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A Century of Service to the Nation

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Title of Paper: **Howrah Bridge: Icon of a 330-year-old City in India – Part 1: History, Planning and Design**

Proceedings of the Institution of Civil Engineers, Engineering History and Heritage, ICE Publishing, Volume 173 Issue 3, August 2020, pp 117-128, Themed issue on Calcutta: part I, ISSN 1757-9430 E-ISSN 1757-9449, Published Online: 10 October 2019

DOI: https://doi.org/10.1680/jenhh.19.00017

Abstract: *Howrah Bridge completes its 75 years of service for the populace of the twin Indian cities of Calcutta (now Kolkata) and Howrah and is considered as the icon of the city. The imposing and heavily built balanced-cantilever suspension bridge has held the fancy of the city population ever since its construction. Calcutta, as it was previously known, was built on the bank away from the mainland and therefore had to depend on the main railway station at Howrah on the western bank as the entrance to the city. The bridge has thus become its main link to the mainland in the west and north of India. The present bridge was preceded by a floating bridge on pontoons that served for an astonishing ~70 years. Almost 35 years of deliberations, planning and tender invitations had proceeded before the bridge construction was started, only to be completed in a period of 6 years – an amazing feat. The planning and design of the bridge incorporated features addressing future maintenance needs and adjustments that have kept the structure in perfect shape.*

Keywords: *Bridges/design methods & aids/steel structures*

Prof S K Mazumder, FIE

Former Professor of Civil Engineering, Delhi College of Engineering (now Delhi Technological University), and AICTE Emeritus Fellow

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Title of Paper: **Discussions on the paper 'Assessment of Planform Changes of the GangaRiver from Bhagalpur to Farakka during 1973–2019 using Satellite Imagery'**

ISH Journal of Hydraulic Engineering, Taylor & Francis, Published Online:10 March 2021, pp 1-6

DOI :https://doi.org/10.1080/09715010.2021.1896391

Keywords: *Landsat Imagery, Bank Erosion, Meandering, Farakka Barrage*

PUBLICATION by Members

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Title of Paper: **Removal of Turbidity from Water using Natural Coagulant and Comparison Study with Chemical Coagulant**

International Journal of Scientific & Engineering Research Volume 11, Issue 10, October 2020, pp 763-766, ISSN 2229-5518

URL: https://www.ijser.org/onlineResearchPaperViewer.aspx?Removal-of-turbdity-from-of-water-using-natural-coagulant-and-comparison-study-with-chemical-coagulant.pdf

***Abstract**: Among the natural resources water is the most vital parameter. Turbidity is the cloudiness or haziness of a fluid caused by large number of individual particles that are generally invisible particles that are generally invisible to the naked eye, similar to the smoke present in the air. In this present study, an attempt has been made to evaluate the comparative effectiveness of chemical coagulant Alum with Natural Coagulant such as banana peel and orange peel for reduction of Turbidity in waste water sample has been collected from the origin source with impurities present in it. The tests were carried out using the turbidity meter test apparatus. The comparative results of turbidity reduction after addition of Alum, banana peel powder and orange peel powder were experimented. It was found that natural coagulant banana peel powder shows better treatment with wastewater. The utilisation of locally available natural coagulant was found to be suitable, easier, cost effective and environment friendly for waste water treatment.*

***Keywords** : Coagulation, Turbidity, Chemical coagulant, Natural Coagulant, Alum, banana peel and orange peel powder, Wastewater*

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Title of Paper: **Estimation of Daylight Availability in Kolkata and Approximation of Indoor Daylight Levels for Different Daylighting Methods**

International Journal of Sustainable Energy, Taylor and Francis, Published Online: 05 March 2021

DOI: https://doi.org/10.1080/14786451.2021.1894145

Co-authors: Sudipta Majumder, Subarna Roy & Imran Hossain Sardar

***Abstract**: This work estimated the daylight availability and luminous efficacy of solar illuminance and approximated indoor daylight levels for various indoor daylighting methods for Kolkata, a major city in eastern India having tropical savanna climate, by applying two computational methods: the Perez model and the IESNA recommended calculation procedure. It was found that hourly horizontal diffuse and global illuminance, horizontal sky and total daylight illuminance values remained mostly over 10 klx throughout the year, and global and diffuse luminous efficacies mostly remained around 95–120 and 110–150 lm/W, respectively. The linear correlation between solar irradiation and estimated illuminance was stronger for Perez model. Thus, the application of Perez model was considered the better choice to appraise the daylighting potential of Kolkata.*

***Keywords**: Daylight availability, Solar illuminance, Daylighting devices, Global luminous efficacy, Diffuse luminous efficacy*

PUBLICATION by Members

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Title of Paper: **Adaptive Traffic Control System for Smart Cities using Computer Vision and Deep Learning**

International Journal of Advanced Research in Computer and Communication Engineering, Volume 10, Issue 3, March 2021

DOI: 10.17148/IJARCCE.2021.10340

Co-author : Shyam Shankaran R

Abstract: *In country like India, billions of people start and end each working day stuck in traffic or commuting on congested trains and buses. By 2025, cities that implement smart mobility systems on average, reduce commuting cycles by 15-20 percent, with some individuals experiencing even greater reductions. Depending on each city's density, current transit facilities, and commuting habits, the capacity associated with each application is highly variable. Slowed synchronization of traffic signals leads to traffic congestion and delays. The pre-programmed, regular signal timing patterns are employed in traditional signal systems. To overcome the problems of traditional traffic control systems, there is a shift in adaption to an Adaptive traffic control system. The ATCS (Adaptive Traffic Control System) is a traffic management technique that modifies or adapts the timing of traffic signals based on the real demand for traffic and achieved using a control system that includes both hardware and software, where hardware is the sensor used for real-time traffic density estimation and software is designed using captured data analysis of the city's current traffic flow. This paper depicts a model of camera-based traffic monitoring and processing system which reduces the cycle time and possesses special provisions for emergency vehicles.*

Keywords: *Traffic monitoring, Traffic congestion detection, Adaptive traffic control system, Intelligent Transportation System, OpenCV, Image Processing, Traffic Management System*

Er C Srinivas, AMIE

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Title of Paper: **Optimal Solution of Economic Load Dispatch using Teaching Learning Algorithm**

Proceedings of the International Conference on Artificial Intelligence and Smart Systems (ICAIS-2021), DVD Part Number: CFP21OAB-DVD; ISBN: 978-1-7281-8381-7, IEEE , pp 827-832

DOI: https://doi.org/10.1109/ICAIS50930.2021.9395984

Co-authors: A Senthilkumar, I Kranthi Kumar & Y V Balarama Krishna Rao

Abstract: *In modern power system the economic load dispatch is considered as a non-linear problem. Many conventional and modern optimization algorithms are proposed to define a solution for the economic load dispatch. Among them, Teacher and learner based optimization is considered as one of the modern searching algorithms. This paper aims to solve the non-linear problem that exists in economic load dispatch using TLBO. Generally, the non-linear problem of economic load dispatch deals with the number of constraints inequality available in nature. The constraints are mainly the voltage, real and reactive power, shunt capacitor, transformer tapping etc. TLBO leverages on optimal solution to the nonlinear problem with a good convergence ratio.*

Keywords: *Differential evolution, Economic load dispatch, Multi objective optimization, PSO*

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Title of Paper: **Design and Development of Smart Personal Protective Equipment Vending Machine using Internet of Thing**

2021 International Conference on Emerging Smart Computing and Informatics (ESCI), AISSMS Institute of Information Technology, Pune, 5-7 March 2021

DOI: 10.1109/ESCI50559.2021.9396775

Co-authors: Gayatri Phade, Akash Tribhuvan & Sanjay Gandhe

Abstract*: Most beneficiary vending machines are PPE Vending machine which dispenses personal protective equipment's such as glasses, gloves, PPE Kit etc. This is highly essential for Industrial sites, Hospitals and construction sites. During the COVID-19 pandemic period, the role of personal protective equipment is very crucial because it avoids contact, droplet or airborne. Many hospitals and medical agencies reported and believed that existing system lack features like contactless access and inventory management of PPE items viz. face mask, hand gloves, clothing suit, respirators, shields, helmets, sanitizers etc. In this paper, Internet of Thing based smart personalized protective equipment vending machine is developed. The RFID technology is used to scan the authorized user and dispense desired item with contactless and keep live tracking of inventory. The live inventory data is transferred to remote system using Webhook software platformapacitor, transformer tapping etc. TLBO leverages on optimal solution to the nonlinear problem with a good convergence ratio.*

Keywords*: Personal protective equipment, COVID-19, Hospitals, Inventory management, Software, Internet of Things, Radiofrequency identification*

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Title of Paper: **Design and Analysis of 25 T Injection Molding Machine**

Materialstoday: Proceedings, Elsevier, Published Online : 04 March 2021, MATPR-D-21-00412

DOI: https://doi.org/10.1016/j.matpr.2021.02.262

Co-authors : Deepak C Patil, Nagaraj K Kelageri & Sanjeev A Janawade

Abstract*: Injection molding process is used for mass production of plastic components, where the varieties of components range from large automotive components to very small toys. Injection molding machines are rated by tonnage, which indicate the maximum amount of clamping load the press can apply on the mold. Present work aims at design and development of cost effective injection molding machine having 25 T capacities. Modeling of various parts of the machine and their assembly is carried out using solid works. The cost of present injection molding machine is more. As in today's competitive market to survive in market economical costing is necessary which is possible by proper optimization of resources used. In this project we try to use the minimum material to fulfill the objectives.*

Keywords*: Injection molding, Mass production, Clamping load, Mold, Optimization*

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Title of Paper: **Independent Component Analysis with Learning Algorithm for Electrocardiogram Feature Extraction and Classification**

Signal Image and Video Processing, Springer, Volume 15, Issue 2, Published: 03 January 2021, pp 391-399

DOI: 10.1007/s11760-020-01813-1

Co-authors: G Rajendran & R B Vidhyakar

Abstract: *Electrocardiogram (ECG) analysis is a conventional way of finding heart abnormality. It is a clinical procedure in which the electrical activity of the heart is measured during every cardiac cycle and checked for healthiness of the heart. It is approximated in this industrialized world that millions of people expire every 12 months because of various coronary heart diseases and short of prompt detection of uncharacteristic heart rhythms. To detect these abnormalities promptly, the ECG measures should provide the cardiac signals without any mixtures or other disturbances. Though accurate classification of ECG is a challenging task as it varies with time and also with persons of different ages, it is the need of the hour. In this proposed research work, an improved independent component analysis (ICA) algorithm is used to extract pure ECG components from the ECG mixtures before the signals are applied to machine learning classifiers for accurate detection and classification of ECG signals. These machine learning models are applied after the signals are preprocessed to reduce the dimensionality and the training time. This work also uses deep learning convolution neural network (CNN) model with different optimizers for ECG classification and analysis. Classification performance of these algorithms is improved when classification is done after extracting the features using ICA technique.*

Keywords: *ECG, Independent component analysis, long-term monitoring, ECG extraction and classification*

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Title of Paper: **Seismic Fragility Assessment of a Pipe Rack Structure in a Petrochemical Complex by Incremental Dynamic Analysis**

Journal of Structural Engineering, Volume 47, Number 5, December 2020- January 2021, pp 408-415

Abstract: *A typical petrochemical complex consists of various components of different complexities such as structures of various proportions, critical piping, tanks and massive compressors. The consequences of a seismic event in a process plant is severe compared to conventional civil structures considering that damage to even a single component would result in release of toxic gases and lead to an interruption in the production causing economical losses and threat to society and environment. Pipe rack structures with the supported piping systems represents an important item in petrochemical complexes, refineries and LNG plants as they run in kilometres of length connecting various process units in the complex. The seismic hazard posed by such structures is evident in that they carry piping systems with hazardous fluids and support other critical equipments such as air coolers and exchangers. The paper presents the seismic fragility assessment for a typical steel pipe-rack structure adapted from a petrochemical complex built in a region of moderate seismicity. Pipe rack structure is first verified for its capacity as per the European codes. The Incremental Dynamic Analysis (IDA) is then performed to obtain an insight into the dynamic response of the structural system in both the transverse and longitudinal directions. The fragility curves developed for different performance levels based on the IDA data are used for the seismic assessment.*

Keywords: *Pipe rack; Eigenvalue analysis; Incremental dynamic analysis; Performance levels; Fragility curves*

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Title of Paper: **Synthesis, Characterization and Properties of Fly Ash based Geopolymer Materials**

Journal of Materials Engineering and Performance, Springer, Published: 29 March 2021

DOI : https://doi.org/10.1007/s11665-021-05647-x

Co-author : Prasanta Kumar Rout

Abstract: *In this present investigation, geopolymer specimens were prepared by fly ash powder and various concentrations of NaOH solution maintained at 10 molar (M), 12 molar (M) and 14 molar (M) along with Na_2SiO_3 solution followed by artificial curing at 60°C up to 50 h. Na_2SiO_3 solution-to-NaOH solution ratio and liquid-to-solid mass ratio are maintained at 1 and 0.3, respectively. The test results indicated that the compressive strength of geopolymer samples was increased with the increase in NaOH concentration from 10 M to 14 M, with the addition of Na_2SiO_3 solution to NaOH solution and with curing time as well. The maximum compressive strength value of 32 and 73 MPa was achieved for the geopolymer sample, namely FAG14NH and FAG14NHNS. The geopolymerization behavior and geopolymer specimen were explained by means of various techniques such as ICC, FESEM, HRTEM, XRD and FTIR. Further hardness and thermal behavior of geopolymer specimens were also studied in this investigation.*

Keywords *: Compressive Strength, Fly ash, FESEM, Geopolymer, HRTEM, ICC, Thermal behavior*

Title of Paper: **Synthesis and Characterization of Fly Ash and GBFS based Geopolymer Material**

Biointerface Research in Applied Chemistry, Platinum Open Access Journal (ISSN 2069-5837), Volume 11, Issue 6, Published: 23 March 2021, pp 14506 - 14519

DOI : https://doi.org/10.33263/BRIAC116.1450614519

Co-author : Prasanta Kumar Rout

Abstract: *This study investigates the synthesis and characterization of fly ash and GBFS based material using geopolymer technology. Geopolymer is a class of inorganic polymer that can be formed by the reaction between an aluminosilicate source material and an alkaline solution. The geopolymer materials are synthesized, where the GBFS are added with fly ash in some specific ratios such as 100:0, 30:70, 50:50, 70:30, and 0:100, respectively. Sodium hydroxide (NaOH) and sodium silicate (Na_2SiO_3) solutions are used as alkaline solutions. NaOH concentration was kept at 14 molars, and the ratio of liquid to solid is kept at 0.3. The specimens are cured at 60°C for 24 hours. The hardened geopolymer specimens were tested by a digital compression testing machine and characterized by the FESEM technique. The hybrid C-N-A-S-H gel is the main reaction product for the fly ash and GBFS based geopolymer specimen, which plays an important role in compressive strength development.*

Keywords *: Fly ash; GBFS; Environment; Geopolymer; Characterization; FESEM.*

PUBLICATION by Members

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Title of Paper: **Is "Consideration of Alternatives" in Project-level Environmental Impact Assessment Studies in Developing Countries an Eyewash: An Indian Case-study**

Journal of Environmental Planning and Management, Taylor & Francis, Published Online: 09 March 2021

DOI: https://doi.org/10.1080/09640568.2021.1886058

***Abstract**: Consideration of alternatives for a development project, with the prime objective of selecting the most appropriate alternative that supports sustainability of the environmental resources, should be the heart of an EIA study. This study was undertaken to examine how alternatives were addressed in 46 EIA reports for infrastructural projects accorded environmental clearance in India, adopting the yardsticks used by Sadler for evaluating effectiveness and criteria-based evaluation. The EIA process considers alternatives superficially and the terms of reference lack emphasis on a wide range of reasonable alternatives, even for potentially controversial and large projects. Radical improvements are needed in the EIA process through a core legislated scoping, and transparent and rigorous appraisal of proposals right from "upstream" through "downstream" of project life-cycle. The capacity building of professionals associated with the EIA process on the structured methodologies for identification, development, and analysis of reasonable alternatives should help meet the EIA objectives.*

***Keywords**: Criteria-based evaluation, EIA process, EIA system, Effectiveness of consideration of alternatives, Scoping, Terms of reference*

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Title of Paper: **Minimization of Nanoparticle Deposition Rate in a Square Duct with a 90° Bend using Taguchi Technique**

Applied Nanoscience, Springer Ltd, Volume 11, Published Online: 31 January 2021, Published: March 2021, pp 995–1008

DOI: https://doi.org/10.1007/s13204-020-01658-7

Co-authors : D Prakash & M Ravichandran

***Abstract**: In this study, a simulation-based optimization technique is employed to reduce nanoparticle deposition rate in a 90° square duct system. Nanoparticle deposition in the 90° bend pipe is highly influenced by bend radius, aspect ratio, airflow velocity, nanoparticle size, and mass flow rate. These factors are optimized for minimum deposition rate through Taguchi's signal to noise ratio analysis and response surface methodology (RSM). L27 orthogonal array is employed in Taguchi's technique, and a central composite with 32 trials is used in the RSM technique. All the above cases are numerically simulated in computational fluid dynamics (CFD) tool using large eddy simulation (LES) and discrete phase model (DPM) for turbulence modeling. The minimum deposition rate of nanoparticles on the bend of a 90° square duct is predicted as 0.1389 through a confirmative test conducted for the best optimum values. The bend radius is the most influencing factor in the ANOVA analysis of deposition rate, and the other factors have shown the least influence on the deposition rate of nanoparticles.*

***Keywords**: Nanoparticles, Ducts, Deposition, CFD, Optimization*

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Title of Paper: **Productivity Enhancement of Single-slope Solar Still with Novel Bottom Finned Absorber Basin Inserted in Phase Change Material (PCM): Techno-economic and Enviro-economic Analysis**

Environmental Science and Pollution Research, Springer, Published : 22 April 2021

DOI: https://doi.org/10.1007/s11356-021-13495-4

Co-author: Sendhil Kumar Natarajan

Abstract: *Solar still is one of the economic and eminent ways of desalinating the available sea/brackish water into potable water. However, the distillate output from the solar still is moderate and various researches are being conducted to improve the productivity of solar still. In this research, a novel bottom finned (solid and hollow) absorber basin is designed and developed to enhance the heat transfer between absorber and phase change material (PCM) which further improves the freshwater productivity from the solar still. The results of the investigation are compared with the conventional solar still. The three single-slope solar stills considered developed for evaluating the effect of modification on the freshwater productivity are (i) conventional solar still (CSS), (ii) solar still with hollow finned absorber inserted in energy storage (SSHFES), and (c) solar still with solid finned absorber inserted in energy storage (SSSFES). The investigation results reported that the SSHFES has greater productivity when compared with the SSSFES and CSS. The freshwater productivity from the SSHFES is 4085 mL/m^2 day, whereas the freshwater productivity from SSSFES and CSS is 3485 mL/m^2 day and 2885 mL/m^2 day, respectively. The efficiency of SSHFES and SSSFES is increased by 41.67% and 20.81% relative to the CSS. It is observed from economic analysis that the cost per liter (CPL) freshwater produced by SSHFES, SSSFES and CSS is about ₹ 2.3 ($ 0.032), ₹ 2.5 ($ 0.034), and ₹2.6 ($ 0.036), respectively. The payback periods of SSHFES, SSSFES, and CSS is 6.3 months, 6.8 months, and 7.1 months, respectively. Also, the enviroeconomic analysis conferred that the carbon credit gained from the SSHFES is $189.28 whereas SSSFES and CSS gained only $158.2 and $132.02. Based on the current study, it is observed that the solar still with hollow finned absorber inserted in energy storage (SSHFES) is effective when compared to others and it is viable for potable water production at cheaper costs.*

Keywords: *Desalination, Solar still, fins, Paraffin wax, Environmental analysis, Economic analysis*

Title of Paper: **Experimental and Economic Analysis of Energy Storage-Based Single-Slope Solar Still with Hollow-Finned Absorber Basin**

Heat Transfer, Wiley Online Library, Published : 05 April 2021

DOI: https://doi.org/10.1002/htj.22136

Co-authors : Arivazhagan Sampathkumar & Sendhil Kumar Natarajan

Abstract: *The paucity of drinking water is an alarming glitch across the globe. The conversion of available seawater into drinking water by utilizing renewable energy is the best way to surmount this challenge. Desalination through solar still is one of the notable, monetary, and viable processes among various desalination approaches. The current research aims to augment the potable water yield of single-slope solar still by using a hollow-finned absorber basin inserted into paraffin wax—phase change material (PCM). The effect of hollow-finned absorber basin on the yield of solar still is investigated separately, with and without PCM, and compared with the results of conventional solar still (CSS). In the first set of experiments, the CSS and solar still with a hollow-finned absorber basin without PCM (SSHF) are investigated. In the second set of experiments, the CSS and solar still with a hollow-finned absorber basin inserted into PCM (SSHFP) are investigated. The experimental results reported that the CSS is having almost the same yield on the 2 days of testing. The yield of SSHF and SSHFP is increased by 15.7% and 52.4%, respectively, when compared with CSS. The results of the economic analysis proved that the payback period and cost per liter of freshwater produced from SSHFP are comparatively better than SSHF and CSS.*

Keywords: *Desalination, Energy efficiency, Hollow fins, Phase change material, Single-slope still, Solar*

PUBLICATION by Members

Title of Paper: **Experimental Investigation of Single-Basin Solar Still using Solid Staggered Fins Inserted in Paraffin Wax PCM Bed for Enhancing Productivity**

Environmental Science and Pollution Research, Springer, Published : 16 January 2021, pp 20330–20343

DOI: https://doi.org/10.1007/s11356-020-11980-w

Co-author: Sendhil Kumar Natarajan

Abstract*: The single-basin solar still is one of the effective ways of desalinating the seawater at an affordable price. But, the productivity of solar still is low and many kinds of research are under progress to enhance the yield. In this regard, a single-basin solar still with a solid staggered pin finned absorber inserted into a paraffin wax bed is developed to investigate the yield enhancement. This investigation is carried out by varying the seawater depths of the absorber basin from 2 to 4 cm in the developed solar still. The obtained results are compared with conventional solar still without fins and PCM bed. It is observed that the yield obtained in the developed solar still with 2-cm depth is having greater productivity when compared to other cases of seawater depths (3 cm and 4 cm). The yield of modified solar still and conventional solar still at 2-cm water depth is 3750 mL/m^2 and 3017 mL/m^2 respectively. It is also observed that thermal efficiency of the developed single-basin solar still is increased by 12.23%, 22.66% and 24.26% respectively compared to the conventional solar still for the seawater depths of 4 cm, 3 cm and 2 cm. In addition to that, it is observed from the economic analysis, the cost per litre potable water produced from modified solar still and conventional solar still is ₹ 2.1 and ₹ 2.25 respectively. Also, the environmental analysis is carried out to analyse the carbon credit from the developed single-basin solar still and found that the carbon credit gained from modified still and conventional solar still is $ 172.8 and $ 137.9 respectively. Based on this investigation, it is observed that the developed single-basin solar still with solid staggered pin finned absorber inserted into paraffin wax bed can be effectively used for the drinking water production to overcome the water scarcity*

Keywords*: Solar still, Staggered fins, Paraffin wax, Energy storage, Thermo-economic, Enviroeconomic*

Title of Paper: **Effect of Wire Electrical Discharge Machining Process Parameters of Al-6082 Hybrid Nano Metal Matrix Composites**

Materials Today: Proceedings, Elsevier, Volume 43, Part 1, January 2021, pp 551-556

DOI: https://doi.org/10.1016/j.matpr.2020.12.047

Co-authors : Venkatasreenivasula Reddy Perla, Manjunath Thimmarayappa & Venkata Ramaiah Pathi

Abstract*: Hybrid nanometal matrix composites (HNMMC) have emerged as a promising material with a broad array of applications in the aerospace, defence and automotive industries due to its remarkable mechanical properties. In this article HNMMC sample prepared by mixing Al-6082 and two reinforcement materials [0.4%Graphene (Gr) and 0.5% Carbon nanotubes (CNT)] using a stir casting process. Wire Electric Discharge Machining (WEDM) process is employed to deal with the composites due to its complexity of machining in conventional processes. Experiments are carried out by choosing four different variable parameters such as pulse off time (TOFF), pulse on time (TON), Gap Voltage (V) and Wire-feed (WF). The design considered for the experimental investigation is Taguchi L27 OA for different process parameter combinations. The experimental outcomes such as Surface Roughness (SR), Material Removal Rate (MRR), and Kerf Width (Kw) are determined for each trial. The results are analyzed in Minitab-19 with the application of main effect plots and Taguchi analysis. The major purpose of the study is to determine the most effective parameter which influences the output response. Based on the experimental result, the pulse on time is the most dominant parameter for all output responses.*

Keywords*: HNMMC, Stir-casting, WEDM, MRR, SR, Kerf width, Taguchi*

PUBLICATION by Members

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Title of Paper: **Current Zero Waste Technologies & Use of Plastic Waste in Making Roads in India**

Annual Technical Volume of the Environmental Engineering Division on Technologies for Zero Waste in India: Current and Future Challenges, Volume IV, 2020, pp 48-54, ISBN: 978-81-952159-4-2

https://www.ieindia.org/webui/IEI-Publication.aspx#annual-technical-volume

Abstract : *No company can claim to be 100% zero waste company. However several companies are trying for the same. To achieve zero waste 5 'R' are i) Refuse ii) Reduce iii) Reuse iv) Recycle v) Rot / Bio grade. In order not to use waste in landfill, open burning or discharge in ocean through rivers / drains, presently following methods are being tried: i) Sorting of recyclable waste, ii) Incineration, iii) Gassification, iv) Pyrolyis, v) Crystallisation. For disposal of non recyclable plastic, plastic roads technology, as developed by Padama Shri Prof. Vasudevan is the best option. These roads are cheaper, stronger, faster in construction with higher life & quality and less maintenance. Presently, India has already built about 1 lakh km plastic roads. In November 2015 Government of India made it mandatory to use waste plastic along with bitumen in road construction. A new study was conducted by M/S Ajay Dwivedi, Manik Matoo, Jaideep Prabhu, Atul Dwivedi & Pankil Jain of Bombay in 2017 about plastic roads. Findings are as below:*

When both Dry & Wet waste plastic is used in road building, cost of plastic road compared to bitumen road is slightly higher by Rs. 25,600/- per km. Still the advantages of plastic roads outweigh this factor. Other studies so far didn't consider use of wet plastic while use of some wet plastic is always done in road building. Using dry plastic only, plastic roads are cheaper. While using waste plastic in roads, as the percentage of plastic coating over aggregate increases, corresponding compressive and bending strength increases. Study reveals that the durability of plastic roads is higher, maintenance cost lower, is less affected by rain and plastic road technology is suitable for building National Highways. Plastic Monoblock - Prof. Vasudevan has also developed 'Plastic Monoblock Technology' which uses plastic and stones at high temperature to build monoblocks with a loading capacity of 300 tonnes. Zero Waste Companies – Zero waste / near Zero waste, companies are – (i) Subaru (USA & Japan) (ii) Toyota (North America) (iii) General Motors (GM) (iv) Google (v) Mircorsoft (vi) Sierra Nevada (vii) New Belgium Brewing (viii) Fetzer Vineyards (ix) Unilver (x) Procter & Gamble.

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Title of Paper: **Design and Construction of Irregularly Shaped Cut & Cover Box Tunnel as an Innovative Solution for Space Restriction at Site**

Engineering for Self Reliance and Sustainable Goals, Technical Volume, 35th Indian Engineering Congress, The Institution of Engineers (India), 18-20 December 2020, pp 497-504, ISBN: 978-81-950662-0-9

https://www.ieindia.org/webui/IEI-Activities.aspx#indian-engineering-congress

Co-authors : Anant Mehendale & Harsha G M

Abstract*: Tunnels and underground structures are playing significant role in solving space congestion problem of urban-transportation and sustainable development of the city. The increasing need of underground structures in transportation system is the main reason for studying design and construction methodology of underground structures in very rapid and cost-effective way. Therefore, it is necessary to have an innovative practice on design/construction methodology with realistic consideration of*

actual site conditions. Also, an innovative technical solution in design/construction might save a project from a deadlock condition arising due to site constraints and other issues. A cut & cover box tunnel section of Lucknow Metro project has been taken for present case study. As per alignment plan, some portions of tunnel infringed with few columns of the portico of a building existing at site. Due to site restriction, an alternative unconventional design/construction methodology was adopted by introducing pile, strut-waler and lattice-girder support systems to construct the cut & cover box tunnel partly irregular in shape without dismantling the existing portico structure. Structural Design/stability and ground deformation have been checked by developing numerical model compared with available analytical solutions. Concept of the present case study may be helpful for the practising engineers in the design of cut & cover tunnels..

***Keywords**: Underground Structure, Cut & Cover Box Tunnel, Construction Methodology*

Title of Paper: Simple and Rapid Methods for Designing of Tunnel Structure in Rock

Annual Technical Volume of Civil Engineering Division on Modern Trends in Bridge & Tunnel Engineering, The Institution of Engineers (India), Volume 5, 2020, pp 61-67, ISBN: 978-81-950662-5-4

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Co-authors: Sibapriya Mukherjee & N Kumar Pitchumani

***Abstract**: With the expansion of modern transportation systems, underground structures have gained popularity in present days all over the world. Requirement of tunnels in such transportation systems and their method of construction mainly depend on cost-benefit ratio, category of transportation system, geology, topography and access. The option of introducing tunnels is relatively cost-effective, safer and time saving as it often provides shorter routes. During the stages of feasibility study and preliminary design of a project, the lack of adequate information and time bring more difficulty in the decision making regarding the introduction of tunnels, and their design and construction methodology. The present paper describes different simple and rapid approaches for designing tunnels with very limited data available at that stage and provides comparative study between their results. A numerical analysis (using finite element method) has also been performed to explain the behaviour of structures and their supports in similar ground conditions to further understand the different design approaches. The present paper may be helpful for practising engineers to simplify the design of tunnels while optimising the time considering the limitation in the data available.*

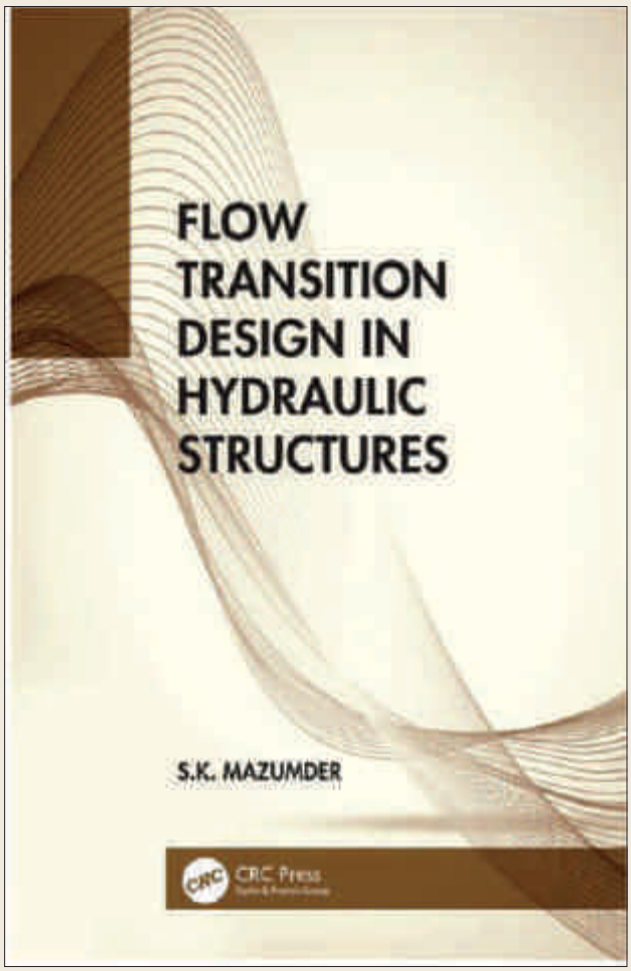
***Keywords**: Underground structures, Tunnels, Preliminary design stage, Construction methodology*

Book Review

Flow Transition Design in Hydraulic Structures

Prof S K Mazumder, FIE
Independent Professional, India
e-mail : somendrak64@gmail.com

Transitions are provided in hydraulic structures for economy and efficiency. This book covers all types of flow transitions: sub-critical to sub-critical, sub-critical to super critical, super-critical to sub-critical with hydraulic jump, and super-critical to super-critical transitions. It begins with an introduction followed by characteristics of flow in different types of transitions and procedures for hydraulic design of transitions in different structures. Different types of appurtenances used to control flow separation and ensure uniform flow at exit of transition and diffusers are included. Examples of hydraulic design of a few typical hydraulic structures are given as well.



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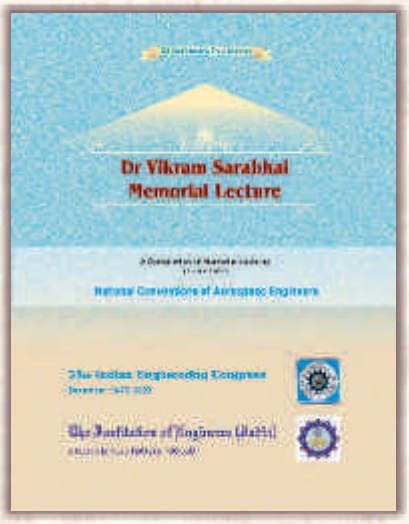

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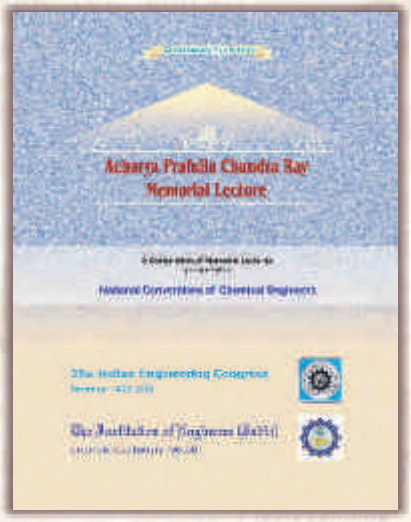

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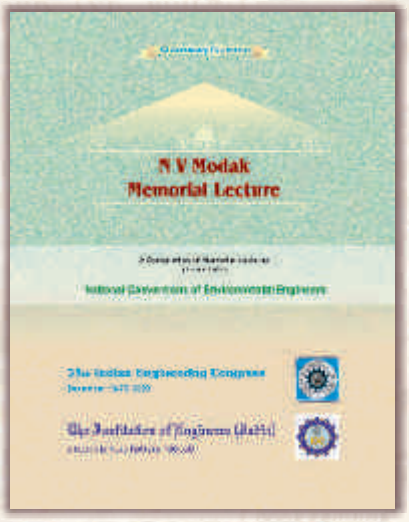

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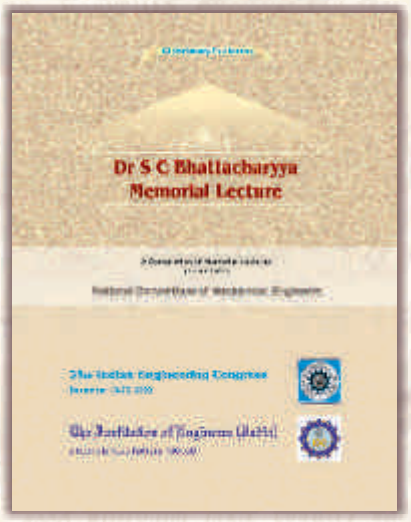

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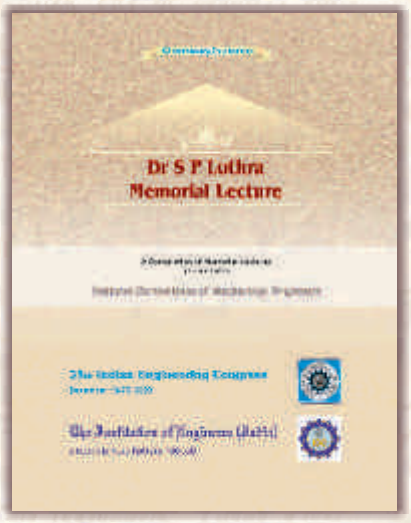

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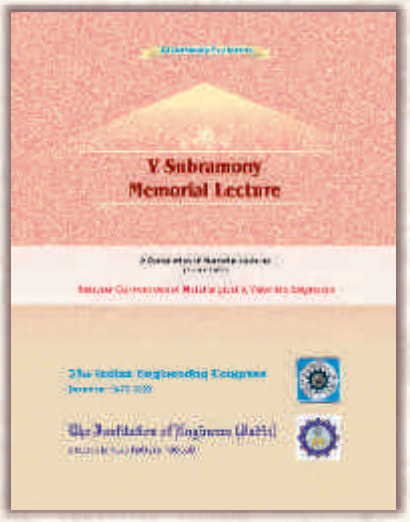

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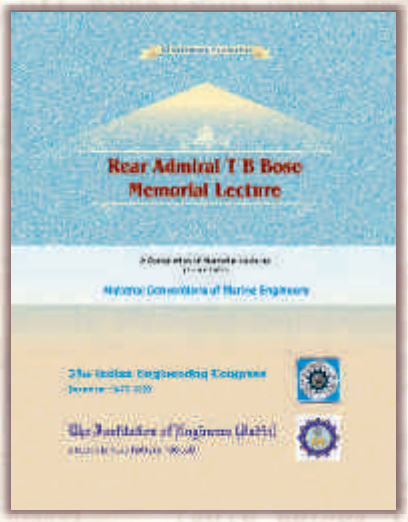

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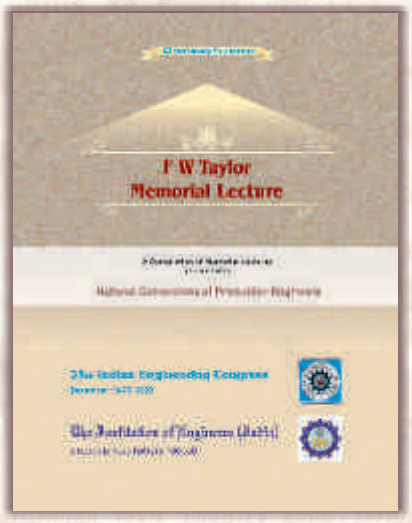

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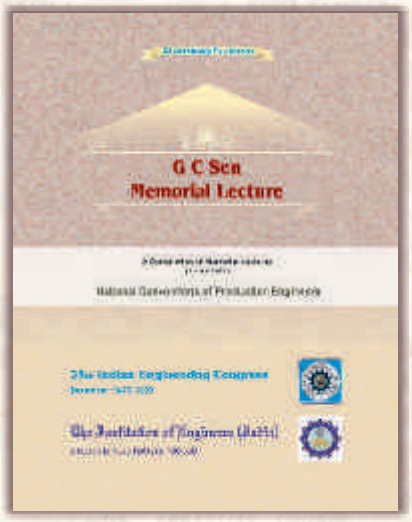

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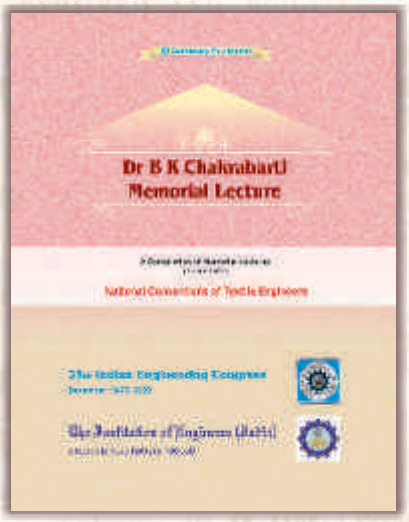

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