

1st IMCEET-2023-Keynote/001

**CASE STUDIES ON GREEN ENGINEERING APPROACH FOR
ORGANIC WASTE MANAGEMENT: PILOT SCALE BIOFILM
ANAEROBIC DIGESTERS TREATING LEACHATE AND FOODS
WASTE**

Fatihah Suja^{1,*}, Arij Yusof¹, Afiq Moffit¹, Infana Kabir Ahmad¹

¹ *Department of Civil Engineering, Faculty of Engineering and Built Environment, Universiti Kebangsaan, Malaysia*

ABSTRACT: The management of organic waste is a major dilemma for developing countries. Biological treatment systems are best at removing things that are organic and easily biodegradable. Choosing the best biological treatment system is a very complex process that requires a substantial understanding of treatment fundamentals and experience in managing treatment operations. Research and consultancy projects that have been carried out for the treatment of major organic pollutants in Malaysia, namely sewage, leachate, and food waste, are used to evaluate how the optimal type and mode can be selected based on the criteria of green engineering principles: minimising emissions with respect to organics, nutrients, and odour; promoting multiple resources of clean water, energy, or sludge recovery; saving energy consumption on aeration and pumping facilities; improving system loading capacity through process intensification; and controlling the optimal operating condition. The Indah Water Konsortium, Malaysia's national sewerage company, generally employs the activated sludge treatment process. A case study was carried out on five regional sewage treatment plants (STP) in Malaysia employing different modes of activated sludge plants: the advanced conventional, the sequencing batch reactor, the modified oxidation ditch (MOD), the advanced oxidation ditch, and the extended aeration type. To ease the comparison of energy usage and cost between the STPs, the treatment plants were divided into major components comprising the inlet work, grit chamber, aeration, sludge treatment, and administrative building. The major consumer of energy is aeration systems, which account for 46.4% to 87.6% of the total daily energy needs of the STPs, followed by sludge treatment. The cheapest aeration system to operate is apparently the advanced conventional STP using a high-speed turbine compressor and submersible aerator. Optimal operations of the STPs are assessed based on the stability of influent characteristics, the aeration basin environment, the clarifier conditions, and the sludge generation. In Malaysia, leachate pollution has become a more serious problem in recent years due to a lack of proper treatment facilities at waste disposal sites. The penetration of leachate into the groundwater

table and its discharge into the rivers affect the quality of the water supply. A closed system utilising anaerobic digestion (AD) is recommended, but the attractiveness of biogas technology for largescale applications has been limited, primarily because of the slow rate and process instability. The performance of a demonstration unit of Anaerobic Biofilm Digester (ABD) employing cell immobilisation techniques for the treatment of leachate from Kuala Lumpur Waste Transfer Station was evaluated. This system consists of an ABD with a working volume of 5.95 m³ and a bioscrubber, which were both partially packed with 3-dimensional high-density polyethylene media for biofilm attachment. Despite the complex leachate characteristics, the system shows great performance with its average COD, BOD₅, and total phosphorus removal efficiencies of 98.1%, 99.1%, and 92.9%, respectively. The system was stable throughout its operation and showed optimal average values for the monitored parameters. Measurement of the average daily biogas production yielded a value of 251 m³/day throughout the system's operation, with a composition of 57.12% methane and 26.6% carbon dioxide. The improper management and uncontrolled discharge of huge amounts of food waste (FW) have been creating environmental pollution and sanitation-related problems. Food waste is a putrescible and recyclable material with a dominant composition of 40% to 64% in Malaysia's estimated municipal solid waste of 38,200 metric tonnes per day (SWCorp, 2018). The performance of a 160-litre lab-scale and a 1 m³ pilot-scale single-stage ABD was examined. Results displayed that the performance of single-stage biofilm reactors was distinctly influenced by HRTs in terms of biogas production rate, biogas yield, methane yield, volatile solids (VS) removal efficiency, and system stability. Reactor feeding once per day displayed better performance and biogas production compared with feeding three times per week, with an increase of 12% and 17%, respectively. When HRT decreased from longer to shorter, the total volatile fatty acid and ammonia accumulation increased rapidly, whereas methane yield and biogas yield decreased continuously. The kinetic study showed that the modified Gompertz model had the best fit ($R^2 = 0.997$). The implementation of green technologies in the organic effluent and waste management sector is in line with the Malaysian National Green Technology Policy and will help transform the sector towards renewable energy resources, water recycling, nutrient recovery, and enhancement of the environment.

* Corresponding author: fati@ukm.edu.my

1st IMCEET-2023-Keynote/002

A RECENT TREND IN BIOENERGY: ENHANCEMENT OF MICROBIOME AND DIGESTIBILITY OF BIO(MASS) WASTES

Prof. Dr. El-Sayed Salama

Professor, Department of Occupational and Environmental Health, School of Public Health, Lanzhou University, Lanzhou City, Gansu Province, China

Abstract: Bio(mass)wastes could be convertible to biofuels in the form of gaseous fuel (i.e., biogas/biomethane) through anaerobic digestion (AD) and liquid fuel (i.e., biodiesel and bioethanol) by transesterification and fermentation, respectively. Microbial fuel cells (MFCs) are also potential technology to convert these biowastes to bioelectricity. However, there are still some challenges to maximizing the energy recovery from these EBs. Toxic effects of long-chain fatty acids (LCFAs), high concentration of recalcitrant lignin, and ammonia accumulation are the major hurdles during energy recovery from lipids (waste oils), carbohydrates (lignocellulosic biomass), and protein (slaughterhouse and seafood), respectively. Our research is focused to address these challenges and maximize the energy recovery from EBs. The effect of different fat, oil, and grease (FOG) loading (0.1-3% v/v) on the AD microbes was systematically studied. Optimum biomethane production was observed at 1-1.5% FOG. The addition of either 2 or 3% FOG permanently inhibited biomethane production due to the coating of microbes by FOG/LCFAs. To overcome the inhibition by LCFAs, various calcium concentrations (0.1-1% w/v) were applied to explore the optimum calcium level that can decrease the toxicity of 2% FOG and boost biomethane production. The optimum calcium concentration (0.5%) showed maximum COD removal and biomethane production and was associated with the dominance of the phyla Bacteroidetes, Firmicutes, Proteobacteria, Chloroflexi, and Euryarchaeota which are actively involved in the conversion of LCFAs to biomethane. The addition of walnut shell biochar resulted in the enhancement of biogas production by 38.26-87.55%. Low-density polyethylene (LDPET) and high-density polyethylene (HDPE) were used as support materials for biofilm formation during anaerobic co-digestion of agricultural wastes. The HDPE was found to accelerate biofilm formation during the co-digestion of agricultural wastes. The optimum range for iron oxide nanoparticles (IONPs) addition (40-60 mg L⁻¹) enhanced VWs digestion and improved biomethane production (>79%). In co-digestion, shrimp chaff (as protein-rich waste) enhanced the biomethane production of corn straw by 8.47-folds. Biodiesel production from edible sources has several socio-economic impacts such as food security and cost issues. Waste cooking oils (WCOs) can be used as an alternative feedstock due to their large production. Six WCOs including chicken oil (CO), fat, oil, and grease (FOG), beef hotpot oil (BHP), mixed waste cooking oil (MWO), duck oil (DO), and vegetable hotpot oil (VHP) were assessed for their potential applications in the current study. The lipid content of all WCOs ranged from 73-84.5% with the highest

C16/C18 (32.1-71.4%) in DO and VHP, respectively. The highest MUFAs (59%) such as oleic acid was found in VHP making VHP highly recommended for biodiesel production, as its derived biodiesel complied with international standards. Bioethanol production as a liquid biofuel was boosted from pretreated cotton stalk lignocellulosic biomass through the co-fermentation of immobilized yeasts. Application of strategies such as calcium, biochar, and biofilm carrier's addition, co- digestion, essential nutrients supplement, and co-fermentation along immobilization could be the potential approaches for improved energy recovery from bio(mass)wastes.

* Corresponding author: salama@lzu.edu.cn

1st IMCEET-2023-Keynote/003

BASICS OF NAVIGATION APPS

Prof. Dr. Ismail Rakip Karas

Dean of Safranbolu Fethi Toker, Fine Art and Design Faculty (Acting), Karabuk University, Turkey

ABSTRACT: Topology is the key structure in a navigation system to handle spatial analyses. In this speech, requirements and basics of such structure will be elaborated. In addition, a web based navigation practice will be introduced in this presentation.

* Corresponding author: ismail.karas@karabuk.edu.tr

1st IMCEET-2023-Keynote/004

**INVESTIGATION OF THE EFFECT ATMOSPHERICALLY
TRANSPORTED DESERT DUST ON PM_{2.5}-PM₁₀ VALUES USING
HYSPLIT BACK TRAJECTORY MODEL IN ERZURUM TURKEY**

Prof. Dr. Zeynep CEYLAN

Dean of Safranbolu Fethi Toker, Fine Art and Design Faculty (Acting), Karabuk University, Turkey

ABSTRACT: In this study; Desert dust transported by atmospheric route to Erzurum city center between 20-26 May 2022 and desert dust precipitation have examined in detail. With the effect of the carried desert dust on the pm₁₀ and pm_{2.5} values; The trajectories of the pollutants until they reach the measurement site on the day of high air pollution levels have determined using the HYSPLIT (Hybrid Single Particle Lagrangian Integrated Trajectory) back-trajectory model. HYSPLIT back-trajectory model is a model that calculates the trajectories that individual pollutant particles have followed in the past or will follow in the future. This model has developed by NOAA – ARL (National Oceanic and Atmospheric Administration Air Resources Laboratory). By considering backward trajectories, long-range pollutant transports have examined and comments have made about the current air quality in the Erzurum city. In the city center; While pm_{2.5} can be measured at only one station (Tashan station) out of 5 air quality measurement stations, pm₁₀ can be measured at all stations (Aziziye-Tashan-Center-Palandöken- Pasinler stations). When the measurements made in the last six months (January 2022-June 2022) at these stations are carefully examined; it has determined that there was a strong dust transport and precipitation to the city center on May 23, 2022. Among the 5 stations measuring particulate matter (pm), pm₁₀ values increased in 4 stations (Aziziye- Taşhan-Palandöken-Pasinler stations) and pm_{2.5} values increased in one station (Taşhan station). With the help of the HYSPLIT back-trajectory model and by examining the 72-hour back trajectories; it has been determined that the sources of these particles are the air masses coming to Eastern Anatolia from the desert regions of the countries located in the south of our country (Iraq- Jordan-Lebanon-Syria). It has determined that these air masses increased the pm₁₀ and pm_{2.5} concentrations in the province. Desert dust transport is also supported by satellite photographs.

* Corresponding author: zceylan@atauni.edu.tr

1st IMCEET-2023-Keynote/007

**SUSTAINABILITY-ORIENTED MULTIMODE RESOURCE-
CONSTRAINED PROJECT SCHEDULING FOR CONSTRUCTION
PROJECTS**

Prof. Dr. Iftikhar Hussain

Vice Chancellor, University of Engineering and Technology, Peshawar

ABSTRACT: In project planning, a reduction in project duration through efficient scheduling and increased resource allocation may come at the cost of the environment and society. Despite this, project scheduling and sustainability assessments are performed separately, disregarding the potential correlation between the two. Therefore, an integrated framework for Multimode Resource-Constrained Project Scheduling Problem (MRCPSPP) with sustainability considerations is proposed. The proposed framework quantifies the environmental and social impacts of the project activities and then constructs and solves a mathematical model based on the obtained data. The model determines the activities' execution mode and schedule that optimizes project completion time and sustainability index. The grey wolf optimization algorithm is modified and used to solve the presented model. The framework has been applied to a real-life construction project to demonstrate its applicability. The results indicate that practical tradeoffs can be obtained by considering sustainability objectives in project scheduling. The framework can be a useful addition to the project management body of knowledge to foster sustainable thinking in construction design and management.

* Corresponding author: iftikhar@uetpeshawar.edu.pk

1st IMCEET-2023-Keynote/008

ROLE OF ADDITIVE MANUFACTURING IN ASSISTIVE DEVICES

Prof. Dr. Sahar Noor

Dean, Faculty of Mechanical, Chemical and Industrial Engineering, University of Engineering & Technology, Peshawar

ABSTRACT: The area of Assistive Technology is one of the areas which is most neglected in the researcher communities in the world in general and Pakistan in particular. Globally, more than 2.5 billion people need assistive products for their daily routine life. In many low-income and middle-income countries, only 5-15% of people, who require assistive devices and technologies, have access to them. Additive manufacturing, also known as 3D printing, has the potential to revolutionize the design, development, and production of assistive devices. Its ability to create highly customized devices, provide greater design flexibility, reduce waste and environmental impact, and potentially lower costs, makes it an exciting development in the field. Using additive manufacturing, designers and engineers can create custom-fit devices that are tailored to the individual's needs, resulting in better comfort and functionality. This enables faster development of devices and allows for greater innovation in the field. Additionally, some additive manufacturing processes use sustainable materials, such as bioplastics or recycled materials, further reducing the environmental impact of producing assistive devices. Ultimately, additive manufacturing has the potential to make assistive devices more accessible and affordable to people who may not have had access to them due to cost barriers.

* Corresponding author: sabarnoor@gmail.com, sabar@mvfpuet.edu.pk

1st IMCEET-2023-Keynote/009

CLIMATE CHANGE: ITS MITIGATION AND ADAPTATION

Prof. Dr. Abdul Qayoom Jakhrani

Director, Postgraduate Studies, Quaid-e-Awam University of Engineering, Science & Technology (QUEST), Nawabshah

ABSTRACT: Climate change is one of the greatest multifarious concerns and universal threat to the natural environment and societies the world has ever experienced. It is critically affecting many disciplines including science, economics, society, politics, and moral and ethical questions. It is a global problem as well as felt on local scales and will be around for thousands of years. Carbon dioxide, the heat-trapping greenhouse gas that is the primary driver of recent global warming, remains in the environment for many thousands of succeeding years. Even if the emission of all greenhouse gases will be stopped today, yet global warming and climate change will continue to disturb forthcoming generations. The extent of climate change can be determined the amount of emissions affecting the climate and the response to tackle those emissions. The response to climate change involves a two-split approach either by reducing emissions of and stabilizing the levels of heat-trapping greenhouse gases in the atmosphere that is called mitigation or by adapting to the climate change already in the pipeline known as adaptation.

* Corresponding author: aqunimas@hotmail.com, aqbaloch@quest.edu.pk

1st IMCEET-2023-Keynote/010

ROLE OF AI IN MODERN ERA

Dr. Samita Bai

Assistant Professor, Department of Computer Science, Salim Habib University, Karachi

ABSTRACT: Recently, Artificial Intelligence (AI) has been seen playing a vital role in reshaping the future. A plethora of diverse AI innovations have revolutionized the ways of workflow in the fields of healthcare, e-commerce, gaming, education, etc. The prominent sub-fields of AI including machine learning, deep learning, and computer vision have proved to be useful for humans in performing complex tasks like prediction, diagnosis, and decision making to name a few. On the one hand, AI has significantly contributed to society and human beings, while on the other hand, different ethical issues have raised the need for ethical and responsible AI. Additionally, another challenge faced by AI in the modern world is the increased need for transparent and interpretable models specifically in the field of medical domain. The black-box nature of different deep learning models used for predicting and diagnosing life-threatening diseases requires the explanation of resulting decisions. Thus, this requirement calls for a need for Explainable AI (XAI). To cater to these issues, the research community is focusing on different strategies to achieve the acceptance and approval of AI applications in critical domains. This talk is based on the discussion of the impact of recent AI applications with the help of three different use cases where the role of AI needs to be well-defined in terms of ethics, responsibility, or explain ability, including ChatGPT, Self-driving cars, and decision-making in the medical domain.

* Corresponding author: samita53@gmail.com

1st IMCEET-2023-Keynote/011

MACHINE LEARNING FOR PRECISE NAVIGATION: CURRENT TRENDS AND FUTURE PERSPECTIVES

Prof. Dr. Madad Ali Shah

*Founder Vice Chancellor, BBSUTSD Khairpur Mirs,
Head of Department, Electrical Engineering, Sukkur IBA University*

ABSTRACT: Accurate, ubiquitous, and reliable navigation can make transportation systems (road, rail, air and marine) more efficient, safer, and sustainable by enabling path planning, route and fuel economy optimization. However, accurate navigation in urban contexts has always been a challenging task due to significant occurrence of signal blockage and contamination of multipath and non-line-of sight (NLOS) signal receptions. The recent advancements in machine learning have initiated new horizons for improvement of navigation systems with accuracy and reliability in the challenging environments. Keeping in view, this research is focused on current trends and future perspectives of introducing machine learning for precise navigation. It includes the development of machine learning algorithms for GNSS-based navigation, latest techniques for navigation signal processing, data fusion, and positioning error mitigation. Additionally, it also includes the benefits of using machine learning for precise navigation in challenging environments, such as urban and congested areas, where signal blockage and multipath effects are potential threats to navigation accuracy. The research will cover a variety of machine learning approaches and demonstrate how these techniques can be utilized to further improve the accuracy and reliability of the navigation systems. Finally, the potential future directions for machine learning in navigation systems including the integration of machine learning with other emerging technologies such as 5G and 6G along with autonomous vehicles are discussed. Overall, this research will provide valuable insights into the current state of the art technologies and the future perspectives of machine learning techniques for precise and accurate navigation systems.

* Corresponding author: madad@iba-suk.edu.pk

1st IMCEET-2023-Keynote/012

POTENTIALIZING AI AND GREEN INTERNET OF THINGS IN HEALTHCARE FOR ACHIEVING UN'S SDGS

Prof. Dr. Hyder Abbas Musavi

Director Academics, MUET SZAB Campus, Khairpur Mirs

ABSTRACT: The integration of Green-IoT and AI in healthcare has the potential to revolutionize a wide range of industries, including healthcare wherein Green-IoT connected medical devices and wearables can collect health data, which can be analyzed by AI algorithms to improve patient outcomes and support better decision-making by healthcare professionals. The convergence of AI and IoT in the field of smart health coupled with machine learning algorithms are enabling new and innovative solutions for healthcare delivery and management. This research presents a review on patients' healthcare services. Particularly, we give an overview of essential parameters of patients' healthcare services through Green-IoT enabled sensor technologies under use case scenario. This includes reducing the carbon footprint of IoT devices and networks, as well as using IoT technology to monitor and mitigate environmental issues such as pollution and resource consumption by mapping UN's SDG 3.

* Corresponding author: drhyderabbas@yahoo.com

1st IMCEET-2023-Keynote/013

SUSTAINABILITY IN PLASTIC INDUSTRY - A WAY FORWARD TO MEET THE ENVIRONMENTAL CHALLENGES AND LEGISLATIVE CONCERNS

Prof. Dr. Abdul Shakoor

*Associate Fellow (AFHEA) Advance HE, UK
Fellow, Pakistan Academy of Engineering (PAE), Department of Mechanical Engineering, University of
Engineering & Technology, Peshawar*

ABSTRACT: Environmental challenges such as dwindling fossil fuels and increasing hazardous pollutants have gained attention in recent years. Non-degradable polymers and composites used in various applications, including filtration, water treatment, food packaging, and trash disposal, pose significant environmental and legislative concerns. To address these legislative and environmental issues, development and promoting the use of novel hybrid biocomposites to support the creation of a green circular economy can be a way out. These biocomposites were developed using natural fibres, mineral fillers, and GNPs for advanced applications offering a wide range of technical and social advantages additionally the integration of these biocomposites into mainstream use, with the ultimate goal of promoting sustainable and environmentally friendly practices. Biopolymers derived from renewable resources are gaining attention due to their biodegradable properties, and combining these materials has led to the development of bio-derived composites with improved thermal and mechanical properties, offering a sustainable solution to cover daily life commodity items while addressing environmental concerns.

* Corresponding author: shakoor@uetpeshawar.edu.pk, a.shakoor@outlook.com

1st IMCEET-2023-Keynote/014

NEED OF COMPUTER AIDED ENGINEERING FOR REAL WORLD ENGINEERING PROBLEMS

Prof. Dr. Muhammad Abid (T.I)

Director, COMSATS University Islamabad (CUI), Wab Campus

ABSTRACT: Real world engineering problems are observed complex based on many factors and applications and cannot be solved with the exact solutions or experimental tests. Keeping in view the interdisciplinary nature of the problems and required boundary conditions, geometries, materials, climate impacts, large data etc; for optimized solutions with higher accuracy and performance and reduced computational cost, the option of Computer Aided Engineering (CAE) with numerical solution is observed the need of the time. This paper presents applications of CAE in solving real world problems of complex engineering problems including but not limited to performance of bolted pipe joints during bolt up and operating condition and welding of flange and pipe joints to ensure no leak conditions; design energy efficient buildings, water and sediment flow simulations through tunnels and reservoirs for their life predictions; optimized renewable energy systems; optimization of critical industrial structure such as overhead cranes, industrial trusses and lightweight hybrid structure; flood and drought Modeling using RS and GIS tools and others. In all above cases, applications of Big Data, AI and Machine Learning and others are discussed.

* Corresponding author: dirwab@comsats.edu.pk

1st IMCEET-2023-Keynote/015

ROAD MAP TO IMPLEMENTING SDGs IN THE MANUFACTURING INDUSTRY

Dr. Awais Khatri

In-charge, Color Research Lab, Department of Textile Engineering, Mehran University of Engineering Technology, Jamshoro

ABSTRACT: The Sustainable Development Goals (SDGs) provide a comprehensive framework for addressing social, economic, and environmental challenges facing the world. The manufacturing and processing industry is a major contributor to global economic growth, but it also has significant negative impacts on the environment and society. The proposed talk is to highlight such needs and how to achieve sustainable development in the said industry. Consequently, efforts must be made to address issues such as resource consumption, waste generation, labor conditions, and supply chain transparency. Key strategies for advancing SDGs in the industry include transitioning to sustainable materials, reducing water and energy use, improving labor practices, promoting circular economy principles, and increasing transparency and collaboration across the supply chain. Successful implementation of these strategies requires the engagement of all stakeholders, including governments, businesses, civil society, and consumers.

* Corresponding author: awais.khatri@faculty.muet.edu.pk

1st IMCEET-2023-Keynote/016

WEAVING THE FUTURE: HOW NANOFIBERS ARE REVOLUTIONIZING HI-TECH APPLICATIONS

Dr. Zeeshan Khatri

Chairman, Department of Textile Engineering, Mehran University of Engineering Technology, Jamshoro

ABSTRACT: Nanofibers are ultrafine fibers with a diameter of less than one micrometer. They are finding increasing use in a wide range of hi-tech industries such as biomedical, electronics, filters, energy, and environment. Nanofibers offer a unique combination of mechanical, electrical, and biological properties that make them ideal for use in advanced materials and devices. In this keynote talk, we will explore the latest developments in nanofiber research and their potential applications in various hi-tech sectors. We will discuss the benefits and challenges of using nanofibers in these applications and highlight some of the most promising areas of research in this rapidly evolving field.

* Corresponding author: zeeshan.khatri@faculty.muet.edu.pk

1st IMCEET-2023-Keynote/017

**APPLICATION OF METAL NANO-PARTICLES AS SENSORS FOR
THE DETERMINATION OF SOME HARMFUL SUBSTANCES**

Prof. Dr. Syed Tufail Hussain Sherazi

Director, National Centre of Excellence in Analytical Chemistry, University of Sindh, Jamshoro

ABSTRACT: Several capping agents such as surfactants, drugs, amino acids, fatty acids, and polymers are used to avoid aggregation, increase stability of metal nanoparticles (MNPs), to achieve desired morphology and size of MNPs. The fabrication of MNPs is usually carried by chemical reduction of biological methods using different suitable capping agents. In the present work, evaluation of the MNPs capped with different capped agents such as surfactants, drugs, amino acids, fatty acids, and polymers as colorimetric sensing was carried out. For the synthesis of MNPs, precursor salts of different metals, and a variety of capping agents are used to develop the colorimetric sensors and to explore opportunities for their innovative applications. Capping agents perform their significant role as stabilizers to avoid the over-growth and coagulation of nanoparticles.

* Corresponding author: tufail.sherazi@gmail.com

1st IMCEET-2023-Keynote/018

CAUSES AND IMPLICATIONS OF RECENT FLOODS IN PAKISTAN: A HYDROLOGIC PERSPECTIVE

Prof. Dr. Habib-ur-Rehman Mughul

Dean, Faculty of Engineering, University of Engineering and Technology, Lahore

ABSTRACT: Despite the advances in flood forecasting and mitigation, flood damages are still seen globally. Recent trends in climate change have also aggravated this situation which can be observed in the extreme meteorological events in the past few years. Pakistan is among the regions adversely affected by the climate change. In the past two decades, Pakistan has suffered two mega-flood events in 2010 and 2022, where almost one-fifth and one-third of the land area of the country were inundated. However, both the happenings of 2010 and 2022 were distinct and caused fluvial and pluvial floods, respectively. In the flood of 2022, the country suffered losses amounting to 40 billion dollars. A major cause of these floods is the extreme monsoon spell where the whole country received rainfall more than the average of the past five decades. Such a forecast has also been made by the intergovernmental panel for climate change (IPCC) due to climate change. Flood frequency analysis has shown that the flood of 2022 in the Swat River went up to 1200 years return period, whereas bridges in the region were having design floods corresponding to 100 years return period. Such incidents have created a need for the reassessment of the design floods of the existing hydraulic structures to reduce flood damages in future.

* Corresponding author: mughalhabib@uet.edu.pk

1st IMCEET-2023-Keynote/019

EVALUATION OF MECHANICAL PROPERTIES OF MORTAR ON INCLUSION OF LOCALLY PRODUCED BIOCHAR

Anwar Khitab^{1,*}, Mairaj Ali¹, Raja Bilal Nasar¹

¹ Department of Civil Engineering, Mirpur University of Science and Technology (MUST), Kashmir, Pakistan

ABSTRACT: Cementitious composites, which include a variety of pastes, multifunctional mortars, and concretes, are the primary materials used in the global building industry. Cementitious composites have low fracture energy, tensile, and flexural strengths, but they are many times stronger when compressed. Over the service life of cement composites, nano/micro fractures may form, leading to macro cracks. Fibers are added for mitigating the cracks initiation and propagation. There are several natural and artificial fibers, available in the market. Present study deals with the application of nano/micro sized fibers obtained from pyrolysis of biomass. In this work, waste Lantana Cammara (plant) was transformed into Biochar, which were further reduced to nano/micro size by ball milling. Initially, biochar was produced by pyrolysis at 550°C in an inert environment. After that it was grinded to nano and micro level. For investigating the effect of syn-thesized nano particles on fracture toughness and other mechanical properties of cementitious composites, the biochar was added to cementitious mortar specimens at the rate of 0, 0.05, and 0.1% by mass of cement. These reinforcements act as crack arresting mechanisms at the nano/micro scale, limiting crack growth under service loads. The initial and intermediate characteristics were determined and compared with those of the control specimens. The results showed 10% -12% increase in flexural & tensile strength at 3 and 7 days age of the material. The fresh density reduced by 8.5% and the followability was enhanced by %. 20%. It is concluded that the addition of the biochar of Lantana Cammara enhances the performance of the cementitious mortars in various parameters as discussed above. Hence, green and more performing cementitious products can be manufactured by adding the biochar of the waste plant. This will also add to Carbon sequestration, which is a global point of concern.

* Corresponding author: anwar.ce@must.edu.pk

1st IMCEET-2023/004

TRIBOLOGICAL INVESTIGATION OF TiO₂ ADDITIVATED BIO-LUBRICANT NEEM OIL

Abdul Karim^{1,*}, Abid Hussain¹, Muhammad Umar Khan¹, Muhammad Shahrukh Atta¹,
Muhammad Abdullah², Nouman Rasool², Muhammad Mubasher Nouman²

¹Department of Mechanical Engineering, University of Engineering and Technology, Taxila

²Department of Mechanical Engineering, Quaid-e-Azam College of Engineering and Technology, Sabawal

ABSTRACT: Lubrication is used in mechanical parts like engines to reduce wear and friction. Oils like lubricant and manmade oil are being used for this purpose. As the global population rises, so does the need for hydrocarbons to meet increased lubricating requirements. Oil supplies are being quickly depleted throughout the planet. And thus, the cost of a barrel of crude oil has shot through the roof. Mineral oil composts too slowly, allowing it to linger for an extended time above Earth's surface, where it exacerbates environmental pollution. Bio lubricants are being used to fight the concerns by reducing wear and abrasion because of their considerable biodegradability. It's possible that oil additives may improve the lubricating qualities of bio-based oils. Here we provide the findings of our tribological investigation on the effects of Neem oil fortified with TiO₂ on bearing Steel. The effectiveness of a mixture of neem oil and TiO₂ nanoparticles at three different weight percents was tested. The wear coefficient was determined by a series of studies using a pin-on-disc tribometer. Input values ranged from 500 N to 1500 N, 100 RPM to 300 RPM, and 0.25 wt% to 1.25 wt.%. Using Archard's wear equation, we were able to get the abrasion coefficient. Scanning electron microscope (SEM) data was presented both numerically and visually. We discovered that 1000N load, 250 rpm, and 0.75wt% TiO₂ provided the optimum wear value. By contrasting the SEM results for good and bad samples, it was shown that the wear coefficient was related to the particle concentration upon which agglomeration commenced. Sometimes at high concentration at low load, there was simply a thin covering of lubricant that led to the accumulation of grooves and debris. Their wear coefficient is minimal under light loads and high rotational speeds. Index terms: Wear coefficient, TiO₂, Scanning Electron Microscopy (SEM), bio-lubricants, tribological study.

Keywords: Tribological Investigation of TiO₂ Additivated Bio-Lubricant Neem Oil

* Corresponding author: chakarim786@gmail.com

1ST IMCEET 2023/005

FRACTIONAL ORDER PI CONTROLLER-BASED HYBRID P&O- PSO MAXIMUM POWER POINT TRACKING TECHNIQUE FOR DISTRIBUTED ENERGY RESOURCES

Shah Zaman^{1,*}, Ahsan Ali¹

¹*Department of Electrical and Electronics, University of Engineering & Technology, Taxila, Pakistan*

ABSTRACT: A new MPPT Tracking technique is put forward for photovoltaic (PV), Wind, and Hydrogen Fuel Cell sources that experience non uniform inputs or partially shaded conditions with multiple peaks in their power-voltage characteristic. Customary MPPT designs, such as P&O, are prone to get stuck at an LMPP during non-uniform irradiance conditions and are unable to find the GMPP. To tackle this issue, intercontinental Algorithms like PSO have been proposed, but they can result in excessive oscillations and slow convergence times. The proposed technique, called Hybrid P&O-PSO, combines P&O and PSO to address these challenges. The P&O tracks the LMPP during non-uniform irradiance and invokes PSO during partial shading by reducing the search library of PSO and resulting in a fast response. Furthermore, the MPPT is also designed to harvest power from the Wind Energy System (WES) and Hydrogen Fuel Cell (HFC) with a fractional order PI controller, minimizing power oscillations and speeding up convergence time. The effectiveness of the Hybrid P&O-PSO has been successfully demonstrated under both uniform and non-uniform irradiance conditions.

Keywords: Fractional Order PI Controller-based Hybrid P&O-PSO, Power Point Tracking technique, Distributed Energy Resources

* Corresponding author: shah.zaman2@students.uettaxila.edu.pk

1st IMCEET-2023/006

**EXPERIMENTAL INVESTIGATION OF SOLAR THERMAL
PERFORMANCE IN PV/T SYSTEM USING SiO₂ NANOFLUID**

Syed Faraz Hussain Shah^{1*}, Muhammad Ali Abro¹, Mazhar Hussain Baloach¹, Tanweer
Hussain¹, Noman Khan²

¹Mehran University of Engineering and Technology SZAB Campus Khairpur Mirs, Sindh, Pakistan

²Mehran University of Engineering and Technology Jamsboro, Sindh, Pakistan

ABSTRACT: Many countries are being forced to use renewable energy sources due to a sharp decline in fuel deposits. Solar energy is one of the options for using PV panels. Photovoltaic panels convert solar energy into electrical energy. To move and use the heat energy absorbed from the sun, all solar thermal systems require active fluid. The efficiency of crystalline photovoltaic cells decreases by 0.5% for every degree Celsius increase in temperature. This study will be useful in modelling, improving, and analysing the PVT System. It will also aid in understanding the impact of the Nanofluid that will be used to cool the PV Panel. In our study, we used SiO₂ nanofluid to cool the PV panel (where absorbed heat energy may be used to produce effective energy to convert into power or generate steam, and it is expected that the PV panel will produce more power due to increased solar energy absorption) and compared the results with and without the use of SiO₂ nanofluid (in our case standalone distilled H₂O). The results of the SiO₂ nanofluid used as working fluid met our expectations. The SiO₂ nanofluid absorbed more heat than the distilled H₂O alone. Because the panel absorbed more heat, its performance improved significantly over that of the standalone distilled H₂O. The output power of the system with SiO₂ nanofluid was also greater than that of distilled H₂O alone. As a result, the efficiency of the system with SiO₂ nanofluid was determined to be greater than that of the standalone distilled H₂O, demonstrating that a PV system that uses nanofluids can achieve better solar power generation performance.

Keywords: Renewable energy, Solar energy, PV/T, Nanofluid

* Corresponding author: rizrehaman@hotmail.com

1st IMCEET-2023/011

**COMPARISON OF POWER SPECTRUM OF EEG SIGNALS
RECORDED BY EEG 32 PRO EEG RECORDING SYSTEMS FOR
BRAIN RESPONSE DURING HAND MOVEMENT TASK**

Rizwan ur Rehman,^{1,3,*} Naveed Anjum^{1,4}, Shumaila Farzand Ali^{1,2}, Muhammad Jahangir^{1,2},
Imran Ahmad Siddiqui¹

¹Department of Physics, University of Karachi, Karachi, Pakistan

²Government National College No.1, Karachi, Pakistan

³Govt. Degree College for Women, 11-F, New Karachi

ABSTRACT: To measure brain activity Electroencephalography (EEG) is used. EEG is a widely used technique for measuring electrical stimulation in the brain. The electrodes were placed on the scalp according to the 10-20 international system. The EEG signals recording was performed on EEG Neuropro 32 machine with 19 channels, the focused channels were C3, Cz, and C4 related to motor movement. The objective of this study was to observe the response of the sensory-motor cortex in terms of the power spectrum for the movement of the left and right-hand respectively. Experiments were performed on 7 healthy female subjects; their task was to move the left and the right-hand. EEGLAB is a MATLAB based software used for the analysis, noises, and artifacts were removed with a Basic FIR filter. The results show that the left-hand movement increases the power values in the right brain hemisphere whereas the right-hand movement corresponds to the right hemisphere of brain.

Keywords: power spectrum, EEG, brain response, hand movement, human computer interface

* Corresponding author: rizehman@hotmail.com

1st IMCEET-2023/012

**NUMERICAL THERMAL ANALYSIS OF NANO FLUID BASED
HEAT PIPE FOR ELECTRONIC DEVICES**

Muhammad Umar Khan¹, Abid Hussain², Abdul Karim³

^{1,2,3} *Department of Mechanical Engineering, University of Engineering and Technology, Taxila, pakistan*

ABSTRACT: With the development of technology use of electronic devices is also increasing causing excessive heat dissipation resulting in failure of electronic devices. This is a numerical study and it tests the effectiveness of heat pipe (sintered wick type) at various power inputs for thermal management of electronic devices. Moving forward this study use magnesium oxide nanoparticles homogenized with DI water. The results of heat pipe containing several concentrations by weight (0.5 %, 1.0 % and 1.5 %) of nanoparticles with simple heat pipe containing just DI water. In order to study the temperature contours of this heat pipe at various power input levels, a numerical approach was followed by using suitable CFD software ANSYS Fluent 2021 R-2. After this numerical study the results were compared with that of experimental setup findings, and it was observed that these results were much closer to each other. Finally it is concluded that heat pipe having concentration of 1.0 % magnesium oxide nanoparticles has visible reduction in temperature as compared to other concentrations.

Keywords: power spectrum, EEG, brain response, hand movement, human computer interface

* Corresponding author: umarkhan0797@gmail.com

1st IMCEET-2023/014

ALGAE-BASED MICROBIAL FUEL CELL FOR BIOELECTRICITY GENERATION

Urooj Javed^{1,*}, Abdur Rehman¹, Faiza Nadeem¹, Tabish Ali¹

¹*Dow University of Health Sciences, Karachi, Pakistan*

ABSTRACT: Increasing environmental pollution, depletion of energy resources, increasing energy demand & population increase are critical challenges in fulfilling energy demands & controlling pollution. Due to this researchers are looking forward to improving ways for sustainable & renewable resources to meet energy demand. Microbial fuel cells are efficient systems for wastewater treatment, bioelectricity, and value-added products from microbial biomass. The use of Microorganisms like bacteria & microalgae function as a biocatalyst to convert valuable organic materials into electrical energy. The dual chamber microbial fuel cell (MFC) consists of an anode & cathode. In the anode, the industrial effluent is treated with microorganisms to conduct the energy generation process. While in the cathode chamber, the supersaturated salt solution is added to balance the electric potential in the external circuit. In the present study, Dual chambered Microbial fuel cell was designed to treat textile effluent from Gul Ahmed® in an anode chamber with *Scenedesmus* sp. Supersaturated NaCl solution was added to the cathode chamber to balance the ionic concentration in the cell & voltage across the circuit. The two chambers were separated by a salt bridge that helped in the migration of protons toward the cathode. Graphite rods were placed in the chambers for electron flow which were connected externally to a multimeter. After 24 hours of incubation with microalgae & textile effluent in a dual chamber, 284 mV, 24 μ A, 6.816 mW, and 11.83 m Ω , were detected as voltage, current, power & resistance, respectively. Hence, the study suggested exploiting the high algal biomass produced from wastewater treatment and energy production that can reduce the energy crisis as well as dependency on fossil fuels for generating electricity. Also, the valuable products from wastewater treatment can be used as feedstock in other industrial processes to reduce the overall cost.

Keywords: Algae, Microbial Fuel Cell, *Scenedesmus* sp., salt bridge

* Corresponding author: urooj.javed@dohs.edu.pk

1st IMCEET-2023/015

A STUDY ON EFFECT OF DURABILITY OF CONCRETE WITH ADDITION OF TEA WASTE PARTICLES AS INTERNAL CURING AGENT

Sadam Hussain Jakhriani^{1,*}, Shamotra¹, Jabir Al¹, Muhammad Yousaf Mushtaq²,
Fahad Ali Shaikh³, Noshad Ali Shah⁴

¹Department of Civil Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development Khairpur Mirs

² Department of Civil Engineering, COMSATS University Islamabad (Sahawal Campus), Sahawal

³ Department of Civil Engineering, Mehran University of Engineering and Technology, Jamsboro

⁴ Department of Civil Engineering, Swedish College of Engineering and Technology, Rahim Yar Khan

ABSTRACT: The high strength concretes are made with low water/binder ratios; therefore, they are vulnerable to shrink more at early ages. This shrinkage occurs due to self-desiccation that leads the specimens to autogenous shrinkage. To overcome self-desiccation, it is necessary to keep the specimens moist for a certain period by not compromising its other properties. Pre-saturated lightweight aggregates, super absorbent polymers and the materials having porous nature are most commonly used materials for this purpose. The purpose of this study was to evaluate the effect of durability related properties on high strength concrete specimens made with tea waste particles as internal curing agent. The pre-saturated tea waste particles were used in two different size proportions i.e. particles passing from 4# sieve and retaining on 30# sieve (TW30), and particles passing from 30# sieve and retaining on 50# sieve (TW50) respectively, making up as much as 3% of the volume of the binder in both cases. Moreover, commonly used lightweight aggregate (perlite) was also used for matching up the results of specimens made with tea waste particles. The durability parameters such as i.e. carbonation, chloride penetration, sulphate attack and freeze-thaw were evaluated on the specimens with and without addition waste particles in different mixes. The obtained results showed that the addition of tea waste particles made with Ordinary Portland cement (OPC) as only binder with tea waste particles had higher permeability in sense of carbonation, chloride penetration, acid attack and freeze-thaw as compared to the specimens made with partial addition of silica fume as a partially cement replacement material. Furthermore, it was observed that the specimens made with TW50 had higher resistance against the

carbonation, chloride penetration, acid attack and freeze-thaw as compared to the specimen made with TW30. The results revealed that the finer tea waste particles had ability to minimize as much as possible the adverse impact on the durability properties high-strength concrete in addition with silica fume as partial cement replacement material.

Keywords: tea waste particles, internal curing agent, high strength concrete, durability

* Corresponding author: dr.shj@bbsutsd.edu.pk

1st IMCEET-2023/017

**A COMPREHENSIVE INVESTIGATION OF THE EFFECT OF
AGRICULTURAL GREEN WASTES ON THE MECHANICAL
PROPERTIES OF CONCRETE**

Wajid Khan^{1,*}, Inam Ullah¹, Awais Ahmad¹, Rawid Khan¹, Md. Adeel Arshad¹, Muhammad
Uzair Khan¹, Farhan Shah¹, Muhammad Hamayun¹

¹Department of Civil Engineering, University of Engineering and Technology, Peshawar

ABSTRACT: In the agriculture site, the production of wheat straw, sugarcane bagasse and rice husk is considered as agricultural wastes and these wastes has no proper disposal after the extraction, which may cause problems in the atmosphere and to the environment. As they may produce methane gas when interact with soil for long time, and this gas is directly emitted to the environment which causes greenhouse effects. Besides, these wastes contained of silica and some other fruitful chemical properties of binding and act somehow like cement because of which, we have to utilize these in the concrete as cement substitute or alternative. The research is completely focused on the effective utilization of the agricultural green wastes such as wheat straw ash (WSA), rice husk ash (RHA) and sugarcane bagasse ash (SCBA) as cement substitute in the concrete to obtain environmentally friendly, economical and good-performance concrete. Different mixes having WSA, RHA and SCBA in the same ratios were investigated for the mechanical properties. In the concrete laboratory 48 total cylinders of size 4inch diameter and 8inch height were casted. Out of these 48 cylinders, 12 were casted for controlled samples and 12 each were made out 10%, 20% and 30% replacement of cement with wheat straw ash, rice husk ash and sugarcane bagasse ash in equal proportions. The result shows, that 20% mix gives good results at 7 days and 30% mix at 28 days for compressive strength, and for tensile strength 30% mix gives excellent result at 7 and 28 days as compared to the control samples of concrete. The conclusion substantiates that WSA, RHA and SCBA has the potentials to substitute the cement at 30% in the manufacturing of concrete.

Keywords: power spectrum, EEG, brain response, hand movement, human computer interface

* Corresponding author: 19pwciv5255@uetpeshawar.edu.pk

1st IMCEET-2023/026

ELECTRICITY GENERATION THROUGH SOLAR PANEL AND INTEGRATION WITH UTILITY

Ali Raza Larik^{1,*}, Halar Mustafa¹, Rahool Rai², Kashif Ahmed Soomro², Adeel Khan¹

¹Department of Electrical Engineering, Hamdard University, Karachi

²Department of Mechanical Engineering, Hamdard University, Karachi

ABSTRACT: To provide electrical energy to consumers at the lowest feasible expense is one of the most challenging tasks, while ensuring a high degree of reliability. To provide continuous Supply, it requires an additional load on generating stations, despite the fact that the cost of energy up surging continuously, owing to an inadequate transmission capacities. Renewable energy sources are playing an important role for imminent progress of power systems. Solar energy's low cost and pollution-free nature has opened up new possibilities for power production to complement the current grid infrastructure. The general trends over the last decade of growing solar cell efficiency, lowering the cost of photovoltaic systems, expanding government reward systems, and a number of other conditions all have combined synergistically to lower the barriers to entry for photovoltaic systems and broaden their impact on the global energy portfolio. The purpose of this project is to create a model of a Smart Power System that incorporates various sources that are synchronized with the grid. It will lower the consumer's unit cost, it will ensure constant supply of power to the consumer, it will supplement the current grid system by supplying excess power back to the grid and it will utilize a smart algorithm to determine the optimal source of power from a pool of multiple options. Furthermore, it will be a locally created, cost-effective, and efficient approach for consumers and businesses.

Keywords: Solar Energy, Grid and Inverter Powers, Charge Controller, Grid Tie Inverter, Smart Power System

* Corresponding author: aza.larik@hamdard.edu.pk

1st IMCEET-2023/027

EVALUATING THE HAZARDS AND RISK PARAMETERS IN HOSPITALS

Tahira Fazal^{1,*}, Hafiz Muhammad Khurram Al¹

¹*Industrial Engineering Department, University of Engineering and Technology, Taxila*

ABSTRACT: Inappropriate risk and hazard measurements are a major problem in hospitals because they increase the chances of spreading diseases among staff and doctors. Therefore, this project aims to identify and analyze the significant parameters involved in the spread of risks and hazards in hospitals. The parameters included in this study were chemical, biological, physical, environmental, ergonomics, equipment, management, human error, management, security, political, social, financial, and medication error. The responses of 100 doctors from the different urban areas' hospitals have been collected through a questionnaire survey. The analysis was made through different statistical analysis techniques to find the significant parameters. A reliability test illustrated the high level of correction among factors. Friedman's test depicted that selected parameters have significant effects on the risks and hazards of hospitals.

Keywords: Risk and hazard measurements; medication error; environmental; ergonomics.

*Corresponding author: tahira.f228@gmail.com

1st IMCEET-2023/029

**INTEGRATION OF BUILDING INFORMATION MODELLING
(BIM) AND INTERNET OF THINGS (IOTS) FOR PILE RAFT
FOUNDATION MONITORING**

Fahad Ali^{1*}, Sayed Izharuddin¹, Haroon Khan¹, Irfan Jamil¹, Muhammad Shoaib Khan²

¹ Department of Civil Engineering, University of Engineering and Technology, Peshawar

² Department of Civil Engineering, Hanyang University, Seoul, South Korea

ABSTRACT: At present for high rise building high-performance pile raft foundation is the most efficient type of foundation. Many research work has been done for the performance and monitoring of pile raft foundation but they are non-integrated static models and do not give us variation of data with time with continuous information. Through BIM we can develop a virtual model of actual pile raft foundation which support data exchange, management and communication during the life time of pile raft foundation. But still BIM cannot give real time data about the pile raft foundation. Unless we integrate BIM with experimental model through IoT (internet of things) which will gives us real time data with continues informations.as well as the settlement behaviours of piles raft and load variation per second. The frame work of integration include 4 layers. First, we extract data from physical model (experimental model) soil information through sensors. Second modelling of mock-up modelling. Third is the integration of a digital and physical models. Fourth is its application for settlement behaviours that how much load is resisted by raft and piles. This research work has provided that how integration of BIM and IoT can make more responsive pile raft foundation management and operation by making sensors data available and accessible for property owner.

Keywords: BIM, IoT, pile-raft, Monitoring

* Corresponding author: 19pwciv5223@uetpeshawar.edu.pk

1st IMCEET-2023/035

COMPARISON OF OFF-SITE AND ON-SITE CONCRETE SLAB

Muhammad Haseeb Khan^{1,*}, Hamza Ahmed Quresh¹, Muhammad Sohaib Khan¹, Haris
Abdullah¹, Muhammad Sohaib¹, Muhammad Hamza Noor Khan¹

¹*Department of Civil Engineering, University of Engineering and Technology, Peshawar, Pakistan*

ABSTRACT: This state-of-the-art review article explains the comparison of off-site and on-site slabs in the construction industry. In this review, the article authors have done a comparison based on Construction Cost, Time, and seismic performance of both off-site and on-site lintel beams. It tells us whether to use an Off-site beam or an On-site cast lintel beam. Off-site slabs are precast lintel beams and On-site slabs are the traditional slab. There are important buildings and sometimes due to time limitations, we use precast slabs, so this paper shows whether it is safe or not. Whether the precast slab is suitable or not for the specific type of building. Sometimes engineers suggest using the lightweight concrete precast slab because of the lifting purposes. So, this paper will also comment on the use of lightweight concrete precast slabs.

Key words: Construction Cost, Time, seismic performance off-site, on-site, precast Slab.

* Corresponding author: 19pvciv5328@uetpeshawar.edu.pk

1st IMCEET-2023/037

**PERFORMANCE EVALUATION OF SUB-SURFACE BOTTLE
WICK IRRIGATION SYSTEM FOR BITTER GOURD AND
SPONGE GOURD CROPS: A NEW HOPE FOR DRY LANDS**

Abdul Rahim^{1*}, Shoukat Ali Soomro¹, Farman Ali Chandio¹, Aneela Hameem Memon²,
Wenquan Niu³, Fahad Akhtar Chandio¹, Jahangeer Dahri¹, Jamshed Ali Channa¹, Yasmin
Junejo⁴, Hyder Bux Khoso¹, Wenquan Niu², Galib Abdulkathim Alkaabi³

¹Faculty of Agricultural Engineering, Sindh Agriculture University, Tandojam, Pakistan

²Pakistan Agriculture Research Centre, Tandojam, Pakistan

³Institute of Soil & Water Conservation, Northwest Agriculture & Forestry University, Yangling, China

⁴Faculty of Crop Protection, Sindh Agriculture University, Tandojam, Pakistan

ABSTRACT: Water scarcity is a serious dilemma of entire globe. It is difficult to meet the food requirements by providing freshwater resources using traditional irrigation systems. The study was conducted during winter season in Tandojam, Sindh, Pakistan to evaluate the performance of sub-surface bottle wick irrigation system. Total 6 basins were used in this study having height of 60cm and width of 90cm and named as B1 to B6. Treatments were arranged as (WS) from B1-B3 and (WB) from B4-B6. Bottles were buried inside moist basins at 10-15cm below the soil surface and the irrigation was applied, Crop seeds were sown inside moist basins and the data was collected. Results showed that water savings were about 90%, and 92% with WS and WB treatments respectively, compared to conventional flood irrigation systems. The crop yield was 3.6 kg/basin (9100kg/hac-1) and 4.1 kg/basin (10400 kg/hac-1) with WS and WB treatments. The crop water productivity (CWP) was about 13.68kg/m³ and 19.66 kg/m³ with WS and WB treatments. The benefit cost ratio (BCR) was 5.30% for WS, 6.93% for WB treatments respectively. The (BCR) ratio for WB was higher than WS treatments, the findings of this study revealed that the production of selected vegetables is profitable for water scare regions around the globe. It was concluded that wick irrigation is a super-efficient irrigation system which satisfactorily perform, especially in terms of water saving and crop yield, crop water productivity and economics, but it need several irrigation intervals and consume more time as compared to traditional irrigation system. Furthers study was conducted during winter season with different soil, environment, and crops. The users are suggested to adopt this system as an alternative to water shortages, small scale farming, urban agriculture, etc. if water is available in large amount, flood irrigation can be adopted to achieve higher yield.

Keywords: Wick irrigation system, Water saving, Crop yield, Crop water productivity, Benefit cost ratio

* Corresponding author: 2k18-fae-12@student.sau.edu.pk

1st IMCEET-2023/040

**DESIGN AND DEVELOPMENT OF PRIORITY-BASED LOAD
CONTROL ENERGY DEVICE USING IOT: A SMART ENERGY
MANAGEMENT SYSTEM IN PAKISTAN**

Sadiq Ur Rehman^{1,*}, Farooq Zia¹, Iqbal Uddin Khan²

¹*Department of Electrical Engineering, Hamdard University, Karachi*

²*Department of Computing, Hamdard University, Karachi*

ABSTRACT: Power is the backbone of every modern society. Pakistan faces many issues in the energy sector due to the enhancement in industrialization and population growth. This causes the power outage and schedules load shedding to stabilize and ensure reliable supply to the remaining part of the system. To overcome this issue, we proposed a prototype system that deals with the load management between industrial and residential load on a priority basis based on IoT technology to get rid of sudden break down where the load is a priority to prevent any significant amount of loss as industries cannot bear sudden break down of electric supply. Testing results and implementation validate the approach's success.

Keywords: Priority, IoT, Arduino, ESP-8266, Load Control

* Corresponding author: sadiq.rehman@hamdard.edu.pk

1st IMCEET-2023/043

**PERFORMANCE ANALYSIS OF PHARMACEUTICAL
MANUFACTURER USING SIMULATION TECHNIQUE (SIMIO)**

Yahya Khushid^{1*}, Imran Anwar¹, Shahid Maqsood¹

¹ Department of Industrial Engineering University of Engineering and Technology, 25000, Peshawar

Department of Industrial Engineering, Jalozai Campus, University of Engineering and Technology, 25000, Peshawar

ABSTRACT: To compete in the current competitive industry on-time delivery of merchandise is the most important aspect of customer loyalty. The local pharmaceutical industry is facing late delivery and missing the issue of deadline which is causing them loss in terms of sales and customers, further the delays also result in penalties imposed. In the pharmaceutical industry because of the wide range of products to manufacture, failure to meet the deadlines is often because of the diverse nature and difficult processes to manufacture the drugs. Because of these limitations often large queues of products to be delivered on time are delayed, these delays result in an increased work-in-process inventory (WIP), increased cycle time (CT) of the finished product, and lower throughput (TH) of the system. So in this paper, the concepts of discrete event simulation (DES) and internal benchmarking (IB) are adopted to solve the issue of late delivery faced by the pharmaceutical industry. Using DES the current production line of the industry is simulated, and then by implementing IB performance is analyzed and inefficient processes are identified, along with bottleneck stations. IB uses different performance analysis scenarios named Best-Case, Worst-Case, and Practical-Worst-Case to identify the current performance of the pharmaceutical industry. The performance analysis showed us that the industry under consideration existed in the bad region and need improvement to meet the demand. An improved production line is suggested where the processes have better CT and less WIP along with improved TH. From the results obtained for the improved production line, a 15% improvement in TH can be achieved along with no bottleneck station.

Keywords: Discrete Event Simulation, Internal Benchmarking, Performance Analysis, Throughput, Work-In-Process, Cycle Time

* Corresponding author: engryahya@yahoo.com

1st IMCEET-2023/044

INVESTIGATION OF ALGAE GROWTH USING PHOTO BIO REACTOR

Aftab Ahmed Khuhro^{1,*}, Farhan Kamboh², Maria Panhwar¹, Sana Jamali³, Fahad Ali Sahito¹

¹Mechanical Engineering Department, Isra University, Hyderabad

²Mechanical Engineering Department, NED University, Karachi

³Environmental Engineering Department, Meharan University of Engineering and Technology, Jamsboro

ABSTRACT: The world's population is expected to grow by around 9 Billion by 2060. With an increase in population at such a huge level comes the need for more energy and food. Many researchers have proposed algae as the best solution. Algae is essentially a plant, Absorbs CO₂ and releases the O₂. Furthermore, if lipid content within algae is greater than 40% biodiesel can be extracted. The rest of the waste mass can be used for chicken farming, fish farming, and fertilizer. However, the growth of algal biomass at the production level is still a challenging task for researchers around the world. Many methods have been proposed to enhance algal biomass growth at a higher level. In this study photo bioreactor method will be used and the reactor will be fabricated with acrylic tubes to allow light to penetrate into algal biomass. Different sensors such as flow rate meters, salinity meters, and Ph. Meter have been used to monitor the effect of various parameters such as temperature, humidity, light, salinity, and Ph. Oxygen negatively affects the growth of biomass hence a sensor placed at top of the bioreactor to monitor the amount of O₂. The key objective of this experimental study was to identify the best local specie that can grow quickly and optimize the bioreactor productivity by analyzing the behavior of algae while changing affecting parameters suitably experimentally and numerically. Several challenges were faced while fabricating and assembling the photo bioreactor—leakage within acrylic tubes at the bending section and PVC and acrylic pipe dia differences. To solve the CO₂ cylinder 20 bar pressure flow rate meter was installed before entering the CO₂ into the bioreactor. This study shows that a significant amount of algal biomass can be produced with suitable nutrients and conditions.

Keywords: Population, Algae, Lipid, Temperature, Humidity, Light, Salinity

* Corresponding author: afiab.khubra@isra.edu.pk

1st IMCEET-2023/045

**ANALYZING THE ENVIRONMENTAL POLICIES AND EFFORTS
OF SOUTH ASIA IN COMPARISON WITH THE EUROPEAN
STATES FOR ACHIEVING CARBON NEUTRALITY**

Mashhood Urfi^{1*}, Zainul Abideen¹, Inshrah Minahil¹, Aman Nadir¹, Umaima Anwar¹,
Rabea Iqbal¹

¹*Institute of Energy and Environmental Engineering, University of the Punjab, Pakistan*

ABSTRACT: The issue of climate change and global warming is one of the most pressing challenges faced by the international community today. To mitigate the effects of climate change, countries worldwide are making efforts to reduce their carbon emissions and achieve carbon neutrality. In this context, this study aims to analyze the environmental policies and efforts of South Asian countries in comparison with European states for achieving carbon neutrality. Europe has long been a pioneer in environmental policy, enacting a variety of laws aimed at lowering greenhouse gas emissions, safeguarding biodiversity, and supporting sustainable development. South Asian countries have also created environmental regulations, although their emphasis has generally been on more important concerns such as poverty reduction and economic growth. Environmental rules, enforcement procedures, and monitoring systems are often better developed in European countries. South Asian countries, on the other hand, frequently face implementation challenges due to insufficient resources, inadequate institutional ability, and corruption. Moreover, Environmental policies in Europe are frequently integrated into larger policy frameworks, such as the EU's Green Deal or the UN's Sustainable Development Goals. South Asian governments, on the other hand, may emphasize infrastructural development or public health over environmental concerns. The research assesses the existing policies, regulations and initiatives adopted by South Asian countries, including India, Pakistan, Bangladesh, Sri Lanka, and Bhutan, and European states, such as Germany, France, Sweden, and Denmark, to mitigate climate change and reduce carbon emissions. The study examines the challenges faced by both regions and identifies the successful strategies that can be adopted by South Asian countries to achieve carbon neutrality. The research concludes that while European countries have made significant progress in reducing carbon emissions and achieving carbon neutrality, South Asian countries face several challenges, including limited resources, inadequate infrastructure, and lack of political will. However, there are still opportunities for South Asian countries to learn from the European experience and adopt effective policies and strategies to mitigate climate change and achieve carbon neutrality.

Keywords: South Asia, Environmental Policies, Carbon Neutrality, Europe, Carbon emissions

* Corresponding author: mashbood.urfi@gmail.com

1st IMCEET-2023/046

COMPARATIVE ANALYSIS OF BURNT CLAY BRICK AND CONCRETE BLOCK FOR BUILDING CONSTRUCTION

Muhammad Waseem¹, Sajjad Ali Mangi^{1*}, Aisha Hassan¹, Kanwal¹

¹Department of Civil Engineering, Mehran University of Engineering & Technology, SZAB Campus Khairpur Mirs

ABSTRACT: Considering the sustainability and urbanization it is important to investigate on the alternative and affordable options for the building construction. The Burnt clay brick is widely used in the building construction in the rural areas. However, the use of Concrete Block is very common in the urban areas. This study focused on the Quality and Cost comparative analysis of Burnt clay brick and Concrete Block. Initially the physical parameter was noted like dimensions, weight and water absorption. Next, the compressive strength was tested. This study considered one square meter wall to be constructed with the Burnt clay brick and Concrete Blocks. It was calculated that wall constructed with Burnt clay brick could save 45% of the masonry unit cost. However, it also gives the better strength 25% greater than the concrete block. Therefore, this study recommended the Burnt clay brick for the economic as well as sustainable construction material for the building construction.

Keywords: Burnt clay brick, concrete blocks, compressive strength.

* Corresponding author: sajjad.ned@gmail.com

1st IMCEET-2023/047

TO INVESTIGATE FAILURE ANALYSIS OF THE COOLING TOWER (JPCL)

Ashraf Bashir¹, Danish Ali¹, Ameer Ali², Sayed Intizar¹ Mahdi, Aftab Ahmed^{3,*}

¹Mebran university of Engineering Technology, Jamshoro

²Quaid-e- Awam University of Engineering, Science and Technology, Nawabshah.

³Isra University, Hyderabad

ABSTRACT: Among four key components cooling tower is a very critical component of a thermal station as well as a solar-concentrated power plant. It absorbs heat due to the circulation of water and by any means, if this flow is disturbed it affects the overall plant performance. Hence, the availability of a cooling tower is essential for smooth operation and its failure analysis helps understand what major threats may exist and can be avoided. The material used for piping is mainly cost iron which is a cost-effective and good conductor of heat. Moreover, other materials are also being tested for optimized as well. In addition to that it uses water as a medium to absorb heat which is economical, abundant, and has high heat capacity as well. On the other hand, there are several challenges associated with that too. It poses serious threats to heat conduction and arability primarily due to corrosion, erosion, algae growth, and several other factors discussed in this study. This study is focused on analyzing key factors which help analyze the availability of cooling towers. It also discusses suggestions to avoid such failure and the implications of failure or contamination on the overall performance of the cooling tower and plant. This study will help future researchers in the field of energy and power sector to understand the availability of critical components and its importance.

* Corresponding author: afiaz.khubra@isra.edu.pk

1st IMCEET-2023/049

DEVELOPMENT OF CONCRETE INCORPORATING PCM BASED COATED COARSE AGGREGATE FOR BUILDING ENERGY SAVING

Shamotra¹, Sadam Hussain Jakhrani¹, Muhammad Ibrahim^{1*}, Kamran Aijaz¹, Arshad Ali¹

¹Department of Civil Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development, Khairpur Mirs

ABSTRACT: Global warming is affecting the world and it has no precautionary measures to overcome this problem. Construction is the second largest sector in the Pakistan. The construction sector is highly energy and carbon-intensive, currently producing 25% to 40% of global carbon emissions. The construction sector is looking for materials and methods that can be used to improve thermal insulation in buildings. Recently the difficulties in electrification, rising cost of digital equipment and machines, electric transportation, power conversion, and high cost involved in residential heating and cooling have revived the attention and awareness of PCM thermal storage applications. The ability of construction materials to store thermal energy can be improved by the incorporation of phase change materials (PCM). PCM is a substance that releases and absorbs energy at the phase transition temperatures to offer useful heating/cooling and, the addition of PCM in construction materials for thermal insulation is proven by many researchers. In this study we will develop PCM based coated coarse aggregate, moreover, the PCM based coated aggregate will prepared using lauric acid and paraffin liquid with vacuum impregnation method and replace with natural coarse aggregate in concrete with different ratios such as: 0%, 25%, 50%, 75%, 100%, the slump value, compressive strength and thermal conductivity will be determined in order to study the mechanical, thermal and bonding characteristics of concrete.

Keywords: lauric acid, paraffin liquid, phase changing material, vacuum impregnation.

* Corresponding author: mishykh345@gmail.com

1st IMCEET-2023/050

EFFECT OF SILICA FUME AS PARTIAL REPLACEMENT OF CEMENT AND POLYETHYLENE TEREPHTHALATE AS FINE AGGREGATE ON PROPERTIES OF CONCRETE

Shamotra^{1*}, Sadam Hussain Jakhrani¹, Muhammad Ibrahim¹, Manthar Ali Keerio¹, Mubashir Mustafa¹, Muhammad Touseef^{2,3,4}

¹Department of Civil Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development, Khairpur Mirs

²College of Civil Engineering and Architecture, Guangxi University, Nanning 530004, China

³Key Laboratory of Disaster Prevention and Structural Safety of Ministry of Education, Nanning, China

⁴Guangxi Key Laboratory of Disaster Prevention and Engineering Safety, Nanning 530004, China

ABSTRACT: The mass production of poly ethylene terephthalate materials due to its high demand around the world. It creates a negative impact to the environment because large volume of poly ethylene terephthalate waste is being disposed into the garbage, drains and rivers. This pollutes the environment as the poly ethylene terephthalate materials are not biodegradable in the environment. This poly ethylene terephthalate pollution affects the humans, animals and the non-livings such as soil, air and water. abrasion resistance, impact resistance, ductility, shock absorption, and thermal conductivity are all qualities to look for in a material have all been shown to increase when waste plastic is partially replaced with concrete aggregate among the several techniques in recycling management, the reutilization of waste plastics in building construction is considered the most ideal disposal technique. The aim of this research is to investigate the effects of poly ethylene terephthalate as partial replacement of fine aggregate and silica fume (SF) as partial replacement of cement on the workability and compressive strength of concrete. Poly ethylene terephthalate and silica fume were incorporated separately and jointly as a partial replacement of ordinary Portland cement in different concrete mixes. Sixteen types of mixes were made by different replacement levels. the replacement levels of OPC by silica fume were 0%, 5%, 10%, 15% and the replacement level of poly ethylene terephthalate as fine aggregate were 10%, 20%, 30%, respectively whereas binary replacement (poly ethylene terephthalate +silica fume) were done at 5%,10% and 15% silica fume constant with increasing dosage of poly ethylene terephthalate from 10 to 30%. a nominal mix proportion of 1:2:4 at w/b ratio of 0.50 was used for all mixes and specimens were tested at age of 28 days. 48 cubes (100mm x 100mm x 100mm) were castes for compressive strength. The research concluded that with the increase the dosage of poly ethylene terephthalate workability of concrete increase and with the increase dosage silica fume, workability of concrete decreased. 10% replacement of fine aggregate with poly ethylene terephthalate is optimum. However, 10% replacement of cement with SF gave desired.

Keywords: silica fume and poly ethylene Terephthalate

* Corresponding author: shamotra@bbsutsd.edu.pk

1st IMCEET-2023/051

DESIGN AND IMPLEMENTATION OF A LOW-COST BATTERY HEALTH MONITORING SYSTEM USING IOT FOR REAL-TIME MONITORING OF LEAD-ACID BATTERIES

Fatima Mohsin Zakai¹, Sadiq Ur Rehman^{1,*}, Muhammad Adeel¹

¹*Faculty of Engineering, Science and Technology, Hamdard University, Karachi*

ABSTRACT: This research article presents a microcontroller-based prototype system, known as Battery Health Monitoring System (BHMS), designed to assess the health and condition of lead-acid batteries. The study focuses on the use of the Internet of Things (IoT) for real-time monitoring of the batteries. The system employs various sensors to monitor and save key parameters, including acid level (PH), state of charge (SOC), remaining charge capacity, temperature, and overall health of the battery. The sensors are configured to trigger an alert when any of the monitored parameters fall below predefined values. The study validates the effectiveness of the proposed low-cost system in real-time monitoring of lead-acid batteries.

Keywords: Lead-acid battery, Temperature, IoT, Arduino Mega

* Corresponding author: sadiq.rehman@bamdard.edu.pk

1st IMCEET-2023/060

DESIGN OF AN EXTENDED RANGE ELECTRIC MOTORCYCLE

Somia Mehar^{1*}, Ali Asghar Memon¹, Chen Hao², Muhammad Hasham³, Muhammad Zain³

¹ Department of Electrical Engineering, Mebran University of Engineering and Technology, Jamshoro, Sindh, Pakistan

² China University of Mining and Technology, Xuzhou, Jiangsu, 221116, P.R. China

³ Department of Electrical Engineering, Mebran University of Engineering and Technology, Jamshoro, Sindh, Pakistan

ABSTRACT: The impact of increasing GHG emissions has been distressing in the world. According to United Nations Environment Programme report, ‘The transport sector contributes approximately one-quarter of all energy-related to greenhouse gas (GHG) emissions’, thereby adding greatly to global warming. Thus, the transition of conventional vehicles to clean-energy vehicles (EV) has been no less than a necessity. However, the penetration of electric means of transportation in the markets and infrastructure has faced some challenges. The limited range of the vehicle has been one of the most significant concerns leading to psychological barriers like range anxiety to large-scale public adoption of these vehicles. Our research aims at mitigating the issue of the range of battery electric vehicles particularly, the electric motorcycle. As motorcycles are a dominant, economical and handy means of transportation in South Asian countries like Pakistan. The deployment of a microcontroller with the motor and battery will be demonstrated, which regenerates the lost kinetic energy to provide for the extra range. The performance parameters of the proposed design would be undertaken using the E-bike range simulator. Further, a small-scale prototype will also be developed. The proposed model is estimated to add to the range of the electric motorcycles that ultimately paves the way to lessening customer's range anxiety and meeting the demand of users, thus contributing to positive climate action.

Keywords: Electric Vehicle, Range-Extension, Regenerative braking, E-bike, EV

* Corresponding author: somiamehar5@gmail.com

1st IMCEET-2023/061

NANOTECHNOLOGY AND THE ANAEROBIC DIGESTION PROCESS: THE STUDY OF BIOCOMPATIBILITY IN ORGANIC WASTE TREATMENT

Asim Ali^{1,*}, Rasool Bux Mahar¹

¹Department of Civil Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development Khairpur Mirs

ABSTRACT: The sustainable exploitation of energy sources has become the top priority of the many nations around the globe. Various energy alternatives have been researched and identified as the leading energy avenues. Among them, the bio-decomposition in control environment through anaerobic digestion (AD) of organic wastes (OWs) is potential candidate to be considered. This type of treatment does not only offer the environmental friendly approach to deal the huge quantity of OWs but also yields the green energy which is known as biogas with nutrient-rich digestate for agriculture. Number of techniques and advancements have been done in the AD treatment process for process and energy yield enhancement over the years. However, the application of nanotechnology (NT) in AD process through the utilization of nanomaterials (NMs) has given new insights and revealed the revolutionary results for the researchers and scientists since last two decades. The simple conventional treatment of OWs through AD has generated the biogas in the range of 250 ml/gVS to 450 ml/gVS. Whereas the AD treatment in the presence of NMs has produced around 1.5 times higher than its conventional generation rate. Moreover, the addition of NMs in AD have shown great biocompatibility with stabilized microbial enzymatic activity and other physical and chemical parameters during the process.

Keywords: Nanotechnology, Anaerobic Digestion, Organic Waste, Biogas, and Microbial Activity

* Corresponding author: asimali@bbsutsd.edu.pk

1st IMCEET-2023/065

**IMPACT OF EMPLOYING PHASE CHANGE MATERIAL IN
BUILDING WALL ON ENERGY CONSUMPTION AND THERMAL
COMFORT LEVEL**

Mohsin Ali¹, Abdul Rehman Soomro^{1,*}, Aftab Ahmed¹, Rizwan Ahmed Memon², Abdul
Fatah Abbasi²

¹Department of Mechanical Engineering, Isra University Hyderabad

² Department of Mechanical Engineering, Mebran University of Engineering & Technology Jamsboro Pakistan

ABSTRACT: Energy crises is becoming problem for many, most of the energy being produced is utilized in buildings. Buildings design and materials that are used in building play a vital role in saving electricity. Sustainable cities is one of the fourteenth goal of SDGs to be achieved and this study is in context of SDGs for developing tools to create this globe sustainable and efficient society for humans. Phase change material is a type of material that can absorb and release heat energy as it changes between solid and liquid states. This ability to store and release thermal energy makes PCM a promising material for use in building insulation, HVAC systems, and other energy-efficient applications. The use of PCM in buildings has the potential to significantly reduce energy consumption and improve thermal comfort levels. By incorporating PCM into building envelopes, such as walls, roofs, and floors, the material can absorb excess heat during the day and release it at night, helping to regulate indoor temperatures and reduce the need for heating and cooling systems. This study investigates the impact of using PCM in building envelope. In this regard office building room is modeled in CAD software and is simulated in energy plus software. The simulation results are validated by considering the experiment and numerical study as a reference from paper. Model room is simulated for Hyderabad, Pakistan. Building envelope without PCM have conduction rate of around 106.6 W/m², whereas building envelope with PCM have conduction rate around 42 W/m². This shows that utilization of PCM reduced heat conduction up to around 40%. PCM reduced energy consumption of around 33.25 kWh/year/m². Results show that without PCM air temperature was above the thermal comfort value. it reached 30C in hot months, it reduced up to 27C with the incorporation of PCM.

Keywords: PCM Materials, Energy saving through use of PCM, Thermal Comfort and Energy Efficient Buildings.

* Corresponding author: ar.soomro@isra.edu.pk

1st IMCEET-2023/067

MACHINE LEARNING-BASED ENERGY THEFT DETECTION USING SUPPORT VECTOR MACHINES

Safdar Ali Abro^{1*}, Farhat Abbas Langah¹, Abdur Rehman Soomro¹, Muhammad Akram
Bhayo², Sadullah Chandio², Uzair Ali Mugheri¹, Muzaffar Ali Murri¹

¹ Department of Electrical Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development
Khairpur Mirs

² Department of Electrical Engineering, Quaid-e-Awam University of Engineering, Science and Technology, Nawabshah

ABSTRACT: Electricity theft is a serious issue that many nations face, especially in developing areas where non-technical losses can make up a sizable percentage of the overall losses sustained by utilities. Energy theft detection is a difficult job because it frequently entails spotting subtle irregularities in customer energy consumption patterns. Machine learning techniques have been investigated as a possible fix for this problem. In this research, we suggest using four of its kernel functions as Support Vector Machines (SVM) to detect energy theft. An effective machine learning algorithm known as SVM has been used in a number of industries, including banking, healthcare, and cybersecurity. Performance of the SVM model's kernel operations has been examined. The suggested approach entails gathering information on energy usage. A real-world dataset obtained from a utility company in Pakistan is used to assess the suggested method. For a group of customers over the course of three years, monthly energy consumption statistics are included in the dataset. The SVM model is tested on the leftover data after being trained on a portion of the data. The findings demonstrate how well the SVM method works to identify energy theft. The suggested approach has a number of benefits over more established ones for detecting energy fraud. First off, since no physical intervention or installation of specialised apparatus is needed, it is non-intrusive. It is also scalable because it can be used with big datasets and is simple to incorporate into current utility infrastructure. Finally, it is adaptable because it can grow and learn. The accuracy of the various kernel functions is 77%, 80%, 78%, and 81% for Sigmoid, RBF, Polynomial, and Linear kernel functions, respectively, demonstrating the effectiveness of the suggested SVM-based method for energy theft detection. Energy theft is an issue that needs to be addressed, and this study helps to create machine learning-based methods for doing so. These methods can assist utilities in reducing losses and enhancing the dependability of their services.

Keywords: Support Vector Method (SVM), Electricity Theft detection, Sigmoid, RBF, Polynomial and Linear Kernel Functions

* Corresponding author: sajdar@bbsutd.edu.pk

1st IMCEET-2023/068

IOT-ENABLED HEALTH MONITORING SYSTEM WITH EEG SENSOR AND AUGMENTED REALITY FOR ENHANCED PATIENT MONITORING AND INTERVENTION

Junaid Murad Sial¹, Izhar Hussain^{1*}, Tooba Azam¹

¹Department of Electronics Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development
Khairpur Mirs

ABSTRACT: Internet of Things (IoT)-based health monitoring systems can enable remote monitoring of patients, allowing doctors and caregivers to keep track of their health and intervene if necessary. This is particularly important for patients who are elderly, have chronic conditions, or live in remote areas where access to healthcare is limited. By automating certain aspects of patient monitoring, these systems can reduce the burden on healthcare professionals and free up time for more personalized care. IoT-based health monitoring systems have the potential to improve healthcare outcomes and reduce costs by providing real-time health data, enabling remote monitoring, and automating certain aspects of patient care. In this paper an innovative health monitoring system based on the IoT is proposed that integrates various sensors to measure vital signs such as body temperature, Electrocardiogram (ECG), blood oxygen level, heart rate, and harmful gases. The system also incorporates a live surveillance feature using a camera for remote monitoring of a patients activities. Additionally, the system enables the control of home appliances through augmented reality technology, providing an interactive and user-friendly experience. The proposed system includes an electroencephalogram (EEG) sensor for recording brain signals, enabling further monitoring of a person's mental state. The integration of these technologies provides a comprehensive and efficient health monitoring solution for people of all ages, allowing for real-time monitoring of vital signs and prompt intervention in case of abnormalities. This system has the potential to revolutionize the healthcare industry by providing an innovative approach to health monitoring and enabling remote care.

Keywords: Internet of Things (IoT), Health Monitoring System, Augmented reality, real time surveillance, electroencephalogram (EEG)

* Corresponding author: izharhussain@bbsutsd.edu.pk

1st IMCEET-2023/069

ENHANCING INDEPENDENCE AND CONTROL FOR INDIVIDUALS WITH DISABILITIES: A STUDY ON EYE- TRACKING-BASED ASSISTIVE SYSTEMS THROUGH EYE MOVEMENTS AND BLINK COMMANDS

Kainat Memon^{1,*}, Izhar Hussain¹, Junaid Murad Sial¹

¹Department of Electronics Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development
Khairpur Mirs

ABSTRACT: The development and advancement of eye-tracking-based assistive systems have opened up new possibilities for individuals with disabilities to enhance their independence and control over their environment. This study focuses on the creation of such a system that enables disabled patients to operate devices, such as wheelchairs and home automation systems, using their eye movements and blink commands. Computer application programs are designed to capture and recognize these eye movements and blink commands through a webcam or laptop camera, which are then connected to the cloud to control appliances. The system also includes a simple user interface, specifically designed for people with disabilities, to easily operate home appliances with their eyes. The integration of this technology offers a novel way for individuals with disabilities to interact with their surroundings and perform tasks that were previously challenging or impossible. The use of eye contact as a control mechanism provides a hands-free and intuitive approach, empowering disabled patients to have greater control and independence in their daily lives. This advancement in assistive technology has the potential to significantly improve the quality of life for individuals with disabilities, enabling them to live more independently and with increased autonomy.

Keywords: Eye-tracking-based assistive systems, Disabilities, Home automation systems, Cloud connectivity & Autonomy, Quality of life

* Corresponding author: Kainatm051@gmail.com

1st IMCEET-2023/070

**ANALYSIS OF WATER POND IN MITIGATING THE EFFECT OF
URBAN HEAT ISLAND IN HYDERABAD SINDH**

Halar Ahmed Bhatti^{1*}, Rizwan Ahmed Memon², Abdul Ghafoor Memon², Abdul Rehman
Soomro²

¹Post Graduate Student, Energy Systems Engineering, Mehran University of Engineering and Technology Jamsboro

²Department of Mechanical Engineering, Mehran University of Engineering and Technology Jamsboro

ABSTRACT: Urbanization leads to increasing heat stress in the hot and humid climates, therefore the formation of a concentrated original microclimate within municipal environs is seen as crucial. The megacity of Hyderabad has experienced heat, but the cooling impact of the water bodies in the megacity has received little attention thus far. While the evaporative action of water is thought to be acting on its own to lower the temperature of the surrounding medium. The microclimate of the girding area is cooled by rivers. Other researchers refocused on the fact that the most efficient non-resisting method of cooling buildings or public spaces is evaporative cooling via water bodies or features. A simulation tool called Envi- met was used to analyse the impact of water bodies on microclimates. The software's application is to analyse the temperature distribution of a typical urban layout with and without water. According to our analysis of the research, bodies of water may effectively lower city temperatures by 0.5 to 4.0 °C. Based on the results, it can be inferred that increasing evapotranspiration in cities, which results in water bodies, may successfully reduce the impact of civic heat islands.

Keywords: Envi-met, Urban Heat Island, Heat mitigation effect, Urban heat island, Pond

* Corresponding author: balarbhatti@gmail.com

1st IMCEET-2023/071

PREVALENCE OF PES PLANUS DEFORMITY IN MULTITUDE OF INDIVIDUALS

Dua Ubaid¹, Rohan Atiq¹, Mehwish Faiz^{1*}, Sana Rehan¹

¹Department of Biomedical Engineering Ziauddin University, (FESTM) Karachi-Pakistan

ABSTRACT: Pes Planus is a widespread foot condition that affects people of all ages. The aim of this study is to find out the presence of Pes Planus (flat feet) and the associated factors among different age groups, using a plantar index-based measurement. A cross-sectional study was conducted among 17 participants from different age groups (children, adolescents, and adults). The study population was selected using a convenience sampling technique. Ink prints of their feet were obtained and the plantar index was figured out to determine the presence of flat feet in which values >1.15 indicated the presence of flat feet and lesser indicates normal feet for the subjects. The total number of participants having flat feet was 9, achieving a prevalence rate of 52.94%.

Keywords: Pes Planus, balance, posture, flat feet, plantar index

* Corresponding author: engrmehwish@yahoo.com

1st IMCEET-2023/072

GREEN AND SMART CITY: INTEGRATING RENEWABLE ENERGY, WEATHER MONITORING, AND SMART TOLL TAX SYSTEM FOR SUSTAINABLE URBAN MANAGEMENT IN PAKISTAN

Izhar Hussain^{1,*}, Kainat Memon¹, Junaid Murad Sial¹, Abdul Qadeer¹

¹*Department of Electronics Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development Khairpur Mirs*

ABSTRACT: Sustainable living and efficient urban management practices from an electronics perspective involve incorporating innovative technologies and systems to reduce environmental impact, optimize resource utilization, and enhance quality of life. This may include using renewable energy sources like solar power, implementing smart grids for efficient energy distribution, utilizing sensors and data analytics for smart waste management, and deploying intelligent transportation systems for effective traffic management. These electronic solutions can help create eco-friendly, technologically advanced cities that promote sustainable living and efficient urban management practices for a greener and smarter future. This research paper presents a comprehensive study on the development of a sustainable town in Pakistan, incorporating solar energy generation, weather monitoring, and a smart toll tax system for vehicles. The town is designed with solar panels installed on the roofs of each house, utilizing net metering to efficiently generate and manage electricity. At the end of each day, a message is generated and sent to the homeowners through GSM technique, providing them with updates on their solar energy production. Furthermore, a weather station is installed in the town to collect real-time weather data, which is used to send updates to all registered citizens regarding the weather conditions. This enables residents to stay informed and plan their activities accordingly. In addition, the research proposes a smart toll tax system for vehicles, which involves the installation of RF chips in allowed cars. These chips are directly connected to the owner's bank account and automatically detect and collect toll taxes. The collected tax is then utilized for maintenance costs of the town's infrastructure, ensuring efficient management and utilization of resources. To demonstrate the feasibility of these ideas, a prototype of the proposed system has been developed specifically for Pakistan. The research aims to contribute towards sustainable urban development, effective resource management, and enhanced quality of life for the residents of the town. The findings of this research provide valuable insights for the implementation of similar systems in other regions, with the potential to promote sustainable living and efficient urban management practices.

Keywords: Sustainable living, urban management practices, Renewable energy sources, Smart waste management, Intelligent transportation

* Corresponding author: izharhussain@bbsutsd.edu.pk

1st IMCEET-2023/073

ASSESSING GROUNDWATER QUALITY FOR DRINKING PURPOSE IN RAINFALL AFFECTED AREAS

Sobia Shaikh^{1,*}, Himat Ali Rind¹, Ashfaq Hussain¹, Muhammad Hanif¹, Asim Ali Abro¹

¹*Department of Civil Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development,
Khairpur Mirs*

ABSTRACT: The groundwater is major source of fresh water which is essential source of living on earth. The one of important goal of Sustainable Development Goals (SDGs) is access to safe and affordable water and this is also considered as basic human right for healthy living. However, the groundwater contamination is continued at catastrophic rate which is serious threat to healthy livings on earth. The one fundamental contamination cause is dilution of hazardous elements in aquifers through stagnant rainwater. This is even alarming for developing countries like Pakistan and in particular province Sindh, in absence of proper rainwater drainage and disposal of system. Considering the current climate catastrophes and heavy monsoon rainfalls, this study proposes to measure the impact of stagnant rainwater on quality of groundwater aquifer. The study will analyze the impact of rainfall on groundwater quality in devastated areas of District Khairpur Mirs and Naushahro Feroze, Sindh Pakistan. The groundwater samples from 39 different areas of District Khairpur Mirs and Naushahro Feroze where the stagnant rainwater is observed will be collected. An assessment of various physiochemical parameters, such as pH, taste, odor, color, turbidity, electric conductivity (EC), calcium (Ca), magnesium (Mg), chloride (Cl), total hardness (TH), total dissolved salts (TDS), and arsenic, will be conducted on the water samples collected in accordance with WHO standards. The study results will present the overall quality of groundwater in District Khairpur Mirs and Naushahro Feroze. The results will provide insight into making effective rainwater drainage systems for preserving the quality of groundwater.

Keywords: Stagnant Rainwater, Groundwater quality, aquifer, physiochemical properties of water.

* Corresponding author: sobiaicce@gmail.com

1st IMCEET-2023/074

STUDY OF HIGH STRENGTH SELF-COMPACTED CONCRETE USING MARBLE POWDER AND POLYMER BASED SYNTHETIC RUBBER LATEX

Rubab Baloch¹, Muhammad Abubakar Shaikh^{2*}, Amber Zehra¹, Ghulam Ali Agha¹
¹Department of Civil Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development,
Khairpur Mirs

ABSTRACT: Self-compacting Concrete is a very special type of concrete which consolidates under its own weight and needs no vibration. The primary aim of this study is to investigate the effects of fresh and hardened properties of high strength SCC using marble powder as partial replacement of cement and styrene butadiene rubber as super plasticizer. The methodology involves developing a suitable mix for high strength SCC that would satisfy the requirements of the fresh state. In total, eight types of mixes of different strengths and incorporated with different percentages of admixtures were cast. After each mix preparation, V-funnel, slump flow and J-ring tests were performed on the fresh SCC. Six cylinders of each mix ratio were cured in water for 28 days and then tested for compressive and tensile strength.

Keywords: Self-compacting concrete, Synthetic rubber latex, Marble powder, Compressive Strength

* Corresponding author: muhammad.abubakar@bbsutsd.edu.pk

1st IMCEET-2023/075

EFFECT OF WASTE GLASS ON THE COMPRESSIVE STRENGTH OF MORTAR AGAINST FIRE

Manthar Ali Keerio^{1,*}, Samiullah², Vishal Kumar², Fayaz Ali²

¹*Department of Civil Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development
Khairpur Mirs*

²*Undergraduate Students, Department of Civil Engineering, QUEST Campus, Larkano*

ABSTRACT: The aim of this research work is to check the effect of waste glass as partial replacement of fine aggregate with waste glass on compressive strength of mortar. The study the influence of waste on the compressive strengths of mortar. In this research work fine aggregate was replaced by 10%, 20%, 30% and 40% with waste glass. Five control specimen and twenty specimen prepared with partial replacement of fine aggregate with waste glass. The mortar prepared with 1:3 binder sand ratio with 0.5 water binder ratio was used. The compressive strength of mortar of control and modified mortar specimen was recorded and average of five specimen was taken. Waste glass was passed from sieve No. 4 before using as fine aggregate substitution material. The compressive strength of controlled mortar and modified mortar prepared with replacement of fine aggregate was tested for compressive strength of mortar at early age of 7 days. The compressive strength of mortar of control and modified mortar specimen was recorded and average of five specimen was taken. It was observed from the results that maximum compressive strength of mortar modified with waste glass was observed at 40% replacement of fine aggregate with waste glass which is 21.54 % more than that of control mix. On the basis of conducted parameter it is concluded that 40% replacement of fine aggregate (hill sand) with waste glass is optimum.

Keywords: waste glass, compressive strength of mortar, waste, optimum

* Corresponding author: mantharali@bbsutsd.edu.pk

1st IMCEET-2023/076

EFFECT OF SILICA FUME ON THE COMPRESSIVE STRENGTH OF MORTAR AGAINST FIRE

Manthar Ali Keerio^{1,*}, Muhammad Qasim¹, Jalil Ahmed¹, Gul Shamas¹

*¹Department of Civil Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development
Khairpur Mirs*

ABSTRACT: In this research the influence of silica fume as a cement replacement on the compressive strength of mortar against fire have been evaluated. Four mixes of mortar with control mix and four modified mixes with inclusion of waste glass as fine aggregate replacement were prepared. The silica fume as a cement replacement were prepared at dosages of 5, 10 and 15% by the weight of cement. After the curing period of 28 days the specimen were kept in uncontrolled fire for 30 minutes. The compressive strength of mortar specimen after the effect of fire were tested in compression testing machine. The outcome of the research revealed that, there is a significant improvement were observed in compressive strength of mortar with inclusion of silica fume as a cement replacement.

Keywords: Fire, compressive strength of mortar, waste glass, fine aggregate replacement

* Corresponding author: mantharali@bbsutsd.edu.pk

1st IMCEET-2023/077

COMBINE EFFECT OF SILICA FUME AND WASTE GLASS ON THE COMPRESSIVE STRENGTH OF MORTAR AGAINST FIRE

Manthar Ali Keerio^{1,*}, Muhammad Qasim¹, Jalil Ahmed¹, Gul Shamas¹

*¹Department of Civil Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development
Khairpur Mirs*

ABSTRACT: The aim of this research is to reduce the production of cement by utilization of silica fume as a cement replacement material. To enhance the compressive strength of mortar against fire at early age fine aggregate is partially replaced by waste glass. Thirteen mixes of mortar with control mix and 12 modified mixes with combined inclusion silica fume as a cement replacement and waste glass as a fine aggregate replacement by the weight of cement and fine aggregate respectively were prepared. The cubical specimen with 2 inch size use was used. The cement was partially substituted with silica fume at various dosages of 5, 10 and 15% by the weight of cement. Fine aggregate was substituted with waste glass prepared at dosages of 10, 20, 30 and 40% by the weight of fine aggregate. After the curing period of 7 days the specimen were kept in uncontrolled fire for 30 minutes. From the results of the research it has been revealed that there is a significant enhancement were observed in compressive strength of mortar against fire at the early age i.e.: 7 days age with combined addition of as a cement substitution with silica fume and fine aggregate substitution with waste glass respectively.

Keywords: Fire, combined effect of compressive strength of mortar, waste glass, fine aggregate replacement

* Corresponding author: mantharali@bbsutsd.edu.pk

1st IMCEET-2023/080

DESIGN OF A COVID-19 PRECAUTIONARY ROBOT FOR HAND SANITIZING, TEMPERATURE MEASUREMENT, AND REAL- TIME CAMERA SURVEILLANCE

Zubair Ahmed Baloch¹, Izhar Hussain^{1*}, Allah Wasayo Chakrani¹, Sarfaraz Hussain Gaho¹,
¹*Department of Electronics Engineering Technology, The Benazir Bhutto Shaheed University of Technology & Skill Development
Khairpur Mirs*

ABSTRACT: The ongoing COVID-19 pandemic has highlighted the need for innovative solutions to ensure adherence to preventive measures, such as hand sanitizing, temperature monitoring, and social distancing, to reduce the spread of the virus. In this article the design of a novel robot that incorporates multiple functionalities to provide a comprehensive solution for following COVID-19 precautions. The robot is designed to be compact and mobile, capable of navigating in indoor environments such as offices, schools, or public spaces. It is equipped with a hand sanitizing dispenser that is easily accessible for users to sanitize their hands when entering or exiting a facility. The robot also features a non-contact temperature measurement system, which accurately measure the body temperature of individuals in real-time as they pass by the robot. This allows for quick and efficient screening of individuals for fever, a common symptom of COVID-19. In addition to hand sanitizing and temperature measurement, the robot is also equipped with a real-time camera surveillance system. The camera allows for remote monitoring of the surroundings, helping to ensure compliance with social distancing measures and detect any violations. The camera can also be used for live video streaming to a control center, enabling real-time monitoring of multiple locations from a central location. The robot is controlled through a user-friendly interface that can be accessed remotely, allowing for remote operation and monitoring by human operators. It can be programmed to operate autonomously or be controlled manually as needed. The robot is designed to be modular, allowing for easy customization and integration of additional features or sensors based on specific requirements. The proposed robot presents a practical solution to promote COVID-19 precautions in public spaces, providing automated hand sanitizing, temperature measurement, and real-time camera surveillance capabilities. Its compact size, mobility, and remote operability make it a versatile tool for various indoor environments.

Keywords: Stagnant Rainwater, Groundwater quality, aquifer, physiochemical properties of water.

* Corresponding author: izharhussain@bhantsd.edu.pk

1st IMCEET-2023/082

**ASSESSMENT OF PHYSICOCHEMICAL PARAMETERS OF
QUALITY OF DRINKING WATER SUPPLIED TO AIRPORT ROAD
AREA OF SUKKUR SINDH**

Saleem Raza Samo¹, Kishan Chand¹, Manthar Ali Keerio^{2*}, Muzaffar Ali³

¹ Department of Environmental Engineering, Quaid-e-Awam University of Engineering Science and Technology (QUEST),
Navabshah

² Department of Civil Engineering Technology, The Benazir Bhutto Shaheed university of Technology and skill development
Khairpur Mirs

³ Deputy Director, OFWM, Agriculture Department, Government of Sindh

ABSTRACT: The aim of this effort to assess the water quality supplied airport area of Sukkur City from Indus River as well as NWC in terms of physicochemical parameters. For this purpose in all 12 samples were collected from 04 different locations (04 sample were collected from each location (1.Source Indus River:- One sample from upstream, downstream, bander road pumping station point & one sample from NWC pumping station point, 2.Bander Road WTP:- One sample from inlet, outlet and 02 samples from different end users, 3. Airport Road WTP: - One sample inlet, outlet and 02 samples from different end users. 12 different physicochemical of all samples of water have been assessed. Results were compared with national and international standards (WHO standards). Results revealed that color of water was muddy/turbid of all sample, excluding samples Airport WTP, while odor is unobjectionable in all samples. However turbidity was too high at all locations excluding outlet and end users of Airport WTP, which indicates that water supplied to Airport road area of Sukkur Sindh. is not suitable for human consumption. It is concluded that poor supervision, poor water treatment and un-proper disinfection treatment is the chief cause of bacterial contamination of surface water supplied to Airport area of Sukkur City from Indus River/NWC. Most common reasons of contamination such like no proper treatment, poor, old and unsecured water pipe lines overlap with the damaged sewage and drainage lines. To supply safe drinking water to Sukkur city following suggestion should be considered to make treatments plants (at Bunder Road WTP, Airport WTP) functional as well as enhance the capacity of treatment plants as per demand. Periodic cleaning of all distribution ponds, old water supply lines must be replaced with new lines especially of those lines which are close to waste water lines. Proper chlorination in distribution ponds proper retention time, waste water lines and water supply lines should be keep away from each other. Waste water must be treated before disposed of in Indus River & NWC & All those waste water lines should be removed which are in upstream of pumping stations. Creation of awareness among the employees of water supply agency and general public about the importance of drinkable water and consequences of unsafe water and the appointment of qualified staff.

Keywords: Assessment of drinking water quality; physicochemical; Airport road area of Sukkur; not suitable

* Corresponding author: mantharali@bbsutsd.edu.pk

1st IMCEET-2023/083

**ASSESSMENT OF BIOLOGICAL PARAMETERS OF QUALITY OF
DRINKING WATER SUPPLIED TO AIRPORT ROAD AREA OF
SUKKUR SINDH AND ITS REMEDIAL MEASURES**

Saleem Raza Samo¹, Kishan Chand¹, Manthar Ali Keerio^{2*}, Muzaffar Ali³

¹ Department of Environmental Engineering, Quaid-e-Awam University of Engineering Science and Technology (QUEST),
Navabshah

² Department of Civil Engineering Technology, The Benazir Bhutto Shaheed university of Technology and skill development
Khairpur Mirs

³ Deputy Director, OFWM, Agriculture Department, Government of Sindh

ABSTRACT: The aim of this effort to assess the water quality supplied airport area of Sukkur City in terms of biological parameters from Indus River as well as NWC. For this purpose in all 12 samples were collected from 04 different locations (04 sample were collected from each location (1.Source Indus River:- One sample from upstream, downstream, bander road pumping station point & one sample from NWC pumping station point, 2.Bander Road WTP:- One sample from inlet, outlet and 02 samples from different end users, 3. Airport Road WTP: - One sample inlet, outlet and 02 samples from different end users. 3 different biological parameters of all samples of water were assessed. Results revealed that total Coliform, fecal Coliform and E-Coli were too much high at all locations of Nimiash area of Sukkur Sindh, which indicates that water supplied to Nimiash area of Sukkur Sindh is not suitable for human consumption. It is concluded that poor supervision, poor water treatment and un-proper disinfection treatment is the chief cause of bacterial contamination of surface water supplied to Airport area of Sukkur City from Indus River/NWC. Most common reasons of contamination such like no proper treatment, poor, old and unsecured water pipe lines overlap with the damaged sewage and drainage lines. To supply safe drinking water to Sukkur city following suggestion should be considered to make treatments plants (at Bunder Road WTP, Airport WTP) functional as well as enhance the capacity of treatment plants as per demand. Periodic cleaning of all distribution ponds, old water supply lines must be replaced with new lines especially of those lines which are close to waste water lines. Proper chlorination in distribution ponds proper retention time, waste water lines and water supply lines should be keep away from each other. Waste water must be treated before disposed of in Indus River & NWC & All those waste water lines should be removed which are in upstream of pumping stations. Creation of awareness among the employees of water supply agency and general public about the importance of drinkable water and consequences of unsafe water and the appointment of qualified staff.

Keywords: Assessment of drinking water quality; biological; Airport road area of Sukkur; not suitable

* Corresponding author: mantharali@bbsutsd.edu.pk

1st IMCEET-2023/084

**ASSESSMENT OF PHYSICOCHEMICAL PARAMETERS OF
QUALITY OF DRINKING WATER SUPPLIED NIMAISH AREA OF
SUKKUR SINDH AND ITS REMEDIAL MEASURES**

Saleem Raza Samo¹, Kishan Chand¹, Manthar Ali Keerio^{2*}, Muzaffar Ali³

¹ Department of Environmental Engineering, Quaid-e-Awam University of Engineering Science and Technology (QUEST),
Navabshah

² Department of Civil Engineering Technology, The Benazir Bhutto Shaheed university of Technology and skill development
Khairpur Mirs

³ Deputy Director, OFWM, Agriculture Department, Government of Sindh

ABSTRACT: The aim of this effort to assess the water quality supplied nimaish area of Sukkur City in terms of physicochemical parameters from Indus River as well as NWC from Indus River as well as NWC. For this purpose in all 12 samples were collected from 04 different locations (04 sample were collected from each location (1. Source Indus River:- One sample from upstream, downstream, bander road pumping station point & one sample from NWC pumping station point, 2.Bander Road WTP:- One sample from inlet, outlet and 02 samples from different end users, 3. Nimaish WTP: - One sample inlet, outlet and 02 samples from different end users. 12 different physicochemical of all samples of water were assessed. Results were compared with national and international standards (WHO standards). Results revealed that color of water was muddy/turbid of all sample, excluding samples nimaish WTP, while odor is unobjectionable in all samples. However turbidity was too high at all locations excluding outlet and end users of nimaish WTP, which indicates that water supplied to nimaish road area of Sukkur Sindh. is not suitable for human consumption. It is concluded that poor supervision, poor water treatment and un-proper disinfection treatment is the chief cause of bacterial contamination of surface water supplied to Nimaish area of Sukkur City from Indus River/NWC. Most common reasons of contamination such like no proper treatment, poor, old and unsecured water pipe lines overlap with the damaged sewage and drainage lines. To supply safe drinking water to Sukkur city following suggestion should be considered to make treatments plants (at Bunder Road WTP, nimaish WTP) functional as well as enhance the capacity of treatment plants as per demand. Periodic cleaning of all distribution ponds, old water supply lines must be replaced with new lines especially of those lines which are close to waste water lines. Proper chlorination in distribution ponds proper retention time, waste water lines and water supply lines should be keep away from each other. Waste water must be treated before disposed of in Indus River & NWC & All those waste water lines should be removed which are in upstream of pumping stations. Creation of awareness among the employees of water supply agency and general public about the importance of drinkable water and consequences of unsafe water and the appointment of qualified staff.

Keywords: Assessment of drinking water quality; physicochemical; nimaish area of Sukkur; not suitable

* Corresponding author: mantharali@bbsutsd.edu.pk

1st IMCEET-2023/085

**ASSESSMENT OF BIOLOGICAL PARAMETERS OF QUALITY OF
DRINKING WATER SUPPLIED NIMAISH AREA OF SUKKUR
SINDH AND ITS REMEDIAL MEASURES**

Manthar Ali Keerio^{1*}

¹ *Department of Civil Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development Khairpur Mirs*

ABSTRACT: The aim of this effort to assess the water quality supplied nimaish area of Sukkur City from Indus River as well as NWC. For this purpose in all 12 samples were collected from 04 different locations (04 sample were collected from each location (1.Source Indus River:- One sample from upstream, downstream, bander road pumping station point & one sample from NWC pumping station point, 2.Bander Road WTP:- One sample from inlet, outlet and 02 samples from different end users, 3. Nimaish WTP: - One sample inlet, outlet and 02 samples from different end users. 3 different biological parameters of all samples of water were assessed. Results were compared with national and international standards (WHO standards). Results revealed that total Coliform, fecal Coliform and E-Coli were too much high at all locations of Nimiash area of Sukkur Sindh, which indicates that water supplied to Nimiash area of Sukkur Sindh is not suitable for human consumption, which indicates that water supplied to Sukkur City is not suitable for human consumption. It is concluded that poor supervision, poor water treatment and un-proper disinfection treatment is the chief cause of bacterial contamination of surface water supplied to nimaish area of Sukkur City from Indus River/NWC. Most common reasons of contamination such like no proper treatment, poor, old and unsecured water pipe lines overlap with the damaged sewage and drainage lines. To supply safe drinking water to Sukkur city following suggestion should be considered to make treatments plants (at Bunder Road WTP, nimaish WTP) functional as well as enhance the capacity of treatment plants as per demand. Periodic cleaning of all distribution ponds, old water supply lines must be replaced with new lines especially of those lines which are close to waste water lines. Proper chlorination in distribution ponds proper retention time, waste water lines and water supply lines should be keep away from each other. Waste water must be treated before disposed of in Indus River & NWC & All those waste water lines should be removed which are in upstream of pumping stations. Creation of awareness among the employees of water supply agency and general public about the importance of drinkable water and consequences of unsafe water and the appointment of qualified staff.

Keywords: Assessment of drinking water quality; biological; nimaish area of Sukkur; not suitable

* Corresponding author: mantharali@bbsutsd.edu.pk

1st IMCEET-2023/086

AN INVESTIGATION ON USE OF LOCAL NATURAL MATERIAL SOORH AS A SOIL STABILIZER

Manthar Ali Keerio^{1,*}, Pervaiz Ahmed², Muhammad Safder², Janib Ali Shah²

¹ *Department of Civil Engineering Technology, The Benazir Bhutto Shaheed university of Technology and skill development
Khairpur Mirs*

² *Undergraduate Final Year Students, Department of Civil Engineering, Quaid-e-Awam University of Engineering Science and
Technology (QUEST), Nawabshah*

ABSTRACT: Soorh is a natural material and available in large quantities in Sindh province Pakistan. During this study an experimental investigation was conducted to use Soorh as a stabilizer in natural loamy soil existing in Larkana Pakistan. For this purpose the soil samples were collected from the premises of QUEST Campus Larkana. The natural material Soorh was obtained from District Dadu Pakistan. The natural material soorh of district Dadu was added in terms of the percentage of the total weight of the soil being 5%, 10%, 20%, 30%, and 40%. The effectiveness of the Soorh in soil as stabilizer was examined in terms of various properties of soil by conducting the different tests such as, particle size distribution, consistency limits (liquid limit and plastic limit). Liquid Limit and Plastic Limit tests were performed on Loamy soil and natural material soorh separately and also these tests were performed with the addition of different proportions of Soorh. The results revealed that the natural material soorh may not be considered as potential stabilizer of relatively poor soils like loamy soil existing in the vicinity of Larkana.

Keywords: Soorh; Soilstablizer; Liuid limit, Plastic Limit.

* Corresponding author: mantharali@bbsutsd.edu.pk

1st IMCEET-2023/087

**EFFECT OF PAPER PIN ON SELECTED PROPERTIES OF
CONCRETE**

Manthar Ali Keerio^{1*}, Noor Ahmed Memon², Amir Ali Keerio³

¹ Department of Civil Engineering Technology, The Benazir Bhutto Shaheed university of Technology and skill development
Khairpur Mirs

² Department of Civil Engineering, Quaid-e-Awam University of Engineering Science and Technology (QUEST), Nawabshah

³ Field Engineer, SRSO, Khairpur Mirs

ABSTRACT: The aim of this study is to investigate the mechanical properties of concrete reinforced with paper pin. For this purpose paper pin of 1 inch length, 0.70 mm diameter and 1.22mm diameter of head were used. Fibers were added from 0.5% to 2.5% with an increment of 0.5% (0.5%, 1%, 1.5%, 2%, and 2.5%) by weight of cement. Workability, compressive and tensile strength of control concrete and of all modified mixes with addition paper pin fiber are studied. Workability and compressive strength of all modified mixes with addition of paper pin fiber is decreased as compared to control mix. Tensile strength of all modified mixes with addition of paper pin fiber is increased as compared to control mix from (0.5% to1.5%). On further addition of paper pin fiber from 1.5% tensile strength increase with the addition of paper pin fiber at 1.5% maximum tensile strength 31.36% more than that of control mix was observed.

Keywords: Paper pin; steel fibers; workability; Compressive and tensile strength of concrete

* Corresponding author: mantharali@bbsutsd.edu.pk

1st IMCEET-2023/088

**EFFECT OF NAIL FIBERS ON SELECTED PROPERTIES OF
CONCRETE**

Manthar Ali Keerio^{1*}, Noor Ahmed Memon², Amir Ali Keerio³

¹ Department of Civil Engineering Technology, The Benazir Bhutto Shaheed university of Technology and skill development
Khairpur Mirs

² Department of Civil Engineering, Quaid-e-Awam University of Engineering Science and Technology (QUEST), Nawabshah

³ Field Engineer, SRSO, Khairpur Mirs

ABSTRACT: Different varieties of fibers are used with cement mortar/concrete which include metallic, polymeric, mineral and vegetable fibers. The aim of this study is to investigate the mechanical properties of concrete reinforced with nail of 1 inch length, 1.23 mm diameter and 3.36mm diameter of head were used. Fibers were added from 0.5% to 2.5% with an increment of 0.5% (0.5%, 1%, 1.5%, 2%, and 2.5%) by weight of cement. Workability, compressive and tensile strength of control concrete and of all modified mixes with addition of nail and nail fiber are studies. Workability and compressive strength of all modified mixes with addition of nail fiber is decreased as compared to control mix. Compressive and Tensile strength of modified mixes with addition of nail fiber is increased as compared to control mix from (0.5% to1%). On further addition of nail fiber from 1.5% to2.5% compressive and tensile strength decreased. With the addition of nail fiber at1% maximum tensile strength 15.16% more than the compared to control mix was observed.

Keywords: Nail fibers; steel fibers; workability; Compressive and tensile strength of concrete

* Corresponding author: mantharali@bbsutsd.edu.pk

1st IMCEET-2023/089

**INFLUENCE OF WASTE GLASS ON COMPRESSIVE STRENGTH
OF MORTAR**

Manthar Ali Keerio^{1,*}, Samiullah², Vishal Kumar², Fayyaz Ali²

¹ *Department of Civil Engineering Technology, The Benazir Bhutto Shaheed university of Technology and skill development
Khairpur Mirs*

² *Undergraduate Final Year Students, Department of Civil Engineering, Quaid-e-Awam University of Engineering Science and
Technology (QUEST), Nawabshah*

ABSTRACT: The aim of this research work is to study the influence waste glass on the compressive strength of mortar. In this research work fine aggregate (hill sand) was replaced by 10%, 20%, 30% and 40% with waste glass. It was observed from the results that compressive strength of mortar modified with waste glass was observed as, at 40% replacement of fine aggregate with waste glass which is 21.54 % more than that of control mix. On the basis of conducted parameter it is concluded that 40% replacement of fine aggregate (hill sand) with waste glass is optimum.

Keywords: waste glass, compressive strength of mortar, waste, optimum

* Corresponding author: mantharali@bbsutsd.edu.pk

1st IMCEET-2023/090

INFLUENCE OF FLY ASH ON COMPRESSIVE STRENGTH OF MORTAR

Manthar Ali Keerio^{1*}, Samiullah², Vishal Kumar², Fayyaz Ali²

¹ *Department of Civil Engineering Technology, The Benazir Bhutto Shaheed university of Technology and skill development
Khairpur Mirs*

² *Undergraduate Final Year Students, Department of Civil Engineering, Quaid-e-Awam University of Engineering Science and
Technology (QUEST), Namabsbah*

ABSTRACT: The aim of this research work is to reduce the manufacture of cement by using waste material as a partial substitution of cement consequently reduction in CO₂ emission. The study the influence of fly ash on the compressive strengths of mortar. In this research work Cement was replaced by 5%, 10% and 15% with fly ash. Five control specimen and fifteen specimen prepared with partial replacement of cement with fly ash. The mortar prepared with 1:3 binder sand ratio with 0.5 water binder ratio was used. The compressive strength of mortar of control and modified mortar specimen was recorded and average of five specimen was taken. Fly ash was passed from sieve No. 325 before using as cement substitution material. The compressive strength of controlled mortar and modified mortar prepared with replacement of cement of cement with fly ash was tested for compressive strength of mortar at early age of 7 days. The compressive strength of mortar of control and modified mortar specimen was recorded and average of five specimen was taken. It was observed that maximum compressive strength is obtained at 5% replacement of cement with fly ash which is 11.66% more than that of control. Further replacement of cement with fly ash increased from 5%, the compressive strength of mortar decreased. On the basis of conducted parameters at 5% replacement of cement with fly is optimum.

Keywords: Fly ash, compressive strength of mortar, waste, optimum

* Corresponding author: mantharali@bbsutsd.edu.pk

1st IMCEET-2023/091

STUDY ON THE COMBINED USE OF FLY ASH AND WASTE GLASS ON COMPRESSIVE STRENGTH OF MORTAR

Manthar Ali Keerio^{1*}, Samiullah², Vishal Kumar², Fayyaz Ali²

¹ *Department of Civil Engineering Technology, The Benazir Bhutto Shaheed university of Technology and skill development
Khairpur Mirs*

² *Undergraduate Final Year Students, Department of Civil Engineering, Quaid-e-Awam University of Engineering Science and
Technology (QUEST), Namabsbah*

ABSTRACT: The aim of this research work is to reduce the manufacture of cement by using waste material as a partial substitution of cement consequently reduction in CO₂ emission. The study the influence of fly ash on the compressive strengths of mortar. In this research work Cement was replaced by 5%, 10% and 15% with fly ash. One control mix and twelve modified mixes prepared with partial replacement of cement with fly ash and partial replacement of fine aggregate with waste glass. Five control specimen and sixty specimen prepared with partial replacement of cement with fly ash and partial replacement of fine aggregate with waste glass. The mortar prepared with 1:3 binder sand ratio with 0.5 water binder ratio was used. The compressive strength of mortar of control and modified mortar specimen was recorded and average of five specimen was taken. Fly ash was passed from sieve No. 325 before using as cement substitution material. The compressive strength of controlled mortar and modified mortar prepared with replacement of cement of cement with fly ash was tested for compressive strength of mortar at early age of 7 days. The compressive strength of mortar of control and modified mortar specimen was recorded and average of five specimen was taken. It was observed from the results that compressive strength of mortar modified with 5% fly ash and 40% waste glass was observed as 9.03% % more than that of control mix. On the basis of conducted parameter it is concluded that 5% substitution of cement with fly ash and 40% replacement of fine aggregate (hill sand) with waste glass is optimum.

Keywords: fly ash, waste glass, compressive strength of mortar, waste, optimum

* Corresponding author: mantharali@bbsutsd.edu.pk

1st IMCEET-2023/092

**STUDY ON THE EFFECT OF LOCAL POZZOLANIC MATERIAL
OF DADU ON COMPRESSIVE STRENGTH OF MORTAR**

Manthar Ali Keerio^{1,*}, Ateeq ur Rehman², Muhammad Wasim², Abdul Salam²

¹ *Department of Civil Engineering Technology, The Benazir Bhutto Shaheed university of Technology and skill development
Khairpur Mirs*

² *Undergraduate Final Year Students, Department of Civil Engineering, Quaid-e-Awam University of Engineering Science and
Technology (QUEST), Larkano Campus*

ABSTRACT: This research aims to analyze the compressive strength of mortar at different binder sand ratio prepared with calcined clay (pozzolana) of district Dadu and to investigate the compressive strength of mortar at different water binder ratio prepared with calcined clay (pozzolana) of district Dadu. The clay is activated by heating in a furnace chamber at 700⁰C for 1 hour each. The compressive strength of mortar prepared with calcined clay of Dadu is determined with 5%, 10%, and 15% replacement of cement with calcined clay of Dadu. The compressive strength test of samples was conducted after 14 days curing age. Maximum compressive strength was observed on 5% replacement of cement with calcined clay given maximum compressive strength which is 5.42% more than that of control mix. Hence on the basis of conducted parameter the 5% replacement of cement with calcined clay prepared from local natural material soorh is optimum.

Keywords: local pozzolanic material; Soorh; dadu; compressive strength of mortar

* Corresponding author: mantharali@bbsutsd.edu.pk

1st IMCEET-2023/093

DESIGN FABRICATION AND ENERGY ANALYSIS OF WET COOLING TOWER

Bilal Ahmed¹, Asmatullah², Ali Mustafa Shah³, Aftab Ahmed Soomro⁴, Aftab Ahmed Sahito⁵

¹ *Department of Mechanical Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development Khairpur
Mirs*

ABSTRACT: Scarcity of water has increased the concern after industrialization as it is responsible for 23 % of total water utilization. In Wet Cooling Tower (WCT) of thermal power plants, major share of industrial water is consumed to maintain low temperature of condenser. Therefore, for WCT efficient design is essential in order to decrease its energy and water consumption. In this paper, experimental setup has been carried out for proposed novel design of induced draft WCT to minimize energy and water consumption. Moreover, to reduce evaporative losses, heat exchanger is installed at top side of WCT. As warm and humid air passes through heat exchanger its temperature is reduced by transferring energy to ambient air, causes condensation of humid air thus reduces evaporative loss of heat exchanger. In this proposed research work, decrease in evaporative losses has been estimated by developing mathematical model, simulating in Engineering Equation Solver (EES) before fabrication. Experimental results of this study reveal that the novel design of WCT reduces energy consumption by 10% and water consumption by 0.028% at 800 liters/hour.

Keywords: Energy analysis, Energy consumption; Water consumption; wet cooling tower

* Corresponding author: asmatmemon@bbsutsd.edu.pk

1st IMCEET-2023/094

ASSESSMENT OF CHEMICAL PROPERTIES OF GROUNDWATER QUALITY OF LARKANA CITY

Manthar Ali Keerio^{1,*}

¹ *Department of Civil Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development Khairpur Mirs*

ABSTRACT: Groundwater is the most important source of drinking water in Sindh Province of Pakistan. However, the quality of this crucial element of life is deteriorating day by day throughout Pakistan particularly in its Sindh province. Thus the study was carried out to determine the chemical contamination in the groundwater of the Larkana city of Sindh province. Total 40 samples were collected randomly from various locations of Larkana city. The chemical parameters like pH, Calcium, Magnesium, Total hardness (TH), Arsenic, Chloride, Sodium, Iron, Nitrites, and Nitrates were determined in the laboratory and were compared with WHO permissible limits. The results revealed that 26% of samples were having chloride beyond permissible limit; 32% samples were having concentration of Total Hardness (TH) above the desirable limits. Moreover, 6%, 23%, 29%, 92%, 80%, of samples had concentration of Nitrates, Nitrites, Sulfate, calcium, and magnesium respectively beyond the permissible limit. However, the concentration pH, Iron, Sodium, and Arsenic in groundwater found within the permissible limit.

Keywords: permissible limit; assessment; Chemical Properties of Groundwater Quality; larkana

* Corresponding author: mantharali@bbsutsd.edu.pk

1st IMCEET-2023/095

**ASSESSMENT PHYSICO-BIOLOGICAL PROPERTIES OF
GROUNDWATER QUALITY OF LARKANA CITY**

Manthar Ali Keerio^{1,*}, Mir Zafarullah Jamali², Asadullah Khoso², Shakeel Ahmed Bhatti²

¹ Department of Civil Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development Khairpur Mirs

² Department of Civil Engineering, Quaid-e-Awam University of Engineering Science and Technology (QUEST), Larkano Campus

ABSTRACT: Water is the most important source of life. However, due to various anthropogenic activities, water is no more pure and drinkable. Pakistan is the country that is facing acute shortage of safe water, and safe water drinking resources in Sindh, which is the second largest province of Pakistan, are depleting day by day. Therefore, a research study was carried out to determine the Physico-Biological properties of groundwater of Larkana city of Sindh province of Pakistan, where groundwater is the only sources of drinking. For this purpose, total 40 samples were collected randomly from various locations of Larkana city and the Physico-Biological parameters like Color, Odor, Taste, Turbidity, Total Solids (TS), Electrical Conductivity (EC), and Fecal Coliform and E-Coli were determined in the laboratory and were compared with WHO permissible limits. The results revealed that all of samples were colorless with no turbidity, but 20% of the samples were having odor of sewage water. Moreover, 20% of samples were having slightly bitter taste particularly the samples collected from Ahsan colony, Sachal Colony and QUEST hostel. Moreover, 92% of samples were having value of Total Solids and EC beyond permissible limits. Further, most of samples were found having no presence of E-Coli, but 8% samples were found having fecal Coliform present.

Keywords: Permissible limit; assessment; physic-biological; Properties of Groundwater Quality; larkana

* Corresponding author: mantharali@bbsutsd.edu.pk

1st IMCEET-2023/096

**ANALYZING THE PHYSICO-BIOLOGICAL PARAMETERS OF
DRINKING WATER OF UC RATOKOT OF TAULKA LARKANA,
SINDH, PAKISTAN USING WATER QUALITY INDICATORS**

Manthar Ali Keerio^{1*}, Mir Zafarullah Jamali², Nadim Karim Bhatti², Shamotra², Muhammad Bux²

¹ Department of Civil Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development Khairpur Mirs

² Department of Civil Engineering, Quaid-e-Awam University of Engineering Science and Technology (QUEST), Larkano Campus

ABSTRACT: One of the greatest sources of drinking water is the groundwater. However, since throughout the world all sources of water are getting degraded, groundwater is also grappling with the threat of global warming and other anthropogenic event. Keeping in mind various causes of groundwater contamination, this study was conducted to evaluate physical and biological contamination of groundwater of UC Ratokot of taluka Larkana using water quality indicator Pollution Index Groundwater (PIG) Model. Since, this UC consists of various villages therefore various samples were randomly collected from each village. The samples were collected from 20 villages of UC Ratokot, and the Physical parameters like Color, Odor, Taste, Turbidity, Total Solids (TS), Electrical Conductivity (EC), and biological parameters Fecal Coliform and E-Coli were determined in the laboratory and were compared with WHO permissible limits and PIG model was used to validate the results of overall quality of groundwater. The results revealed that all of samples were colorless and odorless with no turbidity, but 40% of the samples collected from 8 villages were extremely bitter. Moreover, 75% of samples were found having value of Total Solids and EC beyond permissible limits. Further, all of samples found having no presence of E-Coli, and fecal Coliform. Furthermore, use of PIG model disclosed that 33% of samples were fit for drinking purposes, 11% samples were slightly contaminated, 22% were moderately polluted, and 33% samples were unsuitable for drinking.

Keywords: Permissible limit; assessment; physic-biological; Properties of Groundwater Quality; ratto-kot, WQI

* Corresponding author: mantharali@bbsutsd.edu.pk

1st IMCEET-2023/097

**ASSESSING THE CHEMICAL PROPERTIES OF DRINKING
WATER OF UC RATOKOT OF TAULKA LARKANA, SINDH,
PAKISTAN USING WATER QUALITY INDEX (WQI) MODEL AND
GEOSPATIAL TOOLS**

Manthar Ali Keerio^{1*}, Mir Zafarullah Jamali², Nadim Karim Bhatti², Shamotra², Muhammad Bux²

¹ Department of Civil Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development Khairpur Mirs

² Department of Civil Engineering, Quaid-e-Awam University of Engineering Science and Technology (QUEST), Larkano Campus

ABSTRACT: One of the greatest sources of drinking water is the groundwater. However, since throughout the world all sources of water are getting degraded, groundwater is also grappling with the threat of global warming and other anthropogenic event. Keeping in mind various causes of groundwater contamination, the study was conducted to evaluate chemical properties of groundwater of UC Ratokot of taluka Larkana using water quality Index (WQI) Model and geospatial tools. The samples were collected randomly from 20 villages of UC Ratokot of Taluka Larkana and the chemical parameters like pH, Calcium, Magnesium, Total Hardness (TH), Chloride, Sodium, Iron, Nitrites, and Nitrates were determined in the laboratory and were compared with WHO permissible limits. All the results were validated using Water Quality Index (WQI) Model. The results revealed that all of samples were having pH and Nitrate within WHO limits. However, concentration of chloride in 44.4% samples were above desirable limits, 5% of samples found having nitrite beyond desirable value; and 33.3%, 44.4%, and 33.3% of samples were having Calcium, Sulfate, and Total hardness beyond permissible limits. Moreover, WQI revealed that 15% of water samples fell in Excellent water category, 26% of samples in category of Good water, 22% of samples found Poor Water, 22% of samples found very poor Water and 15% of samples found unfit for drinking. The areas having groundwater unfit for drinking based on WQI include; Hashim Chawro, Mohram Khan Mari, and Shahbeg Jamali.

Keywords: Assessment; physic-biological; Properties of Groundwater Quality; ratto-kot, WQI model, Geospatial Tools; Larkana

* Corresponding author: mantharali@bbsutsd.edu.pk

1st IMCEET-2023/098

**COMPARATIVE ANALYSIS OF SOFT PNEUMATIC ACTUATOR
BY USING FINITE ELEMENT METHOD FOR HIGH
BENDING ANGLE**

Yumna Memon^{1,*}, Shadi Khan Baloch¹, Intizar Tunio², Afaque Manzoor Soomro³

¹Department of Mechatronics Engineering, Mehran University of Engineering and Technology, Jamshoro

²Department of Mechanical Engineering, Mehran University of Engineering and Technology, Jamshoro

³Sukkur IBA University, Sukkur

ABSTRACT: Soft robotics is a rapidly growing field that involves the development of robots made from soft materials that can mimic the behavior of biological organisms. Among the various soft actuators, soft pneumatic actuators (SPAs) are widely used due to their simplicity and low cost. However, predicting the behavior of SPAs can be challenging due to the nonlinear properties of the material. In this research, we designed and analyzed a SPA using different hyperelastic materials. The finite element method (FEM) was used to compare the bending angle and stress distribution of the different materials made of the same loads under similar boundary conditions

* Corresponding author: 21memech06@students.muet.edu.pk

1st IMCEET-2023/100

HYBRID TOPOLOGY OF 15 LEVEL ASYMMETRIC CASCADED H-BRIDGE MULTILEVEL INVERTER WITH RENEWABLE ENERGY SOURCES

Hina Abbasi^{1*}, Mukhtiar Ahmed Mahar¹, Abdul Sattar Larik¹, Touseef Ali Shahani², Elsa Abbasi¹

¹*Mebran University of Engineering and Technology, Jamsboro.*

²*University of Nottingham, Unnited Kingdom*

ABSTRACT: This paper describes a binary topology of Multimodule level inverters that generate a fifteen-level staircase output voltage from renewable DC voltage sources i.e PV and Fuel cell. In this study, a hybrid cascaded multilevel Hbridge inverter is proposed for renewable energy applications. In this model of inverter less switches are used with less number of diodes. Furthermore, the proposed inverter contributes less switching losses which is the advantage of the proposed scheme. As a conclusion, Multimodule level inverters with binary topology generate a staircase output voltage with more voltage levels and fewer switches, resulting in lower total harmonic distortion. For controlling the power semiconductor switches in the MLI, Switching techniques such as phase disposition (PD-PWM) and Phase Opposition Disposition (POD-PWM), are used. The proposed inverter's performance is validated using simulation in MATLAB software.

* Corresponding author: hinaabbasi801@gmail.com

1st IMCEET-2023/103

**OPTIMAL TUNING OF PID CONTROLLER BASED LOAD
FREQUENCY CONTROL OF SINGLE AREA HYBRID ENERGY
SYSTEM USING MATLAB**

Mohammad Ismail^{1,*}, Uhamir Patrick²

¹*Mebran University of Engineering and Technology SZAB campus Khairpur*

²*The Benazir Bhutto Shaheed University of Technology and Skill Development Khairpur Mirs*

ABSTRACT: Contemplations that should be considered during the steady activity of the power framework is that the framework ought to have the option to cater for dynamic power and receptive power load interest. The heap request is constantly changing according to framework necessity and the power framework regulator ought to effectively remunerate the heap prerequisite. Recurrence is the main boundary of the solidness of a power framework. The recurrence shakiness might prompt gear harm, load shedding and potential power outages. The point here is to keep the power framework in an ordinary functional status. The steady activity of an interconnected Crossover Power Framework relies upon a harmony among creation and utilization focuses. Assuming there is a contradiction between the power delivered by generators that are associated with the network and the power requested by the heap in stable activity, a change would happen in the working recurrence of the framework. To guarantee framework strength, different control methods or control calculations to repay the deviations in the framework are utilized. In this venture, the heap recurrence control of a solitary region mixture energy framework is done utilizing the Corresponding Necessary and Subsidiary (PID) regulator. The mixture energy framework might comprise of a sustainable power framework (Wind/Sun oriented) and a traditional interconnected power framework (Warm/Hydro).

Key words: load frequency control (LFC), Proportional-Integral-Derivative (PID), Hybrid Energy System (HES)

* Corresponding author: mubammadismail.el18@muetkbp.edu.pk

1st IMCEET-2023/105

USE OF FRESNEL LENS IN SOLAR DESALINATION TO ACHIEVE ENHANCED DISTILLATE OUTPUT

Raza Mohammad^{1,*} Abdul Shakoor Shaikh¹, Dr. Kashif Hussain Mang², Dr. Aftab Ahmed Soomro¹

¹*Department of Mechanical Engineering Technology, Benazir Bhutto Shaheed University of Technology & Skill Development
(BBSUTSD) Khairpur Mirs*

²*Department of Chemical Engineering Technology, Quaid-e-Awam University of Engineering, Science & Technology, Nawabshah*

ABSTRACT: The demand for drinkable water nowadays is escalating day by day through increasing population, industrialization, agricultural intensification, and climate changes. Due to this, water is polluted more with every passing day. There are two purposes of our research paper; one is the to purify the saline water or brackish water and convert into to drinkable water with the help of solar energy other one is the use of Fresnel lens in solar desalination device to enhance achieved distillate output. In conventional solar still there in low performance of distillate output, the main purpose of installation of Fresnel lens in single-basin single-slope is to the increase heat input in the brackish water and to ensure higher rate of heat transfer. The number of tests performed on solar still with FRL and without FRL show that the distillate output has been achieved around 390 ml / 0.348 m² in 10 hours and 250ml / 0.348m² in 10hrs in a day at global radiation of 6.2 kWh/m². Thus, the introduction of FRL contributed to a system yield enhancement of about 140 ml, due to the increased solar input and an elevated heat transfer coefficient.

Keywords: Water Desalination, Solar Still, Fresnel Lens

* Corresponding author: razakbajar9@gmail.com

1st IMCEET-2023/108

INCREASING THE EFFECTIVENESS OF WORKERS' USAGE OF MODERN TECHNOLOGIES AT WORK

Bahram Chandio^{1,*}

¹The Benazir Bhutto Shaheed University of Technology and Skill Development, Khairpur Mirs, Sindh

ABSTRACT: Technology has become a vital part of our everyday lives, both at home and at work, in recent years. Not only has technology profoundly altered operating operations, but it has also altered consumer behavior and expectations, particularly in the workplace. There are various advantages to using technology in the workplace. Technology advancements have made it simpler than ever to communicate with others. Technology has continuously transformed the way individuals in all sectors of life accomplish their professions throughout history. Technology has improved working conditions since the industrial revolution and continues to do so now. Its influence on the workplace will eliminate time-consuming and ecologically wasteful procedures, speed up access to work, substantially enhance productivity, and make working from anywhere feasible like never before. This research is based on identifying the importance of the impact of technology on work, both in manufacturing and communication. In today's work place, time management is vital since deprived time management may lead to missed targets and consumer discontent. With the support of modern technological tools, time management has become simple. Technology is being used by businesses all around the world to better their operations. Adoption of development technologies such as software as a service (SaaS), cloud-based services, or sophisticated technologies such as artificial intelligence (AI) and machine learning (ML) can help businesses. Some of these technologies claim to increase efficiency, productivity, and well-being, but how will they affect the people who use them every day? Hence, this research project employed quantitative questionnaires to extract relevant information from the respondents. To bring the authenticity and reliability of the data this research undertakes a case of universities especially in Jamshoro & Khairpur, Sindh, Pakistan.

Keywords: Technology, worker, effectiveness, workplace

* Corresponding author: bahramchandio@bbsutsd.edu.pk

1st IMCEET-2023/109

IMPACT OF NANOPARTICLES ON WETTABILITY ALTERATION FOR OIL WET RESERVOIR

Uzair Ali Rajper¹, * Asadullah Memon¹, Sunder Sham Jeswani¹, Ahsan Ali¹, Junaid Ahmed Indher¹

¹ *Department of Petroleum and Natural Gas Engineering, Mehran University of Engineering and Technology, SZAB Campus,
Khairpur Mirs*

ABSTRACT: Due to a new approach for increasing oil extraction, nanotechnologies in the oil field have been highly desirable. Numerous researchers around the world have been trying to make more oil commercially available in recent years, while at the same time they are attempting to minimize the loss of oil fields by using nanotechnology in a variety of energy sectors. In our research the displacement experiments were performed on the original water-wet and imposed oil-wet (after aging in stearic acid/n-heptane solution) glass micromodels. In order to solve the equations, a volume of fluidVOF model was used as a simplified multiphase model, and then a model was created using five steps in a fluent CFD. The results of the model studies were then analysed and comparison was made. The Simulation analysis showed that the levels of trapped oil saturation to nanofluid injection in water flooding models were lowered by 9% and 30% relative to those obtained previously for water flooding cases, within a range between 9 % and 30 %. These characteristics were associated with a positive effect of nanoparticles in the modification of surface wettability during flooding. Compared to a water soaked system with 81% recovery in case of nanofluid flooding, oil extraction from an intermediate wet system was even higher. It was also found that the results of both experiments and simulations had a good agreement. Nanofluid flooding in CFD calculations has been shown to increase oil recoveries by 9% and 30% respectively. Powerful tools to visually evaluate the way nanoparticles could release trapped oil are presented in this study.

Keywords: Nanotechnology, CFD, oil displacement, enhanced oil recovery.

* Corresponding author: uzairrajper74@gmail.com

1st IMCEET-2023/110

ARDUNIO BASED HYBRID ENERGIZED INTELLIGENT FIRE FIGHTING RESCUE ROBOT FOR FIREFIGHTING

Ghulam Qadir Jinjh^{1,*}, Muzamil Hussain Wadho¹, Waseemullah Pahnwar¹, Zubair Ahmed¹,
kashif Ali Jalbani¹, Farhan Ali Mallah¹

¹*Department of Electrical Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development Khairpur Mirs*

ABSTRACT: As science and technology continue to develop and grow, humans are increasingly turning to robots to complete some hazardous duties like rescuing individuals from perilous locations, where doing so could put human life at risk. As a result, the main objective of this project is to develop and implement an autonomous firefighting robot (QRob) that is knowledgeable about the fundamentals of firefighting and can patrol through dangerous areas in order to spot fires early and put them out using the platform's built-in fire extinguishing system. With the help of the directing track, the QRob is able to continuously patrol the building while also making an effort to find the root of the problem by using its flame sensors as its main detecting system. The secondary detection sensors, the Fire Sensor and the Ultrasonic Sensor, are also helpful in detecting the presence of fire sources in QRob. Once the fire source has been located, it moves straight towards it and use the platform-mounted fire extinguisher to put it out as quickly as possible. In other words, this work is deemed successful with goals and objectives meet.

Keywords: Hybrid Energized firefighting Rescue Robot

* Corresponding author: qadirjinjh14@gmail.com

1st IMCEET-2023/113

ASSESSING OCCUPATIONAL ACCIDENTS IN THE CONSTRUCTION INDUSTRY OF SINDH, PAKISTAN

Mujtaba Hassan^{1, *}, Mansoor Ahmed Memon², Manthar Ali Keerio³

¹ *Universiti Tun Hussein Onn Malaysia*

² *Sukkur IBA University*

³ *Department of Civil Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development Khairpur Mirs*

ABSTRACT: This research paper presents the results of a quantitative study conducted among 112 construction companies in the Sindh region of Pakistan to identify the number of occupational accidents that occurred in the last 5 years. The study found that a significant problem exists with the implementation of safety measures in the construction industry in Sindh. Many of the companies surveyed lacked proper safety training for their employees and did not provide adequate personal protective equipment. Additionally, a prevalent culture of risk-taking and negligence towards safety further contributes to the high frequency of accidents, including fatal, non-fatal, and property damage incidents. These findings highlight the urgent need for improved safety measures to prevent accidents and reduce associated human and financial costs. The study provides valuable insights for policymakers and industry stakeholders to prioritize safety initiatives and promote a safer working environment for construction workers in Sindh.

Keywords: Occupational accidents, Construction industry, Sindh, Pakistan, Workplace safety, Safety culture

* Corresponding author: engrmujtaba.hm@gmail.com

1st IMCEET-2023/114

ASSESSING THE SIGNIFICANCE OF CATEGORIES IN ADDRESSING SAFETY ISSUES AND MITIGATING ACCIDENTS IN PAKISTAN'S CONSTRUCTION INDUSTRY

Mujtaba Hassan^{1,*}, Samiullah Sohu², Mansoor Ahmed Memon³

¹ *Universiti Tun Hussein Onn Malaysia*

² *Quaid-e-Awam University of Engineering, Sciences and Technology Navabshah*

³ *Sukkur IBA University*

ABSTRACT: This research paper aims to identify the category with the greatest impact on solving safety issues in the construction industry of Pakistan. The study was conducted based on the categories identified in the literature review. The study employed a quantitative survey approach and collected data from a sample of construction industry professionals in Pakistan. The identified categories included equipment-related causes, environmental causes, organizational and management-related causes, human error-related causes, procedural-related causes, safety culture-related causes, communication-related causes, and maintenance-related causes. The survey results showed that organizational and management-related causes have the greatest impact on solving safety issues in the construction industry of Pakistan. The study findings provide valuable insights for policymakers, industry stakeholders, and practitioners to develop strategies and initiatives that focus on addressing organizational and management-related causes in order to improve safety practices in the construction industry of Pakistan.

Keywords: Construction industry safety, Safety issues in Pakistan, Occupational accidents in Pakistan, Organizational management

* Corresponding author: engrmujtaba.bm@gmail.com

1st IMCEET-2023/115

UTILIZATION OF AGRICULTURAL RESIDUE FOR THE BIOMETHANATION: A SUSTAINABLE ENERGY FOR PAKISTAN

Altaf Alam Noonari^{1,*}

¹*Energy Systems Engineering Department, Balochistan University of Engineering and Technology, Khuzdar, Balochistan*

ABSTRACT: In Pakistan, energy and the environment are challenging issues. One of the major pollution factors is the burning of agricultural residues (AR). Burning causes the formation of smog and haze that effected on human health. Regarding control measures, the utilization of AR for bioenergy is an impressive approach. Around, 40 million tons of AR were available in Pakistan for power generation like as, rice straw (574,0000 tons), wheat straw, cotton stalks, and banana plant substrate (314,638 tons) etc. AR with animal manure through anaerobic co-digestion remarkable biogas can be produced. About, one cubic meter of biogas can be generated 2.5KWh of electrical energy. The usage of biogas contributes to socio-economic and environmental advantages for the community as a whole. Therefore, the study was carried out to determine potential of methane generation to overcome energy problems and evaluate the benefits of bioenergy. So, rice straw with buffalo dung was utilized for methane production through co-digestion. Methane yield was analyzed in batch tests and results revealed that anaerobic co-digestion enhances the methane yield. The highest methane yields of 331.6 and 346.7 mLCH₄/gVS were obtained at 0.3% H₂O₂ and 0.4% Ca(OH)₂ respectively. From this perspective, Pakistan has a huge potential to produce methane because of the agrarian country. The digested material is also beneficial for agricultural fields as a fertilizer. Ignorance and lack of planning are liable and questionable factors from Pakistan Government. AR provides a carbon-neutral source that will assist to stabilize the ecosystem.

Keywords: Agricultural Residues, Burnings, Bioenergy, Potential

* Corresponding author: noonarialtaf@yahoo.com

1st IMCEET-2023/116

ANALYSIS OF FRESH AND HARDENED PROPERTIES OF EGGSHELL BLENDED CEMENT CONCRETE

Akhtar Ali Sargani^{1,*}

¹*Department of Civil Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development, Khairpur Mirs*

ABSTRACT: In this paper the eggshell powder is added to the conventional concrete by replacing the cement to make the concrete economical and eco-friendly. Cement is replaced at the rate of 0, 2.5, 5, 7.5 and 10 percentage with eggshell powder to determine the fresh and hardened properties (Compressive Strength) of concrete of target strength 28MPa. The workability of the concrete increases as with the replacement of eggshell powder with Cement. For the analyzing the hardened properties of concrete the Cube of dimension (100mm x 100mm x 100mm) were casted and tested at the curing age of 7 and 28 days for compressive strength. To determine the split tensile strength of the blended cement concrete cylinder of the dimension 100mmx200mm. The results obtained from the testing showed that compressive strength increases by 11.6% at replacing rate 7.5% after curing the specimen for 28 days and for the split tensile strength an increment of 9.6% in the strength by replacing eggshell powder with cement in concrete after curing the specimen for 28 days.

Keywords: Eggshell Powder, Blended Cement Concrete.

* Corresponding author: akhtarali@bbsutsd.edu.pk

1st IMCEET-2023/120

**DEEP Q-LEARNING BASED AUTOMATED PARKING
ASSISTANCE MODEL FOR FOUR-WHEEL LIGHT TRANSPORT
VEHICLE (LTV)**

Akshay Ahuja^{1,*}, Shahnawaz Talpur¹

¹*Mehran University of Engineering and Technology Jamsboro*

ABSTRACT: In recent years, automatic parking systems have become popular due to their potential to reduce human errors and improve parking efficiency. Reinforcement learning, specifically deep Q-learning, is a promising technique for such systems as it can handle continuous state and action spaces and learn complex decision-making processes. In this paper, we propose a deep Q-learning-based automatic parking system that uses simulation for training and testing. We simulated various parking scenarios, such as parallel parking and perpendicular parking, and the results demonstrated that the system successfully parked the vehicle in different scenarios.

Keywords: Learning rate, Discount factor, Exploration factor, Rewards, Penalties

* Corresponding author: akshayahuja1998@gmail.com

1st IMCEET-2023/121

THE EARLY-STAGE DETECTION AND PREDICTION OF ALZHEIMER'S DISEASE

Sarmad Ali^{1,*}, Samiullah Shaikh¹, Zulqarnain Haider¹, Irfan Ali¹, Asad Ali¹

¹The Benazir Bhutto Shaheed University of Technology and Skill Development, Khairpur Mirs

ABSTRACT: The early detection and timely interventions of Alzheimer's disease (AD) is crucial task for humans. The conventional method of detecting Alzheimer's disease involves several drawbacks due to their high cost, limited availability, and reliance on subjective interpretation. Artificial intelligence (AI) has the potential to revolutionize the medical field by analysing large amounts of data from various sources, including medical imaging to detect subtle changes in brain function and structure. Keeping this in view, this paper presents a detailed study on early detection of Alzheimer's using machine learning algorithms. It starts by training ML algorithms on the raw MRI data to develop an AD detection model that can predict whether an individual is likely to develop Alzheimer's disease at earlier stage. The proposed AD detection model is developed using several machine learning techniques such as Support Vector Machine (SVM), Decision Tree, Random Forest Classifier, Logistic regression and Adaboost. The dataset used in the paper is Open Access Series of Imaging Studies (OASIS) data that consists of Longitudinal MRI data of 150 subjects aged between 60 to 96 years. The performance of each AD Prediction model was evaluated and compared in terms of accuracy and precision. The results show that all AD prediction models have achieved satisfactory accuracy performance. However, the Adaboost and Random Forest model performed better than the 06 supervised learning models in prediction of AD disease with 84% accuracy. In contrast, the lowest accuracy was obtained by the Logistic regression model 75%. With the best validation average accuracy of 80% on the AD test data, the proposed approach demonstrates better outcomes.

Keywords: ML, Alzheimer's disease, Early Prediction.

* Corresponding author: sarmad.20cet20@bbsutsd.edu.pk

1st IMCEET-2023/124

**INFLUENCE OF DIFFERENT SOURCES OF COARSE
AGGREGATES ON THE PERFORMANCE OF CONCRETE AT AN
ELEVATED TEMPERATURE**

Muhammad Fayyaz Ulhaq^{1*}, Muhammad Yousaf Mushtaq¹, Sadam Hussain Jakhrani²,
Muhammad Sohaib Raja¹, Muhammad Babar Riaz¹, Usman Akram¹, Sher Ali¹

¹Department of Civil Engineering, COMSATS University Islamabad, Sahival Campus, Sahival

²Department of Civil Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development
Khairpur Mirs

ABSTRACT: Plain cement concrete (PCC) is a widely used material in the construction industry due to its high compressive strength and maintenance cost is very low. Rather than its major benefits it shows some faults like low tensile strength and high brittle. Therefore, when concrete structures are being exposed to fire then mechanical properties, mainly compressive strength, flexural strength, and splitting tensile strength are badly affected owing to the spalling or deterioration of concrete. High-strength concrete shows spalling behaviour at an elevated temperature above 400°C owing to the low porosity. The major goal of this research work was to investigate the influence of different sources of coarse aggregates such as Margalla, Swat, Sakhi Sarwar, and Sargodha. Cubes and cylinders were cast by using cement 53 grade, all four sources of coarse aggregates, Lawrencepur sand, and adding Sika Viscocrete 3110 with ratios (1 : 1.26 : 1.47); W/C =0.3 and Viscocrete 3110 = 0.25% by wt. of cement and heating at 25°C, 400°C, 800°C. Outcomes show that the decrease in compressive and splitting tensile strength becomes larger when samples exposure to a high temperature above 400°C. Each source of aggregates possesses different properties which is a positive sign in view of the type of construction and economy point. From experimental results, the incorporation of Sakhi Sarwar aggregates in concrete indicated better performance at an elevated temperature and Sargodha aggregates showed improved physical properties.

Keywords: Coarse aggregates, mechanical characteristics, spalling, elevated temperature

* Corresponding author: m.fayyaz@cuisahival.edu.pk

1st IMCEET-2023/125

**INFLUENCE OF MAXIMUM AGGREGATE SIZE ON THE WATER
ABSORPTION CHARACTERISTICS OF RECYCLED COARSE
AGGREGATE CONCRETE**

Muhammad Fayyaz Ulhaq^{1*}, Muhammad Yousaf Mushtaq¹, Saddam Hussain Jakhrani², Muhammad
Sohaib Raja¹, Tayyab Tahir¹, Muhammad Athar Sohail¹, Abdullah Zia¹, Shahzad Dilawar¹

¹*Department of Civil Engineering, COMSATS University Islamabad, Sahiwal Campus, Sahiwal*

²*Department of Civil Engineering Technology, The Benazir Bhutto Shaheed University of Technology and Skill Development
Khairpur Mirs*

ABSTRACT: The early detection and timely interventions of Alzheimer's disease (AD) is crucial task for humans. The conventional method of detecting Alzheimer's disease involves several drawbacks due to their high cost, limited availability, and reliance on subjective interpretation. Artificial intelligence (AI) has the potential to revolutionize the medical field by analysing large amounts of data from various sources, including medical imaging to detect subtle changes in brain function and structure. Keeping this in view, this paper presents a detailed study on early detection of Alzheimer's using machine learning algorithms. It starts by training ML algorithms on the raw MRI data to develop an AD detection model that can predict whether an individual is likely to develop Alzheimer's disease at earlier stage. The proposed AD detection model is developed using several machine learning techniques such as Support Vector Machine (SVM), Decision Tree, Random Forest Classifier, Logistic regression and Adaboost. The dataset used in the paper is Open Access Series of Imaging Studies (OASIS) data that consists of Longitudinal MRI data of 150 subjects aged between 60 to 96 years. The performance of each AD Prediction model was evaluated and compared in terms of accuracy and precision. The results show that all AD prediction models have achieved satisfactory accuracy performance. However, the Adaboost and Random Forest model performed better than the 06 supervised learning models in prediction of AD disease with 84% accuracy. In contrast, the lowest accuracy was obtained by the Logistic regression model 75%. With the best validation average accuracy of 80% on the AD test data, the proposed approach demonstrates better outcomes.

Keywords: Recycled coarse aggregate, water absorption, maximum aggregate size, influence, concrete

* Corresponding author: m.fayyaz@cuisahiwal.edu.pk

1st IMCEET-2023/126

**THE EFFECT OF CFRP SHEET ON CONVENTIONAL
CONCRETE AND MARBLE-TILE POWDER CONCRETE**

Zain Rid^{1,*}

¹The Benazir Bhutto Shaheed University of Technology and Skill Development, Khairpur Mirs

ABSTRACT: Concrete is ubiquitous construction material. Cracks also occur in structures that pose a challenge to strength and longevity as time prevails and eventually affect the structural integrity of the concrete. Extensive work has been carried out using Carbon Fiber Reinforced Polymer (CFRP) as a strengthening and repair material. With the confinement of CFRP composite sheets encased around the concrete cylinder for structural strengthening and rehabilitation, simultaneously replacing up to 10% inclusion of marble dust to cement demonstrates substantial improvements in its strength. The confinement effect depends upon several parameters, such as concrete strength, fiber orientation in the sheet, sheet thickness, the cross-section shape, and the interface bond between the concrete and composite sheets. In this experimental study, the effect of sheet thickness is studied. A total of 24 specimens of the conventional and partially replaced concrete were cast and tested under axial test. The test results showed that partial replacement and wrapping of the CFRP layer significantly improves concrete's compressive strength.

Keywords: Concrete, Durability, Strengthening, CFRP composite sheet, Confinement, Rehabilitation

* Corresponding author: zainrid50@gmail.com

1st IMCEET-2023/127

**A COMPARATIVE STUDY OF EXHAUST GAS TEMPERATURE
AND NOISE EMISSION ON COMPRESSION IGNITION ENGINE
USING WASTE COOKING OIL EMULSIONS**

Faheem Ahmed¹, Liaquat Ali¹, Muhammad Ramzan¹, Aqeel Bhutto^{2,*}, Ali Murtaza¹,
Ali Raza³

¹ Department of Mechanical Engineering, Quaid-e-Awam University of Engineering, Sciences and Technology Nawabshah

² Department of Mechanical Engineering, MUET SZAB Campus Khairpur Mirs

³ Zeeshan Institute of Science and Technology Institute (ZIST) Hyderabad

ABSTRACT: Energy has a significant role in the socio-economic growth for any country. The energy originates from fossil fuels, which are non-renewable and enact an undesirable impact on the environment. Waste cooking oil can be utilized in diesel engine directly. Preheating and trans-esterification process are expensive to convert waste cooking oil into biodiesel. This research aims to replace diesel with waste cooking oil as binary blend and compared with diesel fuel. Engine testing at the constant speed of 1300 rpm at constant load. This study revealed that, addition of waste cooking oil reduced exhaust gas temperature as compared to base line fuel. In case of noise emission, sound level for emulsion fuel DF95WCO5 was reduced compared to DF. It can be concluded that binary emulsion be able to be used in compression ignition engine without any engine alterations. Consequently, WCO can be proficiently used to reduce detrimental effects and reduce fossil fuel dependency.

Keywords: Diesel engine, Waste cooking oil, Binary blend, exhaust gas temperature, Noise emission

* Corresponding author: aqeelahmed@muetkhp.edu.pk

1st IMCEET-2023/128

**INFLUENCE OF N-PENTANOL AND WASTE COOKING OIL
BLEND FUELS WITH DIESEL ON EXHAUST GAS
TEMPERATURE IN COMPRESSION IGNITION ENGINE**

Faheem Ahmed¹, Liaquat Ali¹, Muhammad Ramzan¹, Aqeel Bhutto^{2,*}, Ali Murtaza¹,

Ali Raza³

¹ Department of Mechanical Engineering, Quaid-e-Awam University of Engineering, Sciences and Technology Nawabshah

² Department of Mechanical Engineering, MUET SZAB Campus Khairpur Mirs

³ Zeeshan Institute of Science and Technology Institute (ZIST) Hyderabad

ABSTRACT: The growth of air pollutants is significantly influenced by the temperature of the exhaust gas, which is a reflection of the heat produced inside the combustion chamber. In this research, experimental work deals with the characteristic work on exhaust gas temperature for diesel blend with waste cooking oil blend fuel. The trials were performed on a single-cylinder, horizontal, water-cooled four-stroke and pre-combustion chamber compression-ignition (CI) engine to analyze the abovementioned impact of blends. The blend fuels DF, DF95WCO5 and DF60WCO20Pe20 were investigated at constant load and speed of 1300rpm. According to the recorded data, the highest recorded exhaust gas temperatures for diesel fuel DF100 were 2810 C, 285 0C, and 289 0C, respectively, at 160, 180, and 200 hours. In contrast, the running hours for DF95WCO5 on the same engine were measured at 292, 295, and 298 0C, respectively, with an increase of 5% waste cooking oil in pure diesel. However, the using n-pentanol ternary blend fuel DF60WCO20Pe20 same operating hours were recorded as 266 0C, 2680C and 270 0C reduced as equated to binary and diesel fuel. In the case of DF95WCO5 noise emission results proved that the sound pressure level decreased by 5.8 dB at engine speed of 1300 RPM. Meanwhile, using D60WCO20Pe20 ternary blend showed that the further reduced as compared to diesel fuel.

Keywords: Diesel engine, Waste cooking oil, Binary blend, exhaust gas temperature, Noise emission, N-pentanol

* Corresponding author: aqeelabmed@muetkbp.edu.pk

1st IMCEET-2023/129

INTERPRETATION OF PASSION AND ITS ENTREPRENEURIAL IN MODERN ERA

Robina Sultan¹, Adnan Pitafi¹, Aqeel Bhutto^{2,*}

¹ *Mehran University of Engineering and Technology, Jamsboro*

² *Department of Mechanical Engineering, MUET SZAB Campus Khairpur Mirs*

ABSTRACT: The entrepreneurial passion is challenging but popular theme in modern management system. The entrepreneurial passion is globally acknowledged foundation of a growing life, with torrid tasks that refashioned people's decisions interests and benefits into positive and supportive activities. Therefore, the current study reviews and analyzes the volume of observational evidence on entrepreneurial passion in depth. It has been discussed that how the "first generation" of research on entrepreneurial passion and work passion in entrepreneurs has received a lot of attention in entrepreneurship sub-fields such as entrepreneurship management, psychology, and finance. Further, the components, antecedents and outcomes of entrepreneurial passion have been discussed. Nonetheless, the interpretation of entrepreneurial passion in the past and especially in modern era was also discussed. Such discussions were supported with different research techniques like qualitative vs. quantitative, survey-based vs. experimental/intervention. Following that, it has been proposed with detailed guidance that will serve as a foundation for the next generation of entrepreneurial passion research. Such generation will handle the concerns and deficiencies indicated in our research. Finally, it has been discussed that "how findings from the entrepreneurial passion literature might be used to influence and established a strong thought on passion.

Keywords: Entrepreneurial Passion; Interpretation of Passion; Modern Era of Passion; Entrepreneurial Passion's Components; Antecedents

* Corresponding author: aqeelahmed@muetkhp.edu.pk

1st IMCEET-2023/132**STUDY OF DISCHARGE CHARACTERISTICS FOR A PIANO KEY WEIR**Muhammad Fahad^{1,*}, Usman Ghani¹¹University of Technology, Taxila

ABSTRACT: A piano key weir is a type of flow measurement device used in open channels, such as rivers, streams, and canals. It consists of a series of piano keys. The effectiveness of Piano Key Weirs (PKW) as a way of increasing hydraulic structural discharge capacity has been thoroughly studied in earlier research works. Unfortunately, research on the effectiveness of Trapezoidal C-type Piano Key Weirs (TPKW) is still lacking. By investigating the impact of changing geometrical parameters of TPKW models under various flow conditions on the discharge coefficient (Cd), this experimental work seeks to close this gap. Three different parapet wall heights above the crest of the TPKW were used to investigate their effect on discharge characteristics. The research results indicate that an increase in the height of the parapet wall has caused an increase in the discharge efficiency of the TPKW weir.

Keywords: Piano key weir, discharge coefficient, Efficiency of discharge

* Corresponding author: fabadrana480@gmail.com

1st IMCEET-2023/134

IMPACT OF CRACKS IN MULTI-CRYSTALLINE SILICON SOLAR CELLS ON PV MODULE POWER PERFORMANCE

Maham Murad^{1,*}, Arif Khattak¹

¹US-Pakistan Center for advanced studies in energy, University of Engineering and Technology Peshawar

ABSTRACT: PV cell industry has been tremendously basic and demanding because more dynamic and less expensive resources are necessary to achieve higher production yield in the process of conversion of solar energy into electrical energy by reducing the production cost. PV cell based upon crystalline silicon is established as one of the most proficient photovoltaic mechanized device economically as well as environmentally. In spite of all these circumstances defects like cracks in the wafers of PV cells enhances their manufacturing cost. Cracks in Si wafers are inspected throughout the manufacturing procedure but still there are no unexceptional cracks detecting methods when aiming to further advance the method of assembling the PV cells. Continuous efforts are through to understand the locality of cracks in individual precious stone and in solar cells made of polycrystalline silicon, and to investigate the consequences of these cracks on the efficiency and performance of solar cells by implementing electroluminescence imaging (EL imaging) technique. Different image processing techniques are applied on these EL images to extract the information regarding the percentage of cracks and to evaluate the loss in total power. The effectiveness of solar PV cell is determined by utilizing the voltage (V) and current (I) attributes prior, afterwards cracking of the silicon cell. The effectiveness decreases starting from 1.5% to 15% for one single gem. The significance of the utilization of crack observing methods is featured by examples of polycrystalline. The aim and purpose of this exploration is further develop the PV cell assembling methods, to take necessary precautions during manufacturing, to design new patterns of Module assembly

Keywords: Solar energy, PV panels, cracks, EL imaging.

* Corresponding author: jcmabi121@gmail.com

1st IMCEET-2023/136

**COMPARATIVE ANALYSIS OF SOFT PNEUMATIC ACTUATOR
DESIGNS USING FINITE ELEMENT METHOD FOR HIGH
BENDING ANGLE AT LOW PRESSURE**

Yumna Memon¹*, Shadi Khan Baloch¹, Intizar Ali Tunio², Afaque Manzoor Soomro³

¹Department of Mechatronics, Mehran university Of Engineering and Technology Jamsboro

²Department of Mechanical Engineering, Mehran university Of Engineering and Technology Jamsboro

³Department of Electrical Engineering, IBA Sukkur, Pakistan

ABSTRACT: Soft robotics is an emerging field that involves the development of robots using flexible materials and bio-inspired designs. These robots have high levels of dexterity and safety, making them suitable for use in applications such as locomotion, gripping, and biomedical devices where there is a need for physical interaction with a dynamic environment. Among the various soft actuators, soft pneumatic actuators (SPAs) are widely used due to their low cost and mass, fast response time, and ease of implementation. The actuator's tendency to bend is one of the key factors that determine its performance and related to its structure. The performance of the actuator is determined by its material and air-chamber design. However, Because of the nonlinear properties of the materials involved, developing analytical models that accurately forecast the behavior of SPAs is challenging. To address this, Under the same loads and boundary constraints, two different hyper elastic materials (Dragon Skin 10, and Dragon Skin 30) have been analyzed and compared using the finite element method (FEM). According to the FEM results, the SPA fabricated with Dragon Skin 10 generated the highest bending angle and experienced less stress compared to the other soft actuator. This finding can be useful for the development of soft robots with maximum bending angle and low stress using appropriate hyper elastic materials.

Keywords: Soft Actuator, Design, Finite element method, Stress, Bend angle

* Corresponding author: 21memech06@students.muet.edu.pk

1st IMCEET-2023/137

**MATRIX GEOMETRIC ANALYSIS OF VARIABLE THRESHOLD
BASED DISCRETE TIME SYSTEM**

Mohammad Rafiu Chandio^{1*}, Wajiha Shah¹

¹ Department of Electronic Engineering, Mebran University of Engineering and Technology, Jamsboro

ABSTRACT: Matrix Geometric method is a mode in which Quasi- Birth death procedures are analyzed in which queuing theory is applied to the various traffic line issues where, Markov- Chain is converted into matrix in terms of levels. Basically, the analysis in finite system having threshold is difficult to analyze in scalar domain as system flow process in the scalar domain having the variable threshold is difficult whenever the system capacity increases. Therefore, the congestion is reduced in priority based using matrix geometric method. Furthermore, in system the calculation of probability mass function of each entry state, the construction of the flow process chain, the construction of the flow process time of the system and mean number in the system is calculated. Eventually, By developing a queuing model, constructing the, Markov chain, developing a flow process have achieved the results after analytical equations to represent the flow system.

Keywords: Markov chain, queuing model, flow process, matrix method

* Corresponding author: rafiuchandiobator@gmail.com

1st IMCEET-2023/138

DETERMINATION OF NOISE POLLUTION AND ITS POSSIBLE EFFECTS UPON ROADSIDE RESIDENTS AND TRADERS IN SOUTHERN PART OF NAWABSHAH CITY

Ayaz Ali Mandan¹*, Sikander Ali Mandan¹, Abdul Hafeez Mangio², Asmat Ullah Memon¹,
Ajeeb Ali Mandan³

¹*Department of Mechanical Engineering Technology The Benazir Bhutto Shaheed University of Technology and Skill Development, Khairpur Mirs*

²*Sindh Agriculture University Tando Jam*

³*Shah Abdul Latif University, Khairpur Mirs*

ABSTRACT: The research looked at the amount of noise pollution and the issues associated with noise pollution in light of its negative outcomes on people's quality of life in the southern area of Nawabshah. Noise pollution levels checked out by keeping view of different recommendations from United States of America under the Department of Housing and Urban Development (HUD) for noise level in living domain. Purani Sabzi Mandi and Naya Naka, the noise level was obviously objectionable. It was generally terrible at Golwala Complex Chowk, Sanghar Naka, Shaheed Chowk, and Regal Chowk as well. Highest noise pollution (68.8 dBA) recorded in between 1:10-1:40 pm, at 4:10 to 4:40pm noise pollution was recorded (61.51 dBA), the lowest value (57.04 dBA) at 9:00 to 9:30 pm. During morning hours March saw the maximum noise level of 73.57 dBA, while the november evening hours had the bottom noise level of 57.11 dBA. At Qazi Ahmed Mor and Doctors' Colony, which is close to hospital road, the noise level was measured within the allowed limit for a safe environment. Noise level during the month of May, June, July, August, October & November as well as in the evening time throughout the year was acceptable normally & it was totally unacceptable in January, February, March, April, September and December. Health issues that are concerned with noise pollution includes decrease in hearing capacity, listening barriers, irritation, sleeping disturbances, melancholy as well as mental collapse. Problems were found quite more in quantity during the age limit of 20-40 years and the most frequent reported problems like, annoyance and listening capacity problem. A growing percentage of respondents under older age group domain reported experiencing despair, insomnia, and the deafening impact. The effects of deafness on those older than 60 years of age were substantially more common.

Keywords: Noise Pollution; Southern city Nawabshah; United States under the Department of Housing and Urban Development (HUD)

* Corresponding author: ayazmandan@bbsutsd.edu.pk

1st IMCEET-2023/139

**FEASIBILITY ANALYSIS OF CHILLER PLANT AIR
CONDITIONING SYSTEM IN MECHANICAL ENGINEERING
DEPARTMENT QUEST NAWABSHAH**

Ali Mustafa Shah¹*, Asmatullah Memon¹, Aftab Ahmed Sahito¹, Aftab Ahmed Soomro¹
Rahool Rai²

¹Department of Mechanical Engineering Technology The Benazir Bhutto Shaheed University of Technology and Skill Development, Khairpur
Mirs

²Department of Mechanical Engineering, Hamdard University Karachi

ABSTRACT: Energy crises, Global warming and Climate Change are considered as the major global issues of this era. Industries and buildings are responsible for this problem by consuming large portion of global energy. About 60% of total energy consumption of buildings is just consumed by Air conditioning system of the buildings in order to provide the suitable and comfortable environment conditions in the building. So the world is move towards such Air conditioning systems that have minimum energy consumption, lower initial cost as well lower working cost so that to reduce worldwide energy crises. The Mechanical Engineering Department building is located at 68.4167° E longitude and 26.2500° N latitude in Nawabshah. This region is hot tropical region where humidity is recorded as low as 19% very dry to as high as 92% humid throughout the year. In this research study feasibility of Chiller plant Air conditioning system has been carried out by comparing the energy consumption, initial cost and running cost of proposed Air conditioning system and Existing Air conditioning system. The comparison between the power consumption of the proposed AC System and existing AC System in Mechanical Engineering Department tells a possibility of reducing the power consumption at a rate of around 14.9 kW per hr and saving electricity costs of around 53190.7 rupees per month (638288.64 rupees per year). To install a conventional AC System, the investment cost is around 7780499 rupees and for install a chiller plant AC system, the investment cost is around 4394455 rupees. So it means that for installing the chiller plant instead of conventional air conditioning system the initial cost will reduce up to 3386043 rupees which is the 43.5% of initial cost of conventional air conditioning system This research study is also a one step toward such system that consume least amount of energy for desire air conditioning as compare to conventional Air conditioning System. As the topic of our thesis work Feasibility Of chiller plant in Mechanical Engineering Department, so our work is relate with the cooling load of entire department, deign condition of department and comparison between the chiller plant and conventional air conditioning system.

Keywords: Chiller Plant, Cooling Load, Air Conditioning System, Energy Saving

* Corresponding author: mustafa@bbsutsd.edu.pk

1st IMCEET-2023/144

COMPUTER MODELS FOR OPTIMISATION OF SMART IRRIGATION WATER MANAGEMENT AND PRACTICES

Kanya Lal Khatri^{1,*}, Rod Smith², Haris Shaikh³, Sadiq A Shah⁴, Naveed Channa¹

¹ Faculty ¹Department of Civil Engineering, Mebran University of E & T Campus, Khairpur, Pakistan

²Professor Faculty of Engineering and Surveying Queensland, NCEA, USQ Toowoomba, Australia

³ Post Graduate Student Department of Civil Engineering, Mebran University of Engineering & Technology, SZAB Campus, Khairpur, Pakistan

⁴Department of Mechanical Engineering, Mebran University of E & T Campus, Khairpur, Pakistan

ABSTRACT: Crop production costs have increased to an alarming level due to persistent higher inflation in agrarian based economies in the developing countries. Since water plays a vital role in crop production, therefore its enhanced availability can facilitate crop production process to considerable level. Certain studies are carried out on viability of efficient or intelligent water usage and the conversion of surface irrigation to more contemporary refined irrigation systems such as drip irrigation systems. Drip irrigation method is considered 30 to 45% more efficient to conventional surface irrigation methods. However, efficient water supply systems, such as pressurized drip irrigation systems consume more energy (by 65% to 75%) and are accompanied by release of greenhouse gases due to utilization of fossil fuels and forced circulation of water through water supply channels. Higher energy consumption and carbon emission problems can be balanced with formulation of a balanced technique based on the economic use of fuels and higher efficiency levels of the subsequent irrigated water levels. Computer models such as INFILT and SIRMOD, infiltration estimation, and irrigation simulation, which are capable of real-time optimization implementation, are used for verification of the results produced by such efficient methods. It reveals positive results due to capability of real-time optimization model to bring about significant water conservation of 2.50 ML/ha on surface irrigated farms with zero carbon emissions. Therefore surface irrigation with real time optimization can be considered a smart water management solution for improved surface irrigation performance and practices.

Keywords: Sustainability; real-time Simulation; smart irrigation; INFILT; SIRMOD

* Corresponding author: klalmuet10@gmail.com

1st IMCEET-2023/145

INVESTIGATING THE IMPACT OF BANANA LEAVES ASH AS A PARTIAL CEMENT SUBSTITUTE ON THE PROPERTIES OF GREEN AND HARDENED CONCRETE

Mashood Rehman^{1,*}, Talha Hussain²

¹ Faculty of Architecture and Town Planning, Aror University of Art, Architecture, Design & Heritage, Sukkur, Sindh

² Department of Civil Engineering, Mebran University of Engineering and Technology, Jamshoro

ABSTRACT: The material used to produce concrete as a binding agent is usually cement and it is uneconomical and unsustainable material for the environment because it releases greenhouse gases during its production and the use of silica and limestone in large quantities to produce cement reducing their natural resources. This increases the cost of production of cement and causes hazardous effects on the environment. On other hand, about 154,800 tonnes of bananas are produced in Pakistan every year, and Sindh Province accounts for 87% of that total. As a result, a lot of waste banana leaves are produced, most of which is worthless and disposed of by open burning or land filling, both of which harm the environment. Therefore, this research is conducted with the aim of determination of the effect of Partial replacement of cement with BLA produced from waste Banana leaves of a region of Sindh on fresh properties mainly workability, and hardened properties mainly compressive, tensile, and flexural strength of concrete. For this purpose, the banana leaves ash was developed by calcining Banana leaves obtained from Tando Allahyar, Sindh in a muffle furnace at 900°C for 1 hour and after calcining and cooling down, it was sieved from No.200 sieve to know its effect on properties of concrete mix. The prepared BLA was added to M25 concrete by replacing 5%, 10%, 15%, and 20% of the cement by weight in order to test its workability using a slump cone test. Additionally, 100mm x 100mm concrete cubes, 100mm x 200mm concrete cylinders, and 100mm x 100mm x 500mm prisms were prepared in order to investigate the effect of the prepared BLA on the compressive, tensile, and flexural strengths of the concrete, respectively. It was found that the addition of BLA reduces the workability of concrete, while the compressive strength of concrete cubes was higher with 15% of BLA, while tensile and flexural strength was higher for a mix containing 10% of BLA as compared to the control mix. Thus, it was concluded that 15% of BLA can be utilized as cement replacement material to produce eco-friendly, stronger, and economical concrete.

Keywords: Banana Leaves ash (BLA), Cement replacement materials (CRM), Agricultural waste, eco-friendly concrete

* Corresponding author: mustafa@bbsutsd.edu.pk

1st IMCEET-2023/146

100

Organized by: The Benazir Bhutto Shaheed University of Technology and Skill Development,
Khairpur Mirs

In collaboration with: MUET, SZAB Campus Khairpur Mirs & Sindh HEC

FABRICATION AND ENERGY ANALYSIS OF CONCENTRATED PARABOLIC TROUGH SOLAR COLLECTOR USED FOR HOT WATER GENERATION IN WINTER SEASON

Ghulam Tahir Solangi¹, Asmatullah Memon¹, Ali Mustafa Shah^{1,*}, Samiullah Khan¹, Aftab
Ahmed Sahito¹

¹The Benazir Bhutto Shaheed University of Technology and Skill Development, Khairpur Mirs

ABSTRACT: Pakistan is facing energy crisis which causes the disturbance in daily life of people as well as development and progress of the country has been badly affected. In Pakistan, major portion of energy need is fulfilled through electricity generation from fossil fuels. As fossil fuels are costly and causing negative environmental impacts. Diversification in the field of energy resources are vital for sustainable progress in energy sector. Country has plenty potential of indigenous renewable energy resources like solar, wind biomass and hydropower. Energy from solar seems to be very promising as solar energy is free of cost, environmentally friendly, available 9 to 10 hours per day almost whole year. Auspiciously, Pakistan is located in the hot tropical region of south Asia which receive high quantity of solar radiation which is approximately ranges from 4.2 kWh/m²/d to 5.54 kWh/m²/d every day, which makes Pakistan as the ideal and vital location for Solar Power Plants and other solar applications. In this research study the fabrication and energy analysis of Parabolic trough collector which run on solar energy has been carried out for the application of production of hot water. Moreover the prime focus of this research study is to generate hot water via parabolic trough system by concentrating solar radiations. It consumes approximately 43-55 minutes for 2 liters of water with normal temperature to convert in to hot water at the receiver tube side of the parabolic trough collector. Experiments of this study conducted, where water used as the working fluid and different readings has been taken for different flow rates at reflecting surfaces. Moreover, final calculated values have been tabulated and graphs plotted in order to determine efficiency and performance with different setups. Results of this study shows that aluminium foil Trough, reflecting surface gives better efficiency which is 97% efficient. It was observed that hot water with 62°C in 30 minutes achieved during winter season.

Keywords: Solar Radiation, Parabolic Trough Collector, Hot water, Energy analysis. Solar Energy, Solar Heater.

* Corresponding author: mustafa@bbsutsd.edu.pk

1st IMCEET-2023/149

PLASTIC TO ENERGY: THE WASTE PLASTIC PYROLYSIS SOLUTION

Muhamad Raheel¹, Tariq Ahmed Shaikh¹, Aftab Ahmed Soomro¹, Aftab Ahmed Sahito¹,
Asmatullah Memon^{1,*}

¹*Department of Mechanical Engineering Technology, Benazir Bhutto Shaheed University of Technology & Skill Development Khairpur*

ABSTRACT: The growth rate in economic is unsteady because of present constant usage of fossil fuels including crude oil, natural gas, and coal. However, renewable energy sources are often misused. Whereby, certain resources like plastic waste require to be matured in terms of fully developed task of economy innovation and growth have opened up to an amazing rise in the construction of overall kinds of plastic, having globally acceptance with low loss. This paper has explored the perspective of plastic recycling process. The core aims of this study is to give a comprehensive review of the pyrolysis of plastic waste gained in present recycling technology. However, the calorific significance of plastic is equivalent to the significance of the hydro-carbon petrol, even this study gives a good amount of opportunities to obtain the petrol as the output from the plastic waste. In this paper the methods of fueling waste plastic through the pyrolysis technique has been considered. After performing practiced of heating 1Kg of plastic waste yield an amount of 600ml to 750ml diesel fuel. Whereby heating of gas from 100ml to 150ml through process of changing plastic into fuel, which could reduce atmosphere CO₂ emissions by 80%. This results suggests carbon monoxide emission of plastic wastage oil is higher in comparison to diesel. However, attempts have been tried to subdue the issue of waste plastic and even dearth of fossil fuels obtained out of petrol from wastage plastic. The research paper experts to improvise the balance of environment in shape of plastic has an adverse effect on the climate. As a result, an effort has been tried to discuss the problem of wastage of plastic disposals. Therefore, the paper expects spot lightening on a durable climate for decomposing fossil fuels.

Keywords: Waste to Energy, Plastic waste, Pyrolysis, Waste recycle, Plastic bottle

* Corresponding author: mustafa@bbsutsd.edu.pk

1st IMCEET-2023/150

EFFECTS OF STYRENE BUTADIENE RUBBER AND SUPER PLASTICIZER ON THE PROPERTIES OF CONCRETE

Muhammad Abubakar Shaikh¹, Ayaz Ali^{1,*}, Ume-Habiba¹, Ghayoor Hyder¹, Khalid Hussain¹

¹*Department of Civil Engineering Technology, The Benazir Bhutto Shaheed University of Technology & Skill Development
Khairpur Mirs*

ABSTRACT: This research sought to explore the effects of SBR and SP on the fresh and hardened characteristics of concrete. Its composition of cement mixture, aggregates, water, and admixtures lend to its strength and improve its physical and mechanical qualities, allowing for it to be widely utilized in construction. SBR is frequently used to modify the physical and chemical qualities of cement and has been shown to increase the strength of mortar as well as concrete. The addition of a super plasticizer further boosts workability and strength. Tests were conducted on cement with varying levels of SBR polymer cement ratio (0%, 5%, 10%, 15%) and SP-water ratio (0%, 0.4%, 0.6%, 0.8%) to assess properties such as setting time and compressive strength. Concrete mixtures were also prepared with SBR concentrations ranging from 0-15% to target a 2175 psi strength level. Upon casting, all specimens underwent surface finishing before being kept in water for 24 hours for curing purposes before testing.

Keywords: Styrene-butadiene rubber (SBR), super plasticizer SP and initial and final setting time

* Corresponding author: kb8050335@gmail.com

1st IMCEET-2023/151

**CURRENT SOLID WASTE MANAGEMENT PRACTICES &
ENERGY RECOVERY POTENTIAL IN BBSUTSD KHAIRPUR**

Tariq Ahmed Shaikh^{1,*}, Mujeeb Iqbal Soomro¹, Danish Ali Memon¹, Aftab Ahmed Soomro¹,
Aftab Ahmed Sahito¹, Asmatullah Memon¹

¹*Department of Mechanical Engineering Technology, Benazir Bhutto Shaheed University of Technology & Skill Development Khairpur*

ABSTRACT: To mitigate the environmental and socio-economic consequences, multiple methods for recycling and waste disposal are being developed in developed countries. Consequently, providing clean water, air, and soil has become a significant challenge for developing nations. With referring to Pakistan quantitative soil, air, and waster has been deteriorating because of un appropriate Municipal Solid Waste (MSW) generation in the country. The rapid growth of population and urbanization has led to an alarming increase in MSW generation in the country. Urban areas in Pakistan are unsustainable for residents due to MSW discarding and flaming. MSW is not at all an analogous mixture but a variegated mixture of multiple ingredients like recyclable, reusable, burnable and dangerous materials. In study at hands, MSW was collected from various departments of target vicinities of public university. Furthermore, the quantification, of MSW has made with help of common methods. This research aimed to determine the proportion of each element in MSW such as paper, wood, tree leaves, grass, and garden trimmings, along with their other characteristics, like moisture content (MC), volatile matter (VM), ash content, and elemental composition of Carbon, Hydrogen, Nitrogen, Oxygen, and Sulphur (C, H, N, O, S). The study found that the daily waste generation of MSW was 141.35 kg/day. Statistical analysis results indicate that a large quantity of MSW is dumped in open environments without proper treatment. Based on the findings, it is concluded and recommended that MSW can be utilized as a significant renewable energy alternative, such as through incineration. Additionally, biological treatments like anaerobic digestion and aerobic composting should be considered instead of open dumping and burning.

Keywords: Waste to energy, MSW, Proximate analysis, Ultimate analysis, Waste recycle

* Corresponding author: tariqshaikh@bbsutsd.edu.pk

1st IMCEET-2023/152

**POTENTIAL APPLICATION OF THERMOELECTRIC MATERIAL
TO PRODUCE ELECTRICAL ENERGY FROM THE HEAT
EMITTED BY BUILDING ROOFTOP**

Imran Ali Qureshi^{1,*}, Abdul Shakoor Shaikh¹, Samiullah Khan¹, Ahmed Anas Shamsi¹

¹Department of Mechanical Engineering Technology, The Benazir Bhutto Shaheed University of Technology & Skill Development Khairpur

ABSTRACT: The thermoelectric materials have gained quite a reputation because of their ability to directly convert heat energy into electrical energy without requiring any auxiliary machine. As the need for eco-friendly and renewable energy sources continues to rise, thermoelectric materials present a hopeful opportunity to produce electricity from an energy source that was previously ignored. The utilization of thermoelectric materials on the roofs of buildings could potentially enable the capture of the significant heat generated by the sun and transform it into usable electrical power. Thermoelectric material has substantial practical implications. As there is an increasing requirement for energy-efficient constructions, thermoelectric materials may play a significant role in a more comprehensive plan to minimize total energy consumption, particularly in buildings. Additionally, the advancement of thermoelectric material technology could result in novel innovations in building materials, enhancing the sustainability and functionality of edifices. This paper tries to explore the potential of thermoelectric material, in this case Peltier Cell, to generate electricity directly from heat energy, on building roofs. The ambient temperature of the solar radiations striking the surface of the cells was noted to be 32 C. The Peltier cell of area 2.25 sq. in was used and it produced a current of 2.3 ampere and voltage of 0.05 volts (Power = 0.115 watts). It was calculated that to produce a 12.6 DV volt, which is normally required to operate DC appliances, a module comprising of minimum of 252 cells will be required. When connected in series, the module is calculated to produce the power of 28.98 watts (2.3 amp * 12.6 volt). The area occupied by one module was calculated to be 567 sq. in (3.9375 sq. ft.). The study further investigates the applicability of Peltier modules connected in parallel, to increase the current and yield more power for DC appliances. The results obtained from the calculations reveal that the potential of thermoelectric material is significant and could contribute greatly to the development of new, sustainable building technologies, particularly when applied to building rooftops in regions located in hot tropical areas. This will greatly reduce the need for conventional fossil fuels for power generation and hence help decrease the carbon footprint as well.

Keywords: Thermoelectric generator, renewable energy

* Corresponding author: mustafa@bbsutsd.edu.pk

1st IMCEET-2023/E-006

**MICROALGAE-ASSISTED MICROBIAL FUEL CELLS (MFCs) FOR
ELECTRICITY GENERATION FROM BIOWASTE**

Monika Sharma^{1,2}, Quanxin Li², Nandini Thakur^{1,2}, El-Sayed Salama^{2*}, Xiangkai Li¹

¹ MOE, Key Laboratory of Cell Activities and Stress Adaptations, School of Life Sciences, Lanzhou University, China

² Department of Occupational and Environmental Health, School of Public Health, Lanzhou University, China

ABSTRACT: Microbial fuel cells (MFCs) are a well-established technology that has enormous potential to generate bioelectricity using electroactive microbes as biocatalysts. However, the practical application of MFCs toward achieving high bioelectricity is limited by poor anodic and cathodic performance. Pure fat, oil, and grease (FOG) as a new substrate in the anode and microalgae in the cathode were added to accelerate the electrogenesis. The effect of FOG concentrations (0.1, 0.5, 1, and 1.5%) on the anode chamber was investigated. The FOG degradation, volatile fatty acid (VFAs) production through gas chromatography and soluble chemical oxygen demand along with voltage output kinetics were analyzed. Moreover, the microbial community analysis and active functional enzymes were evaluated. The maximum power and current density were observed at 0.5% FOG which accounts for 96 m Wm⁻² (8-fold enhancement) and 560 m Am⁻² (3.7-folds enhancement). The daily voltage output enhanced up to 2.3-folds with 77.08% coulombic efficiency under 0.5% FOG, which was the highest among all the reactors. The 0.5% FOG was degraded >85% within 30 days, followed by a 1% FOG-loaded reactor. The chief enzymes in β -oxidation and electrogenesis were acetyl-CoA C-acetyltransferase, riboflavin synthase, and riboflavin kinase. The identified enzymes symbolize the presence of *Clostridium* sp. (>15%) and *Pseudomonas* (>10%) which served as electrochemical active bacteria (EAB). The major metabolic pathways involved in electrogenesis and FOG degradation were fatty acid biosynthesis and glycerophospholipid metabolism. Utilization of lipidic waste (such as FOG) in MFC could be a potential approach for simultaneous waste utilization and energy generation.

Keywords: Microalgae; Electrogenesis; Microbial community; Functional enzymes

* Corresponding author: salama@lzu.edu.cn, xkli@lzu.edu.cn

1st IMCEET-2023/E-007

ANAEROBIC DIGESTION (AD): MAXIMIZING THE BIOGAS PRODUCTION FROM LIPIDIC-WASTE VIA ADDITIVES

Nandini Thakur^{1,2}, Wenbo Kong², Monika Sharma^{1,2}, El-Sayed Salama^{2,*}, Xiangkai Li¹

¹ MOE, Key Laboratory of Cell Activities and Stress Adaptations, School of Life Sciences, Lanzhou University, China

² Department of Occupational and Environmental Health, School of Public Health, Lanzhou University, China

ABSTRACT: The lipidic substrates such as duck cooking oil (DCO) and fat, oil, and grease (FOG) have high biogas potential and can increase the active microbes with simultaneous alleviation of environmental contamination. However, the utilization of high loading of lipidic substrates causes microbial inhibition and hinders biomethanation which requires supplementation of additives. Thus, the biogas/biomethane, lipid degradation, volatile fatty acids (VFAs), microbiome, and functional enzymes were investigated under mono-digestion and with various levels of combined additives. The biomethane and VFAs were analyzed using gas chromatography (GC-9700 plus) equipped with a thermal conductivity and flame ionization detector, respectively. For the bacterial and archaeal biodiversity, 16S rRNA variable region (V3-V4) was used using 519F/806R and Arch-349F/Arch-915R primers. The addition of 1.5% DCO and FOG enhanced the biogas production by >5-folds along with 76.87% and 69.76% of lipid degradation, respectively. Followed by this, different concentrations of calcium-modified (Ca-M) biochar ranging from 2 to 10 g L⁻¹ were amended in 2% FOG-loaded reactors to combat microbial inhibition. The FOG was degraded upto 81.91% resulting in 9.03-fold higher biomethane production with 10 g L⁻¹ Ca-M biochar. Acidogenesis and methanogenesis efficiencies were induced upto 53.31% and 67.91%, respectively, due to the enrichment of fermentative bacteria (such as Clostridium >50%, Sporosarcina >18%, Cellulosilyticum >8%) and archaea (such as Methanospaera >49%). Co-A ligase, short-chain acyl-CoA dehydrogenase, acetate kinase, and formylmethanofuran dehydrogenase, representing mixed hydrogenotrophic and acetoclastic methanogenesis were also incremented. The co-additives (such as Ca-M biochar) can be added to overcome microbial inhibition and facilitate biomethanation at high FOG concentrations.

Keywords: Lipidic-waste; Additives; Biomethane kinetics; Microbial community; Functional enzymes

* Corresponding author: salama@lzu.edu.cn, xkli@lzu.edu.cn

1st IMCEET-2023/E-008

**SEAWEEDS (SWS): AN OPTIMIZATION STUDY FOR
PRETREATMENT OF SWS BIOMASS FOR BIOETHANOL
PRODUCTION AS 3RD BIOFUEL GENERATION**

Yulu Yang¹, Yang Yang¹, Wenbo Kong¹, Nandini Thakur^{1,2}, El-Sayed Salama^{1,*}

¹*Department of Occupational and Environmental Health, School of Public Health, Lanzhou University, China*

²*MOE, Key Laboratory of Cell Activities and Stress Adaptations, School of Life Sciences, Lanzhou University, China*

ABSTRACT: The global trend of seaweed biomass utilization for biofuels generation is increased due to their high biochemical and energy content. Thus, in this study, *Ulva* sp., *P. australis*., and *Chondrus* sp. were selected based on their high carbohydrate content (>50%) to optimize pretreatments by response surface methodology (RSM). The independent variables were biomass loading, acid concentration, and pretreatment time. The optimum operating conditions were evaluated through the fit summary analysis, model summary statistics, fit statistics, ANOVA analysis, and model graphs. The optimal biomass loading, acid concentration, and time were 10% (w/v), 1.5% (v/v) and 90 minutes, respectively. The reducing sugar content of *Ulva* sp. increased up to 262.41 mg/g biomass under optimized conditions. The correlation among independent variables with experimental and predicted responses also showed significance ($p < 0.0001$). The coefficient of variation (<10%) indicated that non-experimental factors have minor influence on the results, and the model has significant experimental stability. This study demonstrated that the optimized pretreatment conditions can be combined with different fermentation strategies to enhance bioethanol yield.

Keywords: Seaweeds; Acid pretreatment; Bioethanol; Response surface methodology;

Box-Behnken design

* Corresponding author: salama@lzu.edu.cn

1st IMCEET-2023/E-009

**CURRENT ADVANCES IN BIMOLECULAR TRANSITIONS AND
LIPID SYNTHESIS IN MARINE MICROALGAE: APPLICATIONS
TOWARDS ENVIRONMENTAL AND HUMAN HEALTH**

Zhenni Su¹, Quanxin Li¹, Min Zhang¹, Monika Sharma^{1,2}, El-Sayed Salama^{1,*}

¹*Department of Occupational and Environmental Health, School of Public Health, Lanzhou University, China*

²*MOE, Key Laboratory of Cell Activities and Stress Adaptations, School of Life Sciences, Lanzhou University, China*

ABSTRACT: Enhancement of growth rates and biochemical composition of marine microalgae are necessary for biofuel generation and other applications. Thus, the aim of the current review is to collect the recently published data on marine microalgae. Followed by cultivation conditions (such as media, light, temperature, pH, and cultivation time) of marine microalgae which are responsible for variations in biochemical composition (including carbohydrates, lipids, and proteins) are presented. The strategies for the enhancement of marine microalgae productivity in terms of biomass, and biochemical composition are discussed. The desaturase/elongase pathway for fatty acids (including oleic acid, eicosapentaenoic acid, and other acids) production is elucidated. The recent research on lipid metabolism in marine microalgae and the advantages of genetic engineering are deliberated. The low lipid content in marine microalgae could be enhanced by targeting the microalgal cell factories under the application of genetic engineering and synthetic biology. The genetic modification strategies combined with omics under stress conditions to enhance the potential of marine microalgae are highlighted. The applications of marine microalgae for environmental (i.e., pollutant removal, biodiesel, and/or other biofuel generation) and human health (such as supplements, pharmaceuticals, and other value-added products) are also emphasized.

Keywords: Marine microalgae, Metabolic pathway, Synthetic biology, Biofuel generation

* Corresponding author: salama@lzu.edu.cn