainless Steel have been studied in order to achieve effective structural design. Flange fittings are used to connect pipes, pumps, valves, shafts and supporting structures where the connection between two flanges is very prone to corrosion. The failure of one of these connections could cause severe damage. In this study FEA analysis has been performed on flange fitting using Super Austenitic Stainless Steel. The current work has been initiated from designing a 3D model of Flange Fitting in Auto-Cad which then imported to Ansys Design Modeler for structural, modal analysis and topological optimization. Static structural analysis is usually done for finding overall strength of the design. Equivalent stresses (Von Mises), Total deformations and modal analysis on Flange fitting of Alloy steel and Super Austenitic Stainless Steel (UNS S31254) have been evaluated for checking the stability of the flange fitting. The aim of this study is to reduce the weight of the flange fitting using mass reduction as a constraint in topological optimization. A comparative result between optimized design and original design has been described within this study.

Keywords: Super Austenitic Stainless Steel, Flange Fitting, Topological optimization, Modal analysis, Weight Reduction.

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A Survey on Underwater Image Processing Techniques

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Abstract

Images taken underwater generally suffer from various forms of degradation due to the effects of absorption, light scattering due to suspended particles, presence of background light, low light, et cetera. Over the years, researchers have put forth various underwater image enhancement and restoration techniques to improve the conditions of these images to assist in the examination and analysis of marine life forms and underwater objects. This paper aims to provide a summary and analysis of a few recent existing underwater image enhancement and restoration techniques that were put forth in the past six years. Also, the performance of a few of the methods was evaluated both subjectively and objectively.

Keywords: Underwater Image Enhancement, Underwater Image Restoration, Scattering, Noise.

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Solution of Temperature Fluid Particle in Incompressible Dusty Fluid with the Effect of Week Induced Magnetic Field

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Abstract

The presence of contaminating dust particles in fluids can occur naturally. These problems associated with the flow characteristics and their properties are of fundamental interest in the field of fluid mechanics, the effect of magnetic field of suspended particulate matter on axially symmetrical jet mixing of incompressible dusty fluid has been considered. The presence of dust particles in a homogeneous fluid makes the dynamical study of flow problems quite complicated. Here we are assuming the velocity and temperature in the jet to differ only slightly from that of surrounding stream, a perturbation method has been employed to linearize the equation those have been solved by using Hankel's Transformation technique. Naturally, the studies of these systems are mathematically interesting and physically useful for various reasons.

Keywords: Particulate Suspension, Boundary Layer Characteristics, Volume Fraction, Incompressible Flow.

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Plant Disease Prediction Using Deep Learning

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Abstract

Plant diseases are one of the grand challenges that face the agriculture sector world- wide. In India crop diseases cause losses of a major part of crop production annually. Despite the importance, crop disease diagnosis is challenging for limited-resources farmers if performed through optical observation of plant leaves' symptoms. Therefore, there is an urgent need for markedly improved detection, monitoring, and prediction of crop diseases to reduce crop agriculture losses.

Computer vision empowered with Machine Learning (DL) has tremendous promise for improving crop monitoring at scale in this context. This paper presents a DL-powered mobile based system to automate the plant leaf disease diagnosis process. The developed system uses Convolution Neural networks (CNN) as an underlying deep learning engine for classifying various disease categories. We collected an imagery dataset containing 96,206 (working on) images of plant leaves of healthy and infected plants for training, validating, and testing the CNN model. The user interface is developed as an Android mobile app, allowing farmers to capture a photo of the infected plant leaves. It then displays the disease category along with the confidence percentage. It is expected that this system would create a better opportunity for farmers to keep their crops healthy and eliminate the use of wrong fertilizers that could stress the plants. Finally, we evaluated our system using various performance metrics such as classification accuracy and processing time. We found that our model achieves an overall classification accuracy of 94% in recognizing the most common plant diseases.

Keywords: Plant Disease, Deep Learning, Convolution Neural networks.

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Face Masks Using Nanotechnology

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Abstract

In today's times, corona virus has been one of the biggest challenges to the healthcare community predominantly due to its high infection rate. Researchers have been successful to a great extent in the development of vaccines and understanding the evolution of the harmful virus and its mechanism of action. However, there is always a threat of new variants of the virus coming up. Therefore, it is absolutely essential for us to maintain social distancing along with the mandatory use of face protection. The use of masks is very important in preventing the transmission of the coronavirus. In recent times, nanoparticles having biocide properties are finding increasing applications in the development of face masks. Nanomaterials have been introduced in to mask-making and various face mask designs have been extensively studied to check the filtration efficiency and breathability in addition to antiviral protection. Apart from that, the possibility of side effects on the skin and lungs as well as the environment is also being analyzed. This paper presents an overview of some important properties of nonmaterial's and their utilization in making more efficient facemasks along with presenting the guidelines for using these nonmaterial's for making protective equipment for fighting SARS COV-2.

Keywords: Face Mask, Nanotechnology, SARS COV-2.

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Image Caption Generator Using CNN and LSTM

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Abstract

This project entitled "Image Caption Generator Using CNN and LSTM" is a work that demonstrates the automated generation of captions for a wide variety of images. This technology is used by major tech-giants like Google, Microsoft, IBM, etc. to generate captions for the huge dataset of images produced over various platforms and social media websites. This project embodies the use of various Artificial Neural Networks namely CNN (Convolution Neural Networks), RNN (Recurrent Neural Networks) and LSTM (Long Short-Term Memory) Units. The functionality of the model developed using these neural nets. It has been rendered to an interactive Web Application for the users to understand the methodology.

Keywords: Convolution Neural Networks, Recurrent Neural Networks, Long Short-Term Memory, Computer Vision, Natural Language Processing.

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Colour Detection of an Object in an Assembly Line

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Abstract

Nowadays, vision systems are used in many things to run the industries error free with great accuracy and for that, image processing is one of the keys that is used in this paper. This paper focuses on product differentiation using the colour detection method in real time with the help of MATLAB software. First task is to take snapshot from the web cam and convert that RGB image into HSV image, in this HSV image plays a vital role in colour description as it make easier they need luminous of the image. Threshold value of HSV used for differentiating colour ,after applying the threshold values some of the correction are done for avoiding any kind of error like erosion, dilution and holes.

Keywords: Image Processing, Colour Detection, MATLAB.

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Technologia:ARSET-2022

Procedure to Change the Direction of Rotation of Dual Winding Synchronous Motor "AC Electric Drive System"

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Abstract

In some of the power plants, dual windings synchronous motors are used in Induced Drafts (ID) Fans for which Variable Voltage and Variable Frequency Drive (VVVFD) is used for smooth speed control at different operating loads. Dual Winding Synchronous Motor is a motor with two stator windings on same stator with 300 magnetically apart constructions, and fed by high electrical voltage (2 to 4 KV) from dual HV sources having vector difference of 30 deg available due to (Dd0) and (Dyn1) vector group transformers. One of the dual winding is fed from Do transformer and another winding is fed from Dyn1 Transformer through VVFD system mounted with several racks of thyristors. The compensation of this vector group will be done at VVFD Panel controllers for smooth firing of the thyristors without any overlapping during conduction from both HV sources. The direction of rotation of motor from both windings must be uniform/in same direction. So, during the initial startup of motor from each winding the direction of rotation to be checked one by one. In case of opposite direction of rotation with any one of the winding, special care to be taken for interchanging any two terminals of winding through which the direction of rotation is found reverse/opposite. This article will guide and comes out with the procedure for changing the direction of rotation of dual winding synchronous motor, when the direction with any winding is found in opposite with respect to other.

Keywords: Dual Winding Synchronous Motor, AC Electric Drive System, Variable Voltage and Variable Frequency Drive.

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