IEI Epitome

January 2021, Volume 6, Number 1

A Century of Service to the Nation

Contents

Members in the News

Mr Ashwani Kumar Saxena, FIE

Chairman, Board of Governors, Sustainable Development Forum, The Institution of Engineers (India)

Delivered Lecture during International Conference held through virtual mode on Engineering Education Accreditation (ICEEA), 2021, Myanmar, on the topic 'Quality Engineering Education towards Sustainable Development' on 15 January, 2021.

Mr Sangam Sinha, FIE

Director, Vehicles Research & Development Establishment, Ahmednagar, and Chairman, Ahmednagar Local Centre, The Institution of Engineers (India)

Has been conferred with the prestigious Award for Strategic Contribution by DRDO, Ministry of Defence, Government of India. The Award was presented by Shri Rajnath Singh, Hon'ble Defence Minister, Government of India at DRDO Bhavan, New Delhi in the august presence of Gen Bipin Rawat, PVSM, UYSM, AVSM, YSM, SM, VSM, ADC, Chief of Defence Staff (CDS) of India and Dr G Satheesh Reddy, Secretary, Department of Defence R&D, Chairman, DRDO and Director General, Aeronautical Development Agency on 18 December 2020.

Mr V Sundara Siva Kumar, AMIE

ECE Department, Dr K V Subba Reddy College of Engineering for Women, Kurnool

Promoted as Associated Editor of the International Journal of Applied Industrial Engineering (IJAIE).

Mr Balkar Singh, FIE

Advisor (Energy Efficiency), Former Joint Director, Punjab Energy Development Agency, Chandigarh

Shared his valuable knowledge as Key Note Speaker during celebration of World Habitat Day on 5 October, 2020 on the theme of 'Housing for All – A Better Urban Future' and during celebration of National Energy Conservation Day on 14 December, 2020 by Punjab & Chandigarh State Centre of The Institution of Engineers (India) at Chandigarh through online presentation.

Members in the News

Prof (Dr) Indrasen Singh, FIE
Senior Professor and Dean, National Institute of Construction Management and Research, Goa

Conferred with Asia Pacific Educationist Award and Certificate of Excellence by International Institute of Education and Management, for outstanding achievements and remarkable role in the field of Education at New Delhi on 28 October, 2020.

Dr Krishna Nirmalya Sen, FIE
Head, Environment Health and Safety, L&T Metallurgical & Material Handling

Elected as the Fellow of the Collegium Ramazzini, an international scientific society that examines critical issues in occupational and environmental medicine with a view towards action to prevent disease and promote health.

Mr T Raveendra Babu, MIE
Executive Engineer, Central Public Works Department, Bhubaneswar

Obtained First Rank in AP LawCET 2020 Common Entrance Examination for admission in 3-year LLB course.

Mr Arvind Kumar Mishra, FIE
Managing Director, Mangdechhu Hydroelectric Project Authority (MHPA), Bhutan

Received the Brunel Medal Award on behalf of NHPA from The Institution of Civil Engineers, UK for service to Civil Engineering.

Dr G S Mukherjee, FIE
Defence Research and Development Organization, Delhi

Delivered Invited Talk at the International Online Conference on Macromolecules (ICM 2020) and also chaired a Session, organised by Mahatma Gandhi University, Kottayam, Kerala and Gdansk University of Technology, Chemical Faculty, Gdansk, Poland, during 13-15 November, 2020.

Publication by Members

Mr Naga Eswara Naveen Pasala, AMIE

Department of Mechanical Engineering, N S Raju Institute of Technology (NSRIT), Visakhapatnam, Andhra Pradesh

Email: pne.naveen@gmail.com

Title of Paper: "Design and Analysis of Thin Wall Gear Structure with Tio2/GF Reinforced Nylon66 Composites", *Materials Today: Proceedings, 2020.*

https://doi.org/10.1016/j.matpr.2020.09.212

Co-authors: Batha Sujith Kumar, Bhanu Kiran Goriparthi, Ravi Sankar Hota, M. Chaitanya Mayee, S.S.S.V.Gopala Raju.

Abstract: In machineries, to increase or decrease the speed, gear is very much needed. Such machineries are now days are compact design with less weight. Gears must occupy minimum spaces and materials reduction is required. For that, one of the best options is rimmed gears. The aim of the paper is to design and analysis of different thin-rimmed gear for high strength with high speed of rotations under harsh condition. The composite materials are in trend in recent years. High heat resistance and low wear characterized composite materials such as Nylon66 with TiO2, with and without glass; fibres are implemented in thinned rimmed gears. With TiO2, volume of percentage varies from 0% to 6%, which are used in analysing the individual gear models. The effect of web thickness, web positions, rim thickness, module, hub thickness and face width parameters are analysed to find out the strength that depends on the type of materials and gears, which are analysed in this paper.

Keywords: Thin Rimmed Gears; Composite Materials; Structural Analysis; FEM.

Title of Paper: "Fatigue Behaviour of Gears with Different Loading Conditions", *Materials Today: Proceedings, 2020.*

https://doi.org/10.1016/j.matpr.2020.10.369

Co-authors: Rama Santosh Kumar Annepu, Ravi Sankar Hota, Bhanu K Goriparthi, K Raghu Ram Mohan Reddy, V Satyanarayana.

Abstract: Gears transmit motion, without connector or intermediate link, by direct contact. The tangential contact is made between the surfaces of mating gears, which have either rolling/sliding motion along the point of contact. When two bodies, having curved surfaces, are pressed together, the tangential contact changes the contact area resulting into the development of three-dimensional stresses. The contact stresses develop when each meshing body has a double radius of curvature, i.e., when radius in a perpendicular plane is different from the radius in the plane of rolling. In this paper we have studied fatigue behavior of gear wheels under different loading conditions, loading conditions are mainly deferred by the location of application of load i.e., top edge, teeth face lower edge, side edge, top corner, also two materials structural steel and aluminium are considered.

Keywords: Gears; Structural Steel; Aluminium; Fatigue.

Title of Paper: "Design and Optimization of Nylon 66 Reinforced Composite Gears Using Genetic Algorithm", *Materials Today: Proceedings 2020.*

https://doi.org/10.1016/j.matpr.2020.10.694

Co-Authors:Chaitanya Mayee M, PothalaGayathi, Bhanu Kiran G, K Raghu Ram Mohan Reddy.

Abstract: Lightweight and medium strength gears are very important in robotics and toys industries. In this paper, a short fiber reinforced thermoplastic materials are implemented to design the spur gears. Four types of materials with different compositions and main element is nylon 66 is considered in this present work. Initially, a robotic gear model is optimized using genetic algorithm by considering deformation and bending stress as constrains. These data are used to prepare the 3D model in CATIA software. Further analysis was planned in simulation tool called ABAQUS. Static structural, frequency and critical load analysis is performed using this software. The study on how dynamic loads on shaft are affected when the gear assembly rotates is done in this work. The results are compared to define the optimum and best suitable material for lightweight gears.

Keywords: Gear Weight Optimization; Natural Frequency; Vibration Analysis; Simulation; Inertia Forces on Gear; Structural Analysis.

Publication by Members

Dr Manikandan V M, AMIE

Asst. Professor in Computer Science and Engineering, SRM University, Andhra Pradesh

Email: manikandan.v@srmap.edu.in

Title of Paper: "A Block-wise Histogram Shifting based Reversible Data Hiding Scheme with Overflow Handling", *11th International Conference on Computing, Communication and Networking Technologies (ICCCNT), IIT Kharagpur, 2020, pp 01-06.*

DoI: https://doi.org/10.1109/ICCCNT49239.2020.9225552

Co-author: Kandala Sree Rama Murthy

Abstract: Design and development of reversible data hiding schemes are widely studied topic due to its wide scope in cloud computing and medical image transmission. This paper introduces a new reversible data hiding algorithm based on the histogram of the blocks of the cover images with an efficient overflow management technique. In the new scheme, the peak intensity value from each block is used for data hiding, and to make sure the correct recovery of the original image, the grayscale value used for data hiding from each block is embedded in the same block itself by replacing the least significant bits of eight selected pixels. The lossless recovery is ensured by embedding those least significant bits in the same block itself along with the secret message. Detailed theoretical analysis and experimental study of the scheme are carried out and discussed in this paper. The images from the standard image dataset of the University of Southern California (USC-SIPI) are used in our study.

Keywords: Reversible data hiding; Histogram shifting; Overflow handling; Secure message transmission

Dr Bhagirath Ahirwal, FIE

CSIR-Central Institute of Mining and Fuel Research (CSIR-CIMFR), Dhanbad

Email: ahirwalcmri@yahoo.co.uk

Title of Paper**:** "Stress Analysis due to Internal Explosion Pressure of Designed Flameproof Enclosure for Hazardous Area", *Process Safety Progress, American Institute of Chemical Engineers Journals, USA, 39 (2), 2020, pp 1-6.*

https://doi.org/10.1002/prs.12100

Co-authors: Rashmi Prasad, Sudhir Kumar Kashyap, Gautam Banerjee

Abstract: Flameproof (Ex d) enclosures are constructed in such a way that an internal ignition of a flammable atmosphere will not be transmitted outside of the enclosure and thereby preventing the ignition of surrounding flammables. The large Ex d enclosure was designed for gas group IIB explosive atmosphere with the help of MATLAB and ANSYS software and further a study of stress analysis due to internal pressure had been carried out on the plates and cover by keeping the thickness of body plate and cover constant. The study showed that stress was observed more in the center of the plate and reducing towards the edges of plates. The value of the length and breadth ratio (a/b) was found out with the help of the curve fitting method to calculate maximum stress (σ_{max}) in the designed Ex d enclosure. The calculated maximum stress of all the plates was less than the simulated results, so the simulated results indicated that the designed enclosure is within the safety limit and suitable for hazardous area.

Keywords: Flameproof; MESG; Explosion; Maximum Stress.

Publication by Members

Dr J Harikiran, MIE

Assistant Professor, Sr Grade-1, School of Computer Science and Engineering , Vellore Institute of Technology, VIT-AP, Near Vijayawada

Email: harikiran.jhk@gmail.com

Title of Paper: "Hyperspectral Image Classification using Support Vector Machines", *IAES International Journal of Artificial Intelligence (IJ-AI), 9(4), 2020, ISSN: 2252-8938, pp 684-690.*

DoI: http://doi.org/10.11591/ijai.v9.i4.pp684-690

Co-author: T Subbareddy

Abstract: In this paper, a novel approach for hyperspectral image classification technique is presented using principal component analysis (PCA), bidimensional empirical mode decomposition (BEMD) and support vector machines (SVM). In this process, using PCA feature extraction technique on Hyperspectral Dataset, the first principal component is extracted. This component is supplied as input to BEMD algorithm, which divides the component into four parts, the first three parts represents intrensic mode functions (IMF) and last part shows the residue. These BIMFs and residue image is further taken as input to the SVM for classification. The results of experiments on two popular datasets of hyperspectral remote sensing scenes represent that the proposed-model offers a competitive analytical performance in comparison to some established methods.

Keywords: Bi-dimensional Empirical Mode Decomposition (BEMD); Hyperspectral Image; Image Classification; Support Vector Machines; Image processing.

Title of Paper: "Gridding and Supervised Segmentation Method for DNA Microarray Images". In: Chaki N, Pejas J., Devarakonda N, Rao Kovvur R M (eds), *Proceedings of International Conference on Computational Intelligence and Data Engineering (ICCIDE 2020). Lecture Notes on Data Engineering and Communications Technologies, 56. Springer, Singapore, pp 93-102.*

https://doi.org/10.1007/978-981-15-8767-2_8

Co-authors: B Saichandana, B Srinivasa Rao, T Subbareddy

Abstract : This paper mainly focusses on the image gridding and segmentation methods of micro array analysis. The process of gridding is to divide the image into sub-array of spots (sub-gridding) and sub-arrays are again divided into spot areas(spot detection). Most of the existing methods depend on parameters such as number of rows/columns, spots count in each row/column, and size of sub-array. In this paper, a gridding algorithm is presented without any human intervention removing any parameter initializations. In the segmentation step, first the pixels are classified as spot/background using Support Vector Machine (SVM). This classification result is used for segmentation of spot area in gridded image block. The results show the proposed algorithms that perfectly grids the micro array image and perfectly segments the spot area from background. The log-ratio values calculated for each spot determines the transcription abundance of each gene.

Keywords: Microarray Image; Image Segmentation; Mathematical Morphology; Support Vector Machines.

Publication by Members

Dr Punith Kumar M B, MIE

Associate Professor, Department of Electronics and Communication, PES College of Engineering, Mandya, Karnataka

Email: punithpes@gmail.com

Title of Paper: "Automated Quality Inspection of PCB Assembly Using Image Processing", *International Journal of Image, Graphics and Signal Processing, 3, 2020, pp 13-19.*

DoI: 10.5815/ijigsp.2020.03.02

Co-authors: Dr Shreekanth T, Prajawal M R

Abstract : Quality inspection of PCB is a crucial stage in the assembly line as it provides an insight on whether the board works correctly or not. When the inspection is done manually, it is susceptible to human errors and is time consuming. The boards should thus be inspected at every stage of the assembly line and the process should be dynamic. This is achieved in this work through three crucial stages in the assembly line and by replacing the conventional manual inspection by using image processing to obtain a faster and more precise quality inspection. The solder paste inspection consists of pre-processing using blue plane conversion, comparing with the unsoldered board in blue color plane and post processing using overlay. The X-ray inspection basically consists of pre- processing the captured image by RGB to gray conversion with thresholding, comparing with the expected image and post processing using overlay to show the shorts that has occurred along the assembly. The conformal coating inspection uses conversion of the blue intensity emitted off the board under UV light to RGB scale. Each of the algorithms were tested using 48 actual in-production boards from Vinyas IT Pvt Ltd, a PCB assembly company based in Mysore. The processing time of the algorithms were found to be less than 2 seconds with an accuracy of 85.7%. The system was also found to be cost effective over existing systems available in the market.

Keywords: Image Processing; Solder Paste; X-Ray; Conformal Coating; PCB; Automation.

Title of Paper: Virobot the Artificial Assistant Nurse for Health Monitoring, Telemedicine and Sterilization through the Internet", *International Journal of Wireless and Microwave Technologies, 6, 2020, pp 16-26.*

DoI: 10.5815/ijwmt.2020.06.03

Co-author: Dr Manikant Amaresh Savadatti

Abstract: We all know that during pandemic like corona or generally in hospitals, the front-line workers such as doctors, nurses, compounder in hospitals are nearest to the patients. They all need to look after the patients without caring about themselves and hence doctors, nurses, workers have a high chance of getting contacted to the disease. And few of the medical personnel fearing for the disease and their health, they are not ready to work in the hospital. Hence to tackle this problem we have come up with a solution i.e.,Virobot-The artificial nurse. The result of this project is a robot that is designed to act as a medical assistant robot which can be controlled by nurses or doctors from a distance using their smart phone or it can just use autonomous navigation to reach the patients and give them required medicines, monitor patients health and stream all the patient information wirelessly through the internet to your palm(mobile). And, it has built-in UV sterilizer lights, which sterilizes the hospital wherever it travels. Notonly it can carry lightweight packages and sterilize the hospital, It can be used as a telecommunication robot ad establish communication between doctor and patient since it is a built-in FPV camera and a Bluetooth speaker. The best thing is all these features are connected to the internet hence the doctor can get data from the robot from anywhere around the world.

Keywords: Assistant Medical Robot; Autonomous Robot; Blynk Robot; Communication Robot; Health Monitor Robot; Internet robot; IOT Robot; Line Follower; UV Sterilizing Robot; Wi-Fi Controlled Robot.

Publication by Members

Mr Bishwajit Sharma, AMIE

Department of Mechanical Engineering, NIT Durgapur, West Bengal

Email: sharmabishwajit93gmail.com

Title of Paper: "Steady Laminar Flow Past a Slotted Circular Cylinder", *Physics of Fluids, American Institute of Physics (AIP), 32, 073605, 2020.*

DOI: https://doi.org/10.1063/5.0007958

Co-author: Dr R N Barman

Abstract : A numerical study of the viscous flow past a slotted circular cylinder is presented for the low Reynolds number (Re) regime. The computations are carried out for Re varying from 10 to 50 since it is observed that the flow separation causes the bubble formation at Re > 7 and its shedding at Re > 47 for the slotted cylinder. The solid circular cylinder is modified with three different shapes of slit (converging, diverging, and parallel) of width 0.1 times diameter (0.1D) of the circular cylinder located symmetric to its horizontal axis. Analysis is carried out to understand the flow pattern and effect of slit shapes on the bubble formation, flow separation, and drag coefficient at low Re. It is observed that the size of the bubble increases with an increase in Re and attains the highest value for the cylinder with no slit. The drag coefficient decreases with an increase in the Reynolds number, but it is highly influenced by the viscous effect imparted by the slits. Having a minimum value of pressure drag for the slotted cylinders compared to the normal cylinder, the total drag is found to be maximum due to the dominance of the viscous drag.

Keywords: Laminar; Steady; Cylinder; Slit; Drag; Finite Volume Method.

Prof (Dr) Sushovan Sarkar, FIE

Head, Department of Civil Engineering, Dr Sudhir Chandra Sur Institute of Technology and Sports Complex, Kolkata

Email: hod_ce@dsec.ac.in

Title of Paper: "Fungal Contamination and Exposures in Different Water Resources, Hazards and Remediation", *Journal of Indian Chemical Society, 97 September 2020, pp 1-9.*

https://indianchemicalsociety.com/journal/abstract_s_details.php?journal=NTM2

Co-authors: Rubaid Naskar, Nityananda Ghosh, Samir Mukherjee

Abstract: The fungi population in water has gained attention during the three decades. In this review, article attempt has been made to show its vulnerability as numbers of fungal species are now treated as water contaminants to indicate diseases in the human body. However, the importance of study of fungi has been less focused on surface water, groundwater systems and in agricultural wetlands. Time has come to correlate the population of fungi species isolated and identified from different sources of water-related with the climate change. The number of the fungal species are isolated and identified by the researchers may or may not have common occurrence but those definitely contaminate surface water at the different sources as well as different countries of the globe. In some cases, study has been made to analyze the occurrence of yeasts and filamentous fungi in the water body to investigate their correlation with bacterial indicator and faecal pollution1.

Keywords: Ground Water; Climate Change; Filamentous Fungi; Faecal Pollution; Effects on Human Beings; Remediation.

Publication by Members

Dr K Sujatha, MIE

Professor, CSE Department, Dadi Institute of Engineering & Technology, Anakapalle, Visakhapatham

Email: sujathak@diet.edu.in

Title of Paper: "Institute Examcell Automation with Mobile Application Interface. In: Satapathy S., Bhateja V., Janakiramaiah B., Chen YW. (eds) Intelligent System Design". *Advances in Intelligent Systems and Computing, 1171. Springer, Singapore, 2020, pp 63-69.*

https://doi.org/10.1007/978-981-15-5400-1_7

Co authors : Sujatha Thulam, Surendra Talari

Abstract : Nowadays examcell runs in every college which maintains the student lists and results. However, activities are mostly done manually and this involves a lot of paperwork and delays in searching for relevant data. The manual process of student registration and result generation is always bulky and tedious. All these problems can be eliminated if the college examcell system is automated. Institute Examcell Automation with Mobile Application Interface will make examcell activities more efficient by covering the important drawbacks of manual system, namely speed, precision and simplicity. By this system, the examination coordinators can easily conduct the registration of the students and generation of instant results systematically. This also needs 'less manpower' to execute the system and is more efficient in producing Graphical Output. Organizations can easily check the performance of the student that they give in examinations. As a result of this Organizations can view this result easily. This will also help the students and parents in knowing their percentage and backlogs. Using machine learning the results are predicted to check the students will pass/fail. This system can be used by any colleges who need to automate examcell in the college.

Keywords: Institute Examcell Automation with Mobile Application Interface (IEAM); Instant Results Graphical Output; Machine Learning Algorithms.

Mr S S Basavaraj, AMIE

Assistant Professor, Department of Electronics and Telecommunication, Annasaheb Dange College of Engineering & Technology, Sangli, Maharashtra

Email: raj.ec008@gmail.com

Title of Paper: "Synthesis of ZnO Ultra-Thin Film-Based Bottom-Gate Phototransistors for UV Detection". *Journal of Electronic Materials 49, 2020, pp 5272–5280.*

https://doi.org/10.1007/s11664-020-08280-x

Co-authors: Aniruddh Bahadur Yadav, C R Byrareddy, N V L Narasimha Murty

Abstract : The present study illustrates the fabrication of ZnO ultra-thin film (25 nm)- based bottom gate phototransistors using RF sputtering and thermal evaporation on SiO2/Si substrate for UV detection. According to the literature, phototransistors have the ability to solve persistent photoconductivity (PPC).PPC increases the response time of metal oxide semiconductor-based conventional two-terminal photodetectors. Prior to transistor fabrication, the surface of the deposited ZnO thin film was treated with hydrogen peroxide (H2O2) in order to improve its crystal structure, surface morphology, energy bandgap, and electrical conductivity. The characteristics of ZnO thin film were investigated by atomic force microscope (AFM), field emission scanning electron microscopy (FESEM), x-ray diffraction (XRD), photoluminescence (PL), and x-ray photoelectron spectroscopy (XPS). The electrical and optical performance of phototransistors were investigated by measuring their output and transfer characteristics in dark and UV light. H2O2 treatment was found to be effective in producing efficient optical detection phototransistor. Optoelectronics properties (for UV detection) of the fabricated phototransistors were studied by using low-intensity and low power commercial LEDs of 365 nm wavelength.

Keywords: ZnO Thin Film; Bottom-gate Phototransistor; RF Sputtering; UV detection

Publication by Members

Dr Ravishankar Sathyamurthy, MIE

Associate Professor, Department of Mechanical Engineering, KPR Institute of Engineering and Technology, Arasur, Coimbatore, Tamil Nadu

Email: raviannauniv23@gmail.com

Title of Paper: "Experimental Investigation on Cooling the Photovoltaic Panel using Hybrid Nanofluids", *Applied Nanoscience, 11, 2021, pp 363-374.*

https://link.springer.com/article/10.1007/s13204-020-01598-2

Co-authors: A E Kabeel, Ali T Chamkha, Alagar Karthick, A Muthu Manokar, M G Sumithra

Abstract : This work presents an experimental investigation on the use of CNT/Al_2O_3 hybrid nanoparticles in a Photovoltaic/ Thermal (PV/T) system to enhance the photovoltaic electrical efficiency by reducing the temperature of PV cell. An experimental comparison on thermal and electrical efficiency of PV panel with and without cooling is experimentally analyzed. Furthermore, instead of using a serpentine tube collector, a spiral tube collector is used to enhance the rate of heat transfer from the photovoltaic panel. From the experimental results it is found that the enhancement is observed in the average electrical efficiency with water and nanofluid in the spiral tube collector and found as 7.15 and 8.2% respectively, whereas, the standalone photo voltaic panel it is found as 6.2%. The efficient removal of heat from the collector increased the power production by 11.7 and 21.4% using water and hybrid nanofluid in the PV/T system respectively, while compared to standalone PV system. Similarly, the overall PV/T efficiency using hybrid nanofluids in the spiral tube collector enhances by 27.3% than using water medium.

Keywords: PV/T; Electrical; Thermal; Enhancement

Title of Paper: "Augmenting the Potable Water Produced from Single Slope Solar Still using CNT-doped Paraffin Wax as Energy Storage: An Experimental Approach", *Journal of the Brazilian Society of Mechanical Sciences and Engineering, 42, 625, 2020, pp 1-10.*

https://link.springer.com/article/10.1007/s40430-020-02703-w

Coauthors: Ali J Chamkha, D Dsilva Winfred Rufuss, A E Kabeel, Mohammed Abdelgaid, A Muthu Manokar, B Madhu

Abstract: The present study aims to find the technical feasibility of recently evolved nanomaterial, i.e. carbon nanotubes (CNT), enhanced with paraffin as a novel energy storage material for desalination application. As a primary investigation, the thermo-mechanical properties like density, melting point, thermal conductivity, etc., of CNT enhanced paraffin were first analysed and then integrated with solar desalination application. Three solar desalination stills: (i) conventional solar still, (ii) solar still loaded with fossil paraffin and (iii) solar still loaded with CNT-doped paraffin were fabricated and experimented at Chennai, India (Lat. 13° 08′ N, Long. 80° 27′ E). From the investigation, it is inferred that there is a significant increase (of about 26%) observed in the thermal conductivity of CNT-doped paraffin as compared to fossil paraffin. The cumulative yield of the conventional still, solar still with paraffin and solar still with CNT enhanced paraffin was found to be 2.5 kg/m^2, 3.4 kg/m^2 and 5.8 kg/m^2, respectively. There was 41.4% and 26.4% enhancement, respectively, observed in the daily yield of the solar still with CNT-doped paraffin as compared to conventional still and the still with virgin paraffin. The productivity efficiency was 46.45% for the still with CNT blended paraffin contributing to 24% and 19.6% increase in the efficiency as compared to the other two stills considered for experimentation in this study. Thus, it is concluded that CNT enhanced paraffin is identified as a better potential energy storage material as compared to conventional paraffin in solar desalination application.

Keywords: Energy Storage; Carbon Nanotubes; Paraffin Wax; Yield; Desalination.

Mr Vedang Ratan Vatsa, AMIE

IT & Management Consultant

Email: vedangvats@gmail.com

Title of Paper: "Identification and Mitigation of Algorithmic Bias through Policy Instruments", *International Journal of Advanced Research, 8(7), 2020, pp 1515-1522.*

DoI: http://dx.doi.org/10.21474/IJAR01/11418

Co authors: Rahul Sethi, Parth Chhaparwal

Abstract : With the increasing implementation of technologies like Artificial Intelligence, Machine Learning and sophisticated data analysis algorithms, the process of decision-making and recommendations is being automated with more emphasis on a trained system to generate valuable required outcomes. Taking into consideration the aspect of how the mechanism of any computer-based decision-making process takes the order, this paper aims at understanding the possibility of bias in any output, which may, further, become a cause for bias in the real world. This paper tries to address a stepwise approach to discovering the factors of how such a bias can be quantified and presents a view of the impact parameters for various stakeholders while trying to process an approach for the overall fairness of the system.

Keywords: Algorithmic Bias; Artificial Intelligence; Machine Learning; Policy; Data Governance; Data Analysis.

Publication by Members

Mr Dattu B Ghane, MIE

Department of Mechanical Engineering, Government Polytechnic Awasari, Khurd

Email: dattu.ghane@gmail.com

Title of Paper: "A CFD and Heat Flux Analysis of Various Plasma Arc Cutting Nozzles by using ANSYS", *International Research Journal of Engineering and Technology (IEJET), 07(12), 2020, pp 718-727.*

https://www.irjet.net/archives/V7/i12/IRJET-V7I12125.pdf

Abstract : Recently various types and different sizes of plasma arc cutting nozzles are used for the different types of metal cutting. Mainly plasma arc cutting nozzle sizes are 1/16, 3/64, 1/32 and 5/64 considered for the analysis. From the experimentation and analysis done before on these nozzles operating parameters of the plasma arc cutting machine and nozzle design parameters are taken in consideration as prime affecting factors. That experimentation and analysis was includes dimensional analysis, roughness parameters and amount of material removed of cutting materials as operating parameters for optimization for machine. Also includes effect on design parameters as nozzle shell diameter, nozzle length after burning and nozzle inner shell center pin diameter after burning to find out the minimum wear nozzle size i.e. 3/64. However this paper gives the results on a CFD and heat flux analysis of these plasma arc cutting nozzles with different sizes i.e. 1/16, 3/64, 1/32 and 5/64 by using ANSYS software. Nozzle meshed models with brick and triangular 981 elements and 3024 nodes are used for the analysis considering the uniformly distributed maximum load as 5000 N. During analysis the maximum and minimum limit is found out by this analysis for these nozzles as safe operating zone with respect to stress and strain produced while metal cutting.

Keywords: ANSYS Software; CNC Plasma; CFD; Heat Flux Analysis; Nozzle Wears etc.

Dr Kaarthik M, MIE

Assistant Professor, Department of Civil Engineering, Coimbatore Institute of Technology, Coimbatore

Email: kaarthik@cit.edu.in

Title of Paper: "A Sustainable Approach of Characteristic Strength of Concrete using Recycled Fine Aggregate", *Science Direct, Materials Today: Proceedings, 2020.*

https://doi.org/10.1016/j.matpr.2020.11.058

Co-author: D Maruthachalam

Abstract : Waste handling and management is the major problem faced by the countries in the modern era. Concrete demolition waste has been one among the source of creating environmental pollution. There have been many strength and durability studies taken place to analyze the concrete made with coarse aggregate which has recycled from the old concrete structures and proved high strength compared to the concrete made with new materials. Those research works are limited in analyzing of finer divisions of the concrete made with the aggregates which has recycled. This paper concentrates the applications of Recycled Fine Aggregate (RFA) as partially or complete replacement instead the fine aggregates available naturally to prepare the concrete. The strength of the concrete partially replaced by RFA was investigated and the results suggest that 60% substitution is optimal.

Keywords : Concrete Demolition; Recycled Fine Aggregate; Mechanical Properties; High Strength

Publication by Members

Dr Nitesh Prakash Yelve, FIE

Dean, Postgraduate Studies and Associate Professor, Department of Mechanical Engineering, Fr C Rodrigues Institute of Technology, Vashi, Navi Mumbai

Email: niteshpy@gmail.com

Title of Paper: "Theoretical and Experimental Measurement of Intrinsic and Fatigue Induced Material Monlinearities using Lamb Wave-based Nonlinearity Parameters", *Measurement, 151, 2020, 107148*

https://doi.org/10.1016/j.measurement.2019.107148

Co authors: Faeez Masurkar, Peter W Tse

Abstract: The paper presents development and application of amplitude and physics based parameters for measuring intrinsic and fatigue induced material nonlinearities of plate materials considering Lamb wave motion into them. The amplitude based parameter is derived using Lamb wave equations and expressed in terms of amplitudes of the harmonics. This parameter can be evaluated directly from the results of experiments. The physics based parameter is derived considering the fundamental dislocation theory and it depends on percent fatigue life. It is used to construct a theoretical nonlinearity curve (TNC). Both the parameters are evaluated for Al 7075-T651 at different percents of fatigue life and compared. The close agreement of results show that with reference of TNC, the amplitude based parameter obtained from a field test can be used for estimating the remnant useful life of a plate structure as formation of dislocation substructures during fatigue loading is a prestage of microcrack formation.

Keywords: Material nonlinearity measurement, Nonlinearity parameters, Lamb waves, Plate structures, Remaining useful life

Title of Paper: Estimation of Remaining useful Life of Fatigued Plate Specimens using Lamb Wave-based Nonlinearity Parameters", *Structural Control and Health Monitoring, 27(4), 2020.*

https://doi.org/10.1002/stc.2486

Co authors: Faeez Masurkar, Peter W Tse

Abstract: The present study focuses on estimating material nonlinearity and consequently remaining useful life of fatigued specimens using the amplitude and physics-based material nonlinearity parameters evaluated for Lamb wave motion in plate specimens. The amplitude-based nonlinearity parameter depends on amplitudes of the Lamb wave harmonics generated due to material nonlinearity. Here, it is employed to estimate the inherent and dislocation induced material nonlinearities for different stages of fatigue. The cumulative effect is obtained from the strict matching of phase and group velocities of the S1 - S2 mode pair. The physics-based nonlinearity parameter is obtained from the higher order elastic coefficients, plastic coefficients, and substructural evolution parameters. It does not depend on wave propagation distance; however, it depends on percent fatigue life. Thus, it is used to construct a theoretical nonlinearity curve. A spectral amplitude normalization technique is given to systematically evaluate the material nonlinearity, once the Lamb wave data over different wave propagation distances are known either from experiments or from simulations. The values of amplitude-based nonlinearity parameter thus estimated through the simulation and experiments for different fatigue stages are then plotted onto the obtained theoretical nonlinearity curve. A reasonably good agreement is seen between the fatigue life estimations given by both the nonlinearity parameters. Thus, the amplitude-based nonlinearity parameter obtained from the Lamb wave response can be effectively used to estimate the remaining useful life of the fatigued plate specimens.

Keywords: Lamb Waves; Inherent Material Nonlinearity; Dislocation Induced Material Nonlinearity; Material Nonlinearity Parameters; Fatigue; Remaining Useful Life.

IEI Technical Webinar

The Institution of Engineers (India) has introduced online technical events, which are being organized under the nomenclature **'IEI Technical Webinar'**. The programmes are approved Continued Professional Development Programme of The Institution of Engineers (India). Notifications regarding the programmes are sent to all Corporate members, Student members and Institutional members on regular basis.

Live streaming of the event can be viewed on

https://www.youtube.com/channel/UCkTVQJERDy0AxNiE8wL0PcA

SUB-THEMES OF CONFERENCE

- Use of data analytics in process industries
- Application of Artificial Intelligence and IoT in Process industries
- Emergence of knowledge base technology in process industries
- Impact of digitization on chemical business
- Changing environment of global chemical businesses
- Challenges and scope of new technologies for sustainable development
- New technologies for alternate fuels and energy management
- Advanced optimization techniques to increase profit
- New sunrise technologies to meet the challenges of 21st centuries chemical industries. Engineering and Society
- Resources Mobilization & Techniques in Industries
- Waste Management and Re-Use in Manufacturing industries
- R&D in Advance Processing
- Role, Rules & Policies of Govt. in Process Engineering for sustainability
- Safety, Health & Environment in Industry
- Process Industries Case Studies
- Integration of Technologies
- Manufacturing / Production / Maintenance Case Studies
- Special Presentation for Students (Summer Internship Case Studies) with Poster

Some good quality of papers may be considered for publication in Journal of The Institution of Engineers (India): Series E after peer review process.

The authors are requested to submit the Synopsis/Abstract by e-mail with a copy to durgapurlc@ieindia.org, hens.abhiram@gmail.com before February 10, 2021.

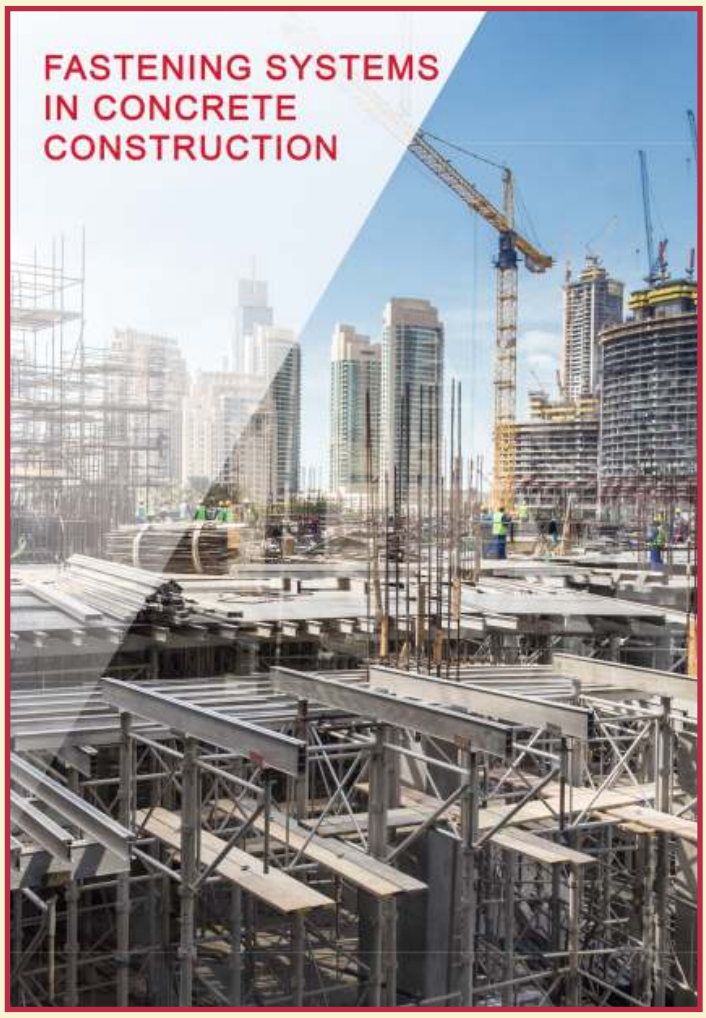
Book Review

Fastening Systems in Concrete Construction

Er Prashant Dasharath Sathe, AMIE
Er Kamalika Kundu

E-mail: Prashant.DSathe@hilti.com

This book is a useful design guidebook for the practicing engineers who have to design different types of fasteners in their projects as well as for academician and students who are interested in this topic. In absence of national standards, it becomes difficult for the engineers to design the fastening systems which are also an integral aspect of structure. Fortunately, there are several international standards as well as specialist literature on the subject. This book talks about innovative fastening technologies like cast-in anchor channels, post-installed anchors, post-installed rebar and direct fastening systems. This book introduces basic concepts related to fastening technology, explains the design method recommended in Eurocodes as well as gives an overview of assessment criteria as per various guidelines developed by "European Organisation for Technical Assessment (EOTA)". Several design examples are also covered in detail. Lastly, this book also discusses some case studies to showcase practical applications of these innovative technologies.



BLUEROSE PUBLISHERS

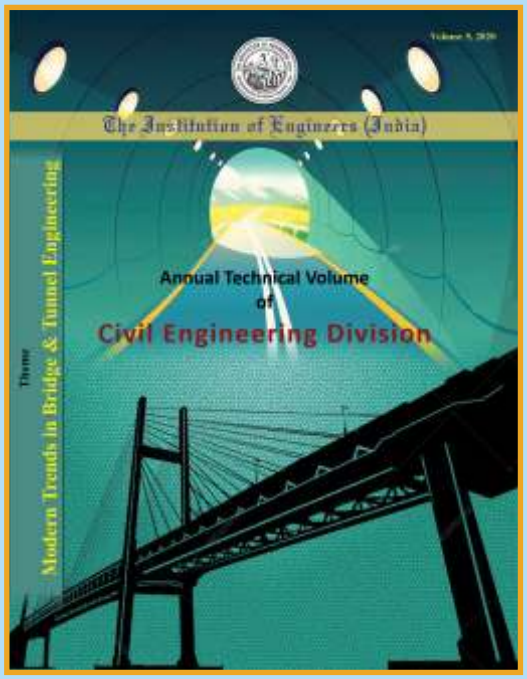
To access the full e-book, please follow the link
https://www.hilti.in/content/hilti/A2/IN/en/engineering/news-and-references/EBooks/FasteningSystemsinConcreteConstruction.html

Annual Technical Volumes of IEI will be available online shortly

Aerospace Engineering Division Board

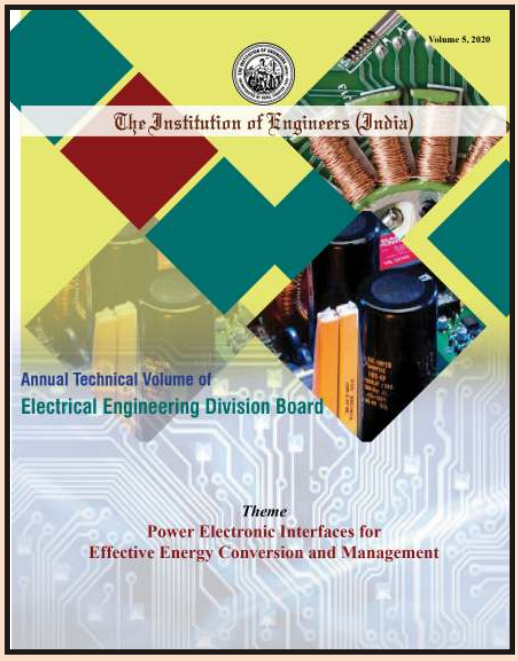
Theme
Increasing Role of Indian Aerospace Industries for Aeronautics, Space Projects and Systems

Civil Engineering Division Board



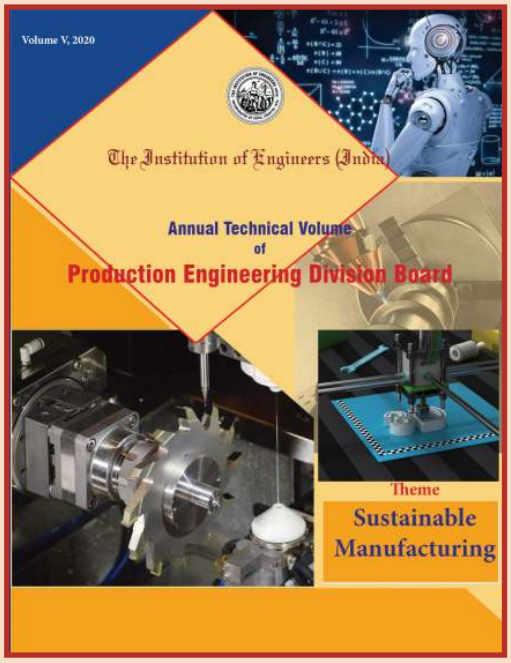
Theme
Modern Trends in Bridge & Tunnel Engineering

Electrical Engineering Division Board



Theme
Power Electronics Interfaces for Effective Energy Conversion and Management

Production Engineering Division Board



Theme
Sustainable Manufacturing

IEI-Springer Journal Series

Series A : Civil, Agriculture, Architecture, Environment

URL: http://link.springer.com/journal/40030

For Submission of Papers, please visit:

www.editorialmanager.com/ieia

ISSN Print: 2250-2149
ISSN Online: 2250-2157

Series B : Electrical, Computer, Electronics & Telecommunication

URL: http://link.springer.com/journal/40031

For Submission of Papers, please visit:

www.editorialmanager.com/ieib

ISSN Print: 2250-2106
ISSN Online: 2250-2114

Series C : Mechanical, Production, Marine, Aerospace

URL: http://link.springer.com/journal/40032

For Submission of Papers, please visit:

www.editorialmanager.com/ieic

ISSN Print: 2250-0545
ISSN Online: 2250-0553

ISSN Print: 2250-2122
ISSN Online: 2250-2130

Series D : Metallurgical & Materials, Mining

URL: http://link.springer.com/journal/40033

For Submission of Papers, please visit:

www.editorialmanager.com/ieid

Series E : Chemical, Textile

URL: http://link.springer.com/journal/40034

For Submission of Papers, please visit:

www.editorialmanager.com/ieie

ISSN Print: 2250-2483
ISSN Online: 2250-2491

IEI epitome

President : Er Narendra Singh
Editor : Dr H R P Yadav, Secretary & Director General
Associate Editor : Mr Kingshuk Sen
Special Contributors : Dr N Sengupta, Dr S Ghosh, Mr T Chakraborty, Ms A Dutta, Mr P Chakraborty, Ms H Roy, Mr S Bagchi
Telephones : 91-33-2223 8311/14/15/16
E-mail : newsletter@ieindia.org
Web : http : //www.ieindia.org