iEi epitome

A Century of Service to the Nation

IN THIS ISSUE

THE INSTITUTION OF ENGINEERS (INDIA) ∘ INCORPORATED BY ROYAL CHARTER 1935 ∘ ESTABLISHED 1920

Tech SAMARITANS

Prelude

We are passing through one of the most unprecedented time of this era. As a learned society, we feel it appropriate to share with you all the experiences, unique perspectives and technical contribution of our esteemed members towards alleviating the sufferings of the people affected directly or indirectly by this pandemic. Besides demonstrating a lot of heart and empathy, they have also shown unmatched grit and tenacity that may be just what is needed to make real, positive change. In face of adversity and the unknown, they persisted in their pursuit of bringing relief and respite for the society leveraging technology and science. That takes character and faith and would also go a long way in reposing the faith of the humanity on this noble profession of engineering.

Because of the dearth of space, we regret not being able to include the details of the contribution by these **Samaritans**, but we earnestly recognize all these efforts through this column of IEI Epitome. Their efforts yielded desired result as these were built on the tenets of flexibility, sustainability and adaptability and could meander across the impediments and challenges of a hybrid work environment, new to most of us. They didn't cave in under the immense pressure, the debilitating circumstances which speak of their dedication to this profession and work as they rose to the occasion.

As an esoteric body of professional engineers, we have a fair share of role in rebuilding the 'next normal' and the attributes exemplified by our own members will be critical in shaping our policies and services as we move forward together.

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COVID-19 related Publications

The Institution appreciates the insightful and well researched work carried out by the following members which have brought to fore newer facts and findings that have assisted and provided us with an edge in holistic management of the pandemic. The thematic focus of these papers and books/book chapters has been on areas like mechanisms driving the spread of virus, mitigation & preventive measures, environmental quality, socio-economic impacts, management & governance, and transportation & urban design.

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Abstract: The vulnerable corona virus (COVID-19) changed our lifestyle drastically and is considered as the highest threat to humanity. However, it proves there is an immense possibility for improvement in lifestyle of people. Social control is one of the main aspects to cease the spread of COVID-19. Manifold researches have been published in recent times for effective monitoring and management of social distancing in public/private places. Motivated by this notion, integrating embedded hardware kit like Jetson Nano with deep learning algorithms for automating the entire process is indispensable. Further, to improve the performance of deep learning-based object identifiers, YOLO (You Only Look Once) object detection algorithm utilizes a single-step locator methodology by computing pairwise distance to detect the objects. Using bounding boxes, YOLO algorithm identifies the presence of multiple objects, and thereby multiple bounding boxes are formed and update the shade of the jumping box to red. An alarm message is sent to the respective authority via WhatsApp. A real-time case study is detailed in this chapter for social control, thereby preventing the spread of COVID-19 with the aid of YOLO algorithm. In addition, specifications of Jetson Nano board and the environment setup are elaborated. It is observed from the experimental framework that effective monitoring and maintaining social control is possible to break the chain of spread of this contagious disease through YOLO object detector.

Keywords: COVID-19, Deep learning, Jetson Nano, Social control, YOLO object detector

Relevance: The chapter illustrates the effective monitoring and management of social distancing in public/private places by integrating Artificial Intelligence based algorithms to avoid spreading of COVID.

Abstract: The whole world is changing quickly into a mechanical world. One of the most encouraging innovations is the smart sensor innovation which is presently accessible all over the place. Nowadays the utilization of internet is exaggerated in our lives everywhere so that most of the things we use in our day-to-day lives are dependent on internet, which leads to a new era of internet of everything (IoE). The internet of everything (IoE) has different applications in medication, from far off seeing to smart sensors and clinical appliances. It can ensure and screen patients and improve the degree of care. This technology shows improvements in different sectors, specifically in critical sectors which lead everything in the world to be very smart.

Relevance: Pre and post COVID-19 impact on Coagulation Testing Market and its potential stakeholders are highlighted in this chapter.

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Abstract*: The present study aims to highlight the contrast relationship between COVID-19 (Coronavirus Disease 2019) infections and air pollutants for the Indian region. The COVID-19 data (cumulative, confirmed cases and deaths), air pollutants (PM10, PM2.5, NO_2 and SO_2) and meteorological data (temperature and relative humidity) were collected from January 2020 to August 2020 for all 28 states and the union territory of India during the pandemic. Now, to understand the relationship between air pollutant concentration, meteorological factor, and COVID-19 cases, the nonparametric Spearman's and Kendall's rank correlation were used. The COVID-19 shows a favourable temperature (0.55–0.79) and humidity (0.14–0.52) over the Indian region. The PM2.5 and PM10 gave a strong and negative correlation with COVID-19 cases in the range of 0.64-0.98. Similarly, the NO_2 shows a strong and negative correlation in the range of 0.64–0.98. Before the lockdown, the concentration of pollution parameters is high due to the shallow boundary layer height. But after lockdown, the overall reduction was reported up to 33.67% in air quality index (AQI). The background metrological parameters showed a crucial role in the variation of pollutant parameters (SO_2, NO_2, PM10 and PM2.5) and the COVID-19 infection with the economic aspects. The European Centre for Medium-Range Weather Forecasts derived monthly average wind speed was also plotted. It can see that January and February of 2020 show the least variation of air mass in the range of 1-2 m/s. The highest wind speed was reported during July and August 2020. India's western and southern parts experienced an air mass in the range of 4-8 m/s. The precipitation/wet deposition of atmospheric aerosols further improves the AQI over India. According to a study, the impact of relative humidity among all other metrological parameters is positively correlated with Cases and death. Outcomes of the proposed work had the aim of supporting national and state governance for healthcare policymakers.*

Keywords*: COVID-19, Air pollutants, Chronic exposure, Meteorological factor*

Abstract*: A novel coronavirus disease (COVID-19) continues to challenge the whole world. The disease has claimed many fatalities as it has transcended from one country to another since it was first discovered in China in late 2019. To prevent further morbidity and mortality associated with COVID-19, most of the countries initiated a countrywide lockdown. While physical distancing and lockdowns helped in curbing the spread of this novel coronavirus, it led to massive economic losses for the nations. Positive impacts have been observed due to lockdown in terms of improved air quality of the nations. In the current research, ten tropical and subtropical countries have been analysed from multiple angles, including air pollution, assessment and valuation of health impacts and economic loss of countries during COVID-19 lockdown. Countries include Brazil, India, Iran, Kenya, Malaysia, Mexico, Pakistan, Peru, Sri Lanka, and Thailand. Validated Simplified Aerosol Retrieval Algorithm (SARA) binning model is used on data collated from moderate resolution imaging spectroradiometer (MODIS) for particulate matters with a diameter of less than 2.5 μm (PM2.5) for all the countries for the month of January to May 2019 and 2020. The concentration results of PM2.5 show that air pollution has drastically reduced in 2020 post lockdown for all countries. The highest average concentration obtained by converting aerosol optical depth (AOD) for 2020 is observed for Thailand as 121.9 μg/m3 and the lowest for Mexico as 36.27 μg/m3. As air pollution is found to decrease in the April and May months of 2020 for nearly all countries, they are compared with respective previous year values for the same duration to calculate the reduced health burden due to lockdown. The present study estimates that cumulative about 100.9 Billion US$ are saved due to reduced air pollution externalities, which are about 25% of the cumulative economic loss of 435.9 Billion US$.*

Keywords*: Air pollution externalities, Coronavirus, COVID-19, Lockdown, MODIS, SARA*

Title of Paper: **Pandemic induced Lockdown as a Boon to the Environment: Trends in Air Pollution Concentration Across India**

Co-authors: Alok Sagar Gautam, Sanjeev Kumar, Aryan Anand, Ranjit Kumar, Abhishek Joshi, Kuldeep Bauddh & Karan Singh

Abstract: *The present paper designed to understand the variations in the atmospheric pollutants viz. PM10, PM2.5, SO_2, NO_2, and CO during the COVID-19 pandemic over eight most polluted Indian cities (Mumbai, Delhi, Bangalore, Hyderabad, Lucknow, Chandigarh, Kolkata, and Ahmedabad). A significant reduction in the PM2.5 (63%), PM10 (56%), NO_2 (50%), SO_2 (9%), and CO (59%) were observed over Major Dhyan Chand Stadium. At Chhatrapati Shivaji International Airport, a decline of 44% in PM2.5 and 50% in PM10 was seen just a week during the initial phase of the lockdown. Gaseous pollutants (NO_2, SO_2 & CO) dropped up-to 36, 16, and 41%, respectively. The Air Quality Index (AQI) shows a dramatic change from 7% to 67% during observation at Chandigarh and Ballygunge during the inspection. Whereas, Ahmedabad, Worli, Income Tax Office, Talkatora, Lalbagh, and Ballygaunge have showed a significant change in AQI from 25.76% to 68.55%. However, Zoo Park, CST, Central School, and Victoria show relatively low variation in AQI in the range of 3.0% to 14.50% as compare to 2019 after lockdown. Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) analysis suggested that long range transportation of pollutants were also a part and parcel contributing to changes in AQI which were majorly coming from the regions of Iran, Afghanistan, Saudi Arabia, as well as a regional grant from Indian Gangatic plains and Delhi Non-capital region.*

Keywords: *COVID-19, Coronavirus, Air quality index, Back trajectories, India*

Title of Paper: **Qualitative and Quantitative Analyses of Impact of COVID-19 on Sustainable Development Goals (SDGs) in Indian Subcontinent with a Focus on Air Quality**

Co-authors: H Bherwani & A Gupta

Abstract: *Coronavirus disease 2019 (COVID-19) is spreading all over the world in a short time. It originated from Wuhan City of China in the late 2019. Proper vaccines have still been in progress; the spread of the virus is contracted by lockdown and social distancing protocols. These lockdowns resulted in significant benefits, improving the quality of air and reducing the level of environmental pollution. In this context, the study proposes to identify the air quality in the region and its relation with COVID-19-affected people in metropolitan cities of India during COVID-19 lockdowns using a geographical information system (GIS), where over 90% of commercial and industrial sites and 100% school and colleges were closed. The study outcomes highlight the areas encountering high levels of pollution under the pre-lockdown scenario and have seen a higher number of cases. The relation is most evident for PM2.5, which is responsible for respiratory disorders and is the place of attack of $SARS-CoV-2$. This approach provides comparable outcomes with other decision-making tools. Our primary precedence should be to develop communities to enable people to remain healthy and stay. Healthy societies are crucial not only for people's health, but also for sustainable development. Centered on GIS is concealed; moreover, it is very flexible to use by policymakers.*

Keywords: *COVID-19, Coronavirus, Fine particulate matter, GIS, Ozone (O_3), SDGs, Thiessen polygon*

Title of Paper: **COVID-19 Lockdowns reduce the Black Carbon and Polycyclic Aromatic Hydrocarbons of the Asian Atmosphere: Source Apportionment and Health Hazard Evaluation**

Co-authors: Balram Ambade, Tapan Kumar Sankar, Amit Kumar & Alok Sagar Gautam

Abstract: *The entire world is affected by Coronavirus disease (COVID-19), which is spreading worldwide in a short time. India is one of the countries which is affected most, therefore, the Government of India has implemented several lockdowns in the entire country from April 25, 2020. We studied air pollutants (i.e., PM2.5, Black Carbon (BC), and Polycyclic Aromatic Hydrocarbons (PAHs) level, and observed significantly sudden reduced. In India, most of the anthropogenic activities completely stopped. Therefore, we studied the levels of BC, PAHs and PM2.5 concentrations, their sources apportion, and health risk assessment during normal days, lockdown (from lockdown 1.0 to lockdown 4.0) and unlock down 1.0 situation at Sakchi, Jamshedpur city. It was observed that lockdowns and unlock down situations BC, PAHs and PM2.5 concentrations were significantly lower than regular days. We applied the advanced air mass back trajectory (AMBT) model to locate airborne particulate matter dispersal from different directions to strengthen the new result. The diagnostic ratio analyses of BC shows that wood burning contribution was too high during the lockdown situations. However, during normal days, the PAHs source profile was dedicated toward biomass, coal burning, and vehicle emission as primary sources of PAHs. During the lockdown period, emission from biomass and coal burning was a significant contributor to PAHs. The summaries of health risk assessment of BC quantified an equal number of passively smoked cigarettes (PSC) for an individual situation was studied. This study focuses on the overall climate impact of pandemic situations.*

Keywords: *COVID-19, Black carbon, PAHs, Backward trajectory, Health risk assessment*

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Title of Paper: **South Asian Countries are Less Fatal Concerning COVID-19: A Fact-finding Procedure Integrating Machine Learning & Multiple Criteria Decision-Making (MCDM) Technique**

Abstract: Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) which caused an outbreak of pneumonia in December 2019 in Wuhan, China, has spread rapidly throughout the world. This ongoing pandemic has resulted over 55.6 million cases of COVID-19 leading to 1.34 million deaths in more than 188 countries. However, it has been observed that the death rate is significantly in the lower side for the SAARC countries compared to the First World Nations. In this paper, the possible factors have been represented that determine this uneven distribution of COVID-19 deaths. The significance of the factors has been presented in this paper after the data analysis of the factors from 165 different countries. Based on the correlation of the factors and their critical impact towards the concerned countries death toll, the risk index of each factor has been labeled using analytical hierarchy process (AHP)-based MCDM, i.e., multiple criteria decision-making technique. The risk index of all the factors has been used to generate the susceptibility of COVID-19 for each of the countries in study, specifically the SAARC Nations. Finally, the hierarchical clustering was applied to visualize the death toll of the countries corresponding to their susceptibility index.

Keywords: COVID-19, Risk factor, Susceptibility index, Hierarchical clustering, AHP, MCDM

Title of Paper: **South Asian Countries Are Less Fatal Concerning COVID-19: A Hybrid Approach Using Machine Learning and M-AHP**

Abstract: The outbreak of pneumonia in December 2019 in Wuhan, China, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has spread rapidly throughout the world. With over 4.62 million confirmed cases of COVID-19 and 311,000 deaths in more than 188 countries, this ongoing pandemic has wreaked havoc all around the globe. However, the SAARC (South Asian Association for Regional Cooperation) countries, compared to the First World nations, have significantly low death rate. In this paper, the authors have determined this uneven distribution of COVID-19 deaths with the help of some possible factors, which are the prime cause of such variability among the different nations. This paper presents the significance of these factors through analysis of the data corresponding to each of these factors from 165 different countries. On the basis of the relationship between the factors and their significance on the concerned countries' death toll, we have labelled each factor's risk index using the multiple analytical hierarchy process (M-AHP), as it provides several experts' views instead of a single expert's opinion. The risk index of all the factors has been used to generate the susceptibility of COVID-19 for each of the countries in study, specifically the SAARC nations. Finally, we have applied a hierarchical clustering-based machine learning approach to visualize the countries' death toll corresponding to their susceptibility index. This paper's major findings are that authors holistically searched the root causes of why South Asian countries are less fatal concerning COVID-19.

Keywords COVID-19, Risk factor, Susceptibility index, Hierarchical clustering, M-AHP

Abstract: *An unexpected outbreak of 2019 Coronavirus disease (COVID-19) in Wuhan, China, led to a massive catastrophe across the world. The majority of the COVID-19 patients are getting diagnosed with pneumonia in their early stages. Over 22,00,000 confirmed cases have shown various ranges of symptoms, but the most predominant set includes fever, cough, and shortness of breath. The predominant set of symptoms, coupled with other critical symptoms, a prediction process has been devised in this paper to check whether a person is infected with COVID-19 or not. Based on the crucial impact of the symptoms, we have applied the support vector machine classifier to classify the patient's condition in no infection, mild infection, and serious infection categories. We have achieved an accuracy of 87% in predicting the cases.*

Keywords *COVID-19, Critical symptoms, Pneumonia, Supervised learning, SVM classifier*

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Development of Devices, Equipments & Research Initiatives

The Institution also acknowledges the effort of the members who have demonstrated unmatched passion, tenacity and ingenuity to rise to the occasion and develop technically assistive devices in solo or in collaboration which are commercially scalable, cheap and can be put to use by the masses without much technical knowhow. We need to remember that these efforts were initiated and delivered during amidst unprecedented crisis, uncertainties and insecurities. More importantly, they have been developed with resource constraints coupled with restrictions imposed on workspace, laboratories etc.

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During the outbreak of the first wave of Covid pandemic at Itanagar (Arunachal Pradesh), Dr Kirki Ori and his team from Housing Corporation took initiative to develop "Covid-19 Wash Basin and hand sanitizer stand made with locally available materials which were installed at Police headquarters, Police Housing Office, Lone Medical College Hospital-Itanagar and Kimin Health Centre to assist the frontline workers. The works of Dr Ori is all the more relevant and of significance as these units were not manufactured/ available in the local market at that point of time. The Institution duly acknowledges the effort of Dr Kirki.

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Dr Arjun Sil from NIT Silchar is credited for his research work aimed at modeling epidemic patterns and disease dynamics using AI tool like Data Analytics. The details of the project are appended below:

Project Title: **Investigation on developing model of transmission dynamics characteristics of COVID-19 in human health**

Expected Outcome: This outcome would help at determining under what environmental conditions this Covid-19 favorably grows or affects the human, and necessary precautionary measure that could be taken by the citizen or by the government to break the chain and thereby helping to mitigate such human disaster consequences.

Relevance: As per WHO, the whole world has an emerging health risk of the epidemic and there is a need to assess the transmission dynamics of influenza due to Covid-19 so that the necessary precautions and care could be taken to contain it. The incubation rate and reproduction rate concerning the different atmospheric conditions prevailing across the globe are to be assessed to reduce the surge and spread of the pandemic.

**URL**: http://www.nits.ac.in/departments/civil/civil.php

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Dr Manoj K Patel is credited with the design and development of an Electrostatic Disinfection Device under the aegis of CSIR-CSIO which can be used to spray and apply the liquid based solutions such as surfactants, disinfectants and sanitizers in an effective and efficient manner. This electrostatic spray can control the aerodynamic conditions in a desired manner by inducing charge to fine droplets. Charged droplets cover the directly exposed and obscured surfaces uniformly with increased efficiency and efficacy. This electrostatic disinfection machine can sterilize the indoor and outdoor surfaces to stop the spread of Corona virus effectively and efficiently.

The technology know-how of electrostatic disinfection machine has been transferred to three (03) industries for commercial production and the products are available in the market with the brand name of "**ENCESPRAY**", "**Micro-Sprayer**" and SMQRT-ES by M/s. Rite Water Solutions (I) Pvt. Ltd., Nagpur, Maharashtra, M/s Bharat Heavy Electricals Limited (BHEL) Haridwar, Uttrakhand and M/s. Jhosna Corporation, Raichur, Karnataka respectively. The device is mobile, handy environment friendly and easy to use and will assist in effectively sanitizing indoors.
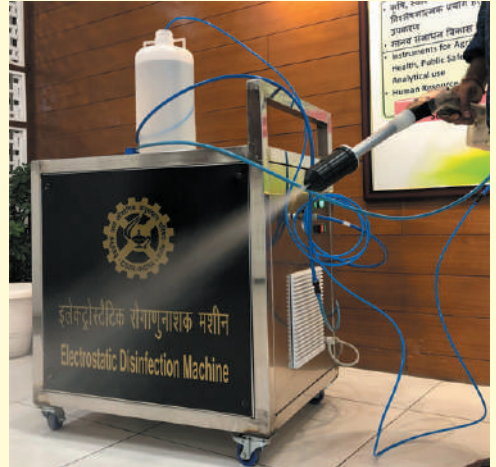
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Er Jitendra Patil and his team, engaged with one of the leading container terminals operating at JN Port considered as an essential service sector, despite chronic challenges, like shortages of manpower & raw material supply, came up with an ingenious idea of locally developing and implementing the following assistive tools/devices to ensure a safe health ecosystem within the terminal premises:

1. Foot operated Sanitizer Dispenser and Hand Wash Station
2. Foot operated Door Opener
3. Partition for workstation
4. Sensor Taps
5. Operation & Maintenance of HVAC System at workplace
6. Sanitization facility for the LMV

The Institution duly recognized the efforts of Er Patil to ensure a safe workplace for his team as well as keeping the terminal functional during the pandemic.
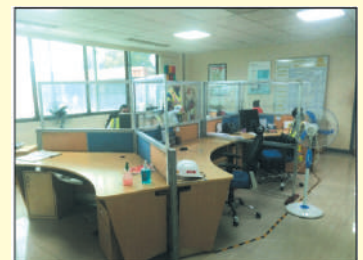
This column is a tribute to the **COVID** specific initiatives of these '**TECH SAMARITANS**' and many others behind the scene who have demonstrated exemplary selfless determination for the sake of saving lives, in these challenging times and have resolved to rise to the occasion and reaffirmed the credence of the profession of engineering.

will be continued in the next issue

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Outsourcing Maintenance, Scaling Between Top Line & Bottom Line
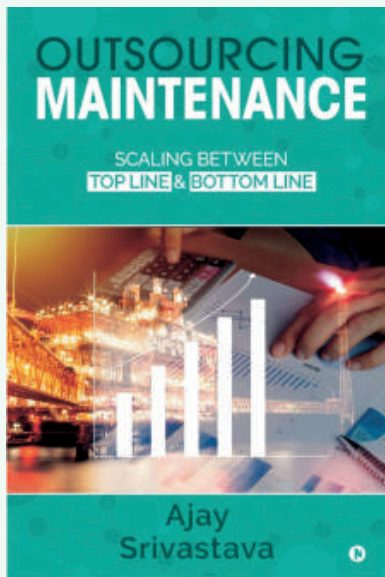
Synopsis *(Only for reference purpose):

Outsourcing maintenance is an ongoing trend in industry incorporating almost all functions of any business operation.

As maintenance, outsourcing within service business organization comprise of sales, Business development, Execution, HR and supply chain management etc. making it most competitive in pricing for service provider and challenging in decision making for customer from different industries. The entire business lies between top line for service provider which is about pushing sales and increasing revenues, whereas industry customer priority lies with bottom line to reduce maintenance cost , enhancing profitability.

This book is a small step toward summarizing different aspects of maintenance outsourcing as guide for new entrants in industry and reference book for old industrial folks to review the subject as whole to ensure, not missing out any dimension.

The information expressed herein is known to most of the professional and vividly available in public domain and has been summarized, with blend of day to day experience covering all perspective of contract management as relevant to plant maintenance. The values figures and graphs used are not actual but only indicative for better understanding.

This book comprise of all aspects right from business overview, forming maintenance organization, Developing safety culture, Contract management to analytics with wide examples , we are very familiar in day to day life. This book tries to establish balance between both side of table i.e. on one hand it says industry to insist on realistic achievable KPI & on other side service provider to keep tap on performance with appropriate reporting setup.

Outsourcing has become very important aspect of day to day life and also deeply enrooted in industry. In everyday life it starts from outsourcing car cleaning job to Job placement agency , investment advisory to publishing house. The objective of such services to be much bigger than profit making and is about going extra mile to make client successful.

About the book

This Book is about

- Explaining concise business model of outsourcing, precisely relevant to maintenance and touching all its components as evident in current industrial scenario. There are lot of books available on technology parts of equipments and also covering other areas in isolation. Since long the requirement of single book was felt, integrating all aspects of business. The objective here is to provide holistic view of business, as sometimes people deputed at site focusing on their strength area found suddenly out of business due to reason beyond their control. This book shall help them to give idea of business in nutshell.

- Outsourcing business is lying between top line and bottom line, where top line is revenues with gross sales and bottom line is company's net income. However top line and bottom lines are relevant for both Industry and service agency as a business. Here in context we are taking top line for service provider refer to add on sales and revenues by adding customer and their scope, whereas customer focuses on bottom line towards increasing profit by improving system reliability at lowest cost. Successful business operation lies in area between both lines.

This Book is for….

- Any one in Industrial maintenance or maintenance / Service provider business including asset management, facility management etc.
- for anyone i.e. people in maintenance team including shop floor personal, Contract cell, SCM, HR, safety etc.
- for all people in maintenance business i.e. Facility management, Asset management, Service/ maintenance contract, AMC etc.

PUBLICATION

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A Text Book on Mastering Digital Electronics: Principle, Devices and Applications
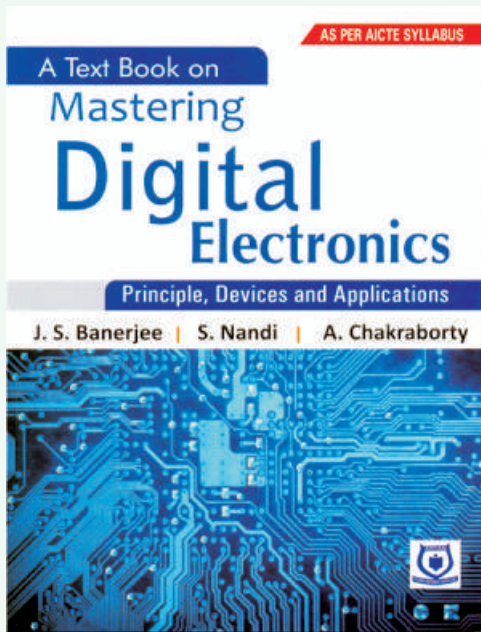
This book is written to serve the purpose of a text book to the engineering students of degree, diploma, AMIE and graduate courses and obviously for those who are opting to gain knowledge and understanding of the principles of digital electronics and circuits.

Key Features

- A dedicated chapter is included in the book to discuss the important & frequently come questions-answers.
- Fundamental concepts presented lucidly through numerous solved examples and practice problems.
- Practical IC's & their pin diagram have been mentioned along with the digital circuits.
- Hands-on exercises are attached with every chapter for the students to carry out.

PUBLICATION

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Abstract: E-waste can be defined as the waste from electrical and electronic equipment discarded after their intended use by the end-user. It is one of the secondary resources of precious and valuable materials and day by day, gaining much more interest due to its profitable business and livelihood opportunity. The presence of toxic elements such as lead (Pb), nickel (Ni), zinc (Zn), barium (Ba), beryllium (Be), chromium (Cr), mercury (Hg), cadmium (Cd), etc. is very dangerous for the environment and health of the human being. India is the third-largest E-waste generator in the world and it's a matter of concern for today. The E-waste collection in India is mostly done in informal ways, which is about 95 % and formal ways do 5%. The present chapter deals with the hazardous substance scenario of E-waste. E-waste generations globally and in India, E-waste treatments and processing in India, various policies implemented in India, challenges and opportunities for E-waste management. E-waste contains various valuable precious materials and has the potential to become a lucrative business opportunity in India.

Keywords: E-waste, Environment, Recycling, EEE; Business, Toxic elements

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Abstract

The excavation of long-hole slot raises in a single lift comes with the difficulties of face jamming, insufficient face movement and boulder formation. The main reasons behind these problems are improper blast design, presence of geological discontinuities or inaccuracy in drilling. The proper blast design to get uniform breakage pattern for slot raise excavation consists of design of drilling, charging and delay parameters. This paper has discussed the numerical simulation based approach for assessment of blast induced deformation pattern in slot raise blasting. The numerical models with different variants of slot raise blast design was made for this purpose in Ansys-Explicit Dynamics. The model was given tested rock mass properties data of Rampura Agucha underground Lead-Zinc mine. The deformation pattern output for these variants were analyzed. The analysis of deformation pattern suggests that the ratio of number of reamer holes and blast holes have more impact on deformation pattern. The more uniform deformation contour was observed for the cut hole blast with six reamer holes and five blast holes for the experimental site. The deformation pattern output for excavation of periphery holes were also analyzed. The drilling pattern and delay timing for the slot raise blast was decided on the basis of model output. The experimental trials at the mine was taken on the basis of revised blasting pattern. The face jamming has been reduced with revised pattern. The blasting pattern has also been advantageous in reducing overall blasting cost by reducing the number of drill holes in cut portion.

Keywords: Stoping, Slot raise, Reamer hole, Numerical simulation, Blast induced damage, Deformation

PUBLICATION

by Members

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Title of Paper: **An Efficient Route Failure Detection Mechanism with Energy Efficient Routing (EER) Protocol in MANET**

Co-authors: D S Jayalakshmi, G. Muthu Kumar & M Madhu Rani

Abstract: Mobile ad-hoc network (MANET) is a network with two or more number of nodes with restricted energy constraint. The high dynamic nature in MANET attracts needs to consider the energy efficient features in their construct. The routing protocol is an important criterion to be considered for evaluating the performance of the MANET. Energy consumption plays vital role in MANET. Hence designing the scheme that supports energy efficient is much needed for the high dynamic MANET environment concerned. This paper proposes the Energy Efficient Routing (EER) protocol based on efficient route failure detection. The Scope of this paper is to suggest a fresh routing procedure for Mobile Ad-hoc Network minimizes unsuccessful communication. The projected procedure practices three important criterions to locate the path that assure authentic communication. The channel caliber, connection caliber and node's residual energy is important reason for the failure of the node in MANET. Hence, the suggested routing mechanism believes these three different parameters to choose the finest node in the route. The reliable transmission and reception are attained by transferring information through route nominated by the suggested system verified by means of NS-2 simulator.

Keywords: Channel caliber, Connection caliber, Energy level, Mobile Adhoc Network (MANET)

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Title of Paper: **Partial Replacement of Cement with Coconut Husk Ash: A Review**

Co-authors: V S Ajay, Amal K Reji, S Athulya & Asween Santhosh

Abstract: Concrete is a strong building material holding fine aggregate and coarse aggregate bonded together with cement paste. Portland cement manufacturing can cause environmental impact at whole stages of the process including emission of huge amount of carbon dioxide. Use of agricultural waste as a coarse material for the production of concrete will reduce the expenditure of natural raw materials as resource and reduce the amount of solid waste in the environment. Due to the increasing cost of cement, it is now becoming unaffordable to use. Other binding materials are being used instead of cement, and one such agricultural waste is coconut husk ash (CHA). CHA is obtained by the burning of coconut husk at high temperatures. This paper covers the chemical properties and application of coconut husk ash. It deals with the effect of CHA on setting time, workability, compressive strength and porosity of concrete.

Keywords: Concrete, Cement, Coconut husk ash, Setting time, Workability, Compressive strength, Porosity

PUBLICATION

Er Jyotirmoy Mishra, AMIE

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Abstract*: The use of mine tailings (MTs) as aggregates or precursors of alkali-activated materials and geopolymers (GPs) seems to be a promising approach for their sustainable utilization since it allows not only reducing the dynamics of MTs accumulation in the environment and the environmental damage they cause but also it combines the advantages geopolymer technology that is associated with reducing the carbon footprint, the ability to utilize other technogenic aluminosilicate waste, the versatility of the properties of GPs as a general construction binder. Taking into account the complex material composition of mine tailings, and relatively little knowledge of the features of the geopolymerization of tailings and the influence of various factors on the properties of MTs-based geopolymers, there is now a need to generalize these aspects and assess the prospects for possible applications. This article is a generalization and a detailed analysis of the relationship between structural, mechanical, and thermal properties, durability, leaching behavior, and other important characteristics of MTs-based geopolymers. Here, in addition to the key fundamental aspects of the formation of properties of MTs based geopolymers, well-known examples of their applications in binder pastes, mortars, and concretes, as well as bricks, backfill materials, adsorbents, porous materials , and other promising applications are considered in detail. In addition, economic and production aspects are also discussed.*
Keywords*: Geopolymers, Alkali-activated materials, Mine tailings, Industrial waste*

Dr K Dhayalini, MIE

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Abstract*: Nanoscience and technology have grown manifold ever since its inception into the world of technology. The technological marvel has led to the study of new areas in nanoparticles and nanocarriers. An attempt is made to research in one such area of electrical engineering in this paper — to study the effects of furans in natural ester oils using nanocarriers. By experimenting with a total of 54 samples, the research derives positive results from the study and indicate the ability of antioxidants to resist furan derivatives. Further, the outcome of the research also indicates a strong inverse correlation of antioxidants in natural esters can be used as the biodegradable choice for the transformer insulation.*
Key words*: Natural ester, Furan, Antioxidant, Adsorption rate, Incipient fault*

Lt Dr A K Priya, MIE

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Title of Paper: **The War using Microbes: A Sustainable Approach for Wastewater Management**

Abstract*: Anthropogenic activities and population growth have resulted in a reduced availability of drinking water. To ensure consistency in the existence of drinking water, it is inevitable to establish wastewater treatment plants (WWTPs). 70% of India's rural population was found to be without WWTP, waste disposal, and good sanitation. Wastewater has emerged from kitchens, washrooms, etc., with industry activities. This scenario caused severe damage to water resources, leading to degradation of water quality and pathogenic insects. Thus, it is a need of an hour to prompt for better WWTPs for both rural and urban areas. Many parts of the world have started to face severe water shortages in recent years, and wastewater reuse methods need to be updated. Clean water supply is not enough to satisfy the needs of the planet as a whole, and the majority of freshwater in the polar regions takes the form of ice and snow. The increasing population requires clean water for drinks, hygiene, irrigation, and various other applications. Lack of water and contamination of water result from human activities. 90% of wastewater is released to water systems without treatment in developing countries. Studies show that about 730 megatons of waste are annually discharged into water from sewages and other effluents. The sustenance of water resources, applying wastewater treatment technologies, and calling down the percentage of potable water has to be strictly guided by mankind. This review compares the treatment of domestic sewage to its working conditions, energy efficiency, etc. In this review, several treatment methods with different mechanisms involved in waste treatment, industrial effluents, recovery/recycling were discussed. The feasibility of bioaugmentation should eventually be tested through data from field implementation as an important technological challenge, and this analysis identifies many promising areas to be explored in the future.*

Keywords*: Anthropogenic, Microbial population, Sanitation facilities, Sustainable development, Wastewater*

Dr Manoj Wagh, AMIE

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Title of Paper: **Application of Cascade Feed Forward Neural Network to Predict Coagulant Dose**

Abstract*: Inlet water quality fluctuations affect mainly coagulant dose, and outlet water quality of the water treatment plant (WTP). Many complex physical and chemical processes are involved in WTP and water distribution networks (WDN). These technologies show non-linear behavior, which is challenging to be described by linear mathematical models. Thus, there is a need to develop prediction models for coagulation dose. The present study involves the application of cascade feed-forward neural networks (CFFNN) to predict coagulant dose. CFFNN Model was developed by using the Levenberg-Marquardt Training Algorithm and Bayesian Regularization Training Algorithm to predict coagulant dose. During the development of these models, hidden nodes are varied from 15 to 60, and R is found between 0.914 and 0.947. The best results were obtained by the CFFNN model using the Bayesian Regularization Training Algorithm (CFNNCD2) with hidden node 40, where R = 0.945 for training and 0.947 for testing.*

Keywords*: Water quality, Water treatment plant, Residual chlorine concentration, Coagulant dose, Chlorine dose*

PUBLICATION

Er Arnab Gupta, FIE

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Title of Paper: **An Investigation into Pressure Vessel Fatigue Cracking caused by a Tack Weld**

Abstract: Oil &Gas industry, comprise of numerous pressure vessels and safe design and fabrication quality control is of prime importance for process safety management and mechanical integrity, considering the huge impact of potential failure during the operational life cycle of equipment. The design of welds is critical to any pressure vessel fabrication process. Tack welds are an inherent part of the fabrication process and also during any repair. However, many engineering drawings and quality control plan do not explicitly address the issues related to tack welds. This is a case study highlighting the detrimental effect of a tack weld in a pressure vessel fabrication, leading to fatigue cracking and eventual loss of containment.

Keywords: Pressure vessels, Welding, Tack welds, Fatigue crack, Quality control

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Title of Paper: **Bioaerosols in the Landfill Environment: An Overview of Microbial Diversity and Potential Health Hazards**

Abstract: Land filling is one of the indispensable parts of solid waste management in various countries. Solid waste disposed of in landfill sites provides nutrients for the proliferation of pathogenic microbes which are aerosolized into the atmosphere due to the local meteorology and various waste disposal activities. Bioaerosols released from landfill sites can create health issues for employees and adjoining public. The present study offers an overview of the microbial diversity reported in the air samples collected from various landfill sites worldwide. This paper also discusses other aspects, including effect of meteorological conditions on the bioaerosol concentrations, sampling techniques, bioaerosol exposure and potential health impacts. The bioaerosols present in the landfill environment are of respirable sizes and can penetrate deep into lower respiratory systems and trigger respiratory symptoms and chronic pulmonary diseases. Landfill workers involved in solid waste disposal activities are at the highest risk of exposure to these bioaerosols due to their proximity to solid waste and as they practise minimum personal safety and hygiene measures during working hours.

Keywords: Bioaerosols, Air pollutants, Organic dust, Occupational health, Landfill site, Aerobiological monitoring

PUBLICATION

Dr Manikandan Sridharan, AMIE

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Title of Paper: **Recognition of Font and Tamil Letter in Images using Deep Learning**

Co-authors: Delphin Carolina, Rajeswari K, Suma Thimmana, D Sivabalaselvamani

Abstract: This paper proposes a deep learning approach to recognize Tamil Letter from images which contains text. This is recognition process, the text in the images are divided to letter or characters. Each recognized letters are sending to recognition system and filter the text using deep learning algorithms. Our proposed algorithm is used to separate letter from the text using convolution neural network approach. The filtering system is used for identifying font based on that letters are found. The Tamil letters are test data and loaded in recognition systems. The trained data are input which contains filtered letter from image. For example, Tamil letters such as are available in test dataset. The trained data are applied into deep convolution neural network process. The two dataset are created which contains test data with Tamil letter and second one for recognized input data or trained data. 15 thousands of letters are taken and 512 × 512 × 3 size deep convolution network is created with font and letters. As the result, 85% Tamil letters are recognized and 82% are tested using font. Tensor Flow is used for testing the accuracy and success rate.

Keywords: Deep learning, Recognition system, Filtering, Font recognition, Letter recognition

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Title of Paper: **Enhanced Human Activity Recognition based on Activity Tracker Data using Secure Homomorphic Encryption Techniques**

Co-authors : Indusha M & Dharani D

Abstract: The fitness tracker data for human activity recognition is playing an important role in improving health and monitoring the daily movements of human such as health care and fitness. This detects human activities such as step count, sleeps rate, calories burned, and person mood for the data collected by the activity tracker device and mainly helps in identifying the Apnea-Hypopnea Index (AHI) which is caused due to Obstructive Sleep Apnea. Medical data is very susceptible for many external threats that affect its security and privacy. The privacy and security of the data shared across the medical field is very difficult to maintain. To overcome these problems, Homomorphic Encryption techniques are proposed, which is used for privacy preserving out-sourced storage and computation. The encrypted technique helps in protecting sensitive data from outsourced. The two Homomorphic techniques are Gorti's Enhanced Encryption Scheme and Carmichael's Encryption Scheme that are used to encrypt the fitness tracker data. The computation is made with the encrypted data without revealing the original data to providers. The analysis is made on the encrypted data by computing the AHI to predict the disease based on the range given in AHI. Thus, security of the data is maintained. The performance of the schemes is measured based on the time taken for encryption and decryption of the medical data and analysis performed on the encrypted data.

Keywords: Apnea hypopnea index, Homomorphic encryption, Activity tracker

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Title of Paper: **PV-STATCOM Based Smart Inverter for Reliable Distribution System**

Co-authors: S Prakash & Reta Dengesu Haro

Abstract: The design technique based on the well-established concept of PV-STATCOM is implemented. The main task towards the achievement of more reliable increased integration of distributed energy resources on to the grid requires new pattern shift to improve the efficiency as well as overall performance of the system. The inverter which can act as a smart inverter by controlling active and reactive power, frequency control and regulation of voltage and power factor apart from its typical function of DC to AC conversion could be a potential solution. PV inverter based reactive power control strategies. The control algorithm is based on balancing the power production from a solar PV depends directly on solar isolation. Hence the solar PV remains idle when there is no isolation. Solar PV along with its inverter resembles the functionality of STATCOM. The PV-STATCOM concept allows utilization of solar farm throughout the day. During daytime, real power generation takes place normally and switches to compensate for dynamic reactive power needs at critical times. The dual functionality of the proposed system to regulate the reliable voltage at PCC and mitigate low voltage issues is demonstrated through MATLAB simulation to make reliable effective use of available resources Arduino controller is used to switch between the functions depending on the system requirement.

Keywords: Solar photovoltaic system, PV-STATCOM, Voltage source converter component, PWM technique

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Title of Paper: **Code to Label: Lessons Learned and the Case for India**

Co-author: Tarun Garg

Abstract: This paper summarizes the residential building labelling program/policies for energy-efficiency in 12 countries, including learnings in terms of designing, implementation and enforcement, quality assurance, and impact of the labelling program. The paper contains key features of the labelling program from these 12 countries and India, whilst highlighting each one's scope, minimum performance criteria, methodology and criteria for rating, and implementation and administrative framework. It concludes with various challenges in the current framework, highlighting the shortcomings of the program and provides a plausible set of actions for further improvement and effective uptake of the labelling program in India.

Keywords: Energy codes, Energy-efficiency labels, Labelling, Ratings

CH Rama Krushna Chary, FIE

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Title of Paper: **Climate Change and Preventive Measures**

Abstract: Humans have successfully adapted to environmental change over time, from evolving natural physiological responses to the use of science, technology, and knowledge to improve our lives and advance our health. During this process, there is a phenomenal growth in industrial sector worldwide. This phenomenal industrial growth is influencing the climate change more than the natural causes. These human causes of climate change is depends on the region where more greenhouse gases are produced.

We can avoid many of the worst health effects of climate change by following very simple environmental friendly steps in our routine life. The research need to describe the process, helping us to develop the proper tools and make informed choices that will ultimately result in better health and better lives.

Prof Abhijit Mitra, FIE

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Title of Paper: **Survey of Mobile BTS Power Density and Efficacy of Protective Shields in Compactly Inhabited Areas of Kolkata**

Abstract: A crucial topic of common interest is presented here through a field survey: whether the non-ionizing electromagnetic or microwave radiation power received at a livable distance from the mobile base stations in densely inhabited areas are within the safe limits or not. The article mainly aims at spreading awareness to readers in this domain. In order to delve deeper, a detailed field investigation was carried out over a time span of 18 months at 54 circumspectly chosen sites in Kolkata where human inhabitation is exceedingly close to the mobile base stations, increasing the risk of unwarranted exposure to EM radiation. Fortunately, it is found that in all the sites, the maximum power density level is well within half of the maximum allowable safe level as specified by Govt. of India. As a green technology initiative, a window shielding protective technique is also proposed and shown that it is capable of providing only 10% reduction in received power density and therefore it is advised not to make use of such shields without expert opinion.

Keywords: Base transceiver station, Electromagnetic radiation, Non-ionizing, Power density, Safe level, Window shielding

Title of Paper: **A Deep Learning Recovery Mechanism using LSTM for UAV Channel Modeling**

Abstract: Unmanned Aerial Vehicle (UAV) communication channel is vital for its safe and reliable operations. Attempts

to model the UAV channel using traditional approaches rarely explore the performance enhancements that can be achieved by using special mechanism for recovery of lost values or regeneration of sparse samples. This leads to loss in performance which, if addressed with neural network solutions, can help in enhancing link reliability. In this respect, iterative learning aided methods especially those based on deep learning techniques can play a very significant role. In this work, we attempt to design a recovery mechanism based on recurrent neural network architecture with Long Short Term Memory (LSTM) cell and a specially configured deep learning network. The mechanism uses past and present values as inputs to three LSTM cells configured using split phase consideration to recover lost values. The contribution of the lost values thus recovered significantly improves the link reliability of the UAV channel network designed using deep learning approaches.

Keywords: Channel modeling, Deep learning, Long short term memory, Recovery mechanism, Rectified linear unit, Unmanned aerial vehicle

Title of Paper: **Low-light Video Enhancement with SVD-DWT Algorithm for Multimedia Surveillance Network**

Co-authors: Niladri Halder & Dibyendu Roy

Abstract: After the outbreak of the global pandemic COVID-19, video surveillance has become an important aspect of multimedia communication in monitoring-based systems, security systems, object tracing etc. However, due to drawbacks like video frame distortion, the quality of the video in surveillance may be affected in some cases. In this work, a video enhancement-based multimedia surveillance network has been developed by using a Discrete Wavelet Transform (DWT) and Singular Value Decomposition (SVD). The proposal, in particular, uses SVD-DWT along with median filtering and contrast limited adaptive histogram equalization to enhance low illuminated distorted video frames by using video sensor nodes. The performance of the proposed scheme is evaluated by calculating parameters like mean square error, peak signal to noise ratio, normalized cross-correlation etc. of the video frames in different types of environments. The results delineate that the proposed scheme is better than other available methods in diverse types of environments.

Er Jnan Ranjan Pal, FIE

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Title of Paper: **Sedimentation Study of Tawa Dam Reservoir**

Abstract : Tawa Irrigation Project is a major irrigation scheme consisting of a Dam on Tawa River and about 2713 Km long canal system in districts Hoshangabad and Harda of Madhya Pradesh. The dam on Tawa River in Narmada Basin is the second biggest dam of M.P. completed in 1978. The irrigation was started in the command during 1974-75.

In general sedimentation problem reduces the capacity of a Reservoir with time, that causes changes in the area-storage capacity curve. These curves are important for planners, designers and regulators of dams. Many Empirical and other methods have been suggested for predicting these curves. In this case study Empirical Area Reduction Method for full-service time of 50 years (2025), and feasible service time of 100 years (2075) with base year 1975 has been applied to determine the accumulated sediment volume, revised area and modified revised capacity of the Tawa Dam Reservoir.

Total accumulated sediment calculated as 212.57 MCM. & 482 MCM., results in gross capacity of the reservoir as 2099 MCM. & 1830 MCM. against original capacity of 2311.54 MCM. respectively for 50 years of full-service time and 100 years of feasible service time.

Keywords: Reservoir, Dam, Sedimentation, Empirical, Hydrology, Area, Capacity

PUBLICATION by Members

Title of Paper: **Solar Energy and Hydropower Complementing Each Other — A Global Trend for Achieving SDGs**

Abstract: Renewable energy is a clean and sustainable source of energy derived from nature and it has potential to provide solutions to the vulnerable energy problems being faced by India. India has the continuous supply of solar energy, which can be utilized for producing electricity. World's largest single location solar energy plant is being established in India in the beautiful mountainous landscape of Ladakh. In its first assembly in New Delhi in March, 2018, International Solar Alliance (ISA), was formed by solar- resources rich countries to undertake joint efforts to reduce cost of finance and technology for deployment of at least 1000 GW, solar energy world wide by 2030. Hydro-electric power is a renewable source of energy, which has immense potential in India, which can be harnessed to mitigate electricity shortage in India and even out the variability added to the grid system, due to solar and wind power generation. The 193 member states of the united Nations adopted 17 new Sustainable Development Goals (SDGs) as a unanimous commitment to end poverty, fight inequalities and injustice and tackle climate change. The goals are to be achieved by 2030. Target 7.1 and Target 7.2 ensure universal access to affordable, reliable and modern energy services, by increasing substantially the share of renewable energy.

Keywords : Solar energy, Hydropower, Renewable energy, Environment, Conservation, Electricity, Generation

Title of Paper: **Tunneling, its Challenges & Solution in Yamuna and Ganga Valley Hydel Projects**

Abstract: Planned Development for the generation of power in Yamuna Valley in Uttar Pradesh (U.P.) started in the early sixties. The Yamuna Hydel Scheme, Stage II, Part I, comprises of a Dam on the Tons River at 'Ichari' and an underground Power House (4*60=240 MW) at Chibro. In the Head Race Tunnel (HRT) of the Ichari-Chibro Project, the first pressure tunnel in Himalayas, excessive over-breaks lead to chimney formation and collapses were encountered during tunneling. They were tackled by presupporting the roof of the tunnel by perfo-anchors and shot-creting. This project was commissioned in 1975.

The Chibro-Khodri (4*30=120 MW) project forming Part II of Stage II, fully commissioned in 1984, comprises of a Syphon Tunnel below Tons River, which leads the tail water from Chibro Power House to main Head Race Tunnel. Two major thrusts (Nahan and Krol) associated with strike step tear faults inferred to be tectonically active, have been encountered in the tunnel.

Excessive squeezing and rock closure, indicative of residual tectonic stresses and creep movements, have also been encountered. These necessitated the construction of three tunnels of small diameter (4.8m) instead of one of bigger diameter (7.5m) for a length of 1.0 km, with a view to avoid and minimize the construction problems during tunneling.

The Maneri Bhali Hydroelectric Project stage I (30*3=90 MW) on the Bhagirathi river was the only project which had been completed and commissioned for the first time in Ganga valley in October 1984.

Maneri Bhali Hydroelectric Project Stage II (76*4=304 MW) was in construction stage during 1984 to 2000, during which the author was posted as an Executive Engineer in the project. After formation of Uttarakhand, the project was completed and commissioned by Uttarakhand Government. In the ongoing construction stage, geological investigations have been of great help to the project engineers in evolving suitable treatments to meet the various adverse geological conditions in the tunnel and Power House site. Out of tunnel length of 16 km (6.0 m, dia. Horse shoe shape), 9.16 km length had been excavated and overt concreting in a length of 5.04 km was completed by the Irrigation Department U.P. Work Stopped due to paucity of fund. 50% of other works, such as Barrage, Power House etc. was also completed during that period.

It was a challenge to restart the project and revive the old civil work contracts. The civil works were completed by the existing old contractors as the earlier civil work contracts were revived. The remaining tunneling works were done by using 3 Boom Jumbos with Pneumatic feed drifters, better track, latest available equipment's for Mucking and Shot-creting.

Keywords: Tunneling, Head race tunnel, Barrage, Dam, Power house, Underground, Hydroelectric, Irrigation, Geology, Drill, Blast, Excavation, Explosive, Rock, Concrete, Adit, 3 boom jumbo, Pneumatic drifters

PUBLICATION

Title of Paper: **Flood Risk Assessment, Forecasting and Geosynthetics in Flash Floods Management**

IEI Centenary Publication of Civil Engineering Division, The Institution of Engineers (India), Theme: 'Flash Floods: Challenges and its Management', 2020, pp. 103-110, ISBN: 978-81-950662-7-8

URL:https://www.ieindia.org/webui/ajax/Downloads/WebUI_PDF/Publication/Flash_Floods_Challenges_and_its_Management.pdf?v.20210212.1

Abstract : *For planning of any feasible and sustainable flood control system, it is necessary to ascertain the magnitude and occurrence of all great floods in the past and the expected flood being exceeded them in future. Any method is not perfect in predicting with certainty the time and size of any floods that may take place in future. Floods occurrence and magnitude are as uncertain as the meteorological phenomenon and contributing factors which are responsible for causing devastating floods. Probability of occurrence of major floods is greatest at a certain time of the year, which, in the case of the Indian rivers is the middle of the monsoon season i.e. the month of July and August. To reduce the impact of floods, it is very appropriate for a planned combination of water control structures, flood plain zoning and review of Flood Risk Assessment (FRA) in India and understand the best practices globally to take proactive measures to reduce risk and ensure sustainable development. It is worth mentioning that Geosynthetics can be immensely used for flood control structures and useful in concrete, earth and rockfill dams. If Geosynthetics are meticulously designed and correctly installed for all types of water resources structures, they can contribute to increase safety.*

Keywords: *Flood, Natural disaster, Risk-management, Fore-casting, Flood peak, Flood frequencies, Meteorological, geosynthetics*

Title of Paper: **Rain Water Harvesting and Ground Water Recharge for Sustainable Water Conservation**

Annual Technical Volume of Agricultural Engineering Division, The Institution of Engineers (India), Theme: 'Advances in Soil and Water Conservation Engineering', Volume 4, 2020, pp. 77-87, ISBN: 978-81-952159-6-6

URL: https://www.ieindia.org/webui/IEI-Publication.aspx#IEI_Centenary_Publication

Abstract: *As India continues to experience high economic and population growth, water demand for meeting various domestic and productive needs also rising. Hence, there are a new set of challenges for planning and managing available water resources to meet the growing water demand and consumption. In those areas experiencing water stress (in physical or economic terms), there is need to manage, reduce water demand and consumption, and conserve water through different methods as discussed later, such as, Rain water Harvesting, Artificial Recharge to ground water, Spring Rejuvenation and Ground Water Recharge, NABARD Initiative for Soil & Water conservation. Underground Taming of Floods for Irrigation is also a unique method for water & soil conservation and can control severe floods. Water conservation and soil conservation complements each other. The concept of soil conservation cannot be materialized without conserving and efficient use of water resources.*

All out efforts in optimizing the efficiency of water use in the Irrigation, Domestic and Industrial Sectors, is the road to development and prosperity.

Keywords: *Water, Soil, Conservation, Ground, Recharge, Artificial, Aquifer, Domestic, Agriculture, Industry*

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We would like to thank our erudite members for sharing their professional achievements through the IEI Epitome in the process making the content more inveigling and at the same time inspiring many others to share their accomplishments as well. But, it would be our endeavour to accommodate your success stories in a more structured and comprehensive manner so that it can be referred, traced and retrieved by the entire gamut of professionals who are avid followers of this e-Newsletter. To this end, we would request our Members to send the details of their achievements as per the appended formats only.

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(xiv)	Date of Grant (DD/MM/YYYY)*	
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(ix)	Title of Paper	
(x)	Name of Journal/Proceeding/Technical Volume	
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(xiii)	Theme (Only for Technical Volumes of IEI)	
(xiv)	DOI: (Not required for Indian Engineering Congress/Annual Technical Volumes of IEI)	
(xv)	ISSN	
(xvi)	Date of Publication (Date-Month-Year)	
(xvii)	Co-authors (if any)	
(xviii)	Abstract in full	
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(xx)	Supporting Documents/links [which are clearly indicative of the incumbent's achievement(s)]	
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(viii)	Membership No (please use the prefix F/M/AM as the case may be)	
(ix)	Title of Book/Book Chapter	
(x)	Publisher Details	
(xi)	ISBN	
(xii)	Date of Publication (Date-Month-Year)	
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Advertisement in IEI Epitome

The Institution of Engineers (India) reserves a coveted privilege in being the largest multi-disciplinary professional body of engineers in our Nation encompassing 15 engineering disciplines with a Corporate membership of over 2 lakhs maintaining a National presence through hundred twenty five Centres and six Overseas Chapters, Fora's and Organ (Engineering Staff College of India). The Institution has been disseminating the quality information regarding its activities and latest developments in the field of Engineering and Technology through IEI-Epitome and other publications.

We would like to share with you that we are now providing the facility to advertise engineering / technical products / services, information brochure, recruitment notices etc. in our official publication portal IEI Epitome (12 issues-140000 reach online). Besides, IEI Epitome is also uploaded on our website (www.ieindia.org) on a monthly basis and is accessible to all free of cost. Given its immense footprint in the engineering and technical diaspora spanning the globe, IEI with its distinguished heritage of a century provides you the ideal portal to connect with the National and International Engineering and Technical Community at very competitive rates. We invite you to take this unique and privileged opportunity to advertise and communicate your service and product portfolios under our prestigious banner and make us your brand emissaries in your promotional campaigns.

The booking form containing details of each publication, rates for the advertisements and the advertisement form are appended below.

BOOKING FORM

Publication	Description	Type	Rate (Rs.) including GST	Number of issues / volumes	Total (Rs.) including GST
IEI Epitome	Inside Full Page	Colour	30,000		
	Inside Half Page	Colour	15,000		
	Inside Quarter Page	Colour	8,000		
Less discount* @ ....% Total Cost of Advertisement					
*5% discount for advertisement in 6 consecutive issues of IEI Epitome *10% discount for advertisement in 12 consecutive issues of IEI Epitome					
Payments to be made by cheques / drafts drawn in favour of "The Institution of Engineers (India)". Transfer through NEFT/RTGS will be also accepted.					

Cheque / Draft No. .... Drawn on..

NEFT/RTGS/IMPS/Online Net Banking Transfer to IEI Account (please enclose the transaction slip generated):

Transaction date: .... Name of Bank & Branch..

Transaction ID/UTR No./Payment Reference No. : ....

Date

Mobile No.

Email:

GSTIN: Signature with seal

Advertisement in IEI Epitome

Details required for Payment to IEI

Sr No	Particulars	Details
1	Name and address of the Beneficiary	The Institution of Engineers (India) 8 Gokhale Road, Kolkata 700 020
2	Account Number of Beneficiary	005010100002704
3	Account Classification	SB
4	Name and address of the Bank Branch (where payments are to be sent by Applicant)	Axis Bank Ltd, Kolkata Main Branch, 7 Shakespeare Sarani, Kolkata 700 071
5	Branch Code	005
6	The 9 Digit MICR code of the Branch (as appearing on the MICR cheque)	700 211 002
7	IFSC Code of the Bank Branch for RTGS mode	UTIB0000005
8	IFSC Code of the Bank Branch for NEFT mode	UTIB0000005
9	Email ID of Beneficiary for advice of payment by Bank	technical@ieindia.org
10	PAN	AAATT3439Q
11	Name in PAN	The Institution of Engineers (India)
12	GSTIN	19AAATT3439Q1ZR
13	Service Tax Registration Number	AAATT3439QSD027