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A Century of Service to the Nation

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Members in the News

Mr V B Singh, FIE

Council Member & Chairman, Civil Engineering Division Board, IEI

Has been nominated as a Member of the Building Committee of Babasaheb Bhimrao Ambedkar Central University, Lucknow.

Dr R Venkatesan FIE

Scientist G & Programme Director, Ocean Observation Systems, National Institute of Ocean Technology, Chennai, Ministry of Earth Sciences, Government of India

Conferred with prestigious NACE International's 2020 NACE Fellow Award from the NACE International- The Corrosion Society in recognition of his significant and sustained contribution in the field of marine corrosion, biocorrosion and materials for deep sea and polar applications and to develop a broadly based forum for technical and professional leaders to serve as advisers to the Association.

NACE International-The Corrosion Society, established in the year 1943 is the World's largest nonprofit society with more than 38000 members in 130 countries working on all Industries impacted by corrosion.

Dr R Venkatesan received this Award of recognition including Guinness Certificate and United Nations Appreciation Certificate for his contribution.

Mr Mool Chand, MIE

Associate Professor, Maharishi Markandeshwar (Deemed to be University), Mullana, Ambala, Haryana

Awarded PhD in Civil Engineering from Maharishi Markandeshwar (Deemed to be University) on the topic 'Experimental Investigations on Precast Cement Concrete Paver Blocks using Fly Ash and Addition of Polypropylene', under the guidance of Dr Vanita Rai Aggarwal, Professor and Head of the Department of Civil Engineering, Maharishi Markandeshwar (Deemed to be University).

Dr G S Mukherjee, FIE

Defence Research & Development Organization

Inducted as the prestigious Editorial Board Memberand Technical Committee of MEAMT 2020 (Material Engineering and Advanced manufacturing Technology), Seoul, under the aegis of International Academy of Science and Engineering for Development (IASED).

Mr Vellanki Chandra Sekhar, MIE

Visiting Faculty, DMS SVH College of Engineering, Machilipatnam

Has been nominated as a Member of the Association of Computing Machinery.

Publication
by Members

Dr Daruri Venugopal, AMIE
OPJS University, Churu, Rajasthan

E-mail: profdarurivg.edu@gmail.com

Title of Paper: "Educational Evaluation and Analysis of Statistical Techniques", *International Journal for Research in Engineering Application & Management, 6 (2), 2020, ISSN: 2454 -9150, pp 286-290.*

https://doi.org/10.35291/2454-9150.2020.0408

Abstract: In education evaluation plays an important role in the teaching-learning process. In Evaluation analysis it contributes to formulation of objectives. Structuring of learning experiences and assessment of learner performance. It is very useful to bring improvement in teaching and learning process. It provides accountability to the society, parents, and to the education Systems. Educational and Statistical Evaluation scrutiny provides the accurate results as approved judgments In evaluation process good evaluation always coordinated by Validity, Reliability, practicability, fairness, and Usefulness. In Statistical Analysis process we can identify the Quantitative Data, Continuous and Discrete Data, Qualitative, primary and Secondary Data. In Educational Evaluation Statistical Techniques plays a vital role Standard graphic forms will always provide evaluation confirmation in easy understanding method in the form of Graphical representations.

Keywords: Assessment of Learner; Curriculum; Evaluation; Learner Performance; Practicability; Reliability, Scrutiny

Title of Paper: "Applications of Queuing Theory in Quantitative Business Analysis", *International Journal for Research in Engineering Applications & Management (IJREAM), 6 (3), 2020.*

https://doi.org/10.35291/2454-9150.2020.0474

Abstract : Queuing Theory provides the system of applications in many sectors in life cycle. Queuing Structure and basic components determination is computed in queuing model simulation process. Distributions in Queuing Model can be extracted in quantitative analysis approach. Differences in Queuing Model Queue discipline, Single and multiple service station with finite and infinite population is described in Quantitative analysis process. Basic expansions of probability density function, Expected waiting time in queue, Expected length of Queue, Expected size of system, probability of server being busy, and probability of system being empty conditions can be evaluated in this quantitative analysis approach. Probability of waiting 't' minutes or more in queue and Expected number of customer served per busy period, Expected waiting time in System are also computed during the Analysis method. Single channel model with infinite population is used as most common case of queuing problems which involves the single channel or single server waiting line. Single Server model with finite population in test statistics provides the Relationships used in various applications like Expected time a customer spends in the system, Expected waiting time of a customer in the queue, Probability that there are n customers in the system objective case, Expected number of customers in the system.

Keywords : Expected Waiting Time; Life Cycle; Simulation Process; Single Server; Queuing Structure; Queuing Problems.

Title of Paper : "Studying the Applications of Linear Programming in Basic Science and Engineering Curriculum", *International Research Journal of Engineering and Technology (IRJET), e-ISSN: 2395-0056, 7 (7), 2020.*

https://www.irjet.net/archives/V7/i7/IRJET-V7I7432.pdf

Co-author : Dr N Ramya

Abstract: Linear Programing deals with the statistical data to maximize or minimize the given function of variables. It provides the complete structure of Linear Programming. Considering the assumptions we can determine the different test statistics in Linear programming models like transportation, Variation transportation, unbalance business supply and demand problems, Degeneracy and its resolution problems etc., LPP provides different methods of finding initial feasible solutions with given data. Graphical Method representations can be utilized for representation of test statistics for easy understanding. Simplex applications, Penalty methods, Least Cost Approximation Methods, Degeneracy methods are the major applications in Linear Programming Solutions. Properties of LPP and graphical method of solving a LPP with distinct variable cases Dual form, are also discussed in this Study of Research paper. Solving the Analytical problems using Matrix form of LP, Two Phase method approaches, Computational procedure of Simplex methods, Artificial Variable Techniques are also discussed in this Study of Linear Programming Problem.

Keywords: Artificial Variable; Degeneracy; Dual Form; Graphical Method; Penalty Method; Simplex Method; Two Phase Method

Publication
by Members

Dr Latha M S, MIE

Professor, Civil Engineering Department, Sri Venkateshwara College of Engineering, Bangalore

E-mail: lathamsm@yahoo.co.in

Title of Paper: "Flexural Behavior and Validation of Reinforced Concrete Beams with Opening using Foundry Sand International Journal of Recent Technology and Engineering (IJRTE)", *International Journal of Recent Technology and Engineering, 8 (5), 2020, pp 846 – 850.*

https://www.ijrte.org/wp-content/uploads/papers/v8i5/E4900018520.pdf

Co-authors: Naveen Kumar B M, Priyanka S, Rudraswamy M P

Abstract: The provision of transverse openings in floor beams to facilitate the passage of utility pipes and service ducts results not only in a more systematic layout of pipes and ducts. It also translates into substantial economic savings, in the construction of a multi-storey building. Along with opening, the partial replacement of foundry slag sand with crushed stone is done which further reduces the cost of the beams. In order to obtain the optimum level of replacement, foundry slag sand is varied from 0-100% and tested under compressive strength for maximum strength. With help of ANSYS software, various shapes of openings, keeping equivalent area of cross section such as rectangular and provided at critical zone are modelled and analysed. To reduce stress concentration at corners of the openings, Special reinforcements are provided as per ACI specification. With that optimum shape experimental work is carried out. Where 3 beam were casted of size 2000*450*230mm and tested under loading frame with two pint loading and simply supported condition. The results obtained such as deflection, initial cracks, and ultimate failure load were compared with the beams without openings, with openings using foundry slag sand and without using foundry sand. Also comparison of analytical results with that of experimental results was carried out.

Keywords: Compressive Strength; ANSYS; Openings

Title of Paper : "Optimization of High Performance Concrete Mix Incorporating Bagasse Ash and Slag Aggregates using Statistical Method", *International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, 8(4), 2019.*

https://www.ijrte.org/wp-content/uploads/papers/v8i4/D7412118419.pdf

Co- authors : Revanasiddappa Madihalli, Dr J R Dattatreya

Abstract: In recent years, it is found that there is an exponential increase in use of natural resources for infrastructure development of the country. Concrete is one of the most widely used materials for any infrastructural development activities. In this research an effort is made to utilize slag aggregates and bagasse ash in High Performance Concrete as partial replacement materials for M-Sand and cement respectively. A statistical approach called Taguchi method is used for deciding various combinations of replacement levels of alternate materials along with various levels of water cement ratios. L16 Taguchi orthogonal Array is utilized to decide experiment conduction matrix. Statistical analysis of the results was carried out using Analysis of Variance(ANOVA) and the optimum mix proportions of the High Performance Concrete for better strength and durability characteristics is arrived. It is found that the mix proportion containing water cement ratio of 0.3 with 10% replacement of cement by Bagasse Ash and 20% replacement of M-sand by slag sand gives satisfactory compressive strength and split tensile strength results.

Keywords : High Performance Concrete; Optimization; Bagasse ash; Slag Sand; Taguchi Method

Publication
by Members

Dr B Venkateswara Rao, MIE
Associate Professor, Department of EEE, V R Siddhartha Engineering College (Autonomous), Kanuru, Vijayawada, Andhra Pradesh

E-mail: drbvrao@vrsiddhartha.ac.in

Title of Paper: "Strategy and Optimization of a Mixture of Nonconventional Energy Sources in the Energy System", *International Journal of Electrical Engineering and Technology (IJEET), ISSN Print: 0976-6545 and ISSN Online: 0976-6553, 11(4), 2020, pp. 225-233.*

http://www.iaeme.com/ijeet/issues.asp?JType=IJEET&VType=11&IType=4

Co-authors: M Rambabu, G V Nageshkumar, B Sravan Kumar

Abstract: This paper treaties with design and optimization of a hybrid renewable energy sources in power system with HOMER software. The hybrid sources with renewable sources like solar, wind and battery, diesel generator are used. With these sources it going to meet the electric demand. The main objective of this paper is to design an individual renewable energy system to see the anticipated electric load with high renewable fraction & little energy cost. To minimize the net present cost of the constraints in mixture energy system, the best optimization analysis are used like search space optimization in order to find out the best prime possible configuration. A search space is formed for each component (solar, generator, battery & converter)using lower and upper limits of each component & dispatch strategy. The two control strategies are nominated for this study; those are load following (LF) & cycle charging (CC). The simulation results proves that the advised model finished with lowest energy cost, less losses & major fraction of renewable energy.

Keywords: HOMER; Off-grid; Solar System; Wind Energy

Mr Vinay Anand, AMIE
Research Scholar; Lovely Professional University Jalandhar; Punjab

E-mail: vinayanand77@gmail.com

Title of Paper: "IOT Based Fault Detection of Underground Cables through Node MCU Module", *International Conference on Computer Science, Engineering and Applications (ICCSEA 2020) IEEE Conference Record #49143, Organized by the Department of Computer Science & Engineering, IET University, Gunupur, 2020, IEEE.*

DoI: 10.1109/ICCSEA49143.2020.9132893

https://ieeexplore.ieee.org/document/9132893

Co-authors : Laxmi Goswami, Manish Kumar Kaushik,Rishi Sikka, Kanta Prasad Sharma, Madhav Singh Solanki

Abstract: In the downtowns, underground cables are used rather than of overhead transmission lines. It is hard to go through the specific spot of the shortcomings. As India become prominent as a progression country, civilized field is too boosting every day. The underground lines are beat under the same circumstances its uses is additionally growing a result of its clear advantages such as lower line losses, lower maintenance cost and they are less powerless to the effects of serious climate. As it isn't clear it move extreme to identify propel area of the shortcoming. In this proposed work we are trying to rectify this problem by proposing a method which is good enough to the digital world. In this paper we have used IOT based technique with Google database for the fault detection with the help of Node MCU Wifi Module. It is totally based on IOT. We used here Node MCU which connects arduino sensors to Internet. We had created a Hot spot through router for communication. We connected each MCU Module with transformer and used Google data base to checking the status of transformers. The accuracy and efficiency of our proposed method is more as compare to the other techniques.

Keywords : IOT; Node MCU Wifi Module; Arduino; Power Lines and Google Database

Publication
by Members

Mr Prashant Basavaraj Bhagawati, AMIE

Assistant Professor, Department of Civil Engineering, Annasaheb Dange College of Engineering and Technology, Ashta, Maharashtra

E-mail: prashantbhagawati@gmail.com

Title of Paper: "A Hill Slope Failure Analysis: A Case Study of Malingoan Village, Maharashtra, India", *Geology, Ecology, and Landscapes, 2019.*

DoI: 10.1080/24749508.2019.1695714

Co-authors : Chetan R Shah, Sandip S Sathe, & Santosh S Mohite

Abstract: Landslide catastrophe happen on 30 July 2014 has buried almost 140 peoples under a loose soil mass in Malingaon village of Pune district, Maharashtra, India. Soil samples from a hill slope sections were collected (viz. bottom, middle, and top) for determination of the soil properties and slope stability. Mainly excess rainfall triggered the land slide, which directly affcted on geotechnical properties of soil. The results showed that the hill slope was unstable with factor of safety less than one and which is prone to failure. The land use and land cover map (viz. before and after of land slide) analysis have inferred that the hill slope was unstable. The unscientific way of agriculture practices method and conversion of nonagricultural land into agricultural usage was the major cause for land slide in the study area. This study provides a technically viable solution method to avoid such disaster in same topographical features.

Keywords : Landslide; Stability of Slope; Arc-GIS; Hilly Terrain

Dr B Sarath Chandra Kumar, MIE

Associate Professor, Department of Civil Engineering, Koneru Lakshmaiah Education Foundation, Vaddeswaram, AP

E-mail: sarath.9b@gmail.com

Title of Paper: "Seismic Pounding of G+6 Building with Different Building System", *Seismic Pounding of G+6 Building With Different Building System, Test Engineering and Management, 83, pp. 2571- 2579.*

https://scholar.google.com/citations?user=iD0rq6oAAAAJ&hl=en

Co-authors: J S R K Santhosh Kumar, M Jagadish, P Sirkar, K Aravind

Abstract: Collisions of buildings that exhibit various dynamic characteristics at the time an earthquake is called as seismic pounding. The prime reason for seismic pounding occurrence is not having enough separation gap in between the buildings. Seismic pounding can be controlled by providing safe gap, but required gap is not possible in Metropolitan cities as the density of the population is very high and it is highly uneconomical. In this study seismic pounding on G+6 buildings with different building system using ETABS Software. In this study we will use different building systems like Frame, Full RCC Shear wall, RCC Shear wall on outer peripheral Corners, RCC Shear wall on middle outer peripheral walls, Full RCC Shear walls on inner peripheral walls, Full X-bracing, X-bracing on outer peripheral Corners, X-bracing on middle outer peripheral walls, X-bracing walls on inner peripheral walls, Full V-bracing, V-bracing on outer peripheral Corners, V-bracing on middle outer peripheral walls, V-bracing walls on inner peripheral walls. Shear walls locates on Full RCC shear walls on inner peripheral walls has better results compared with other system.

Keywords: Seismic Pounding; Shear Walls; Bracings; Different Building System; E Tabs

Publication
by Members

Mr A Muthu Manokar, AMIE
Assistant Professor, School of Mechanical Engineering, B S Abdur Rahman Crescent Institute of Science & Technology GST Road, Vandalur, Chennai

E-mail: a.muthumanokar@gmail.com

Title of Paper: "Extracting Water Content from the Ambient Air in a Double-slope Half-cylindrical Basin Solar Still using Silica Gel under Egyptian Conditions", *Sustainable Energy Technologies and Assessments ISSN: 2213-1388, 39, 2020.*

https://doi.org/10.1016/j.seta.2020.100712

Co-authors: F A Essa, Ammar H Elsheikh, Ravishankar Sathyamurthy, A W Kandeal, S Shanmugan, A E Kabeel, Swellam, W Sharshir, Hitesh Panchal, M M Younes

Abstract: Direct generation of drinking water from ambient air using sunlight is of great interest for many populations. Here, a new desiccant mechanism using a highly hygroscopic silica gel was tested on the double-slope half cylindrical basin solar still (DS-HCBSS) to extract the water content from the ambient air. As this mechanism is new to be applied into the solar still, an experimental and predictive study was conducted to investigate the thermal performance of the solar still under this modification. The modification was done in a double-slope half cylindrical basin solar still, which has four longitudinal fins from inside to increase the surface area. The basin liner of the solar still and the fins were covered by a layer of silica gel with a thickness of 1.5 cm. A parabolic trough solar collector was used to raise the temperature inside the solar still during daytime solar illumination. The productivity of the DS-HCBSS with silica gel was enhanced by about 72% and 166% when longitudinal fins and longitudinal fins with gravels were used, respectively. Moreover, the efficiency of the DS-HCBSS with silica gel was increased by 15% and 35% when longitudinal fins and longitudinal fins with gravels were used, respectively. The best accumulated productivity (400 mL/m2) was recorded for the DS-HCBSS with silica gel, longitudinal fins, and gravels. Finally, a Neuro-fuzzy Inference System (ANFIS) model was employed to predict the process response (productivity) of the investigated systems under different process input factors (ambient temperature and solar irradiance). The predictive model obtained a good agreement with the experimental results. The experimental results revealed that the double-slope half-cylindrical basin solar still with the modification provides a new concept for Air Water Harvesting (AWH) and atmospheric water generation.

Keywords: Solar Still; Silica Gel; Air Water Harvesting; ANFIS; Double-slope Half-cylindrical Basin Solar Still.

Title of Paper : "Rehash of Cooked Oil for the Palatable Water Production using Single Slope Solar Still", *Fuel, ISSN: 0016-2361, 271, 2020.*

https://doi.org/10.1016/j.fuel.2020.117613

Co-authors : Gurukarthik Babu Balachandran, Prince Winston David, Padmanaban Valayudhaperumal Chellam, Mohamed Nasrulla Akbar Ali, Vignesh Radhakrishnan, Ramkumar Balamurugan

Abstract : The present work investigates about the performance of single slope still (with rehash cooked oil) to enhance the palatable water productivity. The tray with basin contains rehash cooked oil represent the external heat source to increase the temperature of basin water. The performance of proposed solar still with the effects of high heat exchanger rehash cooked oil are studied. In this study, the proposed solar still is compared with conventional solar still for the purpose of evaluating the palatable water productivity under the presence of same ambient condition. The experimental result is obtained during the period from March to May 2019 under the Indian conditions. The production of palatable water reached 3.77 L\m2 for the proposed still, while it is only 3.02 L/m2 for the conventional still. The rate of rise of yield obtained from the single slope solar still with used cooked oil is 57.02% more than the yield obtained from the conventional still in an average. For the proposed still, the energy efficiency is 24.35% and the exergy efficiency is 0.69%.

Keywords: Solar Still; Exergy Analysis; Energy Efficiency; Rehash Cooked Oil; Recycling

Publication
by Members

Mr Y Kamala Raju, MIE
Assistant Professor, Department of Civil Engineering, Gokaraju Rangaraju Institute of Engineering & Technology (GRIET), Hyderabad

E-mail: kamalse2011@gmail.com

Title of Paper: "Reinforced Cement Concrete Cylindrical Shell for Parking Sheds", *TEST Engineering & Management Magazine, May –June 2020, ISSN: 0193-4120, 83, 2020, pp 9855–9858.*

link: http://testmagzine.biz/index.php/testmagzine/article/view/8991

Co-authors : N Tejaswi, S Anjali Reddy

Abstract: The present reinforced concrete shells as a relevant and valuable structural solution. Shell structures are constructed from one or more curved slabs or folded plates. These are basically three-dimensional structures which are spatial in nature. The designers always aim to achieve economy by minimizing costs within the constraints of functional and aesthetic requirements. They thus try to choose a more relevant material which are cheaper and stronger or try to evolve new forms that resist the loads more efficiently. Off all one of the most efficient structural forms are shells and they are a perfect example of achieving strength through form as opposed to strength through mass. As we are trying to design efficient structure for parking space, we choose to design a reinforced concrete cylindrical shell. These concrete cylindrical shell structures allow area to be wide and to be spanned with no interior columns giving a good interior.

Keywords: Cylindrical Shells; End Frames or Traverses; Interior Columns; Most Efficient Structural

Prof Lala Behari Sukla, FIE
Biofuels and Bioprocessing Research Center (BBRC), Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar

E-mail: suklalb@yahoo.co.in

Title of Paper: "Evaluation of Molybdenum Recovery from Sulfur Removed Spent Catalyst using Leaching and Solvent Extraction", *Scientific Reports, 10(1960), 2020.*

https://doi.org/10.1038/s41598-020-58972-x

Co-authors: Debabrata Pradhan, Dong-Jin Kim, Archana Pattanaik & Seoung-Won Lee

Abstract: In this article, a new spent catalyst sample preparation method was implemented for the purpose of molybdenum leaching in a single step. Further molybdenum and vanadium in the leach liquor were separated and their concentrations were enriched using the solvent extraction and stripping techniques. The impervious sulfur (S_0) layer of the spent catalyst sample was removed using carbon disulfide (CS_2). The advantages of S_0 removal were evaluated by conducting different sets of Mo leaching experiments and they were further examined by varying different conditions such as three lixiviants, hydrogen peroxide (H_2O_2) addition, and three leaching parameters. The leaching rate increased in an order, e.g. acetone washed < acetone-CS_2 washed < acetone washed-H_2O_2<acetone-CS_2 washed-H_2O_2, for the experimental concentration range of different lixiviants with the maximum of 94.8%(w/w) Mo dissolution in a single step. Optimization of the pulp density was important as the interaction of lixiviant molecules with multiple reacting solid particles decreased the driving force of the chemical reactions. The solvent extraction followed by the stripping technique was found to be excellent as the concentration of vanadium and molybdenum enriched from 0.55 to 1.9M and 0.0448 to 1.08M, respectively.

Keywords: Spent Catalyst; Leaching; Solvent Extraction; Strpping Techniques

Publication
by Members

Mr GVSSN Srirama Sarma, MIE
Assistant Professor, Department of Electrical and Electronics Engineering, Matrusri Engineering College, Saidabad, Hyderabad

E-mail: sriramasarma@matrusri.edu.in

Title of Paper: "Error Evaluation Techniques of Short Term Load Forecasting in Power Systems", *High Technology Letters, ISSN NO : 1006-6748, 26, (6), 2020, pp 431-437.*

http://www.gjstx-e.cn/gallery/48-june2020.pdf

Co-authors : Dr Vasudeva Naidu, Dr G Ravindranath, P Anil Kumar

Abstract: The load forecasting is very important for the electrical industry and its role is vital in energy purchase and generation, load switching and infrastructure development. A great assortment of mathematical methods have been built up for load forecasting. In this paper the short term load forecasting using ANN has been produced and compared with regression methods. The learning data for the ANN is past, current freight and weather conditions and interpolates the future load as the training data set. The prediction of daily loads for the future loads is as accurate as high above 90% and forecasting is done based on the factors called identification factors which are past load data and the weather conditions. The analysis is carried out with Neural Networks and compared with the Bagged Regression Trees and Time series techniques. The results have shown that the Neural Networks technique has given less error comparatively and it is treated as a best forecasting method. Simulation conducted using MATLAB tools. The techniques will also be compared to ascertain the best method for load prediction and to bring down the percentage of error in forecasting the load.

Keywords: Load Forecasting; Correlation Techniques; Regression Based; Trend Analysis; Artificial Neural Network (ANN).

Mr Giridhar Maji, MIE
Faculty Member, Electrical Engineering Department, Asansol Polytechnic Department of Tech. Edu.& Training, WB

E-mail: giridhar.maji@gmail.com

Title of Paper: "A Systematic Survey on Influential Spreaders Identification in Complex Networks with a Focus on K-shell based Techniques", *Expert Systems With Applications,2020, 113681.*

DoI: https://doi.org/10.1016/j.eswa.2020.113681

Abstract: Almost all the complex interactions between humans, animals, biological cells, neurons, or any other objects are now modeled as a graph with the nodes as the objects of interest and interactions as the edges. The identification of the most central or influential node in such a complex network has many practical applications in diverse domains such as viral marketing, infectious disease spreading, rumor spreading in a social network, virus/worm spreading in computer networks, etc. Many centrality measures using the position/location of a node and network structure have been proposed in the literature. The node degree, shortest paths(closeness), and betweenness are used since long with degree capturing local effect and others global effect. The k-shell considers the coreness of the nodes by dividing the network into layers or shells. Many variations of k-shell proposed in recent years, as well as many researchers, use k-shell as a building block in their heuristic technique to alleviate the problems of classical k-shell and to identify influential spreaders more elegantly. The main objective of this paper is to analyze and compare the major variations of the k-shell based methods along with representative network topology based hybrid techniques by considering a toy network with detailed computations. A discussion on different performance evaluation metrics and, simulation models such as the SIR epidemic model, has been undertaken with a comparative analysis between different state-of-the-art on a few standard real networks.

Keywords: k-shell Decomposition; Systematic Review; Node Centrality; Influential Spreader Identification; Node Ranking Heuristics; Kendall's Rank Correlation; Influence maximization

Publication
by Members

Mr Yadvendra Singh, AMIE
Department of Electronics Engineering, Indian Institute of Technology, Indian School of Mines, Dhanbad

E-mail: yadvendra.iitdhanbad@gmail.com

Title of Paper: "Sensitivity Enhancement of the Surface Plasmon Resonance Gas Sensor with Black Phosphorus", *IEEE Sensors Letters, 3 (12), 2019, pp 1-4.*

DoI: 10.1109/LSENS.2019.2954052.

URL: https://ieeexplore.ieee.org/document/8903251

Co-author : S K Raghuwanshi

Abstract: In this letter, a new optimization structure is proposed for enhancing the sensitivity of the surface plasmon resonance (SPR) based gas sensor with the help of alternative striations structure of the gold metal (Au) and black phosphorus (BP) [two-dimensional (2-D) material]. The sensitivity of the proposed optimized structure was enhanced by ~80.5% from the conventional sensor, and it again improved up to ~102.39% with the addition of extra BP layers between the gold layers. The results obtained show that the proposed sensor can play a vital role in the application of BP 2-D material in SPR-based sensors for gas sensing.

Keywords : Sensitivity; Gold; Gas Detectors; Optical Sensors

Mr S Manikandan, AMIE
Assistant Professor & HOD/IT, E.G.S. Pillay Engineering College (Autonomous), Nagapattinam

E-mail: profmaninvp@gmail.com

Title of Paper: "Prediction of Human Motion Detection in Video Surveillance Environment Using Tensor Flow", *International Journal of Advanced Science and Technology, 29(5), 2020, pp 2791 - 2798.*

http://sersc.org/journals/index.php/IJAST/article/view/11386

Co-author : Chinnadurai M, Thiruvenkatasuresh M P, Sivakumar M

Abstract: In recent year, Deep learning concepts are used to investigate image processing and machine learning applications. As the same experience we use deep learning prediction method for finding moving object and human motion in video surveillance environment. Deep learning approach is used to detect, classify and find the moving object and classify the person in captured videos. For finding human, a set of image processing steps are applied in moving areas that contain moving objects. The selected area are applied convolutional neural network classifier which has various layers and available in Google Tensor Flow learning tool. In this approach, shaking videos, low resolution videos are taken into account and video dataset examined. The experimental studies says that the relationship between moving object and video surveillance dataset has been analyzed and prediction performance has noted as 85% accuracy and from 65 videos.

Keywords: Deep Learning; Human Motion Detection; Convolutional Neural Network Classifier; Google Tensor Flow; Image Processing.

Publication
by Members

Dr Sreekanth, M P, AMIE

Assistant Professor, Department of Mechanical Engineering, Vimal Jyothi Engineering College, Chemperi, Kannur

E-mail: smpcadd@gmail.com

Title of Paper: "Individual Customization Strategy Accomplished by Developing Prototype of a Laparoscopic Forceps Handle using Additive Manufacturing, *Emerald Rapid Prototyping Journal, 26 (4), 2020, pp 689-697.*

DoI: 10.1108/RPJ-06-2019-0157

Co-authors : Dr Rajesh Ranganathan, Arivazhagan Pugalendhi

Abstract: Purpose – Laparoscopic surgeons suffer due to discomfited body posture while performing surgery and experience discomfort owing to lack of customized surgical instruments. Accordingly, this paper aims to recommend an individual customization strategy by developing an ergonomically designed laparoscopic forceps handle and thereby increase the comfort of surgeons.

Design/methodology/approach – Hand anthropometric parameters of 282 south Indian male subjects are used to customize the handle. uPrint and Objet 260 Connex, which works based on fused deposition modeling (FDM) and polyjet respectively are used to fabricate the prototype of the handle. Design modifications include pistol-type grip, increased contact area between the hand and handle, and neutral wrist posture.

Findings – Ergonomic evaluation parameters such as grip, functionality, comfort, and wrist posture using subjective ratings from laparoscopic surgeons were recorded and obtained average values of 4.1, 3.6, 4.1, and 4.1 respectively based on a 5-point ordinal scale. Additionally, stress analysis also confirms the safety of the handle based on von Mises stress criteria.

Research limitations/implications – Anthropometric data is limited to 282 subjects and subjective evaluation is conducted using prototype, not the end-use product.

Originality/value – Evaluation using subjective rating confirms the ascendancy of modified handle over the existing handle in terms of assessed parameters. Proposed individual customization strategy can be applied for other industrial hand tools to enhance comfort.

Keywords: Individual Customization; Laparoscopic Forceps Handle; Comfort; Subjective Rating; Additive Manufacturing.

Title of Paper: "Mass Production Strategy for Additive Manufacturing by Stacking the Product at Design Phase", *International Journal of Rapid Manufacturing, 9(2/3), 2020, pp 83-90.*

DoI: 10.1504/IJRAPIDM.2020.10019426

Co-authors : Arivazhagan Pugalendhi, Dr Rajesh Ranganathan.

Abstract: Mass production is usually aimed to reduce the costs involved in product development by increasing the number of units without compromising the quality. Additive manufacturing (AM) technology can reduce the manufacturing lead time; however, it is widely seen as a non-mass production system due to its build volume restrictions and many other factors. In this paper, a strategy named as stacking of parts during modelling/design phase is suggested to overcome the above-mentioned limitation. For this strategy, a square component and a washer were printed in Objet260 Connex machine which yielded a good amount of material (model and support) saving. Further, the numbers of parts which can be built with stacking in the design phase have increased drastically compared with the case of the array made using Objet Studio. Thus, the study recommends adopting the mass production approach in AM. Finally, mechanical properties were also analysed for parts quality.

Keywords: Mass Production; Additive Manufacturing; PolyJet; Stacking; Build Volume; Material Consumption; Clearance; Mechanical Properties.

Publication
by Members

Prof Nitinkumar Raghunath Anekar, AMIE
Assistant Professor, MIT-WPU, Pune

E-mail: nitin.anekar@gmail.com

Title of Paper: "Wear Behavior of Spheroidal Graphite Cast Iron in Biodiesel Blends", *Journal of Bio- and Tribo-Corrosion, 6, 2020.*

https://doi.org/10.1007/s40735-019-0300-2

Co-authors : Sunil Deshpande, Shashikant Vagge, Akshay Joshi

Abstract: Biodiesel as an alternative fuel is overcoming to replace petroleum diesel partially. The tribological performance of biodiesel is crucial with respect to application in automobiles. Cast iron is widely used in for manufacturing of many automobile engine parts such as piston, valves, piston rings, etc. This research article evaluates the wear behavior of spheroidal graphite cast iron which is used for the manufacturing of piston rings with respect to different blends of biodiesel. Many experiments were carried out under metal to metal contact and lubricated sliding condition on, pin on disc wear testing machine. This shows the metallographic changes due to wear damage. Previous experimental result shows that friction coefficient and wears loss decreases significantly due to decrease in lubrication percentage of palm biodiesel. The test parameters used under this work were 8 kg, 10 kg, 12 kg, 14 kg and 16 kg loads for 1 h, at speed 300 rpm and at ambient temperature. Wear behavior of spheroidal graphite cast iron is evaluated using five different blends of biodiesel, B0 (100% petroleum diesel), B5 (5% biodiesel), B10 (10% biodiesel), B20 (20% biodiesel), B100 (100% palm biodiesel)).The period for which cast iron can sustain is determined by its wear and abrasion resistance. Due to formation of lubrication layer of ester compounds in palm biodiesel wear resistance of nodular cast iron increases as biodiesel percentage increase in the blend. Therefore, high wear resistance is critical for ensuring a long life of the cast iron in biodiesel environment. The results showed that the B100 has higher coefficient of friction and lowest surface roughness and wear volume loss as compared with petroleum diesel (B0). It also shows that wear and friction decrease as percentage of biodiesel increases. Scanning electron microscopy (SEM) investigations used to analyze the structure and surface morphology. Wear scar diameter (WSD) was investigated using optical microscopy in tested specimen. The wear rate was found to be more in petroleum diesel compared with palm biodiesel than other blends.

Keywords: Spheroidal Graphite Cast Iron; Wear; Palm Biodiesel; Petroleum Diesel; Piston Ring; SEM; EDS

Title of Paper: "Effect of Heat Treatment on Corrosion Behavior of Nodular (Spheroidal Graphite) Cast Iron using Electrochemical Tests in Biodiesel Environments", *Materials Today: Proceeding, 28, (2), 2020, pp 684-692.*

https://www.sciencedirect.com/science/article/pii/S221478531934307X

Co-authors : Sunil Deshpande, Akshay Joshi, Shashikant Vagge

Abstract : In recent years due to environmental issues, have a great demand to search for alternative energy sources. The high demand of fuels in transportation and industrial sectors strengthen the identification of alternative fuel sources. In this regards biodiesel and its different blends (corrosive environments) with petro diesel, can be considered a prompt substitute for petro diesel. But the use of biodiesel possesses several limitations, such as metal surface degradation, auto oxidation and instability of fuel properties. Automobile industries are also facing a major problem related to compatibility of automotive components with biodiesel and its blends. The majority of engine components manufactured by different metals and non-metals which gets affected due to contact with biodiesel. Current research used nodular (spheroidal graphite) cast iron which is widely used for manufacturing of engine parts like piston and piston rings. For automotive components palm biodiesel (B100) is more corrosive as compared with petro diesel (B0). Therefore, this research was carried out on nodular cast iron used for piston ring in different corrosive environment of fuel such as petro diesel (B0), palm biodiesel (B100) and their respective blends (B20, B10 & B5). The corrosiveness behavior of nodular C.I. with different blends was tested using static immersion test followed by Open Circuit Potential (OCP), Electrochemical Impedance Spectroscopy (EIS) & Tafel plot. Electro chemical degradation studies were characterize a nodular cast iron metal surface by Scanning Electron Microscopy (SEM) and Energy Dispersion Spectrography (EDS) after immersion test. Results conclude palm biodiesel is more corrosive to nodular C.I. than petro diesel and with different blends under above testing methods.

Keywords: Nodular Cast Iron; Palm Biodiesel; Petro Diesel; EIS; Bode; Nyquist; Tafel

Title of Paper : "Corrosion Behavior of Nodular Cast Iron in Biodiesel Blends", *Engineering Failure Analysis 105, 2019, pp1319–1327.*

https://doi.org/10.1016/j.engfailanal.2019.07.060

Co-authors : Sunil Deshpande, Akshay Joshi, Shashikant Vagge

Abstract : Today various alternative fuels are used due to new emission norms and environmental factors. Biodiesel and its blends are one of the alternative fuel used nowadays due to its low sulphur content. Automobile metals like copper, aluminum, cast iron etc. are more resistive to corrosion in petro diesel but more corrosive in biodiesel and its blends. So study corrosive nature of biodiesel is important for longer life of these automobile metals and its components. Piston rings made of nodular cast iron are always in contact with burnt and unburnt fuel in engine during working. In present study, a corrosive characterization of nodular cast iron is investigated by giving a proper heat treatment to it and static immersion test in biodiesel blends. Scanning Electron Microscope, Energy Dispersion Spectrograph and optical microscope are used for analysis of present investigation study. Results show that change in basic microstructure of metal can increase resistance to corrosion due to change in phase of metal.

Keywords: Biodiesel; Diesel; Nodular Cast Iron; Static Immersion Test; ECM; EDS; Coupons; Corrosion

Publication
by Members

Dr Konjengbam Darunkumar Singh, FIE
Professor, Department of Civil Engineering, IIT Guwahati

E-mail: darun@iitg.ac.in

Title of Paper: "Cold-formed Steel Square Hollow Members with Circular Perforations Subjected to Torsion", *Journal of Constructional Steel Research, 2019, 162, 105730.*

https://doi.org/10.1016/J.JCSR.2019.105730

Co-authors : SanasamVipej Devi, Tekcham Gishan Singh

Abstract: This paper describes an experimental and numerical investigation on the torsional behavior of unperforated and perforated cold-formed steel hollow section members. The material characteristics and torsional performance of YSt-310 cold-formed steel square hollow section members (conforming to Indian Standard 4923), were initially studied, experimentally. Effects of size, number, and position of circular perforation on member torsional strength were investigated using validated finite element models, via Abaqus. Additionally, using the FE analysis results, design equations were proposed in Eurocode (EN), Direct Strength Method (DSM), and Deformation Based Method (DBM) formats; for unperforated square hollow section members. The approach is then extended for perforated cases, having circular single and double perforations, using suitable reduction factors, considering the effects of both cross-sectional slenderness and perforation size. The proposed design equations were assessed through reliability analysis and were found to be safe for the design of cold-formed square hollow sections under torsion.

Keywords : Torsion; Square hollow section; YSt-310 steel; Cold-formed steel; Circular perforation

Dr P Pathalamuthu, AMIE
Associate Professor & Head, Anand Institute of Higher Technology, Chennai , Tamilnadu

E-mail: muthup2001in@yahoo.co.in

Title of Paper: "Enhanced Performance of Aloe Vera Incorporated Chitosan-polyethylene Oxide Electrospun Wound Scaffold Produced using Novel Spirograph based Collector Assembly", *International Journal of Biological Macromolecules, 140, 2019, pp 808-824.*

https://pubag.nal.usda.gov/catalog/6593211

Co-authors : Siddharthan, A, Giridev, V R, Victoria, Victor, Thangam, Ramar, Sivasubramanian, Srinivasan, Savariar, Vincent, Hemamalini, T.

Abstract: Spirograph is a geometric drawing that produces mathematical roulette curves of the variety technically known as hypotrocoids and epitrocoids. This paper presents a research on a novel Spirograph based Mechanical System (SBMS) meant for the production of electrospun mat with near uniform characteristics for wound dressing applications. A combination of natural (Chitosan) and artificial (Polyethylene oxide) polymer, along with Aloe vera plant extract has been evaluated as a material for wound dressing application. The improvement in the mechanical property, in vitro and in vivo studies indicate developed SBMS compared to the typical collectors has been found suitable for producing electrospun mat for wound dressing applications.

Keywords: Aloe Vera; Chitosan; Electrospun Mat; Mechanical Property; Polyethylene Oxide; Wound Scaffold.

Publication
by Members

Dr G Indumathi, MIE
Department of Electronics & Communication Engineering, Mepco Schlenk Engineering College, Sivakasi, Tamilnadu

E-mail: gindhu@mepcoeng.ac.in

Title of Paper: "Low Profile Antenna Based on a Fractal Shaped Metasurface for Public Safety Applications", *International Journal of RF and Microwave Computer Aided Engineering, 30(2), 2019, pp 1-12.*

https://doi.org/10.1002/mmce.22048

Co-author : Paulkani Iyampalam

Abstract: In this article, design and analysis of a fractal shaped metasurface (FSMS) antenna for public safety applications is presented. It comprises of two layers, upper layer and lower layer. The upper layer has the metasurface (MS) and lower layer has the fractal inspired monopole antenna. MS is made up of Sierpinski Knopp fractal shaped unit cell, which is arranged in 4 ×6 layout to achieve miniaturization. Ansys Electronic Desktop tool is utilized for analyzing the performance of the MS antenna. The projected FSMS antenna is fabricated using FR4 dielectric material and experimented with the help of an anechoic chamber and Vector Network Analyzer (VNA). Results show that the FSMS antenna exhibits a bandwidth of 200 MHz and a gain of 1.56 dBi at 4.89 GHz. The results obtained in simulation and measurement are in good agreement. Consequently, the proposed antenna with a low profile of $0.43\lambda_0 \times 0.43\lambda_0 \times 0.03\lambda_0$, where λ_0 is the free space wavelength at 4.89 GHz is well fit for public safety applications.

Keywords : Fractal; Metasurface Monopole Antenna; Public Safety; Sierpinski Knopp Curve

Title of Paper: "Efficient Beam Allocation Strategy for Statistical Beamforming-based Massive Multiple-input–multiple-output Downlink Systems" , *IET Communications, 13(16), 2019, pp 2461-2468.*

doi: 10.1049/iet-com.2018.5120

Co-author : Roscia Jeya Shiney Jayakumar

Abstract: This study focuses on an efficient fairness aware beam allocation strategy which is based on user position approach. The proposed algorithm is efficient to cope with the effects of user position uncertainties and imperfect channel state information (CSI). It allocates beam to individual users based on directivity and user position with the objective of serving many users simultaneously. On the basis of the user position, individual data rate requirements are also considered in the proposed scheme which is very much important for practical systems thereby considering the fairness issue amongst the users. The proposed scheme is best suited for a system with covariance-based beamforming, where statistical CSI is highly preferred under high dense deployments and the channel coherence time is short. It also requires low average feedback load with less multiuser interference and is of low complexity compared with the searching-based beam allocation strategy. The simulation results are given to show the advantage of the proposed beam allocation on comparing with the prevailing schemes.

Keywords : Statistical Analysis; Radiofrequency Interference; Array Signal Processing; MIMO Communication; Resource Allocation

Title of Paper: "A Comparative Study of Linear Receivers in Spectral Efficiency of Uplink Massive MIMO Systems with Low Resolution ADCs", *International Journal of Advanced Science and Technology, 29(7s), 2020, pp 1194-1200.*

https://sersc.org/journals/index.php/IJAST/article.view/10638

Co-author: S Nisharani

Abstract: In Massive MIMO systems, Spectral Efficiency mainly depends on the number of antennas used at the Base Station (BS). In 5G, the data requirement is very much high and the increase in Spectral Efficiency is crucial. This letter proposes the uplink Massive MIMO systems with low resolution ADCs architecture. We show that the massive number of antennas compensate the performance degradation of low resolution ADCs and increase the Spectral Efficiency which will be the major requirements in 5G Internet of Things (IOT) networks. We compare the performance of Massive MIMO systems for different receivers with low resolution ADCs

Keywords : Massive MIMO: MRC: ZF: MMSE Receivers: Low-resolution ADC: Uplink Spectral Efficiency

Publication
by Members

Dr Saadat Ali Rizvi, MIE
Workshop Superintendent, University Polytechnic, JMI,New Delhi

E-mail: saritbhu@gmail.com

Title of Paper: "Multi-attribute Decision Making Parametric Optimization in Weld Bead by Gas Metal Arc Welding through Grey Relation Analysis: A Case Study", *International Journal of Engineering, Science, and Technology, 12(2), 2020, pp 59-66.*

https://www.ajol.info/index.php/ijest/article/view/196449

Co-author : Wajahat Ali

Abstract: The basic purpose of this study was to identify the effect of gas metal arc (GMA) welding process parameters on the weld bead geometry of IS2062 structural steel of A grade. L16 Taguchi orthogonal array (OA) design with the idea of S/N (signal to noise) ratio was applied to obtain objective function to be optimized within the experimental field. In this research work the Taguchi technique was joined with grey relational analysis to solve the multi-response optimization problem. ANOVA (Analysis of Variance) was applied to estimate the most significant input parameters which contribute toward the output parameters. Arc voltage, gas flow rate, and wire feed speed were carefully selected as input parameters, whereas weld bead, depth of penetration, and reinforcement were output respectively. The optimal GMA welding process parameters were identified in order to enhance the productivity and curtail the overall functional cost of weld.

Keywords: Grey-relational Analysis (GRA); Taguchi Technique; Optimization; GMAW; ANOVA

Dr Yogendra Arya, AMIE
Assistant Professor,Electrical and Electronics Engineering Department, Maharaja Surajmal Institute of Technology, Janakpuri, New Delhi

E-mail: mr.y.arya@gmail.com

Title of Paper: "Effect of Electric Vehicles on Load Frequency Control in Interconnected Thermal and Hydrothermal Power Systems Utilising CFFOIDF Controller", *IET Generation, Transmission & Distribution, 14(14), 2020, pp 2266–2275.*

https://ieeexplore.ieee.org/document/9132785

Abstract: Load frequency control in modern-complex-uncertain power systems (PSs) assumes significance due to their challenging nature of the operation and hence utilisation of robust controllers is indispensable. In the industry, conventional single-loop controllers may not offer robust behaviour under changed operating conditions. Alternatively, two-loop cascade fuzzy structured controllers can show significant robust performance in dynamic conditions and best suited in systems having nonlinearities. Hence, a novel optimal cascade fuzzy-fractional order integral derivative with filter (CF-FOIDF) controller is utilised for 2-area thermal and hydrothermal PSs considering various physical constraints from a practical point of view. As physical constraints mandate an energy storage system, hence in this study, batteries of electric vehicles (EVs) are employed to assist power plants to swiftly arrest oscillations in the system frequency following load demands. A combined model of EV fleets is incorporated in the control areas of PSs. Numerous simulations are conducted to authenticate the robustness and excellence of EVs and the suggested control strategy over existing methods.

Keywords: Electric Vehicles; Electric Energy System; Optimal FLC; AGC; GRC; FOIDF Controller; Cascade Controller

Publication
by Members

Mr Ram Naresh Mishra, MIE
Assistant Professor, Department of Electrical Engineering, GLA University, Mathura

E-mail: rnaresh2007@gmail.com

Title of Paper: "Recent Philosophies of AGC Techniques in Deregulated Power Environment", *Journal of The Institution of Engineers (India): Series B, 2020.*

DoI: 10.1007/s40031-020-00463-8

Co-authors: D K Chaturvedi, Prabhat Kumar

Abstract: The face of power system is changing toward the deregulation concept; the objective is to benefit consumers by providing cheaper electricity, more alternatives, and better services. In this paper, various control techniques, such as conventional control, adaptive and self-tuning, robust control, soft computing/artificial intelligence control and other control techniques, are reviewed for the design of AGC in deregulated power environment. Besides this, the coordinated actions of energy storage devices and FACTS units in the deregulated AGC systems are discussed. In addition, various AGC design structures are highlighted. Further, the merits and demerits of reviewed control techniques have been presented.

Keywords: Automatic Generation Control (AGC); Frequency Deviation; Bilateral Contracts; Deregulated Power System (DPS); Load Frequency Control (LFC); AC/DC Links; Tie-lines Power Deviation

Dr Yellamanchali Sreenivas Rao, FIE
Project Director, AD(FV-Exo), PGAD/DRDO, Kanchanbagh P.O, Hyderabad

E mail: ysr@rcilab.in

Title of Paper: "Mobile Virology Research and Diagnostic Laboratory (MVRDL: BSL-3) for COVID-19 Screening, Virus Culturing and Vaccine Development", *Transactions of the Indian National Academy of Engineering, 2020.*

https://doi.org/10.1007/s41403-020-00150-6

Abstract: In order to prevent spread of COVID-19, World Health Organization (WHO) has specified that measures such as cleaning hands regularly with alcohol-based hand sanitizer or washing with soap and water, avoiding touching nose, eyes, mouth and social distancing should be followed by people. Another important measure for containing spread is by Testing–Testing and Testing. By testing, patients affected by COVID-19 can be isolated and further spread from them can be prevented. For testing, clinical specimen inactivation should be performed in a bio-safety level-3 (BSL-3) laboratory and after this step, routine testing can be performed in a bio-safety level-2 laboratory. Based on the infection and death rates in the current pandemic situation, few high-level bio-safety facilities are required to handle this deadly virus associated with potential exposure risks. It would take a long time, a large staff and many resources to construct a new fixed bio-safety facility, thus delaying the prevention and control of the pandemic. Therefore, a mobile BSL-3 laboratory with both bio-safety and flexibility is urgently needed to manage the pandemic and emergent public health incidents. To meet this requirement, the author has designed a mobile virology research and diagnostic laboratory with inputs from ESIC Medical College, Hyderabad, identified two companies which specialize in fabrication of shelters and containment facilities, realized and installed it within 15 days of time. This state-of-the-art, one of its kind laboratory was inaugurated by Hon'ble Raksha Mantri on 23 April, 2020. The MVRDL developed as per WHO and ICMR bio-safety standard (BSL-3) can be used:

- To conduct real-time reverse transcription polymerase chain reaction (rRT-PCR) test for diagnosing COVID-19.
- Possibility to test up to 2000 samples per day.
- For virus culturing for drug screening, convalescent plasma-derived therapy.
- To aid in the development of vaccine and development of diagnostic kits.

Keywords : COVID-19; Bio-safety; Mobile Bio-safety Laboratory; Containment

Publication by Members

Dr Manoj Pandurang Wagh, AMIE

Associate Professor, Dr Vithalrao Vikhe Patil College of Engineering, Ahmednagar

E-mail: profmpwagh@gmail.com

Title of Paper: "Assessment of Coagulation Process for the Distillery Spent Wash using Alum Polyelectrolyte and Fenton", *Indian Journal of Environmental Protection, 40 (7), 2020, pp 747 - 751.*

https://www.researchgate.net/publication/343547504

Co-authors : Pravin Dinkar Nemade, Ashok Biradar

Abstract: All over the world, around 61 % distillery industries utilize sugarcane molasses to produce the ethanol and rectified spirit. Gradually demand for ethanol, alcohol and rectified spirit increases on a large scale. Ethanol rectified spirit and alcohol production in distillery industries in India is 8 to 15 % by quantity, it illustrates that 85 to 92 % distillery spent wash (Wastewater) generated by volume. As a result, distillery industries comprise an enormous unpleasant impact on the surroundings. Numbers of clean up techniques have been worked out to competently treat the distillery spent wash (DSW). Coagulation processes were carried out using Alum polyelectrolyte and advanced oxidation processes such as Fenton were implemented to treat the DSW. Polyelectrolyte Magnafloc 1011, Magnafloc1997, Zetag 63 and Zetag 7650 were implemented. Treatment with alum cum polyelectrolyte (Magnafloc 1011, 1mg/L) gave 29% COD removal at pH 8. Fenton reduces maximum COD 79%. Maximum decolourization achieved 98% by application of hydrogen peroxide dose in ratio 4:1 at 45 °C. At higher peroxide dose the effect of temperature on COD removal efficiency is very small.

Keywords : Distillery Spent Wash; Electrocoagulation; Biomethanation

Title of Paper : "Augmentation with Ozone-Assisted Electrochemical Degradation of Distillery Spent Wash for the Removal of Color and Chemical Oxygen Demand", *International Journal of Environmental Science and Technology, 2020.*

https://doi.org/10.1007/s13762-020-02837-3

Co-authors : P D Nemade, A Sengupta

Abstract : Distillery spent wash (DSW) is an extremely cumbersome and recalcitrant effluent. The present technologies are implemented for the industry to remove certain pollutants like chemical oxygen demand and color, to safe and acceptable limits for final disposal into surface water or on land and to meet the requirements of regulatory standards. In view of this above condition various methods such as Electrochemical (EC) and ozone-assisted EC processes are implemented. Pair of aluminum (Al–Al) electrodes are more effective than other electrodes such as iron (Fe), copper (Cu), and graphite (Gr). Pair of Al–Al electrodes eliminate the chemical oxygen demand by 54.45% and color by 52.35%. Punched Al–Al electrodes minimize the chemical oxygen demand by 61.75% and color by 58.45%, respectively. Continuous electrochemical process reduces the chemical oxygen demand by 94.88% and color by 78.65%, respectively. Ozone-assisted electrochemical process using conventional plain electrodes removes chemical oxygen demand by 72% and color by 92%, respectively. Ozone-assisted punched electrodes enhance the degradation rate of chemical oxygen demand and color by 87.2% and 92%, respectively. Continuous ozone-assisted EC process with punched electrode removes chemical oxygen demand and color by 97.27% and 98.72%, respectively. Ozone-assisted EC was found more beneficial as compared to conventional plain EC. A pilot plant is designed to treat the intensive, recalcitrant, caramelized distillery spent wash, hence augmenting with ozone assisted EC method helps in achieving the desired satisfactory result.

Keywords : Ozone-assisted Electrochemical; Electrochemical (EC); Punch Electrodes; Distillery Spent Wash (DSW); Chromophoric Groups; Molasses

Publication
by Members

Dr Sunil Kumar Gupta, MIE
Department of Mechanical Engineering, Motilal Nehru National Institute of Technology Allahabad, Prayagraj, Uttar Pradesh

E-mail: sunilgupta303@gmail.com

Title of Paper: "Quasi-static and Dynamic Lap Shear Strength of Aluminium Joints Bonded with Epoxy/alumina Nanocomposite Adhesive", *Journal of Dynamic Behavior of Materials, 6, pp 186–196, 2020, ISSN: 2199-7446(Print) 2199-7454(Online).*

DOI: https://doi.org/10.1007/s40870-020-00235-x

Co-author : Dharmendra Kumar Shukla

Abstract: Quasi-static shear strength of aluminium alloy single lap joints was determined as a function of wt.% (0.5, 1.0, 1.5, and 2.0) of spherical and rod shaped nanoalumina in epoxy adhesive under compressive loading. Static shear strength for nanoadhesive containing 1.5 wt.% of nanoparticles (for both spherical and rod shaped nanoalumina) was observed to be maximum. Dynamic shear strength for neat adhesive and nanoadhesives containing 1.5 wt.% of spherical and rod shaped nanoalumina were analysed at two different loading rates using a split Hopkinson pressure bar system. A significant improvement (3 to 7 times) of dynamic shear strength of joints was perceived over static shear strength of joints. Static and dynamic lap shear strength for nanoadhesive containing nanospheres were significantly more than that for neat adhesive and nanoadhesive containing nanorods.

Keywords: Dynamic Shear Strength; Epoxy Adhesive; Single Lap Joint; Shape of Nanoalumina

Dr Plaban Bora, MIE
Department of Energy Engineering, Assam Science and Technology University, Guwahati

E-mail: bncplaban@gmail.com

Title of Paper: "Leveraging Microalga Feedstock for Biofuel Production and Wasteland Reclamation using Remote Sensing and Ex situ Experimentation", *Renewable Energy, 159, 2020, pp 973-981.*

https://doi.org/10.1016/j.renene.2020.06.047

Co-author : Mayur Mausoom Phukan, Nabajit Hazarika, Tapanjit Borah, Bolin Kumar Konwar

Abstract: Biofuel production becomes a sustainable developmental strategy, when wastelands are reprocessed as prospective mass culture sites (PMCS) for microalgae feedstock. Remote Sensing (RS) data and field visits were used to delineate eutrophic water bodies for PMCS. The floodplains of the Brahmaputra River Valley of Assam, India, were selected as PMCS and were defined using RS data. A green alga of the genus Parachlorella was isolated from an algal bloom present in drainage system, of Tezpur University, Assam, India. The species was cultured in representative water samples from the PMCS and growth was monitored in open laboratory conditions against the control. The microalgal biomass was characterized and subjected to in situ transesterification. The fuel properties such as viscosity, density, calorific value and cetane number (CN) were determined to assess the fuel quality. The results showed the biodiesel fuel properties were within the American Society for Testing and Materials (ASTM) purview. Additionally, the thermo-chemical conversion and subsequent characterization underscored the feasibility of bio-oil production from open laboratory culture of microalgae. This study highlights the practicability of combining RS data and experimental appraisal for cost effective, environment friendly and sustainable biofuel production, from microalgae cultured in wasteland PMCS.

Keywords: Microalgae, Remote sensing (RS), Eutrophic, PMCS, Brahmaputra River Valley

Publication
by Members

Mr Subhendu Bikash Santra, MIE
Assistant Professor, School of Electrical Engineering, KIIT, University

E-mail: subhendu.santra89@gmail.com

Title of Paper: "Generalized Switch Current Stress Reduction Technique for Coupled-Inductor based Single Switch High Step-Up Boost Converter", *IEEE Journal of Emerging and Selected Topics in Power Electronics, 2020.*

https://doi.org/10.1109/JESTPE.2020.2998487

Co-authors : Debashis Chatterjee, Yam P Siwakoti, Frede Blaabjerg

Abstract: Coupled inductor based boost converters suffer from high switch current stress in steady state and transient due to less self-inductance value in their winding. In this work, a generalized switch current stress reduction technique is proposed by modifying circuit topology of coupled inductor based high step up boost converter (CIHBC). This is achieved by half cycle resonating branch utilizing inductance of coupled inductor. Further, applying the concept, a coupled inductor boost converter is proposed for achieving high stepup ratio with low switch current and voltage stress. The operation of the proposed converter using resonating branch is discussed in both continuous and discontinuous conduction mode. The theoretical findings are verified through simulation study in PSIM 9.1.1. A prototype converter of 100W output power is designed to prove the concept and for performance analysis of the proposed converter.

Keywords : Current Stress; Coupled Inductor; High Step-up Boost Converter

Title of Paper: "Capacitor Selection Method in PV Interfaced Converter Suitable for Maximum Power Point Tracking", *IEEE Journal of Emerging and Selected Topics in Power Electronics, 2020.*

DoI: https://doi.org/10.1109/JESTPE.2020.2986858

Co-authors : Debashis Chatterjee, Kundan Kumar, Manuele Bertoluzzo, Ariya Sangwongwanich, Frede Blaabjerg.

Abstract: Capacitor is connected primarily between photovoltaic (PV) panel and power electronics converter (PEC) to suppress input voltage ripple and filter ripple current. However, this capacitor creates an error in maximum power point tracking (MPPT) for a fixed step algorithm under rapidly changing environmental condition if not selected properly. Therefore, the capacitor value selection along with maximum sampling rate determination is crucial for achieving error-free MPPT. A comprehensive analysis is carried out to prove the dependency of capacitor value on MPPT performance under irradiation and temperature variation. The analysis also includes the effect of ripple power on capacitor value selection when PV interfaced converter is connected to the grid. Finally, the capacitor value and the sampling rate of PV interfaced power electronics converter is determined. Simulation and experimental results confirm the theoretical findings.

Keywords : Maximum Power Point Tracking (MPPT); Capacitor; PV Interfaced Converter

Title of paper: "Performance Improvement of DC-DC Converter using L-D-based Modified GaN-FET Driver", *International Journal of Circuit Theory and Application, 48(6),2020, pp. 860-873.*

Doi: https://doi.org/10.1002/cta.2787

Co-authors : Aratrika Roy, Tanmoy Roy Choudhury, Debashis Chatterjee, Byamakesh Nayak.

Abstract : Bootstrap capacitor in FET gate driver plays an important role in the transient performance of the half bridge configured synchronous buck DC-DC converter especially in the top switch. In this paper, a new bootstrap capacitor based GaN-FET driver is proposed. This new GaN-FET driver is tested in a synchronous buck converter for performance verification like dv/dt immunity, transient response, and voltage ringing. A comparison study with the existing LM5113 (Texas Instrument)–based driver for GaN-FET and IR2110-based Si-MOSFET driver on a DC-DC converter is carried out to show the performance improvement using the proposed GaN-FET driver. The simulation study is performed on spice-based NI-Multisim 14.1. Finally, the designed GaN-FET driver is tested on a 60-W synchronous buck DC-DC converter in open-loop and closed-loop configuration.

Keywords : Bootstrap Capacitor; DC-DC Converter; GaN-FET

Publication
by Members

Mr Sumit Aole, AMIE
Department of Instrumentation Engineering, Shri Guru Gobind Singhji Institute of Engineering and Technology, Nanded, Maharashtra

E-mail: sumit.aole@gmail.com

Title of Paper: "Improved Active Disturbance Rejection Control for Trajectory Tracking Control of Lower Limb Robotic Rehabilitation Exoskeleton". *Sensors 2020, 20(13), 3681.*

https://doi.org/10.3390/s20133681

Co-authors : Irraivan Elamvazuthi, Laxman Waghmare, Balasaheb Patre, Fabrice Meriaudeau

Abstract: Neurological disorders such as cerebral paralysis, spinal cord injuries, and strokes, result in the impairment of motor control and induce functional difficulties to human beings like walking, standing, etc. Physical injuries due to accidents and muscular weaknesses caused by aging affect people and can cause them to lose their ability to perform daily routine functions. In order to help people recover or improve their dysfunctional activities and quality of life after accidents or strokes, assistive devices like exoskeletons and orthoses are developed. Control strategies for control of exoskeletons are developed with the desired intention of improving the quality of treatment. Amongst recent control strategies used for rehabilitation robots, active disturbance rejection control (ADRC) strategy is a systematic way out from a robust control paradox with possibilities and promises. In this modern era, we always try to find the solution in order to have minimum resources and maximum output, and in robotics-control, to approach the same condition observer-based control strategies is an added advantage where it uses a state estimation method which reduces the requirement of sensors that is used for measuring every state. This paper introduces improved active disturbance rejection control (I-ADRC) controllers as a combination of linear extended state observer (LESO), tracking differentiator (TD), and nonlinear state error feedback (NLSEF). The proposed controllers were evaluated through simulation by investigating the sagittal plane gait trajectory tracking performance of two degrees of freedom, Lower Limb Robotic Rehabilitation Exoskeleton (LLRRE). This multiple input multiple output (MIMO) LLRRE has two joints, one at the hip and other at the knee. In the simulation study, the proposed controllers show reduced trajectory tracking error, elimination of random, constant, and harmonic disturbances, robustness against parameter variations, and under the influence of noise, with improvement in performance indices, indicates its enhanced tracking performance. These promising simulation results would be validated experimentally in the next phase of research.

Keywords: Improved active disturbance rejection control (I-ADRC); lower limb robotic rehabilitation exoskeleton (LLRRE); trajectory tracking; linear extended state observer (LESO); tracking differentiator (TD); nonlinear state error feedback (NLSEF).

Mr Himanshu Agrawal, AMIE
Ph.D. Research Scholar, Department of Mechanical Engineering, NIT Kurukshetra, Haryana

E-mail: himanshurdk@gmail.com

Title of Paper: "Economic Analysis of Solar Thermal System for Melting of Ice at High Altitude Regionsusing Scheffler Solar Concentrator", *International Journal of Sustainable Engineering, 2020.*

DoI: https://doi.org/10.1080/19397038.2020.1740821

Co-author : Avadhesh Yadav

Abstract: The present paper deals with the economic investigation of hot water generation from melting of ice through Scheffler solar concentrator at high altitude regions like Leh Ladakh in India. for determination of the cost incurred per litre in terms of the Indian Currency, several factors have been studied and evaluated. In all three examined cases, for every respective case, the undeviating technique is adopted. The experimentation is performed in the atmospheric conditions of National Institute of Technology, Kurukshetra, Haryana, India. Exclusive economics of yearly cost per litre is achieved for the generation of hot water from ice at high altitudes by making use of direct heating process.

Keywords: Economic Analysis; Schefflersolar Concentrator; Water Generation

Publication
by Members

Mr Soham Ghosh, AMIE
Electrical Engineer, Black and Veatch Corporation, KS, USA

E-mail: cagpcik@gmail.com

Title of Paper: "A Comprehensive Forecasting, Risk Modelling and Optimization Framework for Electric Grid Hardening and Wildfire Prevention in the US", *International Journal of Energy Engineering, 10(3), 2020, pp 80-89.*

DOI: 10.5923/j.ijee.20201003.02

Co-author: Sreejata Dutta

Abstract: Historical wildfire patterns have experienced a recent shift in terms of its scale and intensity. Through the continuing advancements in electrical protection technology, statistical forecasting methodologies, availability of meteorological field data, and regional risk-modelling, wildfire management practices can be made more proactive in the United States and around the globe. To create a comprehensive and practical operating framework, an advanced seasonal autoregressive integrated moving average time series modelling technique for wildfire forecasting is explored. These regressive models, due to their mathematical accuracy has been used in many engineering and scientific applications. The study presented here was done using a qualitative investigation approach to wildfire data. Computer automated grid search techniques were developed to determine suitable seasonal regressive model hyper-parameters. With the usage of power transforms to fit skewed statistical models under study, it is found that a much more accurate and computationally efficient model can be generated. Statistical forecasts and regional risk mapping techniques can influence strategic operational practices for regional and local fire authorities. Concepts that can enhance power system protection and electrical grid hardening are explored and practical guidelines to help electrical utilities improve electrical grid operations are provided. Many benefits of using distributed energy resources are discussed and an optimal power flow involving these resources is formulated to help grid operators preserve system stability under these wildfire scenarios.

Keywords: Grid Maintenance Planning; SARIMA; Auto-regressive Models; Forecasting; Wildland-urban Interface; Risk-model; Distributed Energy Resources

Dr B Meenakshi, AMIE
Professor/ EEE department, Sri Sai Ram Engineering College, Chennai

E-mail: meenakshi.eee@sairam.edu.in

Title of Paper: "Design of Safety Control for Gas Turbine using PLC and SCADA", *Test Engineering and Management, ISSN: 0193-4120, 83, 2020, pp 12653 – 12662.*

http://www.testmagzine.biz/index.php/testmagzine/article/view/5917

Co-authors: Vallikannu, S Shrividhyaa, R Anu Kumari

Abstract: Gas Turbines are one of the most efficient rotary equipment for converting fuel energy to mechanical energy. A GT is a machine delivering mechanical power or thrust to the generator with maximum efficiency. Gas turbine functions in the same way as the IC engine. It sucks in air from the atmosphere, compresses it. The fuel is injected and ignited. The gases expand doing work and finally exhausts outside. In the gas turbine, there is a continuous flow of the working fluid. The gas turbine and generator controls are implemented using PLC in the proposed model. The article also discusses the control parameters for each equipment such as compressor, turbine and generator. The results demonstrate an increased control mechanism with gas turbine engine which insists on competitive pressure to provide more and more sophisticated controls, while at the same time reducing cost. This is achieved by means of optimal logics developed for the control.

Keywords: Thrust; GT; PLC; IC Engine; Working Fluid Compressor; Turbine; Generator; Logic

Publication
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Dr Nilaj N Deshmukh, FIE

Dean (Faculty) & Head of Mechanical Engineering Department, Fr. C. Rodrigues Institute of Technology, Vashi, Navi-Mumbai

E-mail: nilaj.deshmukh@fcrit.ac.in

Title of Paper: "Coefficient of Rayleigh Index based Performance Evaluation of Radial Micro Jet Injection Technique for Thermo-acoustic Instability Control", *Measurement, 151, 2020.*

DoI: https://doi.org/10.1016/j.measurement.2019.107245

Co-author: S D Sharma

Abstract: This study proposes a coefficient of Rayleigh Index (CRI) obtained by normalizing the acquired data which can circumvent the problem of arbitrary scale and unit while quantifying the Rayleigh Index. CRI is estimated from the simultaneous measurements of luminescence of a flame as an indicator of unsteady heat release and pressure fluctuation near the burner head. Experiments were carried out for six different mixture equivalence ratios ranging from 0.75 to 1.0 and a burner positioned at x/L = 0.2. The control technique of micro jets is found to completely suppress the thermo-acoustics by decoupling the pressure waves and unsteady heat release waves as indicated by increasing phase difference between them. The coefficient of Rayleigh Index is found to reduce to nearly zero with the use of radial micro jets for suppressing the thermo-acoustic instability. In such case, the flame luminescence was observed to significantly reduce. The proposed coefficient of Rayleigh index is very useful in quantifying the effectiveness of control technique for the thermo-acoustic instability.

Keywords: Thermo-acoustics; Rayleigh Index; Rijke Tube; Premixed Flame; Combustion Instabilities.

Dr Laxmi Narain Rohilla, AMIE

Professor and Head, Department of Mechanical & Civil Engineering, Echelon Institute of Technology, Faridabad

E-mail: lnrohilla@gmail.com

Title of Paper: "Direct Normal Irradiance Predictions using Broadband Models for Indian Stations", *Energy Reports, 6 (2), 2020, pp 572-576.*

https://doi.org/10.1016/j.egyr.2019.11.121

Co-author: Dr Dinesh Kumar Singh

Abstract: In this paper three parametric models CPCR2, MLWT2 and REST have been used to compute direct normal irradiance (DNI) for five Indian stations, namely New Delhi, Pune, Jaipur, Kolkata and Mumbai. Computed values of DNI have been compared with measured values in terms of percentage root mean square error (RMSE) and percentage mean bias error (MBE). It is observed that the average percentage RMSE for the year is the minimum for MLWT2 model for Jaipur followed by New Delhi and Pune and the values are 1.67%, 2.33% and 2.49%, respectively. But for coastal stations Kolkata and Mumbai the corresponding minimum values occur for CPCR2 model and REST model respectively, and the values are 2.62% and 2.76%, respectively. It shows that MLWT2 model performs better for most of the Indian stations except the coastal stations.

Keywords: Direct Normal Irradiance; Root Mean Square Error; Mean Bias Error

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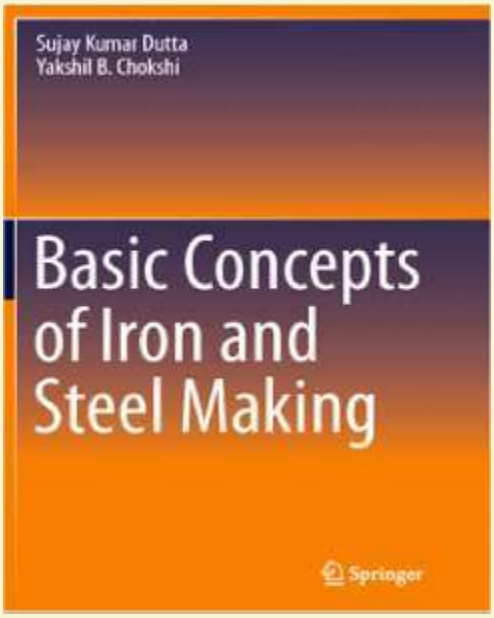
Book Review

Basic Concept of Iron and Steel Making

Dr Sujay Kumar Dutta, MIE
Mr Yakshil B Chokshi

E-mail: drskdutta1981@gmail.com



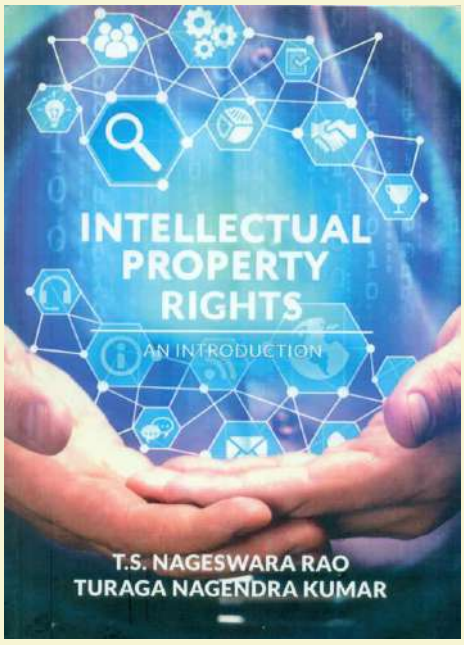
This book presents the fundamentals of iron and steel making, including the physical chemistry, thermodynamics and key concepts, while also discussing associated problems and solutions. It guides the reader through the production process from start to finish, covers the raw materials, and addresses the types of processes and reactions involved in both conventional and alternative methods. Though primarily intended as a textbook for students of metallurgical engineering, the book will also prove a useful reference for professionals and researchers working in this area.

Publisher : Springer

Intellectual Property Rights – An Introduction

T S Nageswara Rao, FIE
Turaga Nagendra Kumar

E-mail: tsnrao30@rediffmail.com



Intellectual Property is the creation of human mind, human intellect and an asset, that can be bought, sold, mortgaged, licensed or exchanged. Intellectual Property Rights (IPRs) are the key elements required to maintain the competitive edge of any industry. Intellectual Properties are emerging as a new wealth and power of nation and through propagation of new knowledge and ideas, become a significant component of world trade. IPRs is highly significant for the engineers, technologists and professionals, who are involved with technological inventions and innovations. Knowledge of the IPRs helps the technocrats not only to protect their valuable ideas and thus create intellectual property, but also to promote its licensing and development for the larger interest of the society. In this book, an attempt has been made to describe the features of IPRs including their registration, legal rights etc associated with them.

Publisher : Educreation Publishing

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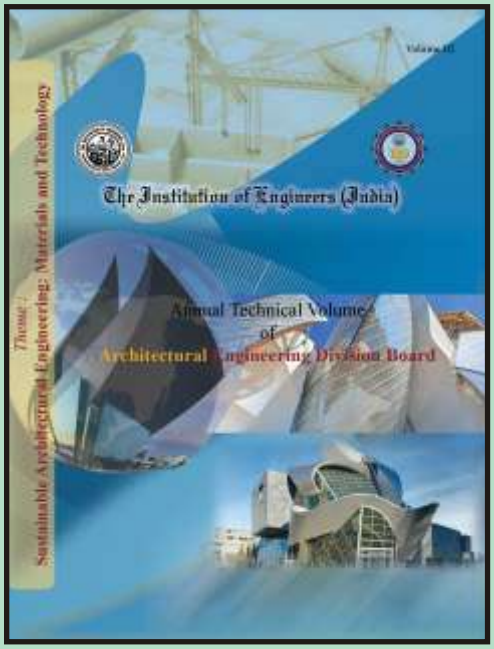

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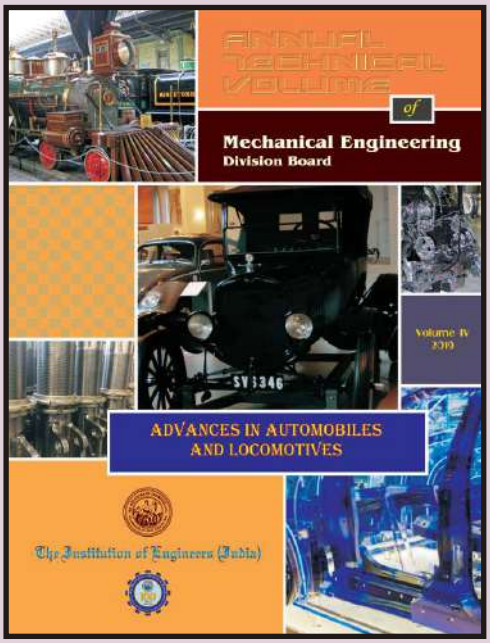

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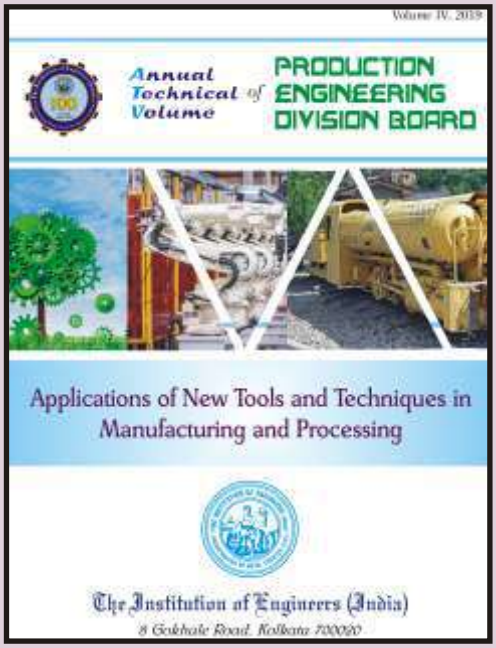

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