ICMIEE 2018

5th International Conference on Mechanical Industrial and Energy Engineering

23-24 December, 2018
Khulna, Bangladesh.

Organized by :

Faculty of Mechanical Engineering
Khulna University of Engineering & Technology (KUET)

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Conference Digest

ICMIEE

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23-24 December, 2018, Khulna, BANGLADESH

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Faculty of Mechanical Engineering
Khulna University of Engineering & Technology (KUET)
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Preface

The faculty of Mechanical Engineering of Khulna University of Engineering & Technology is going to organize the 5th International Conference on Mechanical, Industrial and Energy Engineering ICMIEE 2018, during 23-24 December 2018 at KUET to encourage the faculties and researchers of this University and also from other Universities and organizations. The field of mechanical, Industrial and Energy, leather and Textile Engineering has great importance to the development of industries. It will bring great opportunities for both academician and industry to share their research outcomes. Around 150 researchers and Engineers from Bangladesh, Malaysia, China, Japan, Saudi Arabia, Australia, UK, Croatia, Canada, and USA will attend the conference and will present 125 technical papers at different technical sessions in this conference.

Eminent researchers from various countries will deliver their valuable keynote speeches in the conference. This will make a bridge among the researchers and the experts of the industry, which is essential to meet the challenge of 21st century. This conference will provide a common platform for the participants throughout the world to exchange their views and share their recent ideas in the broad field of Mechanical, Industrial, Energy, Leather and Textile Engineering.

I express my gratitude to the faculty members of Mechanical Engineering Faculty for their spontaneous support to organize the conference. I would like to thanks Prof. Quazi Sazzad Hossain, Vice-Chancellor, KUET for giving us logistic support. I would also like to thanks to the reviewers and authors for their contribution in the conference. It is my pleasure to congratulate and to express gratefulness to the sponsors for their financial help in this conference.

Publication Committee, ICMIEE 2018
Faculty of Mechanical Engineering
Khulna University of Engineering & Technology

Message from UGC Chairman

It is a matter of Great Pleasure to know that the Faculty of Mechanical Engineering, Khulna University of Engineering & Technology (KUET) is going to organize the 5th International Conference on Mechanical Industrial & Energy Engineering (ICMIEE 2018) on 23-24 December 2018. On this auspicious occasion, I would like to extend my heartiest congratulations and felicitations to all concerned with the conference

.

The Faculty of Mechanical Engineering with very broad area has been contributing to the national development since long back through the remarkable progress of industry and products in its deferent branches. To keep abreast with this progress, efforts are going on and researchers, Academicians and scientists are eager to share their views and ideas. I earnestly believe that the conference will be able to create momentum, pace with great enthusiasm among the research communities to share their innovative ideas. Therefore, it will foster the growth of significant research outcome.

I believe this year's conference will also be another successful event with the involvement of researchers from home and abroad like previous ones. I am confident that the aim of sharing research ideas and result will be fulfilled through the sincere and hard work of the ICMIEE 2018 authorities.

I wish the conference a grand success.

10/12/18

Professor Abdul Mannan
Chairman
University Grants Commission of Bangladesh

Message from VC

I am very pleased to know that the 5th International Conference on Mechanical Industrial and Energy Engineering (ICMIEE 2018) will be held on 23-24 December 2018 at Khulna University of Engineering & Technology campus organized by faculty of Mechanical Engineering. This is the 5th time in a row that such dignified conference is going to be held in this university by the same faculty.

At present, the faculty of Mechanical Engineering comprises of seven departments, namely Mechanical Engineering, Industrial Engineering and Management, Energy Science and Engineering, Leather Engineering, Textile Engineering, Chemical Engineering and Mechatronics Engineering. In addition, Institute of Environment and Power Technology (IEPT) has started its activities since 2016.

As the different branches of Mechanical Engineering contribute greatly in the advancement of technologies, a research platform coverage of all disciplines is required for sustainable development. So, ICMIEE 2018 can contribute in this thrusting dimension creating an effective platform for young and experienced researchers and professional experts sharing recent ideas and innovations. Moreover, from such conference both the researcher and industrial communities will be benefited mutually from the research outcomes. I am happy to learn that the conference has attracted significant number of contributors and delegates from different parts of the world. I must appreciate the decision of the technical committee of ICMIEE 2018 to get the papers reviewed by renowned experts in the relevant fields maintaining high scientific standard which definitely improve the quality of the papers as well as the scientific standard of the conference.

It is also my pleasure to congratulate the authors, paper presenters, sponsors, supporters, participants and all other members for their initiatives, contribution and support to make the event a lively and remarkable. Special thanks are indispensible to University Grants Commissions, Bangladesh for supporting this event. I do believe that participants will enjoy this great event and return home with sweet memories.

Finally, I would like to take the opportunity to congratulate all the members of various organizing committees for their hard works to arrange such an excellent event and hope that it will take place regularly.

Prof. Dr. Quazi Sazzad Hossain
Vice-Chancellor
Khulna University of Engineering & Technology

Massege from Organizing Chairman

It gives me great pleasure that Faculty of Mechanical Engineering, Khulna University of Engineering & Technology (KUET) is going to organize an international conference ICMIEE 2018 in Khulna, Bangladesh. The objective of this conference is to bring together both the policy makers and the researchers with the aim of exchanging and sharing the ideas, experiences and innovations on the solution on national problems with advanced technologies. I am confident that the outcome of the conference will be highly beneficial to the professional and scientific community not only for the development and advancement of new technology at home and abroad, but also for the various Asian and other developing countries.

I am greatly indebted to the members of the organizing committee for their relentless efforts in arranging the details of the conference. I would like to deliver special thanks to the authors of the technical pears as without their valuable and enthusiastic participation, the conference itself would have not been possible. I would like to thank the sponsoring organizations for their generous support.

I am also thankful to my colleagues, members of various committees, participants and researchers for their cooperation and supports to make this event successful. My sincere thanks goes to sponsoring organization whose cooperation and supports make it successful.

I wish every success of this International Conference.

Prof. Dr. Mihir Ranjan Halder
Chairman ICMIEE 2018
Faculty of Mechanical Engineering
Khulna University of Engineering & Technology

Message from Organizing Secretary

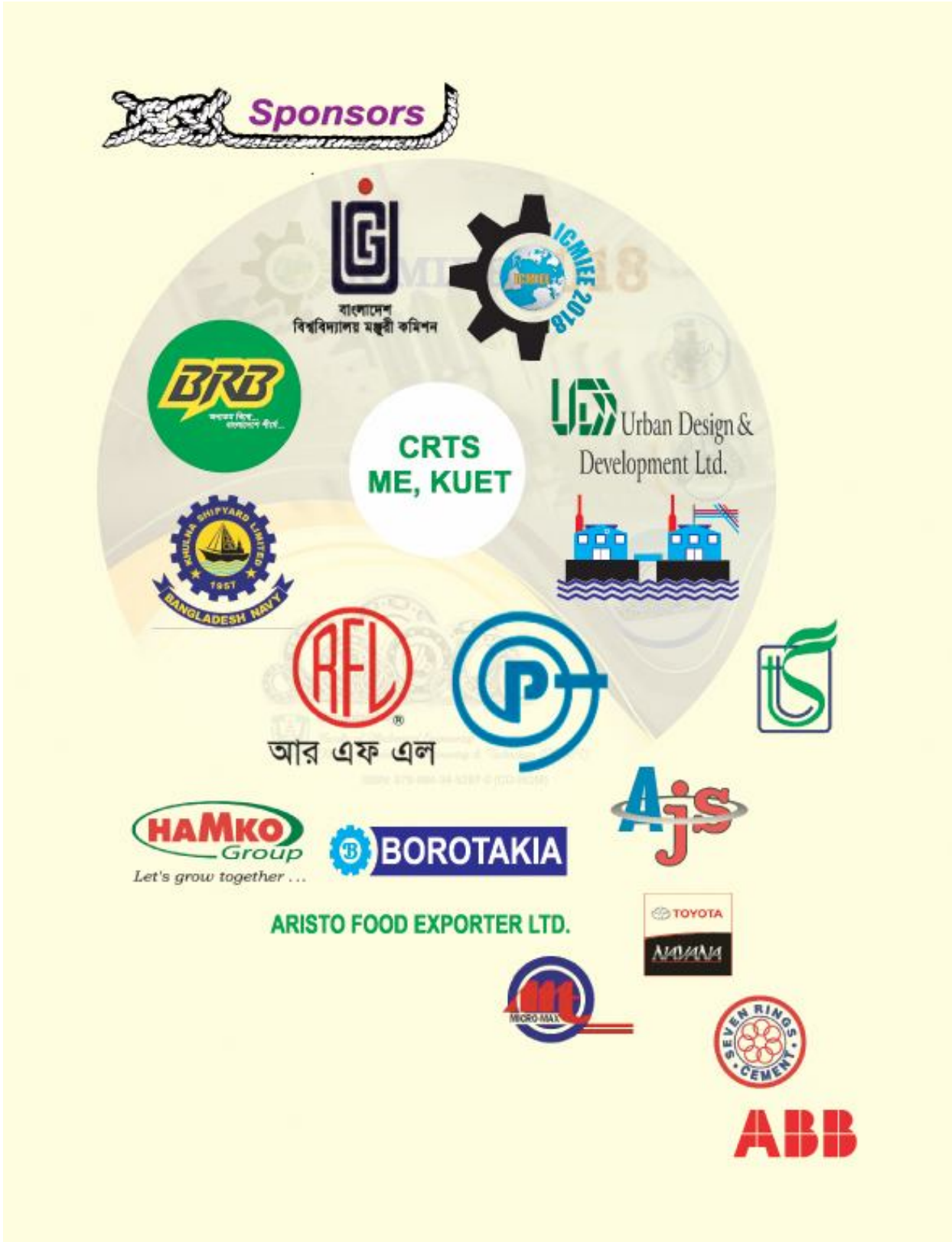
In my capacity as the Secretary of the Organizing Committee, I am pleased and greatly honored to welcome you to the 5th International Conference on Mechanical Industrial and Energy Engineering at Faculty of ME, KUET, Khulna, Bangladesh. I believe we have chosen a venue that guarantees a successful technical conference amid the culture and scenery of the industrial city Khulna.

We are very thankful to the International Journal of Mechanical and Allied Engineering for agreeing to publish the elected presented papers in the coming publication. The generous financial supports from UGC, UDDL, BRB, Hamko Group, Khulna Shipyard, RFL, KPCL, Precisa Techno Trade, AJS, BCC, Spintex, Navana Toyota, ABB, Seven Ring Cement, Micro-Max and Aristofood have greatly assisted the conference to come into existence.

Organization of such pretentious conference would have not been possible without the true blue efforts of many individuals. We are indebted to the honorable Vice-Chancellor of KUET for his continuous supports and guidance throughout the conference. We are very fortunate for having few world-renowned researchers as our keynote speakers. ICMIEE 2018 is obliged to hundreds of faculty members and volunteers who contributed as the International Advisory Committee, Technical Committee, Local Advisory Committee, Secrariat and Reviewers to the various processes that make up the conference. We would like to express our gratitude to the ICMIEE Chair for his dram to organize an international-standard conference at KUET. We are also thankful to the Chair of 5th ICMIEE who shared his technical expertise that brings the ultimate success of the conference.

We hope that you will find this program interesting and thought-provoking and that the conference will provide you with a valuable opportunity to renew old friendship make new friends and share ideas with other researchers, students, developers, and practitioners from institutions around the world. We also hope that you will join as and take extra time to enjoy the sight-seeing tour of World's largest Mangrove Forest.

Prof. Dr. Shahidul Islam
Secretary, ICMIEE 2018
Faculty of Mechanical Engineering
Khulna University of Engineering & Technology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ICMIEE18-KN01

Nanomembranes for Sustainable Fresh Water Production

Md. NizamUddin, Mohammed Alamir,Harish Muppalla, Muhammad MustafizurRahman and Ramazan Asmatulu
Dept. of Mechanical Engineering, Wichita State University, 1845 Fairmount Street, Wichita, Kansas 67260-0133, **USA**

ABSTRACT

The scarcity of pure drinking water has been one of the major humanitarian challenges in the globe. The world population growth, urbanization, and depleting water resources are deteriorating the water quality and global climate change hasalsointensified this crisis especially in countries with arid and semi-arid regions. The concern is drastically increasing and therefore scientists and engineers are challenged with urgently developing viable solutions of this problem in the near future. The development of a sustainable, cost-effective, reliable, efficient and stable water collection materials and methods for continuous fresh water production is crucial for many regions of the world. Among many other options, nanoscale membranes seem to be quite attractive and very promising option to solve the global water problem due to their low energy cost and simple operational processes to produce clean water. Most natural sources of water contain high salt concentration and other contaminants. Nanotechnology has played an important role in developing cost-effective and efficient processes for purification and use of this natural water. In addition, water can be efficiently collected from atmospheric fog and filtered using nano-membranes without using any large infrastructure. The nanotechnology-based collection systems are unique because of the fine structures of the nano-membranes with tunable properties. The produced water can be used for drinking, agriculture, gardening, medical, industrial, and other purposes. The present study investigated the availability and practical use of nanomaterials and membranes for the collection and production of pure drinking water from various natural sources. Also, some important recommendations are made based on our research results and current practices of nanotechnology applications in the water industry for pure water production.

Keywords: Nanomaterials, Water Collection, Water Purification, PAN Nanofiber, Graphene, Desalination.

ICMIEE18-KN02

Aerodynamics and Hydrodynamics in Sports

Firoz Alam[1], Harun Chowdhury[1]and Hazim Moria[2]
[1]School of Aerospace, Mechanical and Manufacturing Engineering, RMIT University, Melbourne, VIC 3083, **AUSTRALIA**
[2]Department of Mechanical Engineering Technology, Yanbu Industrial College, Yanbu, **SAUDI ARABIA**

ABSTRACT

Aero/hydrodynamics plays a vital role in speed sports (athletes, athletes' outfits, sports balls, sports equipment, etc.). Sports balls (spherical - golf, cricket, tennis, soccer, baseball, softball, etc. and oval shape - rugby, American football, Australian football), sports garments (swimsuits, ski jumping & alpine skiing suits, cycling skin suits, skating suits) are affected by aerodynamic and hydrodynamic behaviour of fluids (air and liquids). The aero/hydrodynamics dictates the curved flight path of a soccer, tennis, cricket, baseball or golf ball and the course of a surfboard and sailboat through water. It affects speed, motion (position and placement) and ultimately athlete's performance. Ignoring the effect of aerodynamic and hydrodynamics, it is almost impossible to achieve the desired success in any competitive speed sports. Due to stiff competition, the outcome of most sports aero/hydrodynamics research work undertaken by commercial organisations as well as individual sports teams/organisations are kept in-house and scant information is available in the public domain. The RMIT University's Sports Aerodynamics Research Group has been active in aerodynamics and hydrodynamics research related to some popular speed sports. This paper highlights some research work on sports aerodynamics and hydrodynamics undertaken at RMIT University.

Keywords: Sports aerodynamics, Cycling, Ski jumping, Swimming.

ICMIEE18-KN03

Acoustic Emission Measurement as Adaptive Biomarker in Integrity Analysis of Knee Osteoarthritis

T I Khan[1]*, S Idei*[2] *and T Yoshimura*[3]
[1]Department of Advanced Technology Fusion, Saga University, Saga 840-8502, **Japan**
[2]Departmentof Orthopedic Surgery, Saga University, Saga 849-8501, **Japan**
[3]Daishin co., Ltd, Higashioka-machi, Saga 840-2223, **Japan**

ABSTRACT

Acoustic emission (AE) technique has been applied as an adaptive biomarker for evaluating the disorder of knee joint. Integrity analysis of knee joint involves a detail study of several anatomical parts of knee joint like bones, cartilage, tendons etc. Any damage of these anatomical parts causes several knee diseases like osteoarthritis (OA). The incidence of knee OA increases due to some damages in the cartilage of knee. The major concern of this disease is the incurability at its matured stage. However, early detection for adopting appropriate measures can reduce the risk of this disease. The present investigation focuses on the dynamical behavioral characterization of knee joint for its integrity analysis with AE parametric features. AE signals have been collected from participants with different ages healthy people as well as OA patients. Data have been collected and clarified according to the guidelines of the ethics committee of Saga University, Japan.

Keywords: Integrity of Knee Joint, Osteoarthritis, Acoustic Emission, Biomarker.

ICMIEE18-KN04

Engineering the Reliability into Products under Harsh Environments

Sabuj Mallik
School of Mechanical Engineering and the Built Environment, University of Derby, Derby, DE22 3AW, **UK**.

ABSTRACT

In the current global competitive market, it is crucial to make highly reliable products. This, in turn, will reduce product cost by having fewer warranty claims and low repair costs. Indeed, reliability is of increasing importance for electronics systems operating in harsh environments. Some examples are electronic control units (ECUs) used for automotive engine controls (automotive) and the electronic telecommunication systems used at the subsea level (telecommunication). The ban of lead from electronic products was a major step towards a greener environment. This however brought in new challenges, especially with the reliability of lead-free solder materials. This talk will explore some research studies on the reliability of electronics packaging, with a special focus on lead-free solder joints. It is indeed very important to ensure that solder joints are reliable for the expected product lifetime as they are the weakest parts of an electronics assembly. The talk will shed some light on how various experimental and simulation research studies helped to understand, characterize and predict solder joint behaviors under severe operating conditions.

Keywords: Product, Reliability, Solder joint, Harsh Environments

ICMIEE18-KN05

Non-Singular Second Order Terminal Sliding Mode Incorporating Time Delay Estimation for Uncertain Exoskeleton Robot

Brahim Brahmi[1,*], *Mohammad Habibur Rahman*[2], *Maarouf Saad*[1] *and Abdelkrim Brahmi*[1]
[1]Département de génie électrique, École De Technologie Supérieure, Montréal (QC), **Canada**
[2]Mechanical /Biomedical Engineering Department University of Wisconsin-Milwaukee, **USA**

ABSTRACT

Advanced robotic technology has become an important component in various medical specializations, including rehabilitation treatment such as physiotherapy. Robot aided rehabilitation is a new practical approach created to provide intensive therapy that typically required an important effort by the therapist in conventional rehabilitation. Robot aided rehabilitation is used to assist patients such as stroke victims while saving the therapist's time. This treatment also aims to help the patient in recovering from their lacking functional capability, obtaining new skills, and increasing their quality of life. In addition to the complex design of this kind of robots, the collaboration with humans who suffer from an uncontrollable upper limb makes the robot subject to many uncertain dynamics which can influence the performance of the robot. This paper presents a tracking control by proposing a new Non-Singular Terminal Second-Order Sliding Mode Control incorporating Time Delay Estimation implemented to an exoskeleton robot with dynamic uncertainties and unknown bounded disturbances. The success of the second-order sliding mode is due to its attractive features of accuracy, attenuation of chattering and fast convergence. However, its dilemma is that the unknown dynamics of the exoskeleton robot and external disturbances generated by its different wearers can be magnified by the second derivative of the switching surface, which drives to the instability of the exoskeleton system. Applying Time Delay Estimation will approximate the uncertain dynamics while overcoming the main restriction of the second-order sliding mode. The stability analysis is formulated and established based on the Lyapunov function. Experimental results with two healthy subjects validate the effectiveness of the suggested control.

Keywords: Rehabilitation Robot, Time Delay Estimation, Second-Order Sliding Mode Control, passive assistive motion.

ICMIEE18-104

The Effect of Swirl on Array of Turbulent Impinging Jets

Sudipta Debnath, Md Habib Ullah Khan, Zahir U. Ahmed and Md. Mahmodul Alam
Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna-9203,BANGLADESH

ABSTRACT

Impinging jets are widely used for their effective heat and mass transfer for several decades. Arrays of jet impingement have also been studied before due to its practical relevance to electronics cooling. A number of jet variations and jet-to-jet orientations have previously been studied, mainly to further improve the magnitude and uniformity of heat transfer. In recent years, swirling jets has also gained interest in heat transfer application due to their inherent mixing and spreading characteristics, which is believed to be an improvement on overall heat and mass transfer. As such, this paper numerically investigates an array of circular jets with and without swirl that impinges vertically onto a flat surface located at a fixed vertical distance H = 2D and at Reynolds number equals to 11,600, where D is the nozzle diameter. As the entire was symmetric, only quarter of the model was constructed for numerical analysis to save computational cost. In this case, numerical calculations were done via commercial software package ANSYS Fluent using SST k-ω turbulence model. Inlet conditions were taken from experimental data. The jet flows were in downward direction and gravity was not considered. This paper also compares numerical predictions with previously published literature for non-swirling and swirling jets.

Keywords: Swirl jet, Impingement, Turbulence, Heat transfer, CFD.

ICMIEE18-105

Design, Construction and Performance Test of a Box Type Solar Cooker

Al Aman, Syed Istiaq Mahmud, Md. Nawsher Ali Moral, Jamshedul Islam and Shahinur Rahman
Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna-9203,BANGLADESH

ABSTRACT

Solar energy is that produced by the sun's light. It is one of the largest renewable resources which isused for various domestic and industrial purposes like cooking, dehydration, drying, heating power generation etc. and available almost everywhere. The paper provides information about the collection of solar energy by a box type solar cooker. Solar cooker retains heat from the sun and focus it in a container that holds the food and traps the gathered heat. Capturing and thermal conversion are accomplished by the greenhouse effect, thermal conversion is accomplished with a material that absorbs solar energy and thereby increases its own internal energy. A cover system consisting of one or several layers of materials such as glass, which transmit the solar radiation but do not transmit thermal radiation the reflected light is either absorbed by other materials within the space or because it doesn't change wavelength, passes back out through the glass. The maximum temperature inside the cooking pot was found to be 114^{o} C with no load condition at a radiation level of 223-313 W/m^{2}.

Keywords: Solar Cooker, Solar Energy, Thermal Conversion, Greenhouse Effect.

ICMIEE18-107

Design, Simulation, and Economic Analysis of an Optimal Mini-grid Solar-Fuel Cell Hybrid Power Generation System for a Remote Island of Bangladesh

Sk. Suzauddin Yusuf[1], Md. Mahmodul Alam[2], Md. Hasan Ali[3] and Nirendra Nath Mustafi[4]
[1,2] Department of Mechanical Engineering, Bangladesh Army University of Science and Technology, Saidpur Cantonment-5311, Saidpur, BANGLADESH
[3]Department of Industrial and Production Engineering, Bangladesh Army University of Science and Technology, Saidpur Cantonment-5311, Saidpur, BANGLADESH
[4]Department of Mechanical Engineering, Rajshahi University of Engineering and Technology, Rajshahi-6204, BANGLADESH

ABSTRACT

It is the international trend to promote renewable energy, as part of energy security as well as greenhouse gas emission reduction. Wind and solar energies can be used to supplement the conventional energy sources predominantly in remote coastal localities of Bangladesh. Feasibility study of renewable resources of Kutubdia, an off-grid remote island, is presented in this paper. Purpose of this study is to design, simulation, and economic analysis of a stand-alone optimal mini-grid Solar-Fuel cell hybrid power generation system in a remote island of Bangladesh to satisfy the energy demands in a sustainable way by HOMER ENERGY software. Three Fuel cell are added to ensure uninterrupted power supply due to the intermittent nature of renewable resources. Optimum size of different components, electrical load with a certain random variability, fraction of renewable energy, excess electricity, performance of its different components, environmental impacts, cost of energy(COE),net present cost(NPC), annualized cost are analyzed in this paper.

Keywords: Hybrid energy system; Mini-grid; Renewable energy; Fuel Cell; Environmental impact; HOMER optimizer.

ICMIEE18-109

Boundary Layer Flow of Micropolar Fluid over a Stretching Conical Surface with Magnetic Effect

M. Ali[1], M. A. Alim[2], R. Nasrin[3] and Md. Delowar Hossain[4]
[1, 4] Dept. of Mathematics,Chittagong University of Engineering & Technology, Chittagong-4349, BANGLADESH
[2, 3]Department of Mathematics, Bangladesh University of Engineering & Technology, Dhaka-1000, BANGLADESH

ABSTRACT
Similarity solution of unsteady forced convection magnetohydrodynamic boundary layer flow and heat transfer over a porous stretching cone are analyzed. The governing partial differential equations are transformed into ordinary differential equations by using local similarity transformations. The transformed equations are solved numerically subject to the boundary conditions by using Nachtsheim-Swigert iteration technique along with the 4th order Runge-Kutta integration scheme. The numerical results are checked against previously published work for special cases of the problem in order to access the accuracy of the numerical method and found to be in good agreement. The results indicates that the fluid velocity decreases for increasing values of magnetic parameter, porosity parameter and unsteadiness parameter but the reverse results arises for pressure gradient parameter, material parameter and stretching ratio parameter. The heat transfer rate decreases for increasing values of stretching ratio parameter, material parameter, pressure gradient parameter but increases for magnetic parameter, unsteadiness parameter, porosity parameter, Prandtl number and wall temperature parameter. The numerical results are presented graphically and also in tabular form.

Keywords: MHD, Microrotation, Pressure gradient, Stretching.

ICMIEE18-110

Effect of Nano Particle and Aspect Ratio in Natural Convection Heat Transfer in a Rectangular Enclosure: A Numerical Analysis

Md. Shariful Islam and Mohammad Ilias Inam
Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna-9203,BANGLADESH

ABSTRACT
This numerical study investigates the natural convection heat transfer characteristics of water-based nanofluid in a rectangular enclosure. Nanofluid contains copper as nanoparticle. The effect of volume fraction of particle (φ) and Aspect ratio (A) have been studied in this numerical study. A series of Direct Numerical Simulation (DNS) have been conducted into the range of $0 \leq \varphi \leq 0.1$ and $0.5 \leq A \leq 2.0$ at fixed Rayleigh Number, $Ra = 5 \times 10^6$. A Commercial software ANSYS Fluent v16.1 (student version) has been used for these simulations. These numerical results demonstrate that the heat transfer rate increases almost linearly with respect to the particle volume fraction, however Nusselt number (Nu) decreases. Numerical results also demonstrate that heat transfer rate increases with respect to Aspect ratio up to $A = 1$, after that it starts to decrease. .

Keywords: Convection, Aspect Ratio, Nanofluid, Volume fraction, DNS.

ICMIEE18-111

Implementation of 9S Approach in a Jute Industry: A Case Study

Md. Sumon Rahman[1], Md. Ariful Islam[2], Md. Tahiduzzaman[1] and Md. Shohanur Rahman[1]
[1]Department of Industrial and Production Engineering,Jessore University of Science & Technology, Jessore-7408,BANGLADESH
[2] Business Administration Discipline, Khulna University, Khulna - 9208,BANGLADESH

ABSTRACT
Productivity improvement is one of the foremost intentions of any manufacturing industry. This productivity may fall due to various non-value-added activities. In this study, implemented "9S" is actually an extension in basic and conventional "5S" (Sort, Set in order, Shine, Standardize and Sustain) system which is a Japanese system for overall organizational adjustment and good maintenance of places in a selected jute industry (Platinum Jubilee Jute Mill) which is situated in Khulna, Bangladesh. Authors have extended this basic 5S system by incorporating Safety, Spirit, Simplicity and finally Skill. It creates a dynamic environment where improvement efforts in safety, quality, cost, delivery and creativity are heartened with the participation of all employees. The purpose of the study is to improve productivity by implementing the 9S approach in a new manner of 5S. After proper implementation of 9S in selected jute industry the productivity improved from 1477.63 tons to 1837.04 tons of jute product.

Keywords:9S, Productivity, Jute product, Case Study.

ICMIEE18-113

Numerical Investigation of Laminar Convective Heat Transfer and Friction Factor of a Pipe by Using Al_2O_3-Water Nanofluid

Md. Insiat Islam Rabby, S.A.M. Shafwat Amin, Sazedur Rahman and A.K.M Sadrul Islam
Department of Mechanical Engineering, Military Institute of Science & Technology, Dhaka,BANGLADESH

ABSTRACT
The Numerical study of laminar convective heat transfer of aluminum oxide (Al_2O_3) - water nanofluid for the developed region through a plain tube is presented. The second order single phase energy equation, mass and momentum equation are solved by using finite volume method with the ANSYS FLUENT 16 software. The plain pipe's diameter is 5mm and length is 750mm. Aluminum oxide (Al_2O_3) nanoparticles with different volume fraction (1% - 5%) using with water which is considered as the base fluid are analyzed for a range of Reynolds number from 100 to 1400 at constant heat flux 500 W/m^2 at the tube wall. The result revels that for increasing the Reynolds number the Nusselt number and heat transfer coefficient are increased linearly and friction factor decreased linearly in the developed region for both water and Al_2O_3-H_2O nanofluid. At constant Reynolds number, by increasing the volume fraction of Al_2O_3nanoperticles from 1% to 5% the value of Nusselt number increased rapidly from 0.27% to 15%, heat transfer coefficient increased 7.2% to 31.5% and friction factor increased very little from 0.1% to 2%.

Keywords: Convective heat transfer, Friction factor, Nanofluids, Nanoparticles volume concentration, Thermal conductivity.

ICMIEE18-120

Significance of Cotton Cultivation to Keep Sustainable RMG Sector in Bangladesh

Md. NurUddin, Nayan Chandra roy, Md. Delwar Hassain and Md. Abdur Rahim
Department of Textile Engineering, Dhaka University of Engineering & technology,DUET-1707, BANGLADEH

ABSTRACT

The root (backward linkage) of RMG sector is fiber and cotton is the major fiber crop. The textile industry of Bangladesh predominantly depends on imported cotton. Annual demand is approximately 7 million bales (480 lbs. or 218 kg per bale) where, Bangladesh produces only 0.16 million bales in a year, which is less than 3% of the total requirement in spite of being agriculture dependent country. RMG sector is being contributed more than 80% of the total export earnings. This study illustrates that how we can reduce dependency on imported cotton and save the partial imported cost. To keep sustainable RMG sector, Bangladesh should cultivate cotton as well as reduce over dependency on imported cotton. In a year, more than $3 billion is being spent to import cotton. If we can produce 1 million of bales in 2,42,000 hectares of land then we can save about 12% of total imported cotton, along with, $279 million can be saved.

Keywords: Backward Linkage, Cotton Cultivation, Sustainable RMG Sector, Saving imported cost.

ICMIEE18-125

CFD Study on Aerodynamic Effects of NACA 2412 Airfoil as Rear Wing on a Sports Car

Shamudra Dey[1]and Ranabir Saha[2]
[1]Department of Mechanical Engineering, Shahjalal University of Science & Technology, Sylhet, BANGLADESH
[2]Dept. of Mechanical Engineering, Bangladesh University of Engineering & Technology, Dhaka, BANGLADESH

ABSTRACT

In the present research, an aerodynamic effect of NACA 2412 airfoil as rear wing on a sports car has been investigated using Computational Fluid Dynamics (CFD) approach. The sports car has been modeled in the commercial software SOLIDWORKS 2016. Two different types of simulations were run: one for the flow around a simplified high speed sports car model with a rear wing, which is actually a NACA 2412 airfoil and the other for the flow without using a rear wing. The analysis has been carried out in ANSYS 15.0 FLUENT using k-epsilon model and for the velocity condition of 60 m/s. The effect of rear wing has been visualized from the aerodynamics perspective. Graphs of drag and lift coefficients and figures of velocity streamline, pressure distribution, Turbulence Kinetic Energy for both models have been discussed and compared. The detail of the aerodynamic study has been presented in the paper.

Keywords: Computational Fluid Dynamics, Rear wing, Sports car, Lift, Velocity streamline.

ICMIEE18-128

Recovery of Liquid Fuel through Thermal Pyrolysis of Medical Waste (Waste Syringe) in a Batch Reactor

Adnan Abedeen[1],Uday Som[2], Md. Shameem Hossain[1], Farzana Rahman[3], Md. Rezaul Karim[4] and Md. Moniruzzaman[5],
[1]Department of Energy Science and Engineering, Khulna University of Engineering and Technology, Khulna- 9203, BANGLADESH
[2]Department of Chemical Engineering, Jessore University of Science & Technology, Jessore-7408, BANGLADESH
[3]Department of Physics, Jahangirnagar University, Savar, Dhaka, BANGLADESH
[4]Dept. of Chemical Engineering, Z. H Sikder University of Science & Technology, Shariatpur, BANGLADESH
[5]Designated Reference Institute for Chemical Measurements, Bangladesh Council of Scientific & Industrial Research, Dhaka,BANGLADESH

ABSTRACT

Various types of plastic materials are important items of medical waste one of which is syringe wastage covers an important fraction of plastic medical waste. These plastic syringes have a great potentiality to be used as liquid or gaseous fuel as well as source of hydrocarbon. High density Polyethylene and Polypropylene are the main components of syringes. The pyrolysis process was accomplished in a batch reactor. Gas Chromatography-Mass Spectrometry and Fourier Transform Infra-Red Spectroscopy analysis of pyrolysis liquid were carried out in this study which specified the presence of aromatic compounds, alkenes and alkanes. The chemical and physical properties of the pyrolysis liquid were much closer to commercial fuel like diesel and gasoline. The density, viscosity and calorific value of the liquid product were 758 kg/m^3, 4.75 cSt and 39.561 MJ/kg. The maximum amount of liquid yields was 53 wt. % at 220°C and char yields 70.00 wt. % at 180°C respectively. The gas yield increased from 10 to 18 wt. % over the whole temperature range, while char yield decreased from 70 to 29 wt. %.It could be used as an alternative source of energy.

Keywords: Medical Waste, Plastics Syringe Wastage, Pyrolysis, Liquid Fuel, Batch Reactor.

ICMIEE18-130

Numerical Study of a Stand-alone Flat Plate Solar Water Heater using Rectangular Flow Channel with Fin

F. Rashid, M.R.I Sarker, S .S.Tuly, J. Ferdous and R. A. Beg
Department of Mechanical Engineering, Rajshahi University of Engineering & Technology, Rajshahi-6204, BANGLADESH

ABSTRACT

This paper presents a study of fluid dynamics behavior and thermal performance of a flat plate solar water heater. Flat plate solar collectors have lower efficiency since large heat losses occur from the collector surface by convection and radiation. This paper presents a model of a flat plate solar water heater having rectangular flow path with fin. In this study, the performance of a flat plate solar water heater having rectangular flow channel with fin is compared with the performance of conventional solar collector. The sole purpose of this study is to enhance the thermal performance considering the effect of enhanced turbulence of the working fluid. A CFD model is developed using Discrete Ordinate radiation model to solve radiation effect and model for analyzing fluid flow inside the systems Numerical simulation model solution is carried out using finite volumes method. Results showed that the flow behavior of the solar collector was approximately rotational type. The maximum thermal efficiency was 41.75%, which was 13.43% higher than a conventional one. The numerical results also showed that presence of fin inside the flow channels over the absorber plate provided an increase in the outlet temperature than the conventional one.

Keywords: Flat plate solar water heater, thermal efficiency, Fluid dynamics behavior.

ICMIEE18-134

Effect of Inertia and Gravity on Three Dimensional Non-isothermal Film Stability

Kazi Rumman Islam and Zahir U. Ahmed
Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH

ABSTRACT

In three dimensional Newtonian film casting process inertia and gravity plays an effective role on the physical mechanism in non-isothermal condition. This paper investigates the effect of inertia and gravity on critical draw ratio of non-isothermal film casting process using both linear stability analysis. An Eigen value problem is solved from a system of linear ODE equations as nonlinear two-point boundary value problem. Neutral stability curves indicate that in non-isothermal condition gravity and inertia tends the process to be more stable than in

isothermal condition. The disturbance frequency is found to be more sensitive to thermal effect. The growth rate of oscillation increases (decreases) above (below) the critical draw ratio results show that the critical draw ratio for the effect of different parameters is greater than the classical value of Drc=20.218 for isothermal condition.

Keywords: Non-isothermal, Film casting, draw resonance, draw ratio, Stability.

ICMIEE18-140

Study of Alternative Fuel Extracted from Solid Waste

Susmita Das Puja and Md. Golam Kader
Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH

ABSTRACT

Pyrolysis is the process of heating of an organic material in the absence of oxygen. A mini pyrolytic plant was made by using a pressure cooker as reactor. An external heating source had been used for heating purpose. 1 kg of plastic bottle cap and a mixture of bottle cap and tire (750g bottle cap, 250 gram tire) were processed. Around 200g liquid fuel had been extracted for both sample. Physical property of that extracted oils were checked. Density of the oil from only bottle cap sample was found 731 kg/m3 and of mixed sample was 743 kg/ m3, where density of conventional fuel such as diesel is 820 - 850 kg/m3 and gasoline is 719-780 kg/m3 .kinematic viscosity of pure bottle cap sample oil at 40°C was found 1.8 cSt and mixed sample was 2.2 cSt, where diesel has a value of 2-4.5 cSt and gasoline has 1.95-3.3 cSt. Gross calorific value of pure sample was found around 40.98 MJ/Kg and of mixed sample 39.5 MJ/Kg. Flash point of pure one was near around 63°C and of mixed one was 73°C. Diesel has a calorific value of 44-46 MJ/Kg and gasoline has a value of 43.2 MJ/Kg. The physical properties of pyrolytic oil is comparable with diesel and gasoline.

Keywords: Pyrolysis, Pyrolytic oil, Kinematic viscosity.

ICMIEE18-141

Integrated Approach of Ergonomics and MCDM into Truck Drivers' Seat Comfort: A Case Study in Bangladesh

Pobitra Halder[1, 2]*, Chitralekha Karmaker*[2] *and Mustafizur Rahman*[2]
[1]Chemical and Environmental Engineering, School of Engineering, RMIT University, Melbourne, Victoria 3000, **Australia**
[2]Department of Industrial and Production Engineering, Jessore University of Science and Technology, Jessore-7408, BANGLADESH

ABSTRACT

Seats are one of the most significant components for automotive vehicles. Prolonged driving a truck in Bangladesh is not so comfortable because no one design the seat properly considering anthropometric data. The improper seat design causes various health problems. Therefore, the improvement of seating posture is the urgency for reducing health issues. In this paper, a total of 120 Bangladeshi truck drivers were taken as sample for measuring anthropometric data. A comparison of health status between drivers and normal people showed that drivers suffer much than the control group. The relevant feedbacks required for the analysis were collected from the expert's opinion. The integrated approach (AHP-TOPSIS)found that among four health issues, back pain is more critical health issue associated with the existing seat dimension. Finally, the study suggested seat width as the most decisive design parameter on which designers should give much attention while designing truck drivers' seat.

Keywords: Anthropometry; Seat dimensions; Truck driver; AHP-TOPSIS; Bangladesh.

ICMIEE18-144

Investigation of the Effect of Sample Geometry on Drying Energy Requirement of Plant-Based Food Materials

Md. Washim Akram[1] and Mohammad U. H. Joardder[2]
[1]Dept. of Mechanical Engineering, Bangladesh Army University of Science & Technology, Saidpur, BANGLADESH
[2]Dept. of Mechanical Engineering, Rajshahi University of Engineering & Technology, Rajshahi, BANGLADESH

ABSTRACT

Drying is a simultaneous heat and mass transfer phenomena; primarily remove water to extend the shelf life of food materials. Over the course of drying, food quality deteriorates significantly along with taking huge energy. From the literature, it is found that both food properties and drying conditions affect the energy consumption criteria. However, there is a very limited number of research found that conducted investigation on the effect of sample geometry on energy requirement to dry. In this study, three typical shapes with a constant volume of selected food materials have been investigated to attain a correlationship between sample geometry and energy requirements.The amount of energy requirement during drying of Brinjal, Carrot, and Radish varies significantly with the variation of sample geometry. The minimum energy was required for sliced samples of selected food materials; whereas, cylindrical shaped samples took higher energy. The minimizing amount of energy also reduces the environmental pollution and GHG (Green House Gas). It can be concluded that sample compactness remarkably affects the energy requirement.

Keywords: Plant-based food material, Food drying, Energy requirement, Sample geometry, Environment pollution.

ICMIEE18-147

Numerical Study of Pumping Power and Volumetric Flow Rate Advantage of SiC-Water Nanofluid through a Channel

Md. Insiat Islam Rabby, Farzad Hossain, Md. Ehsanul Hasan, Md. Abdullah Al-Amin and A.K.M Sadrul Islam
Department of Mechanical Engineering, Military Institute of Science & Technology, Dhaka, BANGLADESH

ABSTRACT

The numerical analysis of laminar heat convective heat transfer of Silicon Carbide (SiC) - water Nanofluid for the developed region through two parallel plates is presented in this present work. The second order single phase energy equation, mass and momentum equation are solved by using finite volume method with the ANSYS FLUENT 16 software. The distances between two parallel plates are 4mm and length 600mm respectively. Silicon Carbide (SiC) is used as nanoparticle and water is used as the base/working fluid for the investigation. At the time of simulation 1% to 5% volume concentration of the SiCnanoparticles are used for mixing with water to produce Nanofluid. A wide range of interval of Reynolds number from 500 to 1100 at constant heat flux 500 W/m^2 at the channel wall has been also introduced. The result revels that for increasing the Reynolds number the Nusselt number and heat transfer coefficient are increased linearly in the developed region for both water and SiC-H_2O nanofluid. At constant Reynolds number by increasing the volume fraction of SiC-H_2O nanofluid from 1% to 5% the value of Nusselt number and heat transfer coefficient has been increased compared to pure water. And at constant heat transfer coefficient SiC-water nanofluid required 10% to 80% less pumping power and 4% to 25% less volumetric flow rate compared to pure water.

Keywords: Volume concentration, constant heat flux, pumping power, volumetric flow rate.

ICMIEE18-148

Optimization of an Emergency Relief Supply Model using Genetic Algorithm along with a Framework for Structuring Humanitarian Logistics Distribution Network

Shekh Rasel[1], *Md. Mahmudul Hasan Bhuiyan*[1] *and Khairun Nahar*[2]
[1]Department of Industrial & Production Engineering, Rajshahi University of Engineering & Technology, Rajshahi, BANGLADESH
[2]Assistant Professor, Department of Industrial & Production Engineering, Rajshahi University of Engineering & Technology, Rajshahi, BANGLADESH

ABSTRACT
The work is aimed towards formulating a disaster related emergency relief supply model of humanitarian relief goods and then solving with Genetic Algorithm and a more traditional approach of Linear Programming by considering collected data of a sample relief work. The model includes surpluses and shortages goods as variables and vehicle space as constraint. The constraints on demand, available minimum inventory and maximum labor level, load capacity of the vehicle, distribution center (DC) space all of which affect a relief distribution system directly used in the model. The model determines and optimizes the amount of relief supplies to be stocked, loads to be transported in each trip, labor level required, and the amount of surpluses and shortages goods so that the total cost is minimized. We compared results obtained by Genetic Algorithm and Linear Programming techniques. It is found that the Genetic Algorithm has better performance than the traditional Linear Programming. Finally a comprehensive framework for restructuring the transportation and distribution system of humanitarian relief items is provided.

Keywords: Optimization; Emergency relief logistics; Vehicle constraint; Penalty cost; Genetic algorithm.

ICMIEE18-149

Barriers against the Development of Solar Cooker & its Solution

Tamal Chowdhury[1], *Hemal Chowdhury*[2], *Piyal Chowdhury* [3], *Abul Hasnat*[1], *Birol Barua*[1] *and Rabiul Islam*[1]
[1]Dept. of Electrical & Electronic Engineering, Chittagong University of Engineering & Technology, BANGLADEH
[2]Dept. of Mechanical Engineering, Chittagong University of Engineering &Technology,Chittagong, BANGLADEH
[3] Chittagong Collegiate School& College, Chittagong, BANGLADEH

ABSTRACT
Cooking with natural gas is not only unhygienic but also results in green house gas emission. So, the alternative method of cooking should need to be checked. Solar cooker provides an efficient way to cook food without any consumption of fuel. The feasibility of solar cooker in rural regions of Bangladesh has been checked. But this renewable energy market faces some barriers against its development. This paper gives an analytic view of the barriers against the development of the solar cooker energy market and tries to suggest some solution in order to overcome this barrier.

Keywords: Solar Cooker; Change agent, Bangladesh.

ICMIEE18-150

Biodiesel Production from Chicken Skin: a Green Energy for Bangladesh

Tamal Chowdhury [a], Hemal Chowdhury[b], Pranta Barua[a], Rabiul Islam[a] and Bodius Salam[b]
[a]Department of Electrical &Electronic Engineering, Chittagong University of Engineering & Technology, Chittagong, BANGLADESH
[b]Dept. of Mechanical Engineering, Chittagong University of Engineering & Technology, Chittagong, BANGLADESH

ABSTRACT

From the slaughtering and processing of livestock, a huge amount of animal discards are produced. Much of this waste biomass is animal fat and skin and these discards can be used to produce biodiesel. In this study, chicken skin was used as raw materials for biodiesel production. Chicken skin was extracted from a local shop and subjected to transesterification. The products of transesterification were Fatty acid methyl esters (FAME) and glycerol. After separating glycerol it was observed that the yieldpercentage was 35%.Then FAME produced was tested for two parameters namely calorific value, Kinematic viscosity.

Keywords: Chicken skin; Transesterification; Biodiesel**.**

ICMIEE18-151

Feasibility of Integrated Pico Hydro System at Choto Komoldoho, Mirsharai

Tamal Chowdhury[a], Hemal Chowdhury [b], Piyal Chowdhury[c], Abul Hasnat[a] and Birol Barua[a]
[a]Dept.of Electrical & Electronic Engineering, Chittagong University of Engineering & Technology, BANGLADESH
[b]Dept.ofMechanical Engineering, Chittagong University of Engineering & Technology, Chittagong, BANGLADESH
[c]Chittagong Collegiate School & College, Chittagong, BANGLADESH

ABSTRACT

Renewable energycan be an effective option to meet up the electricity demand of people. Where grid connection is not possible, power generation from renewable energy resources can help to meet up the load of these off-grid places. This present study aims to find out the feasibility of Pico hydro scheme on the waterfall of ChotoKomoldoho, Mirsharai, Chittagong, Bangladesh. The Pico hydro system was integrated with PV to form a hybrid system. The whole system was simulated by Homer software. It was found from the simulation that the cost of energy is $ 0.270 /kWh which is 21.6 taka in BDT (1US=80 Taka).

Keywords: Pico hydro, ChotoKomoldoho, Homer.

ICMIEE18-152

Analysis of a Solar PV system for Aeration system in Aquaculture

Tamal Chowdhury [a], Hemal Chowdhury[b], Piya lChowdhury[c], Abu lHasnat[a], Birol Barua[a] and Rabiul Islam[a]
[a]Dept.ofElectrical &Electronic Engineering, Chittagong University of Engineering & Technology, BANGLADESH
[b]Dept.ofMechanical Engineering, Chittagong University of Engineering & Technology, Chittagong, BANGLADESH
[c]Chittagong Collegiate School & College, Chittagong, BANGLADESH

ABSTRACT

Artificial fish ponds harvester often face the problem of lacking the oxygen content in ponds. If there is too much oxygen, fish can even get sick. This will result in a great reduction of income for fish harvesters. Solar aeration can

play a vital role in improving the water quality by removing dissolved gases. This aeration system can be applicable where electricity is not available .This paper discusses the feasibility of solar aeration system in rural places of Bangladesh. Homer software was used to simulate the aeration system for small scale ponds of a place called Godagari, Rajshahi. It was found that the optimal sizing of photovoltaic 2 kW, 2 battery of 400 Ah and inverter of 0.6 kW and Cost of energy is about 0.463 $/kWh which is 37.04 taka in BDT (1 US=80).

Keywords: Aquaculture; Solar aeration; Homer.

ICMIEE18-153

Assessment of Water Saturation Using Archie's Formula, Indonesia Equation and Simandoux Model of Shahbazpur Gas Field (SBZ 01)

Jebin Fouzia and Shehab Uddin

Department of Petroleum and Mining Engineering, Chittagong University of Engineering & Technology, BANGLADESH

ABSTRACT

Reservoir quality assessment is a process for quantitatively assigning reservoir properties, recognizing geologic information and uncertainties in spatial variability. A petroleum reservoir is a heterogeneous system with large intrinsic complexity. A good reservoir is one that is commercially productive; it produces enough oil or gas to pay back its investors for the cost of drilling and leaves a profit. The improvement of reservoir performance analysis is one of the most important existing and emerging challenges to geoscientists and engineers. The aim of this study is to use an integrated technique in computing an essential parameter - water saturation of Shahbazpur gas field (SBZ 01). This study shows the assessment of water saturation using Archie's formula, Indonesia equation and Simandoux model with the help of wireline log data. Well logging plays an essential role in the determination of the production potential of a reservoir. The process involves lowering a number of instruments into a borehole with the purpose of collecting data at different depth intervals. The assessment of water saturation is undertaken to determine the reservoir's capability to both store and transmit fluid. According to wireline log data analysis, the average water saturation found from Archie's formula is 17.30 percent, by Indonesia equation 40.00 percent and by Simandoux model 52.14 percent. This analysis is very important to predict the overall performance of a reservoir as well as to enhance the production and life of the reservoir. The aforementioned analyzed results can be used for further reservoir evaluation and reservoir properties analysis.

Keywords: Water Saturation, Reservoir Quality, Archie's Formula, Indonesia Equation, Simandoux Model.

ICMIEE18-156

Proposition of Additive Manufacturing Technique for Artificial Bone Implantations and Its Feasibility Assessment via Cost Analysis

Nusrath Zahan[1], M. Fakhrul Islam Jony[2] and Khairun Nahar[1]

[1]Department of Industrial & Production Engineering, Rajshahi University of Engineering & Technology, Rajshahi, BANGLADESH

[2]Lira Group of Industries, Gulshan 2, Dhaka, BANGLADESH

ABSTRACT
Osteoarthritis (OA) of the hip is the most common joint disease in elderly people and associated with significant physical disability. Pain relief is a primary treatment of hip OA. When the patient with hip OA has failed medical treatment modalities and remains in pain, the patient should be referred for hip replacement surgery in which the damaged surfaces of the joint is removed and replaced with a set of artificial ball-and-socket implants. In this research, a proposition for Additive Manufacturing (AM) is advocated to produce the bone implant to enhance the customer satisfaction along with minimization of costs. AM is fundamentally different because it creates product by successive deposits of material instead of using removal or forming processes. Because of this difference, the cost and operational characteristics are distinct from traditional manufacturing. For this reason, additive manufacturing is placed in an end-to-end supply chain context and a stochastic optimization model is proposed to help a manufacturer decide when AM is best for them. Two business models are also proposed based on the additive manufacturing technology: manufacturing dominant model and retailer dominant model to investigate the financial viability of these models.

Keywords: Biomedical implants; Additive manufacturing; Supply chain; Cost analysis; Stochastic programming model; Business model innovation.

ICMIEE18-164

Study of Heat Transfer Enhancement in Tubular Heat Exchanger with Twisted Tape Inserts

Sadman Hassan Labib[1], Md. Riad Arefin Himel[1], Jobayer Ibn Ali [1] and Anjan Goswami[2]
[1]Department of Mechanical and Production Engineering, Ahsanullah University of Science and Technology (AUST), Dhaka-1208,BANGLADESH
[2] Assistant Professor, Department of Mechanical and Production Engineering, Ahsanullah University of Science and Technology (AUST), Dhaka-1208,BANGLADESH

ABSTRACT
In the present work an experimental investigation has been carried out to study the convective heat transfer augmentation in a double pipe counter flow heat exchanger (HE) with twisted tape insert. Also, the results are compared with a basic heat exchanger (BHE) of similar length, diameter and flow rate. The HE consists of a 140inches long copper tube with diameter of 1inch which is concentered in a PVC pipe having a diameter of 2inch. Hot fluid is allowed to flow through the inner copper tube and the cold fluid was allowed to flow through the annular passage between copper tube and the PVC pipe. Experiments were conducted at different mass flow rates of the hot fluid for both the BHE and MHEs. The effects of inserted twisted tapes and twist ratio on heat transfer rate, pressure drop and thermal performance factor characteristics have been investigated extensively. A twist ratio is defined as the ratio of twist length (y) to twisted tape width at the large end (W). The experiments were carried out by using twisted tapes with three different twist ratios (y/W) of 4.5, 6.0 and 7.5. All cases were tested under turbulent flow regime for Reynolds number between 20000 and 50000. The thermal performance indicators, i.e. heat loss from hot fluid, overall heat transfer coefficient, effectiveness, Nusselt Number etc. have been found to be enhanced for the modified HEs compared to that for the basic one. Also, the thermal performance factor tended to increase with decreasing tape twist ratio. The effectiveness of HEs is found to be increasedwith modifications with twisted tapes. However, after a certain limit of the mass flow rate of the hot fluid the variation in HE's effectiveness becomes less significant compared to that found up to that limiting mass flow rate.

Keywords: Basic Heat Exchanger, Modified Heat Exchanger, Twisted Tapes, Twist Ratio, Turbulent Flow.

ICMIEE18-165

Drive Cycle of Heavy Vehicles in Dhaka City: A Case Study

M. Fahim Asif Khan, Mirza Farhan Hasin, Md. Jubayer Hossain, Anjan Goswami and Mozammel Mia

ABSTRACT

In this present work, a case study of non-legislative drive cycle for heavy vehicles in Dhaka, the capital of Bangladesh, has been presented. The methodology is as follows (i) two major routes were chosen (ii) the data was analyzed in terms of speed-time and acceleration-time profile graphically (iii) lastly, the findings were compared with international drive cycles. For measurement purpose, a GPS device, having low response time, was used for recording the time-distance values. It has been found that the average speed for heavy vehicles was 7.949 km/h which is significantly lower compared to other international drive cycles. Furthermore, it was noticed that for 89.156627% of travel time the speed was below 30 km/h, for 4.8192771% of travel time the speed was between 30 to 60 km/h and for 6.0240964% of travel time the speed was between 60-90 km/h. The research outcomes can be of direct interest to the Bangladesh Road and Transport Authority (BRTA), Dhaka Metropolitan Police (DMP, Traffic) and other transportation authorities to effectively plan Dhaka city's traffic system.

Keywords: Drive cycle; Speed-time profile; Heavy vehicle; Dhaka City.

ICMIEE18-170

Study on Bio-Fertilizer Extraction and Management of Municipal Solid Waste of Khulna City

Debasish Adhikary and Md. Shahidul Islam
Dept.ofMechanical Engineering, Khulna University of Engineering & Technology, Khulna-9203,BANGLADESH

ABSTRACT

The increasing population of Bangladesh leads to the growth of urban areas and slums which in turn, generating a huge volume of wastes. In this study, Main focus is given on bio-fertilizer extraction from municipal solid waste as well as analyzing present waste generation and management procedure. Although major portion of solid waste is organic but unsatisfactory solid waste management system creates some common problems. At the same time, those wastes have a potential value of producing organic bio-fertilizer. The total daily household wastes generated in Khulna City areas is about 500 tons and from this total waste it is possible to produce 200 tons of compost daily. But only 1.5 tons of compost is producing per day in Rajbandh by RUSTIC and generating about 10,000 taka profits. In this context, to meet up the growing demand of bio-fertilizer, it is the best way to use renewable resources like municipal solid waste.

Keywords: Municipal solid waste, Solid waste management, Bio-fertilizer, Khulna city.

ICMIEE18-171

Design and Numerical Analysis of Suspension Geometry for a Formula Student Race Car

Shafi Md. Istiak
Dept. of Mechanical Engineering, Rajshahi University of Engineering & Technology, Kazla-6204, BANGLADESH

ABSTRACT

Formula Student (or Formula SAE (F-SAE)) is a worldwide university competition, organized by the
Society of Automotive Engineers (SAE), which encourages university teams to design, build, and compete with a Formula-student race car. Design analysis of suspension especially for racecar is very crucial to achieve maximum performance and handling. Suspension design may vary depending on the road terrain and the vehicle purpose itself. The main objective of this project is to design and numerical analysis of a suspension system for a student formula car. We discussed the conditions, factors and FSAE rules that should be considered to design a student formula race car. According to the desired performance some packaging parameters are selected and other suspension and sprung parameters are calculated. Then according to the calculation the suspension geometry is determined with an

optimized result by numerical simulation in Lotus Suspension Analysis. Further this process can be followed for designing suspension system for any kind of vehicles.

Keywords: Suspension design, Formula Student, Race car suspension, Lotus suspension analysis, Vehicle dynamics.

ICMIEE18-172

Performance Analysis of Nylon Made Vortex Tube

Tirtha Sen Gupta[1] *, Radif Uddin Ahmed*[1]*, Hemal Chowdhury* [1]*, Tamal Chowdhury*[2] *and Md.Tazul Islam*[1]
[1]Dept.ofMechanical Engineering, Chittagong University of Engineering & Technology, Chittagong, BANGLADESH
[2]Dept.ofElectrical &Electronic Engineering, Chittagong University of Engineering & Technology, BANGLADESH

ABSTRACT

A Vortex tube is a cooling machine which separates the flow of air or gas into two components: hot and cold streams. In spite of its limited use, it has several advantages over the conventional cooling system. In this study, an experimental investigation is carried out to find the performance of Nylon made vortex tube. Effects of varying cold mass fraction on the thermodynamic features of the tube were examined. A thermodynamic analysis is also performed to determine the key aspects of the tube.

Keywords: Ranquee Hilsch vortex tube (RHVT); Nylon; Refrigeration.

ICMIEE18-176

Feasibility Study of Pico Hydro Power Plant in Shongrampunji Waterfall for Clean Environment

Syed Tahmid Hussan[1] *and Pranta Barua*[2]
[1]Department of Petroleum and Mining Engineering,
[2]Department of Electrical & Electronic Engineering
Chittagong University of Engineering & Technology, Chittagong-4349,BANGLADESH

ABSTRACT

Electricity from the energy of combustion of fossil fuel is increasing day by day in Bangladesh. In this case, increasing carbon compounds in environment is a great threat. Besides, in many hilly remoted regions there is no access of electricity. Another energy resources cannot meet the demand of electricity due to lack of transportation, lack of management and high cost of energy. To solve the problem, pico-hydro powerplant can be an alternative energy source for such kind of hilly remotedregions.Shongrampunji waterfall can be a resource of hydroelectricity for remoted hilly regions around Jaflong of Sylhet. The paper represents the overall important data of Pico-hydro powerplant and evaluates the feasibility of Shongrampunji water fall as a resource of pico-hydropower plant. To justify the feasibility, flow rate, water head of Shongrampunji waterfall is recorded and approximate power generation, COE are calculated using HOMER software.

Keywords: Pico-Hydro, Shongrampunji, Electricity, Environment, Waterfall.

ICMIEE18-181

Agricultural Scenario and Solar Irrigation System of Bangladesh

M. S. Islam, Md. Bakhtierkhalzi, Sabbir Ahmed and Pronob Das
Dept. of Mechanical Engineering, Rajshahi University of Engineering & Technology, Rajshahi, BANGLADESH

ABSTRACT

Bangladesh is an agronomic country where two third of the total population directly or indirectly involves with agriculture and about 14.75% of gross domestic product (GDP) emanates from the agriculture sector.Although Bangladesh's economy is dependent on agriculture, she is not self-sufficient in food.Besides, frequent natural disasters such as flood, drought, and cyclone cause damage to crops every year. To provide food for her overpopulation, a large amount of food grains is imported every year. The total amount of cultivable land is about 85,60,964 hectares, of which 1154141 hectares land are being unirrigated every year.The typical irrigation systems of Bangladesh are primarily diesel based and electricity based pump. At present, 1.31 million diesel based pumps and 313,929 electricity based pumps are in operation for irrigation and it demolishes above 1.06 million tons of diesel and about 1400 MW electrical power individually. The power crisis in Bangladesh along with high diesel cost make the solar irrigation system as a promising alternative to power and diesel based pumping systems. The main objective of the study is to present a review of agricultural scenario, conventional pumping method, the prospect of solar pumping in Bangladesh. The study focuses on the update on advancement, barrier and remedies and socioeconomic benefit of the solar irrigation system. Since, Bangladesh is an energy starving country and most of the farmers are poor, therefore solar irrigation may be supportive for the farmer as well as in the total crop production in Bangladesh.

Keywords: Bangladesh, Agricultural scenario, pumping method, Solar irrigation, Advancement.

ICMIEE18-183

An Automatic Solar Tracking System Using Programmable Logic Controller

M. E. Hoque, F. Rashid, S. Shahriar and *M. K. Islam*
Dept. of Mechanical Engineering, Rajshahi University of Engineering & Technology, Rajshahi-6204, BANGLADESH

ABSTRACT

Recent research shows that about 36% more energy can be obtained by tracking the motion of sun by using solar panel as compared to soar panel at fixed position. In this paper, the tracking process is governed and controlled by programmable logic controller (PLC) where two stepper motors are used to guide the motion of the solar panel in azimuth and elevation angle. The azimuth and solar altitude angles of sun were calculated at 24.3636ºN, 88.6241ºE (Rajshahi, Bangladesh). It is observed that automatic solar tracking is providing better performance than fixed solar panel and maximum surplus energy was obtained about 36%. The experimental results are obtained for the voltage-current characteristics and power generation at the output of solar panel both for tracking and without tracking. An automatic solar tracking system can easily be employed in industry and suitable for mass energy production.

Keywords: Tracking system, programmable logic controller, solar panel, azimuth angle, elevation angle.

ICMIEE18-184

Development of Water Transport Network in the Northern Region of Dhaka City

Abu Sumaiya[1], *Nazmul Alam Nahid*[2], *Md. Mashiur Rahaman*[3], *Khandaker Rasel Hasan*[4] *and ABM Mahbubar Rashid*[5]
[1, 2, 3] Department of Naval Architecture and Marine Engineering, Bangladesh University of Engineering and Technology, Dhaka-1000, BANGLADESH
[4]Dept. of Port and Shipping Management, Bangabandhu Sheikh Mujibur Rahman Maritime University, BANGLADESH
[5]Metacenter Ltd., Dhaka-1000, BANGLADESH

ABSTRACT

All the megacities in the world suffer from traffic jam at certain hours of the day. But in Dhaka, traffic jam is the most severe and regular affliction in the daily life. People here have to kill hours simply sitting in the jam and that brings sufferings not only to themselves but also to the productivity. Northern region of the Dhaka city is one of the most important areas of Bangladesh with highly promising projects of the Government of the People's Republic of Bangladesh at Bashundhara Residential Area, Purbachal New Town etc. Therefore, with the existence of rivers and canals in and around that region, there is a possibility to develop a waterways network. At present, road transport is the only mode of transportation for accessing with other parts of the Dhaka City. The proposed waterways network will ensure the safety of the natural environment and bring a source of entertainment in the city life. Many cities around the world like London, Paris, New York, Shanghai, Venice etc. have already implemented successful waterways network inside the city.

Keywords: Water transport network, vacuum infusion process, modular concept, turning circle.

ICMIEE18-185

Prediction of Resistance, Sinkage and Trim of a Bulk Carrier by Computational Fluid DynamicsMethod

Md. Rakibul Hasan, Md. Abdur Rahim, Md. Sharier Islam and *Md. Mashiur Rahaman*
Department of Naval Architecture & Marine Engineering, Bangladesh University of Engineering & Technology
DHAKA-1000, BANGLADESH

ABSTRACT
Prediction of resistance, sinkage and trim has always been a challenging task for the naval architects at the design stage to achieve optimum power requirement and fuel consumption for desired speed. Previously, experimental methods laid the foundation of ship design. Later, towing-tank experiments become more practical but long dated, expensive, limited on the availability of physical tanks. Flow characteristics differ significantly from full scale due to insufficient Reynolds similarity at model test. Now-a-days, the applications of computational fluid dynamics (CFD) are advancing rapidly in marine hydrodynamics fields. CFD solves Reynolds similarity problem by offering both model and full scale results with a great details of flow fields. In this paper, a commercial CFD code STARCCM+ is used to simulate and compute the calm water resistance, sinkage and trim of a bulk carrier. The simulation results were compared with experimental data which mark a wealthy harmony between two results.

Keywords: resistance, CFD, marine hydrodynamic,STARCCM+, bulk carrier.

ICMIEE18-187

Heat Storage System: A Modern Way to Reuse and Recycle Energy to Reduce Thermal Pollution

Md. Fahel Bin Noor, Ahsan Habib and Bijoy Mallick
Department of Mechanical Engineering, Chittagong University of Engineering & Technology, Chittagong-4349, BANGLADESH

ABSTRACT
Waste heat is a large amount of thermal energy, which is unused and emitted to the environment by some mechanical processes or, emitted from machines and machinery parts. Waste heat is always generated while producing mechanical output by using the temperature difference. Firstly, the paper deals with the study of waste heat produced in different types of power plants and industries. Secondly, designing the way to restore and reuse the waste heat produced as a by-product in the industries by implementing thermal storage system for lower temperatures, which is environment-friendly as well as efficient enough to restore and recycle a large amount of heat. The ways of enhancing the efficiency of heat storage, without disturbing the operational process of the furnace are prescribed thoroughly. The paper further deals with the feasibility of waste heat in the industries and shows its quality is good enough for different uses in the industries. Calculates the efficiency of the prescribed heat storage model, as well as the calculation of the net energy stored in the heat storage system, is also shown in the paper.

Keywords: Waste heat, Thermal storage, Heat loss, HTF, Water.

ICMIEE18-190

Feasibility Study of Hybrid Renewable Energy System for Electrification of Kutubdia

Tamal Chowdhury[1], *Hemal Chowdhuy*[2], *Piyal Chowdhury*[3] and *Monirul Islam Miskat*[1]
[1]Dept.ofElectrical &Electronic Engineering, Chittagong University of Engineering & Technology, BANGLADESH
[2]Dept.ofMechanical Engineering, Chittagong University of Engineering & Technology, Chittagong, BANGLADESH
[3]Chittagong Collegiate School & College, Chittagong, BANGLADESH

ABSTRACT

Bangladesh has been experiencing several problems over the past few decades**.** Day by day, the no of population is increasing significantly. Sufficient amount of power generation in a sustainable way is an important issue for this rapidly increasing population and economic development. As a result, the country has been struggling. Hybrid system can play a vital role in the electrification of rural development. In this study, a renewable hybrid system has been proposed for Kutubdiaisland. The simulation was designed by Homer software and planned to apply in Kutubdia city to meet the electricity demand. The optimum system consists of PV array, diesel generator, biogas generator, wind turbine for power generation and battery for surplus energy storage Economical analysis was also carried out and it was found that COE is $0.221/kW which is 17.68 taka in BDT (1 US=80 taka).

Keywords*:*Hybrid System , Homer software, Kutubdia**.**

ICMIEE18-193

Production of Syngas using Entrained Flow Gasification of Pine Bark Biomass Aiming to Reduce Greenhouse Gas Emission from Power Generation

M. Shahabuddin and Sankar Bhattacharya
Department of chemical engineering, Monash University, Wellington Rd, Clayton, 3800 VIC, **Australia**

ABSTRACT

In this study, CO_2 gasification characteristics of pine bark biomass have been explored using state of the art entrained flow gasifier. The effect of temperature, CO_2 concentration (gasification reagent), and particle size on carbon conversion and syngas yield have been analysed. The results show that increasing temperature and CO_2 concentration in the feed increases the carbon conversion, though the effect of CO_2concertation is minimal. The influence of particle size on carbon conversion was also dominant. A full carbon conversion was achieved at a temperature of 1400 and 1200 °C with 20 % CO_2 using particle size 250-300 and 90-106 µm respectively. Higher conversions between 1-14%-point from smaller particle size under different operating conditions were determined. The analyses on syngas yield show that increasing temperature increases the generation of CO but decreases H_2 and CH_4. A higher gas yield and heating value from larger particle size were determined.

Keywords: Entrained flow, CO_2 gasification, Pine bark biomass, syngas, heating value

ICMIEE18-194

Economic Viability of Biomass Power plant in Bangladesh

Tamal Chowdhury[1], *Hemal Chowdhury*[2], *Piyal Chowdhury*[3], *Pranta Barua*[1] *and Monirul Islam Miskat*[1]
[1]Dept.ofElectrical &Electronic Engineering, Chittagong University of Engineering & Technology, BANGLADESH
[2]Dept. of Mechanical Engineering, Chittagong University of Engineering & Technology, Chittagong, BANGLADESH
[3]Chittagong Collegiate School& College, Chittagong, BANGLADESH

ABSTRACT

Combustion of fossil fuels results in high emission of green house gas. Besides it also results in shortage of fossil fuels So, it is necessary to look for alternate solution. Biomass is a renewable source which is abundant in nature. Combustion of biomass produces gas which can be used to generate electricity. In this study, a simulation has been done by RET Screen software to find out the economic viability of 3MW biomass based power plant in Chittagong**.** From simulation it is found that electricity export to grid from plant is 23,915 MWh and revenue earned by selling electricity is $2,391 480.It was also observed that the proposed system reduces 13000 tonne CO2 annually.

Keywords: Renewable energy, Organic waste, Solid waste, RET Screen.

ICMIEE 18-201

Finned-tube Heat Exchanger with Circular, Elliptical & Rectangular Tubes with Water-vapor as Working Fluid

Md. Hasibul Hasan and Dipayan Mondal
Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna 9203, BANGLADESH

ABSTRACT

3D numerical study has been conducted on the finned-tube heat exchanger with multiple rows of tubes using ANSYS. The objective of this study is to numerically investigate finned tube heat exchanger for multiple rows of tube with severaltypes of tubes such as circular, elliptical and rectangular tubes with water-vapor. Heat transfer performance analysis has been performed for three and six rows of tube. Heat transfer characteristics were studied with various inlet air velocities. The results show that in the case of water-vapor, modified heat exchanger (HX) 1 & 2 have 3.48% decrease in heat transfer from conventional circular tube heat exchanger. Also modified HX 1 & 2 have 2.11% decrease in heat transfer from conventional elliptical tube heat exchanger. On the contrary, at high inlet velocity, modified HX 2 have 10.45% higher from grouped elliptical tube heat exchanger, for modified HX 6 gives 5.80% higher heat transfer from grouped elliptical tube heat exchanger when N=3. Again in case of water vapor when N=3 modified HX 2 gives 2.38% higher heat transfer than baseline HX 2. When N=6, for water-vapor, all modified heat exchanger have a lower heat transfer than the conventional heat exchanger. For water-vapor, when N=3, all modified heat exchanger has alower pressure drop than the conventional elliptical heat exchanger.

Keywords: Finned-tube heat exchanger, Darcy friction factor, Nusselt Number, Heat transfer, Pressure Drop

ICMIEE18-203

Experimental Study on NACA 2415 Airfoil with Rotating Cylinder at Leading Edge

Nashidul Islam, Md. Mamun Islam, Mohammad Mashud and Abdullah Al Faruk
Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH

ABSTRACT

An aircraft's aerodynamic efficiency largely depends on lift and drag forces, stall angle at different stages of flight. The increase of lift and stall angle improve maneuverability and performance of any fixed wing aircraft. An experimental investigation has been conducted on a two dimensional NACA 2415 airfoil equipped with a rotating cylinder at leading edge. Rotating cylinder serve as active control device for boundary layer flow separation, thus increasing airfoil's lift and stall angle of attack. The effect of angle of attack, momentum injection ratio (ratio of cylinder linear motion to free stream air velocity) on the lift coefficient, drag coefficient and stall angle of attack are investigated in this study. The use of rotating cylinder at the leading edge of the airfoil increases the lift coefficient compared to the conventional NACA 2415 airfoil about 38.63% and stall angle increases to 16° from 12° at momentum injection ratio of 0.1173.

Keywords: NACA 2415, Coefficient of Lift, Momentum Injection Ratio, Rotating Cylinder, Stall Angle.

ICMIEE18-204

Numerical Solution of One-Dimensional Heat Equation by Crank Nicolson Method

Md. Amirul Islam[1], S.M. Kamal Hossain[2] and Abdur Rashid[3]
[1,2]Department of Mathematics, Uttara University Dhaka-1230, BANGLADESH
[3]Department of Mathematics, Jahangirnagar University, Savar, Dhaka-1342, BANGLADESH

ABSTRACT

In this paper we consider a Crank Nicolson algorithm for solving one-dimensional heat equation. In numerical analysis, the Crank–Nicolson method is a finite difference method used for numerically solving the heat equation and similar partial differential equations. The proposed method is quite efficient and is practically well suited for solving this problem.We compare numerical solution with the exact solution. The numerical solution is in good agreement with the exact solution. Finally, we investigate and compute the numerical results of proposed method for different step size. Several examples are given to verify the applicability and efficiency of the proposed method.

Keywords: Heat equation, Crank–Nicolson method, Numerical Solution Schemes, Application examples.

ICMIEE18-205

Air Pollutants Emission from Coal Fired Kiln and Its Variation for Use of Different Fuel Types

Md. Riad-Ul-Hasan and Kazi ABM Mohiuddin
Department of Civil Engineering, Khulna University of Engineering & Technology, Khulna-9203,BANGLADESH

ABSTRACT

Air pollution due to brick kiln has been an increasing environmental concern in Bangladesh. This study investigates the emission from Coal fired brick kiln in Rupdia, Jessore. The emission of air pollutants such as PM_{10} SO_2, CO, NO_x, and VOC_s are calculated using the Emission Factor Method. Brick kiln emission was found for PM_{10} (9.45 ton/yr), SO_2 (8.1 ton/yr), CO (5.4 ton/yr) and NO_x (3.037 ton/yr). Total amount of VOC_s emission is calculated as 9.91 kg/yr. There are also some metal emissions from the brick kiln which emitted in the form of particulate matter. It is observed that emission of PM_{10}, SO_2, and $NO_x$is higher in coal fired kiln whereas CO and VOC_s are dominant in Natural gas fired kiln. This emission assessment of brick kiln is significant for emission reporting, and emission database for the brick kiln in Bangladesh.

Keywords: Air pollutants, Emission estimation, Particulate matter, Volatile organic content.

ICMIEE18-206

Numerical Investigation of Low Velocity Impact on Polystyrene Foam Core Based Sandwich Composites

Md. Ahatashamul, Haque Khan Shuvo and Md. Arifuzzaman
Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH

ABSTRACT

A numerical study on a low-velocity impact on polystyrene foam core based sandwich structure was conducted. Sandwich composite with polystyrene foam core and mild steel sheet as skin was considered for modeling inAbaqus

CAE 6.14 platform. Low velocity impact simulation was performed on the sandwich structure by varying impactor mass for constant impact velocity and by varying impact velocity for constant impact or mass. The primary focus was to investigate the variation of contact force, contact time, displacement and principal strain with respect to both variables and to find out the impact energy threshold for damage initiation. The model was validated by using existing literature for contact force history. Theoretical results were found to be well predicted by simulation. The variation of impact velocity for constant impact or mass does not have any effect on contact time. No damage in the sandwich was found up to impact energy of 8J.

Keywords: Low velocity Impact, Composite, Sandwich, Polystyrene Foam, Simulation.

ICMIEE18-208

Dyeing of 100% Cotton Fabric using Natural Dye, Mordant and Natural Finish

A. K. M.Nayab-Ul-Hossain, Mohammad Naim Hassan, Aniruddha Sarkar, S. M. Kamrul Hasan and Kaniz Fatima Mishfa
Department of Textile Engineering, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH

ABSTRACT
Normally fabric is dyed with synthetic dyes, along with chemical fixing agent. In few cases fabric is dyed with natural dyes using synthetic mordant. Here this is clarified that 100% cotton fabric is dyed with natural dyes using natural mordant and at the same time applied natural finish (Neem, *Aloe vera*and Holy Basil (Tulsi) exudates). Ingredients which are applied, collected from surrounding environment that leads to a cost effective dyeing process. Moreover this is advantageous in easy application process as well as harmful free substances. Natural saps were collected from respective ingredients and at the same time the sample fabrics were conditioned for the purpose of easy penetration of dye molecules. Here as usual technique was applied for uniform and level dyeing and subsequently natural finishes were applied. The quality of the dyed fabric levelness is good. The fastness properties are also satisfactory. In comparison with chemical procedure, the applied dyeing process is easy to operate as well as less time consuming which meets all the necessary requirements of a perfect dyed fabric.

Keywords: Red Spinach, Betel Nut, Neem&Holy Basil (Tulsi) exudate, Anti-microbial finish, Natural ingredients.

ICMIEE18-209

Enhancement of Tube Side Heat Transfer using Twisted Stainless-Steel Angle

Md. Tarif Raihan
Fire Safety Engineer, Stitching Bangladesh Accord Foundation, Level - 13, AJ Heights, Cha-72/1/d, North Badda, Pragati Sarani, Dhaka-1212, BANGLADEH

ABSTRACT
The current research was carried out to investigate conventional heat transfer enhancement inside the tube by using twisted stainless-steel angle insert. Main objectives were to find the percentage of increment of heat transfer enhancement using twisted stainless-steel insert and to find the relation between Reynolds number and Nusselt number. A 940mm long copper tube of 26.6 mm internal diameter and 30 mm outer diameter, of which length of 762 mm has been used as the test section. A constant heat flux condition has been maintained by wrapping Nichrome wire around the test section and fiber glass insulation over the wire. K-type thermocouples and rotameter were used to measure temperature and rate of flow. With insert, heat transfer rate has been increased up to 140 percent. This technique does not rely on external power or activation. This experiment has shown simultaneous effects on Reynolds number and Nusselt number too.

Keywords: Heat transfer rate, Convective heat transfer co-efficient, Friction factor.

ICMIEE18-212

Biomaterials Serving the Purpose of Drug Delivery in Human Body

Talukdar Raian Ferdous and Tahsin Solaiman
Dept. of Biomedical Engineering, Khulna University of Engineering and Technology, Khulna, BANGLADESH

ABSTRACT
Today is an era when we overcome all constrains concerning our health. Drug is a substance that when inhaled, injected, smoked, consumed, absorbed via a patch on the skin or dissolve under the tongue causes a temporary physiological change in the body. Total number of approved drugs is 3254. Delivering drugs on the body should be efficient enough. Different types of drug carriers are used for delivering these drugs into body. These carriers are more specialized in biocompatibility apart from other materials. Sometimes the carriers have good effective area coverage but it takes much time to affect and vice-versa**.** As a consequence several prolific researchers have been asked to contribute unique research findings and reviews that could stimulate continuing effort to look for or to understand new biomaterials with biocompatibility, desired residence time, larger area coverage. This text focuses on the recent and far attempts in drug delivery biomaterials that would allow people to have a clear view of materials role in health site. The discussion comprises of metal-organic frameworks, carbon materials, microporousmesoporous materials and Mechanoresponsive materials for drug delivery system.

Keywords: Metal Organic, Photopolymerized ,Mesoporous, Carbon, Protein.

ICMIEE18-215

Influence of Industrial Bleach Wash on the Physical and Comfort Properties of Denim Garments

Niaz Morshed Rifat and Joy Sarkar
Department of Textile Engineering, Khulna University of Engineering & Technology, Khulna-9203, BANGLADEH

ABSTRACT
As the faded denim or old look denim is preferred by the today's youth, washing has become a crucial issue for the technologists to modify denim apparel to fulfill the demand of existing trend. The main factors affecting consumers when selecting garments are aesthetic appearance and fashion. Denim garments are subjected in industrial washing to obtain specific appearance and handle. The washing and finishing processes are utilized for the purpose of fashion and different recipes are applied for different effects which are quite significant for marketing. Washing is a novel process to impart worn-out look, to modify the appearance and to improve the comfort ability of apparel. Bleach wash is used to fade the color of denim as well as it has an effect on the physical and comfort properties of the denim also. This project represents the impact of bleach wash and subsequent softening treatment on 98.88% cotton, 1.12% spandex denim dyed with Sulphur bottom Indigo top (SBIT). Garments are washed using a different bleach concentration i.e. 3 g/l, 5g/l and 10 g/l for the constant time and temperature i.e. 30 minutes and 60°c and then softened using standard recipe. The physical and comfort properties are analyzed in before wash, after bleaching and after softening. The properties that are analyzed include GSM, shrinkage, EPI and PPI, stiffness, tensile strength, tear strength, drape test and comfort properties. Bleach washed and softened garments exhibit a great difference in the physical and comfort properties than the unwashed garments.

Keywords: Denim, Bleach wash, Physical properties, Comfort

ICMIEE18-216

Investigation of Mechanical Properties of Jute-Betelnut Husk Fiber (BHF) Reinforced Epoxy Composite

Tanvirul Islam, Md. Mahmudul Hasan and Md. Shakhwat Hossain
Dept. of Textile Engineering, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH

ABSTRACT
The importance of natural fiber reinforced composite material is increasing in the field of engineering and technology due to their outstanding promising properties. Here we investigate the mechanical properties of alkali treated jute betel-nut husk reinforced epoxy composite with respect to variation of BHF & epoxy .The composite sample was prepared by hand layup method. Different jute-betel nut reinforced epoxy composite was prepared in the ratio of fiber content 10:5, 10:10, 10:15 and 10:20 wt% with 85% epoxy , 80% epoxy, 75% epoxy and 70% respectively. The composite samples were prepared by hand layup process. Mechanical properties including tensile strength, yield strength, young modulus, elongation at break percentage and impact strength of the composites were investigated. The result showed that mechanical properties of 10:10 ratio of jute-betel nut and 80% epoxy was maximum. The effect of alkali treatment of fibers were verified by FTIR analysis.
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Keywords: BHF, alkali treatment, mechanical properties, UTM, FTIR.

ICMIEE18-218

Thermal Hydraulics Simulation of Fuel Sub-Assembly for 1200 MWe Nuclear Power Reactor

Taosif Alam and Dr. M. A. R. Sarkar
Dept. of Mechanical Engineering, Bangladesh University of Engineering & Technology, Dhaka, BANGLADESH

ABSTRACT
This study illustrates the turbulent flow simulation of coolant water through the three sub-channels of a fuel sub-assembly at a pressure around 16 MPa. The geometry details of the fuel rods, coolant sub-channels and operating parameters are similar to those of Rooppur Nuclear Power Reactor under construction in Bangladesh. The fuel sub-assembly is modeled using seven fuel rods where k-ε turbulence model is used for turbulent flow simulation. The effect of turbulent flow on temperature, velocity, pressure drop, friction factor and Nusselt number in interior, edge and corner sub-channels have been discussed for various axial locations (z =0–45Dh). Thermal hydraulic properties of the coolant water are studied for safety analyses such as: i) Hot spot in coolant channel and ii) Departure from Nucleate Boiling (DNB

Keywords: Subchannel, k-ε, Turbulent Flow, Nusselt number, DNB.

ICMIEE18-219

Investigation on Performance of Grass, Orange and Potato as Substrate of Microbial Fuel Cell

Nawrin Rahman Shefa, Ismat Ara Eti, Md. Jony Reza, Sonaton Biswas and Md. Abdul Halim
Department of Chemical Engineering,Jessore University of Science & Technology, Jessore-7408, BANGLADESH

ABSTRACT
The dependence on fossil fuels is unsustainable because of its finite, depleting supplies and impact on environment. It is crying to find not only alternative energy source[1]but also environment friendly energy source. The development of Microbial Fuel Cell (MFCs) is important to the advancement of alternative fuels. Microbial Fuel Cells (MFCs) are an emerging technology that uses bacteria to generate electricity from organic waste. The objective of this study was to observe different substrate which varies in major chemical content and compare the extracted energy to choose the best to extract energy as electricity. In this case, we used carbon felt as anode and copper wire as cathode,0.1MNaCl solution as catholyte and sedimentary mud with a mixture of compost used microbe source in a double chambered

mediator less type MFC. Studied substrates are grass, rotten orange and potato. We obtained maximum 368mV, 517mV and 454mV in a run of 15 days respectively from grass, orange and potato. The power density we got respectively 43.5mW/m^2, 102.9mW/m^2 and 73.7mW/m^2.

Keywords: Microbial Fuel Cell, Substrate, Catholyte, Power density.

ICMIEE18-222

Experimental Investigation on Three Different Natural Convection Cabinet Solar Dryer for Food Drying Applications

Md. Imrul Islam[1], *Mehedi Hasan Tusar*[1], *Amir Hamza Limon*[1] *and Majedul Islam*[1,2]
[1]Dept. of Mechanical Engineering,Chittagong University of Engineering & Technology, BANGLADESH
[2]Post-Doctoral Research Fellow, Queensland University of Technology, Brisbane, **Australia**

ABSTRACT
The development and investigation of efficient solar drier particularly meant for drying vegetables and fruit is described in this paper. Considering the importance of solar drying three different types of natural convection cabinet solar dryers are constructed and their performances are evaluated at natural conditions. To do so moisture removal rate, moisture ratio of various foods (Apple, Banana, pineapple, Guava) are evaluated from 10AM to 4PM for many days in different season. After analyzing the dehydration rate of three different chambers it is appeared that totaldehydration of thin tube chimney type chamber is 44.5%, for attic space type chamber dehydration is 33.3% and for natural draft chamber it is 58.9% in 6 hours. So, it is clear from this analysis thatthe performance of natural draft chamber is best than other two chambers and performance ofattic space type chamber is worst. This is due to the reflection loss in inclined glass of attic space type dryer compared to other chambers.Besides, the performance of chimney chamber isbetter than attic space type chamber. It is also seen that dehydration rate after 1pm is higherthan before 1pm as solar irradiation was higher after 1 pm in best performance days. Besides, dehydration rate of Pineapple is the highest as water level and porosity is so muchhigh and for guava is the lowest as water level and porosity is low. Dehydration rate of banana is higher than guava but lower than apple.

Keywords: Solar drying, Thin tube chimney type dryer, Attic space type Dryer, Natural convection solar dryer, Dehydration

ICMIEE18-223

Dust Effect on Glass Transmittance and Mirror Reflectance of Solar Collectors

Mehedi Hasan Tusar, Amir Hamza Limon, Abdullah Al Noman and Goutam Das
Dept. of Mechanical Engineering, Chittagong University of Engineering & Technology, Chittagong, BANGLADESH

ABSTRACT
Almost every country in the world is leaning towards renewable energy and installation of solar power systems are increasing day by day. But, solar power systems are affected by dust deposition as it reduces optical efficiency of these systems. So, evaluation of dust deposition effect for a particular location needs to be carried out to predict the performance and installation of different solar power systems. In this experiment transmittance and reflectance loss of glass and mirrors are examined respectively at seven days interval for a period of three month in maximum solar irradiation season of Bangladesh to evaluate dust deposition effect on optical performance of them. It is found that glass and mirror suffered from 3% to 6% transmittance and 8% to 16% reflectance loss respectively over the experiment period.

Keywords: Renewable energy, solar collectors, dust effect, optical efficiency

ICMIEE18-227

Experimental Investigation of an Air to Air Heat Pipe Heat Exchanger for Moderate Temperature Waste Heat Recovery

Saddam Hossen, Mahmud-Or-Rashid, Mantaka Taimullah, Farhan Ahmed Shakil, and Dr.A K M Monjur Morshed
Dept. of Mechanical Engineering, Bangladesh University of Engineering & Technology, Dhaka, BANGLADESH

ABSTRACT

Due to environmental concern and high price of the fuel, waste heat recovery has become a central issue for industrial and commercial energy users. Heat pipe heat exchanger (HPHE) could be employed in this regard economically. In this study, an HPHE consisting of heat pipes arranged in stages has been developed. Water was used as the heat carrying fluid inside the heat pipe and square fins were used in the cooling and heating zone of the heat pipe. The constructed HPHE was placed between two ducts carrying hot and cold air. The hot fluid temperature was varied from 60 to 80^{o}C which resembles waste heat and cold air was atmospheric air. The hot and cold air's mass flow rate was varied between 0.037 and 0.087 kg/s and heat transfer between two air streams were measured as 228.5 to 362.2W and heat transfer coefficient varies from 4.22 to 8.09 W/m^2-K.

Keywords: Heat pipe, Heat pipe heat exchanger, Air to air heat exchanger, Waste heat recovery

ICMIEE18-228

CFD Analysis of Two-Phase (Oil-Water) Flow in Horizontal Pipe

Md. Abir Hasan and Mohammad Ilias Inam
Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH

ABSTRACT

In this paper, the behaviors of two-phase (oil-water) flow in horizontal pipe have been investigated numerically using ANSYS Fluent 16.1. For these simulations for oil-water stratified flow, Volume of Fluid (VOF) model and RNG k-ε turbulence model is adopted. A number of simulations have been carried out for different inlet velocity (0.5m/s, 1.0m/s, 1.5m/s, 2.0m/s, 2.5m/s and 3.0m/s) and for different volume fraction (vf) of oil (10%, 20%, 30%, 40%, 50%, 60%, 70%, 80% and 90%). Numerical results demonstrate that pressure drop (ΔP) and wall shear stress (σ), both, are increasing with respect to inlet velocity and volume fraction of oil. A series of empirical relations were also developed to show the effect of inlet velocity and volume fraction of oil on the pressure drop and wall shear stress.

Keywords: CFD Simulation, VOF model, Two-phase flow, Oil-water, Pipe flow.

ICMIEE18-229

Development of Surface Mounted Concentrator for Photovoltaic Solar Cell

Md Anwar Hossain[1] and YiHong Zhang[12]*
[1]College of Information Science & Technology, Donghua University, Shanghai, P. R. China
[2]State key University, Ministry of Education, P. R. China

ABSTRACT

This paper will provide a design of Surface Mounted concentrated photovoltaic (SMCPV) at low cost. First work on finding the best and suitable concentrator that can increase the efficiency of PV cell near about 20% of its traditional efficiency. At the accurate combination point of concentrator and PV cell, the focus point is set behind the PV cell. As the distance between concentrator and PV cell is X, the focus of concentrator is 4X to ensure close contact between concentrator and PV cell and prevent from burning cell sections. To ensure the targeted result, the optical modeling of this system and performance analysis through experimental tests has done. The experimental validation allows concluding that, high accurately controlled application of SMCPV is very important since the big density of the solar radiation leads to important losses of system efficiency or system failure. On the other hand, it is found that the external factors can affect the final results which include the optical and geometrical properties of the concentrators, the absorptivity as well as the weather conditions (especially the wind speed and clouds). Thus, the paper aims to present the advantages and benefits of this technology.

Keywords: Renewable Energy Resources, Solar Concentrator, Surface Mounted Solar Concentrator, Improved Solar Cell.

ICMIEE18-233

Reduction of Chatter in Turning by using a Tool Holder with High Damping Coefficient

A H M Shahjahan, Amin Hasan Khan, Jannatun Naeema and A.K.M. Nurul Amin
Department of Mechanical and Production Engineering, Ahsanullah University of Science and Technology, Dhaka BANGLADESH

ABSTRACT

Machining of metals is generally accompanied by an intense relative vibration between tool and work, known as chatter. Chatter is unwanted because of its many adverse effects during machining. This paper presents a new method of chatter suppression during turning operation of stainless steel - AISI 201 using tool holders with high damping coefficient. Turning operation of the given work material was conducted using a medium carbon steel tool holder along with two fabricated tool holders made of two types of gray cast iron. Response Surface Methodology (RSM) was used for the design of this experiment. Simulations of total deformation, modal and harmonic response analyses of the tool holders were conducted using ANSYS. Fast Fourier Transform (FFT) was later used to transform the vibration data to a function in frequency domain. The experiments focused on monitoring the surface roughness, sound level and analysis of chips formed during metal cutting. It was observed that both the gray cast iron tool holders contributed to reduction of chatter amplitudes but the annealed gray cast iron tool holder contributed most to the improvement of surface finish and reduction of noise level.

Keywords: Chatter, Gray Cast Iron, Stainless steel, Surface roughness, Sound Level.

ICMIEE18-234

Difficulties to Develop a Four Legged Robot

Mohammad Harun-Or-Rashid, Mostafijur Rahman and Sabrina Rashid
Department of Mechanical and Production Engineering, Ahsanullah University of Science and Technology, Dhaka-1208, BANGLADESH

ABSTRACT

Development process of a four legged robot is discussed in this paper. During making the robot many difficulties are faced. This paper is mainly focused on difficulties and their remedies. In 20th century many mathematical

methods are introduced for smooth control of linear as well as nonlinear motion of dynamic system. Sensor, actuator and control algorithm are commonly used to build up field, aerial as well as under water robot. Among different types of field robots wheeled robots are commonly built because compare to aerial and under water robot these are easier to control. On the other hand, there are various limitations of wheeled robot such as move on stairs and rough topography. Therefore, to overcome these problems, in the present study, a four legged robot is developed. During development of a four legged robot many difficulties are arisen such as proper electric motor selection, leg mechanism and motion control as well as synchronization of movement of four legs for steady motion of the robot.

Keywords: Field robot, Gear motor, Leg mechanism.

ICMIEE18-236

Numerical Study of Heat Transfer and Flow Characteristics in a Rectangular Channel with Rib Type Turbulent Promoters

Sunanda Kumar Saha, Md Mosarof Hossain and Dr. Mohammad Ali
Dept. of Mechanical Engineering, Bangladesh University of Engineering & Technology, Dhaka, BANGLADESH

ABSTRACT

Numerical simulation is carried out to study turbulent forced convection heat transfer and friction loss for flow through a rectangular channel having a constant heat flux with different rib type turbulent promoters. The rib shapes used in this study are rectangular, triangular, trapezoidal, wedge rib upstream and wedge rib downstream. Two rib configurations: (i) ribs mounted on bottom wall and (ii) ribs mounted on both wall (staggered rib array) are simulated. Standard k- ε turbulence model and enhanced wall treatment are used to perform the simulation. The inflow Reynolds number is varied from 5000 to 10000. Simulation is performed for a rectangular channel with aspect ratio 13, pitch to height ratio of 4 for configuration (i) and 8 for configuration (ii), rib width to rib height ratio of 2, blockage ratio of 1/3 for configuration (i) and 1/6 for configuration (ii). The results indicate that the heat transfer performance and the friction loss are strongly affected by different rib shapes. The highest heat transfer performance is achieved for wedge rib upstream for configuration (i). For configuration (ii) highest value of heat transfer performance is obtained for triangular rib. The lowest value of heat transfer performance is obtained for wedge rib downstream for both configurations. For ribs mounted in bottom surface wedge rib downstream has the highest frictional loss and for staggered rib arrays highest frictional loss is found for wedge rib downstream. Triangular ribs mounted on both wall with staggered rib array configuration shows the highest thermal performance among the rib shapes.

Keywords: Numerical simulation, Heat transfer, Friction loss, Reynolds Number, Rib type turbulent promoter.

ICMIEE18-237

Effect of Tip Speed Ratio on the Flow Characteristics of Single-bladed Darrieus Wind Turbine

Md. Tanvir Khan, Mohammad Ilias Inam and Abdullah Al-Faruk
Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH

ABSTRACT

Wind energy is considered as one of the most realizable sources of renewable energy on the eve of fossil fuel energy depletion. Vertical axis wind turbines such as the Darrieus turbines appear to be promising for the condition of low wind speed though it has a low efficiency compared to horizontal axis turbines. The aim of this study is to investigate the flow development of a single bladed vertical axis wind turbine using CFD at different tip speed ratios.The blade is designed using the NACA 0015 profile and is operating under stalled conditions. Two dimensional simulations are performed using ANSYS Fluent 16.2, employing the realizable k-epsilon turbulence model and scalable wall function. Simple pressure-based solver is selected along with the second order implicit transient formulation. The CFD results under dynamic cases are presented and the resulting aerodynamic forces are evaluated. The turbine is observed to generate both positive and negative power at certain azimuthal angles. The pressure contours, velocity profiles as well as the velocity streamlines are illustrated and the powers and the power coefficients are calculated. Results show that force as well as the power is proportional to the tip speed ratio and at every case net average power is positive. Moreover, force as well as power varies periodically with the azimuthal angles. Finally, the average power and power coefficient are calculated after the turbine has come to steady state condition—that increase with the tip speed ratios.

Keywords: Darrieus wind turbine, power coefficient, pressure coefficient, tip speed ratio, vortex.

ICMIEE18-241

Environmental Impact of Nuclear Power Plant (Rooppur Nuclear Power Plant) on Third World Country like Bangladesh

Md. Nesar Ali[1], Md. Ridwan Ullah[2] and Shuva Sarkar[3]

[1, 3]Department of Mechanical Engineering, Chittagong University of Engineering & Technology, Chittagong-4349, BANGLADESH

[2]Department of Electrical & Electronics Engineering, Khulna University of Engineering & Technology, BANGLADESH

ABSTRACT

Nuclear power is the use of nuclear reactions nuclear that release nuclear energy to generate heat which most frequent is then used in steam turbines to produce electricity in a nuclear power plant. Bangladesh first conceived building a nuclear power plant in 1961. Bangladesh Atomic Energy Commission was established after independence in 1973. The country currently operates a TRIGA research reactor at the Atomic Energy Research Establishment in Savar. More recently, in 2001 Bangladesh adopted a National Nuclear Power Action Plan. On 24 June 2007, Bangladesh government announced plan to build a Nuclear Power Plant to meet electricity shortage. In May 2010, Bangladesh entered into a civilian nuclear agreement with the Russian Federation. This research paper also deals about the safety aspects of this power plant & RNPP Project Timeline, Overall Safety Management including Effluent treatment and Human safety &Protection from external impacts as well.

Keywords: Nuclear Power, Atomic energy, Electric Energy, RNPP Project Timeline, Safety Management and Radio-Active Waste Management of Nuclear power plant.

ICMIEE18-244

Prediction of Weld Quality by Artificial Neural Network Modeling of Parameters of MIG Welding Process

Israt Zarin Era and Nikhil Ranjan dhar

Department of Industrial & Production Engineering, Bangladesh University of Engineering & Technology, Dhaka-1000, BANGLADESH

ABSTRACT
The study aims to predict the weld quality of MIG welding by Artificial Neural Network Modeling of the process parameters. Due to the lack of any direct analytical mathematical relation among the welding factors, the paper focused on establishing a co-relation among the welding parameters and responses. Tensile strength and Hardness of the welding joints are taken as welding responses. Welding current, welding voltage and wire feed rate are selected among the MIG welding parameters as the inputs to form a multilayer perception (MLP) neural network. The training of the model has been done through Back-propagation (BP) algorithm. The result shows that with the rise of welding current and voltage, the Tensile strength and Hardness of the weld joints have been increased but the best result is obtained at moderate wire feed rate. It is found that the proposed adaptive Artificial Neural Network is capable of mapping the complex relationship among the welding parameters and corresponding weld quality as output.

Keywords: MIG welding, Artificial Neural Network, Multilayer Perception Neural Network, Back-propagation, Welding response.

ICMIEE18-248

Comprehensive Hazard Identification and Safety Evaluation for Shahjalal Fertilizer Industry Limited

Shanzida Sultana Ema, Anamika Roy and Md Tanvir Sowgath
Department of Chemical Engineering, Bangladesh University of Engineering and Technology, Dhaka, BANGLADESH

ABSTRACT
The objective of the paper was to identify the relative hazard index for all the main ammonia process units of Shahjalal Fertilizer Company limited and calculate hazard area for probable toxic release of the ammonia storage tank. Various indices were extensively used for ranking various units of a chemical process industry on the basis of the hazards they pose of the accidental probability of fires, explosions or toxic release with some restrictions and limitation. So, a new, user-friendly tool for swift yet comprehensive hazard identification and safety evaluation index called Safety Weighted Hazard Index (SWeHI) was introduced for representation of overall comprehensive hazard identification and safety evaluation factors SFCL plant. The Dow chemical exposure index (CEI) was also calculated for the process units handling flammable and toxic materials respectively. The hazard area of the ammonia storage tank for probable toxic release with the atmospheric conditions data of the plant location was also determined using ALOHA software and CEI value. The SWeHI ranking was between 1.74 (NG loading) and 10.61 (primary reformer).

Keywords: Hazards, SWeHI, Dow CEI.

ICMIEE18-249

Numerical Study on Aero-Acoustic Behavior for Flow over a Supercritical Airfoil at Low Reynolds Number

Syed Angkan Haider, Tanveer Islam Joy and Md. Fazlur Rahman Akanda
Dept of Mechanical Engineering, Bangladesh University of Engineering & Technology, Dhaka-1000,BANGLADESH

ABSTRACT

A two-dimensional supercritical RAE-2822 airfoil cross-section with 100 mm chord length was analyzed at low Reynolds number (Re) flow and the resulting aero-acoustic parameters were investigated. A Reynolds number of approximately 168,000 (based on airfoil chord length) was used for the analysis. The study was conducted for three different angles of attack, namely 0^0, 6^0 and 12^0. For the computational analysis, 2-D transient Reynolds Averaged Navier-Stokes (RANS) equations were used, coupled with the two equation k-ω shear stress transport (SST) turbulence model and broadband noise source settings. The pressure, turbulent intensity, acoustic power level and LEE self- and shear-noise were analyzed in the vicinity of the airfoil surface and wake; possible explanations behind noise generation and their relation to turbulence, flow separation and vortex formation at different angles of attack were discussed. It was observed that the aero-acoustic noise increased with angle of attack as the vorticity and turbulence effects got stronger.

Keywords: Supercritical airfoil, Reynolds number, shear-noise, self-noise.

ICMIEE18-252

Construction and Performance Test of a Manual Pipe Bending Machine

S. M. Moinur Rahman and A. N. M Mizanur Rahman
Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna 9203, BANGLADEH

ABSTRACT

In modern manufacturing, different type of structures are used that need pipe bending. In today's life SS pipes are frequently used in furniture and decorative works. Pipe bending is quite different from rod bending and it needs special technique otherwise there will be distortion at the bends. Thus, pipe bending machines are used to bend different types of pipe. They can be automatic, semi-automatic or manual type. Manual pipe bending machines are used to bend small diameter pipes and particularly in small entrepreneurs. This paper presents the design, construction and performance test of a 3-roller manual pipe bending machine that could be used to bend a 25mm diameter pipe. The lower two rollers are kept at fixed height and the top middle one could move up and down to give the required shape and bending radius. A lead screw and hand wheel is used to force the middle roller down and give different deflections in the pipe. The rollers were made of cast iron and the base and the structure were made of MS plate. In the performance test 15 and 20 mm GI pipe was used and their bending radiuses were measured for various vertical displacement of the middle roller. It is found that bending diameter depends only on the vertical displacement of the middle roller. The project result shows that for increased displacement in the middle roller, the pipe bending is more accurate and deviation between the theoretical value and the experimental value of bending diameter is reduced.

Key words: Pipe bending, bending machine, roller bender, manual bending.

ICMIEE18-253

Development and Performance Test of Gearless Power Transmission System

Md. Jewel Rana and A. N. M Mizanur Rahman
Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna 9203, BANGLADEH

ABSTRACT

In modern machineries, the motion and power need to be transferred from one shaft to other for various and complex activities. Also, it is essential to achieve such objectives with maximum efficiency and minimum cost. For transmitting power between different orientations of shaft, various medium like belt, chain and especially gears are

used. But due to cost of manufacture of gear, interchangeability in parts and very limited shaft orientations, need arises for an alternative system. In this project a Gearless power transmission system has been studied, a possible gearless power transmission layout is designed and developed where it can transmit power from one shaft to other without any gear being used. This project deals with transmission of power from one shaft to other at right angle by means of sliding links that form revolute pair with the hub. Links bent at right angle slide inside the holes in the hub and three links were used. Thus, as the holes in input hub rotate; it pushes the links and in turn output hub is rotated. Depending upon the power, the system was tested and it ran safely up to 985 rpm when the motor power was 1 hp and up to 246 rpm when the motor power was 0.25 hp. If the system was run higher than this permissible limit, the transmission system produces unwanted noise. Also, when the system was run lower than the mentioned rpm, it could not transfer motion from the input shaft to the output.

Key Words: Gearless drive, Power transmission, Sliding links, Elbow power transmission

ICMIEE18-254

Development of an Izod Impact Test Machine for Non-Metals

Mohammad Emran Hossain and A.N.M. Mizanur Rahman
Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna 9203, BANGLADEH

ABSTRACT
Different type of tests that are conducted to know the various properties of metals and non-metals include tensile, compression, hardness, fatigue, flexural, torsional etc. There are many properties of metals and non-metals such as ductility, brittleness, toughness, hardness, fatigue strength, impact load etc. which are important for their uses. To identify metal or non-metals some characteristic properties are required. To differentiate any metal from another these characteristic properties should be known. Izod Impact test is one of them where the finding is the impact strength of the material. Izod impact testing is an ASTM standard method of determining the impact resistance of materials. A pivoting arm is raised to a specific height and then released. The arm swings down hitting a notched sample, breaking the specimen. A part or material sustainability can be defined by Izod Impact test. The ability to identify the characteristics of the product helps to prevent the failure of the material on sudden load. The optimum value of this parameter for maximum value of Impact energy absorbed can be determined. In plastics and non-metals Izod impact test is required for stability against sudden load and internal strength. In this project an Izod Impact Test machine for non-metals has been designed, fabricated and its performance was tested. The comparison of impact properties of Polycarbonate was made. The machine performance is satisfactory.

Keywords: Material properties, Impact test, Izod impact test, Charpy test, Non-metal test.

ICMIEE18-255

Construction and Performance Test of a Pedal Operated Double Cylinder Reciprocating Pump

Abdullah al Musabbir and A. N. M. Mizanur Rahman
Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna 9203, BANGLADEH

ABSTRACT
Bangladesh is an agricultural country, so irrigation or watering of the cultivable land is a great concern for the farmers. Capable farmers use motorized centrifugal pumps for the purpose of irrigation or lifting water. On the other hand,poor farmers, particularly those have small lands, cannot afford motorized pumps. Also, electricity problem has become a big issue during the irrigation season and many areas of the country are still deprived of electricity. As most of the farmers in rural areas are below the poverty line, so the electricity bill of these motorized pumps become

a burden for them. In this circumstance, a manually operated, cost effective and high efficient water pumping system is going to be a great importance. So, this project emphasizing the design and construction of a pedal operated double cylinder reciprocating pump that may be an amazing solution to this irrigation problem of poor farmers. At this moment, some farmers are using treadle pump in place of motorized centrifugal pump. But it is proven that bicycling pedaling is much more comfortable and efficient, so a pedal operated double cylinder reciprocating pump system would be more convenient than the treadle pump. A model of the proposed pump was constructed and tested. The results show that the pedal operated double cylinder reciprocating pump system is cost effective, easy maintenance and gives an average discharge of about 1250 liter/hr. So, the poor farmers of the remote areas where electricity problem is acute can be benefitted by using this pedal operated pump.

Keywords: Pedal operated, double cylinder, reciprocating pump, discharge

ICMIEE18-256

Numerical Simulation and Analysis of Supersonic Flow over a Circular Cylinder

Shawon Kumar Saha
Dept. of Mechanical Engineering, Bangladesh University of Engineering & Technology, Dhaka-1000, BANGLADESH

ABSTRACT

The purpose of this study is to investigate a two dimensional supersonic flow over a circular cylinder numerically. The calculations are performed on a boundary fitted co-ordinate system. Time dependent Navier-Stokes equations is used to evolve the correct steady-state solution. The analysis is conducted by assuming a rigid circular cylinder with a wide range of Mach number (2,4,6,7) and two different temperatures (300K and 373K) by Ansys Fluent We consider air as calorically perfect gas, with constant Prandtl number and Sutherland's law for the viscosity. The two dimensional Navier-Stokes equations for a unsteady flow, with no body forces, no mass diffusion are solved. Flow fields are obtained. The pressure along the entire surface is computed over a wide range of Mach number and two different temperatures. The temperature variation due to dissipation of kinetic energy has been analyzed numerically.

Keywords: Computational fluid dynamics, Supersonic Flow, Numerical Investigation, Sutherland's Law, Circular Cylinder.

ICMIEE18-258

Metal Surface Defect Inspection through Deep Neural Network

Md. Fantacher Islam and Md. Mahbubur Rahman
Department of Industrial Engineering and Management, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH

ABSTRACT

Visual inspection of a metallic surface has taken thriving attention for the metal product quality control. Deep convolution neural networks have got impressive recommendation rates recently to effectively inspect defects for metallic products. Here, we proposed a deep neural network model to analyze the image data for inspecting metal surface defects and also their respective classes. The designed deep neural network was trained on 1800 images of six different kinds of typical surface defects of 200 × 200 pixel resolutions. The image datasets were obtained from North Eastern University (NEU) surface defect database. And to predict the model performance we had tested 17

images and found 64.7% accuracy. The results manifested that the proposed method gives a good outcome though we used small datasets and it can indeed trace metal surface defects in realistic situations.

Keywords: Metal surface inspection, deep neural network, defect classifier

ICMIEE18-259

Aerodynamic Shape Optimization of Vehicles Using CFD Simulation

Ahmed Zawad Ul Hoque, Mohammad Ariful Islam and Md. Ahatashamul Haque Khan Shuvo
Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna-920, BANGLADESH

ABSTRACT
With the significant improvement of battery technology and manufacturing methods in the last two decades, the automotive industries worldwide are shifting towards more environment-friendly electric and hybrid-electric vehicles rather than fuel based combustion engine vehicles. Aerodynamic shape optimization of vehicles still holds a large potential for cuts in emissions. Drag and lift characteristics of a vehicle play a key role in vehicle aerodynamics and therefore, an active area of research for automobile manufacturers. This paper approaches computational fluid dynamics (CFD) simulation for some of the major design parameters that affect the vehicle aerodynamics. Geometrical bodies of "Ahmed body" and 3 common vehicle types i.e. Sedan, Compact Utility Vehicle (CUV), Truck had been created. Then airflow around the vehicles was simulated to calculate lift and drag coefficients. Also, experimental drag coefficient value for "Ahmed Body" had been validated by CFD simulation before performing design modifications and further simulations. Finally, obtained values of drag and lift coefficients were compared with the benchmark value.

Keywords: Aerody namics, Shape Optimization, Vehicle, Drag, Lift, CFD, Simulation

ICMIEE18-260

Application of Lean and Six Sigma Tool to Waste Reduction and Productivity Improvement in Footwear Industry

Adhir Chandra Paul, Noor-E-Imam and Shakhawath Hossain
Department of Leather Engineering, Khulna University of Engineering & Technology, Khulna-9203,BANGLADESH

ABSTRACT
Footwear sector in one of promising sector in our country as its raw material almost available. As a result we see many footwear industry has been set up in recent decades. This studyassesses the current operational and management practices. By applying Lean and six sigma tool, green manufacturing holds potential economic benefits including long term process efficiency benefits, cost saving, waste reduction. It also assists to attain the knowledge about different techniques of production improvement and environment related factors. This analysis focuses how environmental wastes are produced and analyses possible solutions in order to reduce cost. In this work, productivity has been improved from 13 pair/worker to 16 pair/worker through reducing standard time. In this competitiveness the present and future will belong to those whom can do both to achieve high productivity. The advantages of lean six sigma (LSS) are reduction in defects, cycle time, work in progress etc. as well as increase in product quality, reliability, customer satisfaction, productivity etc. leading ultimately to excellent business result.

Keywords: Lean, Six Sigma, LSS, Time study and Footwear industry.

ICMIEE18-261

Studies on Sewing Complication through Pareto Chart and Cause-Effect Diagram analysis of a Footwear Industry

Adhir Chandra Paul, Md. Atikul Islam and Md. Shohag Hossain
Department of Leather Engineering, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH

ABSTRACT

Due to global competition, declining profit margin and customer demand for high quality product at low cost, push the manufactures to reduce their production cost without compromising quality in order to survive in business arena. The quality and productivity of footwear largely depends on various organized operations especially on the sewing operation. Defects minimization is the first condition of reducing production cost and improving the quality. In this study, information of different types of defects of sewing sections had collected and analyzed through Pareto chart and Cause-effect diagram. The main purpose of the work is to reduce the defects, which will also minimize the rejection and reworks rate. Here we were concentrating on five major defects in sewing process. Finally, these working policies able to % of defects decrease 79.28% to 17.5%. The study also facilitates the process performance of the critical operational processes. It will also reduce the cycle time by reducing reworks and finally result higher productivity.

Keywords: Profit margin, Sewing defects, production cycle time, Pareto chart and Cause-effect diagram

ICMIEE18-263

Planning for Budget Allocation in Digital Marketing

Md. Mahbubur Rahman, Al-Muktadir and Samiya Rahman
Department of Industrial Engineering and Management, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH

ABSTRACT

Globalization and increased internet usage have generated immense marketing opportunities as well as competitions. Marketing onthe internet is now an ever growing practice. Digital Marketing, marketing through digital technologies is a new form of marketing with a few mixes of traditional marketing practices. The aim of this research was to propose a budget plan for digital marketing. In Bangladesh, digital marketing practices made its way as e-commerce and steadily grew from 2000 to 2008. RACE framework was followed to narrow down the digital marketing operations into four key stages to easily manage the expenditure. In this study, nearly 50% of marketing budget was allocated to digital marketing, an expense backed by companies surveyed. This study found that the most popular digital marketing strategy in Bangladesh was Social Media Marketing (SMM) and the most popular SMM platform was Facebook. This project concluded with a budget plan heavily focused on Face book as found by surveys from both consumers and companies.

Keywords: Digital marketing, Email marketing, SMM, SEO, PPC.

ICMIEE18-266

Self-Balancing Autonomous Unicycle using Raspberry Pi

Pulok Tarafder[1,*], *Moyukh Amin*[1], *Syed Samiul Alam Mehrab*[2] *and Abdullah Al Maruf*[1]
[1]Department of Electrical and Electronic Engineering, BRAC University, 66 Mohakhali, Dhaka 1212, BANGLADESH
[2]Department of Computer Science Engineering, BRAC University, 66 Mohakhali, Dhaka 1212, BANGLADESH

ABSTRACT

Traditionally mobile devices contain no balancing mechanism as they are already quasi static containing three or four wheels. Using gyroscopes to power human forwards and backwards only a single wheel is needed to make a vehicle which will be much smaller and lighter with less cost. Being an inverted pendulum design it is inherently unstable so it needs constant control to provide appropriate acceleration. Using Kalman filter algorithm on the gyroscopic data this problem can be solved. As the proposed model is automatically controlled it will help reduce our design cost bare bones. The model always ensures that the tilt factor is minimized. We were successfully able to implement balancing during movement and on lateral level during static state.

Keywords: Self balance, Unicycle, Kalman Filter, PID Control, Raspberry Pi.

ICMIEE18-268

Available and Cost Reductive Materials in Bangladesh Having an Eye to Bone Treatment

Talukdar Raian Ferdous
Dept. of Biomedical Engineering, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH

ABSTRACT

Bangladesh have been announced as a developing country among the countries in the world in 2018. But poverty has not yet been eradicated properly. According to the World Bank, Bangladesh's poverty rate fell from 82% in 1972, to 18.5% in 2010, to 12.9% in 2016, as measured by the percentage of people living on the equivalent of US$1.90 or less per day in 2011 purchasing power parity terms. People die due to lack of treatment every year. Labourer and old people cover a great amount of population in Bangladesh. These people are suffering or will be the sufferer of bone disease like osteoporosis, bone fracture, bone pain etc. As a result the economy of Bangladesh will be hampered greatly. Bone treatment is a material dependent technique. So the cost is dependent on the material whether it is expensive or not. People can't afford titanium but they can afford steel. If the purpose is served by using steel then these sufferers will be the beneficiaries at a low cost. In this treatment there are a several factors that should be looked into. This paper focuses on the features of cheap and very common materials that can be used for bone treatment. Steel, aluminium, zinc, ceramics are very common materials here in Bangladesh. This literature will aggrandize the bone treatment facility in Bangladesh at a low cost and will be inspiring the researcher in this sector.

Keywords: Bone treatment, Steel, Magnesium, Aluminium, Cobalt, Copper,Zinc.

ICMIEE 18-273

Numerical Analysis of Energy Harvesting on a Wind Turbine Blade by Using Piezoelectric Material

Md. Faidid Ahasan, Mohammad Fuad Hassan and Dipayan Mondal
Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH

ABSTRACT

The main concern of this paper is to theoretically prove the absolute possibility of generating electricity from the wind turbine blades' vibration and natural frequency while using piezoelectric material as raw material for turbine blade construction. The reference piezoelectric material used in the design is Lead Zirconate Titanate (PZT-5H).Using design of experiments (DOE), a study was conducted to determine the sensitivity of power with respect to the geometric and material variables. By doing the fluid analysis over the blade, a pressure is obtained which is

further used for static analysis and by this pressure mechanical stress is produced and natural vibration is obtained.Due to mechanical stress, electricity formation is 9.497×10^{2}V and power produced is 1.1527W in whole piezoelectric blade. While in thin piezoelectric blade, electricity formation is 1.138×10^{3}V and power produced is 2.61W. When stress is taken under consideration, with 4.14Hz natural vibration, electricity will be produced up to 129.4 KW (maximum) for whole piezoelectric blade. For 3.4Hz, at a small section of the blade with a small thickness (about 0.01m) electricity will be produced up to 0.5W.

Keywords: Wind Turbine Blade, Vibration, Piezoelectric Material, DOE, Electricity

ICMIEE18-274

Application of Extracted and Modified Gelatin from the Leather Solid Waste in Commercial Finishing Agents

Priyanka Saha Gita and Zia Uddin Md. Chowdhury
Dept. of Leather Engineering, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH

ABSTRACT
Raw trimming has the potential to generate value-added product gelatin which produces the biodegradable film with low physical and mechanical properties. The chemical modifications by using the cross linking agent improved the performance properties of the gelatin. Commercially produced leather finishing binders are mostly non-biodegradable which have an adverse environmental impact with high grain loading. The binders blended with extracted and modified gelatin can reduce the environmental burdens by replacing a part of non-biodegradable materials from leather finishing agent. In this study, the gelatin was undergone thermal hydrolysis in acidic and alkali conditions at 90°C hot water and after modification of gelatin with cross-linkers it was blended with available commercial binders in an optimized ratio and tests carried out to check whether there is any major change to the performance properties of the finished film. Prepared films showed promising results with the gelatin-protein (PGm) and gelatin-acrylic (AGm) formulation. This approach has the implication in leather finishing subject to the assessment of physical properties of the finished film.

Keywords: Gelatin, binders, biodegradable film, performance property.

ICMIEE18-278

Investigation of Different Mechanical Properties on Various Hybrid Natural Fiber Based Polymer Composites

Rahul Sarker and Md. Shahidul Islam
Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna-9203,BANGLADESH

ABSTRACT
The recent era of material belongs to the composite materials because of its numerous numbers of advantages. Several researches have been done on different natural fiber composites. But different mechanical properties on various hybrid natural fiber based polymer composites still uncovered to us. Therefore, in this present research work macro structural analysis of different mechanical properties like tensile, flexural strength and water absorptive on natural fibers (jute, murta and bamboo) as hybrid composite in three combinations (jute-bamboo, bamboo-murta and jute-murta) are studied. Each combination consists of two natural fibers where each has two layers of woven fiber. Epoxy resin as matrix material and hardener with natural fibers as the reinforcement material is used to make the specimens. Hand lay-

up technique is used to fabricate the specimens. After testing the specimens it is found that the jute-bamboo hybrid composite has superior mechanical properties and better water absorption property as compared to the other hybrid composites.

Keywords: Hybrid, Matrix, Reinforcement, Tensile, Flexural.

ICMIEE18-283

Ergonomic Analysis of Bangladeshi Train Passengers

Sajia Afrin Shifa and Md. Golam Kibria
Department of Industrial Engineering and Management, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH

ABSTRACT

Though the train is a common mode of transportation in Bangladesh, it is imported for passengers without considering ergonomic design for the users. The objectives of this study were to identify performed activities and corresponding posture of the passengers, duration of the activities and to assess the comfort in respect of the performed activities and postures. Activities and duration were recorded with a smart phone. The postures were defined using coding technique. A comfort questionnaire was given to weigh the passengers comfort experiences in combination with the activities performed. Eight discrete postures were defined with four main activities: Staring, Sleeping, Talking and Listening to music or using mobile phone. The combination of activities and postures connected to comfort scores. For passenger seat design, it is very important to consider the postures. Vital consideration need to be taken for the long-performed activities (such as sleeping) to avoid musculoskeletal risks. The outcome can help to improve the existing seat design and interior facilities of train as to Bangladeshi passenger's ergonomic consideration.

Keywords: Train passenger comfort, activities, postures, seat design.

ICMIEE18-284

An Experimental and Simulation Study of Larger Volume Micro Discharge for the Realization of Microplama Based Reactor Applicable to Fuel Reforming and Material Processing

R. K. Das[1] *and Dr. A.Z.A Saifullah*[2]
[1]Dept. of Mechanical Engineering, Chittagong University of Engineering & Technology, CTG-4349,BANGLADESH
[2]Dept. of Mechanical Engineering, International University of Business Agriculture &Technology, BANGLADESH

ABSTRACT

Microhollow cathode discharge (MHCD) and microhollow cathode sustained discharge (MCSD) are two particular types of microdischarge configurations that produce stable glow plasmas at high pressures. Larger volume of higher density diffuse plasma in argon at various pressures is generated experimentally by MCSD in a split third electrode configuration. This enlarged volume microplasma serves as a source of high temperature electrons, ions and other excited species. Micro plasma reactor technology either for fuel reforming or material processing is based on using the energy of the high temperature electrons and other charged particles. Owing to their inherent difficulty in conventional diagnostics a detailed study on MHCD or MCSD relies on numerical simulations. This work describes the experimental procedure of generating MCSD with split third electrodes, realization of microreactor based on this enlarged volume microdischarge and numerical simulation of MCSDusing a 2D fluid model to determine the properties of this microdischarge.

Keywords: Microplasma, Microreactor, MHCD, MCSD, Split electrode.

ICMIEE18-285

Harnessing the Ocean's Wave Power for Bangladesh's Dynamic Coastal Areas

Md. Mahbub Hasan, Md. Ashfaqul Islam, Sheikh Ahmad Imtiyaz, Md. Akramul Alim, Md. Momtazur Rahman and Md. Mahmudul Hasan
Department of Electrical & Electronic Engineering, Bangladesh Army University of Engineering & Technology, Qadirabad Cantonment, Natore-6431, BANGLADESH

ABSTRACT
The current energy crisis needs to be solved through renewable and clean energy sources. Now-a-days, the energy transformation technologies from oceanic waves have craved large attention. An extremely promising source of energy exists in the world's oceans. Many energy transformation systems have been introduced to transform the mechanical force of oceanic wave into electrical power. Ocean energy inhabits in the shapes of wave, marine currents, tidal, salinity and fervent (temperature gradient). This research finds out the flourished electric technologies for grid power enhancement of various offshore wave energy transformation devices. The experimental outcomes and simulations for introduced modified inverter technology are submitted. The mentioned Ocean Wave Energy Converter craves lesser construction area and is guileless to conduct. The electrical conjunction configurations for enhancing the electric power of the multi wave energy transformation devices are flourished by applying the most feasible lowcosts grid interface electrical technologies based on power electronics.

Keywords: Ocean wave, Buoying force, Wave energy converter, Offshore wave power, Grid enhancement.

ICMIEE18-287

Efficiency of *Tamarindusindica* Seed Charcoal for Chromium Removal from Tannery Wastewater

Md. Abul Hashem, Kallol Paul, Mst. Nazmin Zaman Khan and Mehedi Hasan
Department of Leather Engineering, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH

ABSTRACT
In this study, chromium sorption ability of the prepared *Tamarindusindica* seed charcoal is presented. The prepared charcoal was characterized by Fourier Transform Infrared Spectroscopy (FT-IR).The effectiveness of charcoal adsorbent for chromium sorption efficiency was examined investigating: charcoal dose, contact time, and relative pH. Chromium content in the raw wastewater and after treatment in the filtrate was 3415.02 mg/L and 27.7mg/L, respectively. The chromium removal efficiency was obtained at 98.9%. The reduction of chloride was 17.2% and pH was (7.7) with the discharged level (6-9).The use of native *Tamarindusindica* seed charcoal adsorbent could be a choice to remove chromiumfrom tannery wastewater.

Keywords: Tannery wastewater, Chromium, Environment, Adsorbent.

ICMIEE18-288

Evaluation of Sewing Performance of Leather, Denim and PVC Coated Fabric Based on Seam Puckering, Seam Strength and Seam Efficiency

Muhammad Naimul Hasan, Md.Imrul Kayes Limon, Md. Jasidul Haque, Nabilul Hasan and Athher Shadab
Department of Leather Engineering, Khulna University of Engineering & Technology, Khulna-9203,BANGLADESH

ABSTRACT
Sewing performance is an important factor in determining quality, security, appearance & durability of a garment. It is related with seam strength, tensile strength of leather or fabric, seam slippage, seam efficiency, stitch density, seam puckering, elongation & elasticity etc. In this work, three types of materials such as leather, denim and PVC coated fabric were selected to construct stitch and turn seams and then their seam strength, seam puckering and seam efficiency were determined following ASTM D 1683 methodology to judge the sewing performance of the

three (leather, denim, PVC coated fabric) materials. Here, cutting point needle LR90, three stitches per cm and thread 60/3 were strictly maintained in all seam constructions. The objective of this study is to show comparison of sewing performance among leather, denim and PVC coated fabrics. The seam efficiency for leather, denim and PVC coated fabric were observed as 93.34%, 78.08% and 33.79% respectively. The thickness strain which indicates seam puckering value for leather was 2.22, the seam puckering indicated satisfactory value for leather. Hence, these data indicate the leather has the best sewing performance among the three. Again, breaking load of leather is higher than denim & PVC coated fabrics. So, it is clearly evaluated that leather has the supreme sewing performance which make its first selectivity to use as garments material.

Keywords: Leather, denim, PVC coated fabric, seam efficiency, thickness strain.

ICMIEE18-289

Experimental Study on Wheel Alignment System of Light Vehicles

Riton Kumer Das, Md. Abu Mowazzem Hossain and Md. Tazul Isalm*
Department of Mechanical Engineering, Chittagong University of Engineering and Technology, Chittagong -4349, BANGLADESH

ABSTRACT

Thewheel alignment system of the light vehicles is investigated experimentally. The different wheel alignment adjustment technique is used to perform the real time wheel alignment of the vehicle. In order to enhance the automobile performance a regular examination and adjustment of wheel alignment angles are needed by means of wheel alignment system. Computerized and computer vision based automobile wheel alignment measuring system is presented in this paper. The experiment analysis shows that the wheel alignment of vehicle became misalignment when the running distance range is approximately 4000 km to 5000 km. The investigation results suggest that the regular checking of wheel alignment by advanced technologies are significantly improved the life of tire, tire safety, and vehicle handling satisfaction.

Keywords: Wheel alignment, Alignment machine and sensor, Light vehicles.

ICMIEE18-294

Amino Acids Extraction from Hair Dissolving Liming Waste to Reduce Pollution in Tannery

Sadia Mim, Anika Tabassum and Md. Abul Hashem
Department of Leather Engineering, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH

ABSTRACT

In leather processing, hair/wool and epidermis are removed in liming operation and discharged as waste. These liming wastes consist of amino acids also yield to wastes. In this study, an investigation was made to extract an amino acids reductive-oxidative method from hair dissolving liming waste to reduce environmental pollution. The hair dissolving liming waste was collected and treated with sodium sulphide (Na_2S) and hydrogen peroxide (H_2O_2). The decanted solution was subjected for the presence of different amino acids was confirmed by different tests e.g., Sakaguchi test, xanthoproteic test, lead sulphide test etc. The tests have confirmed the presence of amino acids namely phenylalanine, tyrosine, tryptophan, cysteine and arginine. The extraction of amino acids from the hair dissolving liming wastes could be a solution to reduce pollution in tannery especially hair dissolving liming operation.

Keywords: Keratin, Hair dissolving liming, Protein, Pollution, Extraction

ICMIEE18-298

A Study on Minimization of Injury and Accidental Causes in Cutting, Sewing and Finishing Units of RMG Industries

Israt Parveen[1], *Mosammot Nelufa akter*[1], *Shima Shil*[2], *Md. Mehedi Hasan*[3] *and Md. Iqbal Mahmud*[1]
[1]Dept. of Textile Engineering, Mawlana Bhashani Science and Technology University, Tangail, BANGLADESH
[2]Trainee Work Study Officer, Ananta Jeanswear Limited, Ashulia, BANGLADESH
[3]Assistant Merchandiser, Montex Fabrics Ltd., Mondol Group, Kashimpur, Gazipur, BANGLADESH

ABSTRACT
The primary objective of this study is firstly to investigate the industrial accident in readymade garments (RMG) industries and find out the ways how these risk of injuries and accidents can be mitigate by implementing safety rules and suggestions. The paper discusses in brief the risk of injury and accidental causes of workers in various sections like cutting, sewing and finishing units of RMG industries based upon the industrial environment and working conditions. The sample respondents were selected from the different industries in Tangail district. Purposive sampling technique was followed for data collection, where different level of respondents was interviewed for collecting information from two selective garments industry. After analyzing the collected data ,the major accidental causes and injuries faced by the workers in those selective units were indicated for which there have been noticed a massive fall down of workers efficiency. Indicating those problems, improvement proposals were given to those industries and were implemented over a course of three month. From the proposed improvement proposal, it has been found that the rate of injury and accidental risks have been decreased far better than before and almost all risks can be properly controlled if the managing as well as responsible parties try to follow the risk controlling technique properly.

Keywords: RMG, Industrial accident, Working environment, Health hazard, Safety measures.

ICMIEE18-299

Forecasting Demand by GMDH Predictor, a Case Study

Syed Misbah Uddin, Aminur Rahman and Emtiaz Uddin Ansari
Department of Industrial and Production Engineering, Shah Jalal University of Science and Technology, Sylhet 3114, BANGLADESH

ABSTRACT
Forecasting demand is very important for manufacturing industry and also needed for all type of business and business suppliers for distribution of finish goods to the consumer on time. Forecasting with high accuracy is required to prevent wasting and system failure to fulfil market demand. This study is concerned with the determination of accurate models for forecasting cement demand. In this connection this paper presents results obtained by using a self-organizing model and compares them with those obtained by usual statistical techniques. A nonlinear modelling technique based on Group Method of Data Handling (GMDH) is considered here to derive forecasts. Various time series smoothing techniques such as exponential smoothing, double exponential smoothing, weightage moving average and moving average method are used for forecasting the demand. For this purpose, Monthly sales data of a typical cement ranging from January, 2007 to February, 2016 was collected. The mean absolute percentage error (MAPE) and mean sum square error (MSE) are also calculated for comparing the forecasting accuracy. The comparison of modelling results

shows that the GMDH model perform better than other models based on terms of mean absolute percentage error (MAPE) and mean square error (MSE).

Keywords: Forecast, GMDH algorithm, Time series, MAPE, MSE.

ICMIEE18-301

Implications of Bangladesh's Present Energy Transition on Energy Trilemma

Shafiqul Alam[1] and Md. Golam Kader[2]
[1] International Climate Protection Fellow, Ecologic Institute, Pfalzburger Strasse 43-44, Berlin 10717, supported by Alexander von Humboldt Foundation, **GERMANY**
[2]Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna-9203,BANGLADESH

ABSTRACT
Although energy efficiency and renewable energy can enhance energy security, improve environmental performance and reduce Greenhouse Gas emissions, the energy transition of Bangladesh over last decade has rather been focused on imported fossil fuels. The transition has mainly been driven by economic growth and quick-fix strategy. This paper draws upon secondary data of last decade, relevant publications and existing policies to explore the status of ongoing energy transition of Bangladesh and its implication on energy trilemma, which is being measured on energy security, equity and environmental performance. Through analysis, diverse range of issues, i.e., options and pathways for sustainable energy transition and linkages of the transition with national climate policy and Sustainable Development Goals, are examined. The paper concludes with the necessity of creating an enabling environment and developing conducive policy instruments, also derived from present experience, to catalyze investment and attract private sectors for sustainable energy transition in Bangladesh.

Keywords: Energy Transition, Energy Trilemma, Renewable Energy, Energy Efficiency, Bangladesh.

ICMIEE18-303

Effect of Blended Yarn on Physical Properties of Single Jersey Knitted Fabrics

Mohammad Naim Hassan, A.K .M Nayab Ul Hossain, Md. Shakhawat Hossain, Moni Sankar *Mondal, Joy sarkar and Rezve Hassan Aunik*
Dept. of Textile Engineering, Khulna University of Engineering and Technology, Khulna- 9203, BANGLADESH

ABSTRACT
In this study variation of knitted fabrics properties due to different blended yarn were analyzed. Here wefts knitted fabrics like single jersey were used. Yarn count and GSM of fabric has great impact on fabric properties. Aim of this project is to find out the convenient strategies to choose yarn count selection, GSM selection to get the desired qualities in the single jersey grey fabrics. In this research, Knit fabrics(made from blended yarn) having different GSM were tested where a specific yarn count was taken into consideration of blended yarns for manufacturing single jersey fabrics.

Keywords: Fiber, Yarn, GSM, Yarn count, Stiffness, Tear strength.

ICMIEE18-304

Sizing of Warp Yarn with a Different Concentration of Animal Fat and Acids and Determination of the Performance in Comparing with Conventional Sized Yarn

Joy Sarkar[1] *and Md. Shamsuzzaman Rasel*[2]
[1] Department of Textile Engineering,Khulna University of Engineering & Technology, Khulna-9203,BANGLADESH
[2]Department of Textile Engineering, World University of Bangladesh, Dhaka-1207, BANGLADESH

ABSTRACT

This paper deals with Animal fat, which could effectively assess alternatives sizing materials than conventional sizing materials. Here, we have picked two yarn types; 1) Sized yarn and 2) Unsized yarn for the test. In sample preparation, we have treated 100gmunsized yarn with 500 ml fat solution each containing 10% HCL, 10% Glacial Acetic Acid, 10% Lactic acid and with only water. Handloom had been used to weave for both treated yarn samples. Then some physical and mechanical properties were tested to calculate weaving performance. After measuring the fabric weight we found that only water and fat solution treated samples weight showed higher GSM than other samples. Besides, higher tensile strength hadmeasured for conventionally treated samples. Approximately 30 – 50% less breaking strength was recorded for other samples for warp way directions, although only a little lower breaking strength had found in weft way directions. Again, higher abrasion resistances were observed for conventional fabric samples however HCL treated samples had prevailed least properties. Therefore costing of acid-fat treated samples are much lower than conventional sizing, besides desizing could be bypassed and single bath scouring and bleaching could be applicable.

Keywords: Animal fat, Sizing, GSM, Tensile strength, Abrasion.

ICMIEE18-305

Natural Gas Scenarios in Bangladesh and Its Future

Md. Saruar Jahan[1]*, Md. Abu Raihan*[1]*, Mohammad Iqbal*[1] *and Farhad Hawlader*[2]
[1]Department of Industrial and Production Engineering, Shahjalal University of Science and Technology, Sylhet-3114, BANGLADESH
[2]Department of petroleum and mining Engineering, Shahjalal University of Science and Technology, Sylhet-3114, BANGLADESH

ABSTRACT

Natural gas is the most important indigenous source of energy that has been continuously produced and consumed in significant quantities since 1970. Bangladesh is the nineteenth-largest producer of natural gas in Asia. Gas supply meet 56% of domestic energy demand. About 75% of the commercial energy of the country comes from the natural gas. So far 27 gas fields have been discovered of which two of the gas fields are located in offshore area. The paper shows the present scenario of natural gas in Bangladesh and its future. Though Bangladesh has considerable amount of gas yet it is not enough for 50 more years at current demand and extraction rate. The analysis suggests to reduce dependency on natural gas by introducing alternative energy sources. Moreover, a comprehensive energy policy should be developed with a proper regulatory body that has oversight responsibilities. Efficient gas marketing is the key to derive numerous benefits from the gas reserves of Bangladesh. Lastly, Bangladesh government need to explore ocean area that has been acquired from India & Myanmar in 2014.

Keywords: Bangladesh, natural gas, production, consumption and utilization, reserve

ICMIEE18-306

Fabrication of a Long Distance Controlled Pan-Tilt Mechanism for Camera

Soma Sarker, Asif Ahmed Shishir and *Shilpi Rani Saha*
Dept. of Mechanical Engineering, Rajshahi University of Engineering & Technology, Rajshahi, BANGLADESH

ABSTRACT
This project is about fabricating a pan-tilt mechanism capable of being controlled from a long distance that can be connected and controlled through cell phones. This simplest and obvious robotic model is based on the motor on motor (MOM) design by using two identical stepper motors to cover the whole area view operated manually from long distance with Dual Tone Multi Frequency system (DTMF) signaling. The lower (pan) stepper motor have to be powerful enough to move the two brackets, DTMF receiver with its holder and the upper (tilt) stepper motor have to move most upper bracket, DTMF receiver with its holder only. We would like a pan-tilt mechanism to be accurate, slow, small, low-powered and inexpensive. The technology is used in many different consumer-based services including ATM booth monitoring; Surveillance based applications; Household security; Car Parking etc.

Keywords: Mechatronics, Pan-Tilt Mechanism, Remote Monitoring, Cost Effective, Security Purpose.

ICMIEE18-307

Design & Fabrication of Low Cost GSM Based Wireless Controlled Robot

Asif Ahmed Shishir, Soma Sarker and Md. Sefatullah
Dept. of Mechanical Engineering, Rajshahi University of Engineering & Technology, Rajshahi, BANGLADESH

ABSTRACT
Many projects are taking place based on design & fabrications of low cost Robots with GSM-based communication system. This paper represents a simplified form of a robot which can be operated from a long distance using DTMF Technology. In this project a four-wheeled platform is made, where a position is created to mount a mobile phone to do real-time video through calling from user's mobile and rotate it up to 180-degree angle. In the front side, two robotic arms are mounted which is controlled by three motors for pick and place operation. We present a whole structure whereby the GSM network can control a mobile robot including Real-time video recording by only a call from user mobile. This paper introduces the steering mechanism which is engaged with the front wheels of the robot to ensure left, right, forward and backward movement of the robot. It can be a low-cost solution for industrial, rescue and surveillance related applications.

Keywords: Design Prototype, Tele-operated control, Extraction arm system, video capturing, Low Cost.

ICMIEE18-308

The Variation of Concrete Strength using Waste Tyre Rubber as Coarse Aggregate

Md. Ashiqul Islam, Tuhin Hasan Shagar and MD. Raihan Bhuiyan
Department of Civil Engineering, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH

ABSTRACT
Waste tyre rubber constitutes a large portion of solid waste which has turned into a worldwide environmental concern. The waste tyres represent a significant environmental, human health and aesthetic problem. The consumption of waste tyre rubber in concrete has gained more attention from the point of view of enhanced engineering properties. The objective of this study is to explore the effect of rubber tyres on mechanical properties of concrete. This study represents the results to the investigation of strength characteristics of concrete produced using waste tyres as substitutes for conventional coarse aggregate in replacement of 10%, 20%, 25%. Here 56 cylinders were prepared using waste tyres for this study. It has been observed that the use of tyre rubber particles provides a new type of concrete that inspires the use of waste tyres as a replacement of coarse aggregate.

Keywords: Tyre rubber, Solid waste, Engineering properties, Replacement, Coarse aggregate.

ICMIEE18-309

DMAIC Approach for Process Improvement: Improving Fabric Width Shrinkage of Basic T-Shirt

Swarnalekha Khandker[1] *and Tasin Us Sakib*[2]
[1]Department of Industrial Engineering and Management, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH
[2]Department of Industrial and Production Engineering, Rajshahi University of Engineering & Technology, Rajshahi-6204, BANGLADESH

ABSTRACT
This paper represents the effectiveness of DMAIC approach for process improvement, which is a structured methodology of Six Sigma that is proven to be a dynamic approach for defect identification, problem solving and future prevention by the support of different statistical tools. In this paper, the major problem was negative shrinkage of garment width which was not within the UCL and LCL. Consequently, the overall AQL of finished product on customer end reached to 7.50%, where the standard allowable shrinkage is ±5.5 cm and standard AQL is 1.5%. Therefore, after identifying the root-cause the DMAIC was used for process improvement and solving the issue. In an overview, DMAIC is one of the most authoritative approaches in Six Sigma problem solving process. This is the short form of Define-Measure-Analyze-Improve –Control. DMAIC is one of the most widely practiced tools to ensure and lead towards maximum quality level that absolutely fulfill the SIX SIGMA methodology. And, this result comes by following the steps of process improvement that includes not only determining existing system but also bringing up new possible process changes to improve quality, process efficiency, productivity and reduce cost. Throughout these steps different supporting tools such as project charter, Pareto chart, process map, CTQ parameter identification, data collection, cause and effect diagram, check list etc. has been used and also form which final corrective actions and preventive actions (CAPA) has been attained to gain the ultimate progress. The progress in any of the mentioned areas is considered to be a catalyst towards the process improvement. The main objective of this study is meet the voice of customer (VOC) that is AQL% level up to 1.5%, in other words improve the overall width shrinkage %. Though, primarily the root cause of high percent defective was identified by 80/20 rule by using the complaint data received from the customer, later by implementing corrective and preventive action the AQL% was controlled up to 1.15% which is 84.67% improvement of the overall quality level.

Keywords: DMAIC, Width Shrinkage%, CTQ, AQL, CAPA

ICMIEE18-310

Design of Automated Biodiesel Blend Plant and Analysis of Rotational Effect on Biodiesel Blends

Shaurin Maher Kikky[1] *and Leonard Sunny Peris*[2]
[1]Dept. of Mechanical Engineering, Military Institute of Science and Technology, Dhaka-1216, BANGLADESH
[2]Department of Mechanical Engineering, Bangladesh University of Engineering and Technology, BANGLADESH

ABSTRACT
Due to the high growth in demand for the use of fossil fuel in today**'**s world, alternative sources of energy extraction is now the prime focus. One such viable medium is the Bio-Diesel**.** In this paper, different blends of biodiesel produced from newly designed automatic biodiesel plant have been studied. During esterification process various speeds were applied by using self-controlled servo motor and settlement time was observed over range of various speeds. Comparative study of the blends for chemical and mechanical properties such as kinematic viscosity, density, flash point and calorific value were also appraised. In this thesis, a clear idea and explanation upon the generation of biodiesel from various available oils as well as contrast of their mechanical, chemical properties have been illustrated**.** The design of the fully automated biodiesel plant and the working procedure of that plant for continuous production and supply have been shown**.**

Keywords: Automated Biodiesel plant, Continuous production of biodiesel, Mechanical and chemical properties of biodiesel**.**

ICMIEE18-311

Evaluating the Impact of Coal Fired Thermal Power Plant on Water: A Case Study of Barapukuria Dinajpur, Bangladesh

Md. Mustafizur Rahman, Md. Arif Hossain and M. Farhad Howladar
Shahjalal University of Science and Technology, Sylhet-3114, BANGLADESH

ABSTRACT

Thermal Power plants have various impacts on land, soil, water, air, and social environment. From the result, it has been identified that pH of the water is relatively low near the plant due to improper water drainage. Moreover, calcium of the water samples is also below than the standard value. On the other hand, Chloride (Cl^-), Total Hardness (TH), Magnesium (Mg) is relatively higher than the Standard Reference value for agriculture. Moreover, maximum degraded water samples are found near the Thermal Power Plant, as the distance increases from the thermal power plant the degradation level of water samples decreases, which is a clear indication of the anthropogenic effects of thermal power plant on the water quality. The collective results of multivariate analysis and Water Quality Index (WQI) imply that most of the areas around the area are dominated by the good to excellent quality water for different purposes. In addition, the results of this research will then be helpful to estimate the major sources of contamination in different areas within the framework of activities intending to improve the quality of water.

Keywords: Thermal Power plant, Water quality, Multivariate analysis, Water quality index.

ICMIEE18-312

Design and Fabrication of an Unmanned Underwater Vehicle

Mohammad Harun-Or-Rashid and Diprajit Biswas
Department of Mechanical and Production Engineering, Ahsanullah University of Science and Technology, Dhaka, BANGLADEH

ABSTRACT

This paper describes the construction of an unmanned underwater vehicle. The UUV was developed to provide the access of underwater for exploit the environment of water and the surroundings of that particular area. The construction of the submarine was done with aluminum to reduce weight and overcome high pressure. About all the components used is water protective, so that, these can give service as submersed. The body is 22 inch long with 10 inch diameter torpedo shaped. Four submersible pumps are used in two ballast tanks for water intake and exert through two solenoid valves. External shapes mount one propeller, one rudder behind the propeller, two elevators and an antenna at the top of the body for receiving signals. The power is derived from two onboard batteries, one for the rudder and elevators, and the other one is for other components. The thrust force generated by the propeller gives forward motion to the vehicle. The machine is equipped with necessary features that would be able to provide service for a long time. In the present research, an UUV is developed and experiment is conducted. It provides an excellent platform for further development of the underwater vehicle as well as can be used in various fields like underwater research, military and civil purposes.

Keywords: Submarine, Unmanned Underwater Vehicle.

ICMIEE18-313

Study the Attitude of a Seesaw to Develop Flying Robots

Mohammad Harun-Or-Rashid and Md. Nadim Bin Wahid
Department of Mechanical and Production Engineering, Ahsanullah University of Science and Technology, Dhaka 1208, BANGLADESH

ABSTRACT

Design, manufacture and attitude control of a seesaw are described in this paper. At the beginning, mechanical design of the system is completed in SolidWorks. Then the system is made. To control the system several dynamic equations and parameters are studied. Furthermore, a number of electric components such as motor, electronic speed controller, micro controller board are studied and selected for the experimental setup. Finally, proportional integral derivative controller algorithm is used to control the seesaw. Gain values of the proportional integral derivative controller are estimated on the basis of trial and error method. Ultimate values of the proportional, integral and derivative gains are 3.05, 0.005 and 0.75 respectively. During experiment, it is found that, system takes only ten seconds to reach the same position as the input command. Therefore, this technique can be used to control the roll and pitch attitude of the quad rotor as well as other unmanned aerial vehicle.

Keywords: Attitude Control, ESC, IMU, Seesaw.

ICMIEE18-314

Biofuels Extraction through Pyrolysis of Banana Waste

Saikat Biswas, Sudip Saha and Mohammad Ariful Islam
Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna-9203,BANGLADESH

ABSTRACT

Demand for energy is increasing at an alarming rate. To overcome this problem pyrolysis of biomass can be counted as an alternative option. Banana waste is a very good source of Banana waste. The aim of the work was finding the worthiness of banana waste as a biomass source for pyrolysis process and extraction biofuels from it. Banana waste is a very common type of bio-mass. Banana waste was collected from tea stalls and hotels, then dried and prepared for pyrolysis. To extract fuel from banana waste, a fixed bed type pyrolysis apparatus was designed and constructed. The pyrolysis apparatus was contained a fixed bed type reactor, dry heater, condenser mechanism, vacuum pump, thermocouple. After extracting liquid fuel, physical properties were measured and compared with various pyrolytic oils. The average amount of biofuel extraction from banana wastes was obtained 3.6% (wt) and it is relatively low in comparison with other waste available in the literature.

Keywords: Pyrolysis, Biofuel, Banana Waste, Pyrolytic Oil.

ICMIEE18-315

Designing Approach of Blimp for a Hybrid VTOL Aerial Robot

Md.Tasnim Rana and Md. Shahidul Islam
Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna-9203,BANGLADESH

ABSTRACT

In case of aerodynamic aspects when mostof the research is going on how to increase lift, with developing bits aerodynamic shape, the most advancement can be drawn with using inflatable blimps where lighter than air gases can be used. The lighter than air gasses will provide a great aerodynamic advances by providing lift using its bouncy forces. For controlling an aerodynamic object there is two forces, one is its own gravitational force in negative direction and controlling forces as required for changing its position .But, most of the cases gravitational forces make the most difficult situation while its time to deal with power consumption. By using inflatable envelope with lighter than air gasses we can easily deal with the gravitational forces of aerodynamic objects. This writing will present a design approach for this kind of inflatable envelope.

Keywords: Aerodynamics, Inflatable, Bouncy, Gravitational

ICMIEE18-316

Design and Construction of a Three-Axis Automated Drilling Mechanism with Depth Controllability

Sudip Saha, Saikat Biswas and Md. Kutub Uddin
Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH

ABSTRACT

To increase the quality and quantity of products current development in the industry has been towards computer-controlled manufacturing process. Manual manufacturing of such items as the wood workpiece or circuit board or metal sheets will have a big faulty case and uneven quality. This proposed drilling machine is designed to drill the holes automatically over a job according to the drilling depth and co-ordinate data programmed through a controller. The goal was to implement an automated drilling mechanism using the automation process for the workpiece movement. The concept of integrating sensor-based controlling with adaptive feedback control allowed the mechanism towards multiple drilling. The depth controllability function allowed drilling with variable depth for each drilling operation within the workpiece thickness. Exploring with CNC system provided control over functions and motions of the machine tool through coded alphanumeric data. Ultimately reducing human effort and time consumption while implementing better accuracy for the small-scale industry is what makes this paper through.

Keywords: Automated drilling, CNC, depth controllability, path planning, reducing human effort etc.

ICMIEE18-317

Efficacy of Watermelon *(Citrullus Lanatus)* Rind Charcoalfor Chromium Removal from Tannery Wastewater

Nabila Nowrin, Tasnim Alam, Sofia Payel, Md. Shahruk Nur-A-Tomal and Md. Abul Hashem
Department of Leather Engineering, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH

ABSTRACT

Over recent years, sustainable development has been more appreciated to achieve the goal of a safe environment with the proper waste management system. Since the complete reduction of waste generation is inevitable, waste management is the best possible solution for a sound environment. In this proposed approach, watermelon rind charcoal was used as an adsorbent to remove chromium from tannery wastewater. Following batch experiment process the system was optimized by different parameters: charcoal dose, contact time and adsorption kinetics and the physicochemical characteristics of both raw and treated effluents were analysed.The chromium content in raw wastewater and treated wastewaters were 2733.4 mg/L and 5.536 mg/L respectively with 99.8% chromium removal efficiency. Additionally, it removes the chloride content by 56.86%. This method revealed the significant potential of watermelon rind in chromium removal from tannery effluent.

Keywords: Chromium, Tannery effluent, Watermelon Rind.

ICMIEE18-318

Design Construction and Performance Test of a Low-Cost Portable Mechanical Ventilator for Respiratory Disorder

S. M. Tamjid Hossain[1,*], *Mihir Ranjan Halder*[1], *Al Aman*[1], *Md. Rakibul Islam*[2] *and Md. Tarek Rahman*[1]
[1]Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH
[2]Dept.of Biomedical Engineering, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH

ABSTRACT

Mechanical ventilator is a medical device which is usually utilized to ventilate patients who cannot breathe adequately on their own. Among many types of ventilators Bag Valve Mask (BVM) is a manual ventilator in which a bag is pressed to deliver air into the lungs of the patient. In present work, a mechanical system along with microcontroller has been developed to automate the operation of BVM. The constructed prototype contains two arms of 0.30 m long, powered by two servo motors through pulling wires and pulleys, supported by wooden frame. These arms compress the BVM in prescribed manner at the rate set by the operator through a control knob. With principal dimensions of 0.55m*0.15m*0.3m, weight 2.5 kg and three 9 V battery for supplying power for at least one hour continuous operation, the prototype can be moved easily. The dimensions of the frame are selected as such to be compatible with the physical dimension of Ambu bag. The performance of the device was tested using BIOPAC Airflow Transducer which illustrates that the Tidal Volume vs. Time graph of the automated system is similar to the graph produced by manual operation of the BVM and to the graph produced by a human subject, but with a mean deviation of 0.332 Litres with manual operation and 0.542 Litres with human subject. Although the developed device cannot compress the bag completely due to low powered servo motors, it proves the concept of automating the operation of BVM using mechanical system for developing a portable ventilator.

Keywords: Mechanical Ventilator, BVM, BPM, Airflow Transducer.

ICMIEE18-319

2D CFD Analysis of a Straight-bladed Vertical Axis Wind Turbine using General Grid Interface Method

Farah Aqilah, Mazharul Islam[1], *Franjo Juretic*[2] *and Waqar Asrar*[3]
[1]Department of Mechanical and Production Engineering, Ahsanullah University of Science and Technology, 141 & 142, Love Road, Tejgaon Industrial Area, Dhaka-1208, BANGLADESH
[2]Creative Fields Ltd., Dragutina Golika 63, 10000 Zagreb, **Croatia**
[3]Department of Mechanical Engineering, International Islamic University Malaysia, 50728 Kuala Lumpur, **Malaysia**

ABSTRACT

Due to the ever-increasing need to lower the carbon pollution on earth, a method of generating electricity from kinetically-induced wind turbines is studied. Despite the commonly ventured horizontal axis wind turbine (HAWT), the vertical axis wind turbine (VAWT) has received increasing interest in the past decades due to its simple blade structures and small size. VAWT, specifically Straight-bladed vertical axis wind turbine (SB-VAWT) is one of the simplest types of VAWT for diversified applications. The winning factor against a normal HAWT is that they are relatively small in size and insensitive to incoming wind direction. In this study, the performance analysis of SB-VAWT is performed using the conventional Computational Fluid Dynamic (CFD) Model in two-dimension using the feature General Grid Interface (GGI) which can be found in the open-source CFD software, foam-extend v3.2. A transient solver with second order discrimination scheme is used. The commonly used, k-ω SST turbulence model is

applied in this study. The resulting power coefficient, C_P from the 2D CFD analysis is validated against experimental data. From the result, it is shown that the model under-estimate C_P value but closely matched with those form the experiment.

Keywords: Straight-bladed Vertical Axis Wind Turbine, fully turbulent model, k-ω SST, General Grid Interface, foam-extend.

ICMIEE18-320

Numerical Analysis of Heat Transfer for Double Pipe Heat Exchanger with and without Fin

Jamshedul Islam, Al Aman and Mihir Ranjan Halder
Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH

ABSTRACT

In this paper, the heat transfer enhancement analyzed using ANSYS FLUENT both in finned and unfinned condition. The numerical analysis went through different inlet velocities. As the cold fluid passed through the outer pipe surrounding the hot fluid in inner pipe, there was temperature fall in hot fluid. And that rate was found greater in finned condition comparing with unfinned one. Optimum number of fins were determined by analyzing the heat transfer through numerical computation. The effectiveness was found to reduce with the increase in flow velocity. For extended surface area in finned setup the overall heat transfer coefficient reduced. The reducing rate was found 28.88% for counter flow and 28.90% for parallel flow, for the flow velocity 0.001 m/s. The LMTD values were found 30.06 for parallel, 28.91 for counter flow in finned heat exchanger and 45.38 for parallel, 43.53 for counter flow in unfinned heat exchanger.

Keywords: Fin, Effectiveness, Parallel and Counter flow.

ICMIEE18-321

Comparative Numerical Analysis of Heat Transfer between Nonporous and Porous Cylindrical Fins

Farida Ahmed Koly, Abu Raihan Ibna Ali, Moham Ed Abdur Razzaq and Mostafizur Rahman
Dept. of Mechanical Engineering, Chittagong University of Engineering & Technology, Chittagong, BANGLADESH

ABSTRACT

Fin is the easiest and cheapest way in enhancing heat transfer of all other methods like increasing fluid velocity, ionizing fluids, using additives, causing vibration etc. It has a lot of applications in the growing number of engineering disciplines. The main purpose of this paper is to enhance heat transfer of cylindrical fin by perforated and axial holes which increases surface area but decreases material cost. Finding out the proper length of the fin is another goal of this paper which also reduces fin size and material cost. Steady state thermal simulation has been done using ANSYS 17. An attempt is made to find out temperature distribution by varying geometry, materials. Investigations show that porous cylindrical fin drops maximum temperature and hence maximum heat transfer occurs because of the increasing ratio of perimeter to cross sectional area. Porous cylindrical fin also has light mass with low cost. And proper length of cylindrical fin increases with the increase in diameter.

Keywords: Thermal Analysis, Heat Transfer, Porous Fin, Proper Length.

ICMIEE18-322

Performance of Heat Transfer of a Plain Tube Fitted With V-Shaped Twisted Tape Inserts of Copper and Stainless Steel Material For Turbulent Flow

Mostafizur Rahman, Mohamed Abdur Razzaq, Abdullah Al Noman and Jamal Uddin Ahamed
Dept. of Mechanical Engineering, Chittagong University of Engineering & Technology, Chittagong, BANGLADESH

ABSTRACT
This paper represents tube side pressure drop, friction factor, heat transfer co-efficient, heat transfer rate, enhancement of heat transfer efficiency and percentage of increase in those parameters for water using V-shaped twisted tape inserts of copper and stainless steel material into a plain tube. The test section is a circular tube made of copper having 26.6 mm inside diameter, 30 mm outside diameter and 939.8 mm in long, of which 900 mm is of effective length. V-cut twisted tape inserts are made of as 800mm length, 1.5mm thickness, twisted ratio 5 and width and depth of 8mm are used in this experiment. The test section is perfectly insulated and electrically heated. Five k-type thermocouples are used for measuring wall temperature. Experimental Nusselt number is found ranging from 34.65 to 69.25 for smooth copper tube without insert whereas, 110.9 to 250.9 for V-cut twisted tape insert of stainless steel and 121.1 to 331.8 for V-cut twisted tape insert of copper. Heat flux is obtained ranging from 9163.8W/m^2 to 15828.3W/m^2 without insert, 18327.5 W/m^2 to 31656.6W/m^2 for stainless steel insert and 18327.5W/m^2 to 39570.8W/m^2 for copper insert. Increment of heat transfer of copper insert is as 2.52 times and of stainless steel insert as 2.5 times more than plain tube without insert. Convective heat transfer co-efficient is found as 3.2, 3.5 times more than plain smooth tube for stainless steel insert and copper insert. Heat transfer enhancement efficiency using stainless steel insert and copper insert is increased 3.2, 4.3 times more than plain tube without insert.

Keywords: **V-shaped insert, Friction factor, Heat transfer rate, Heat transfer performance, Heat transfer enhancement efficiency**

ICMIEE18-323

Performance Analysis of Hydroxy Gas Generator by Varying Conditions of Electrolyte Concentration, Temperature and Time

Joy Datta, Dr. Md. Abu Mowazzem Hossain and Radif Uddin Ahmed
Dept. of Mechanical Engineering, Chittagong University of Engineering & Technology, Chittagong, BANGLADESH

ABSTRACT
Demand and price on fossil fuel is increasing day by day, it is very much crying need to search for a alternative secondary fuel. Devloped countries are spending a lot of money on research and development of non conventional energy and eco friendly energy sources. To cope up with the problem hydroxy (HHO) gas is used as a secondary fuel for compression ignition and spark ignition engine for improving brake thermal efficiency, reducing fuel consumption and emissions from internal combustion engines which reduces fuel consumption that minimizes carbon deposition on the cylinder. In this project, hydroxy gas (HHO) was produced by the electrolysis process of an electrolyte (KOH (aq)) with 20 grade stainless steel electrodes in a leak proof pvc pipe tube (hydrogen generator).It has been observed that with a increased amount of KOH concentration the cell can produce HHO gas 207 ml/min and with 0.1M concentration of KOH and C temperaure it can produce large amount of HHO gas which is 455 ml.

Keywords: Secondary fuel, HHO gas, Concentration, Temperature, Eco friendly.

ICMIEE18-324

Techniques to Improve the Parallel Finite Element Method to Solve Large Scale Problems

Abul Mukid Mohammad Mukaddes[1], Masao Ogino[2] and Ryuji Shioya[3]
[1]Shahjalal University of Science and Technology, BANGLADESH
[2] Information Technology Centre, Nagoya University, **JAPAN**
[3]Faculty of Information Sciences and Arts, Toyo University, **JAPAN**

ABSTRACT

With advent of computer technology finite element method has achieved the popularity in the simulation of engineering problems. In order to get the accurate result, the finite element discrimination of the problem should be as fine as possible. The finest discrimination of three dimensional (3D) problems results in the large linear systems of equations. Consequently, the solution of equation having millions of co-efficient has become the biggest challenge of the researchers. Recent development of the computer technology necessitates the efficient ways to solve those linear systems of equations using less memory and time. In this paper, some efficient ways have been proposed to solve large scale heat transfer and solid mechanics problems using the parallel finite element methods. Firstly, an iterative method with different precondition is implemented in the both thermal and solid problems and significant results have been achieved. Secondly, it is shown that use of sparse matrix storage scheme reduces the computation time and the required memory. Different variations of sparse matrix storages schemes have been studied here for different class of engineering problems.

Keywords: Finite element, domain decomposition, compressed sparse row, heat conduction, preconditioned

ICMIEE18-325

Pyrolysis of Sawdust for Bio-Oil Production using Infrared Heat Source

Md. Rabiul Islam, Muhammad Mostafa Kamal Bhuiya, Bably Das,Mostafizur Rahman and Amir Hamza Limon
Dept. of Mechanical Engineering, Chittagong University of Engineering & Technology, Chittagong, BANGLADESH

ABSTRACT

An experimental investigation was carried out to produce bio-oil from sawdust using pyrolysis process (infrared induction cooker). The experiments were performed for varieties of infrared cooker heat inputs at a particular moisture content. To complete the pyrolysis process, a conical flask type reactor was used in this experiment. The experimental results demonstrated that the maximum of 7% bio-oil, 83% char and 10% gas were obtained at a moisture content of 25%. The properties of produced bio-oil were characterized and compared to other biomass products. The calorific value, density, viscosity, flashpoint and fire point of 10.7 MJ/kg, 922.71 kg/m^3, 20 mm^2/sec 64°C and 68°C were obtained, respectively, when the produced bio-oil was tested. This paper provides a clear information about how to produce bio-oil from biomass resources at a greater extent using infrared induction cooker. It can be noted that the production and usages of bio-oil is one of the roots to produce low-carbon energy.

Keywords: Infrared induction cooker, Pyrolysis, Bio-oil, Calorific value.

ICMIEE18-326

Cleaning of Accumulated Dust Particle of a Flat Plate Solar Collector

Amir Hamza Limon, Muhammad Mostafa Kamal Bhuiya, Mostafizur Rahman and Majedul Islam
Dept. of Mechanical Engineering, Chittagong University of Engineering & Technology, Chittagong, BANGLADESH

ABSTRACT

An experimental investigation was carried out to find out the effective cleaning method of the glazing material of solar collector. The study emphasized on solar panel glazing material cleaning process using water force impinging by a nozzle. A nozzle is used to make a water jet having a velocity which is impacted on the glazing material of a solar plate collector. The project investigated the optimum position of nozzle with respect to glass at which the dust removing rate is maximum. The jet of different velocities were used to perform the experiment and the maximum tangential force was found between 30º-40º relative angle of impacted jet with respect to the glazing material at which the maximum cleaning can be possible. This project will help to ensure the maximum amount of solar beam reach to the receiver for power generation. It can be noted that this technique will help to clean the solar collector with a reasonable cost and effectively.

Keywords*:* Accumulated dust, Cleaning, Water force, Nozzle, Glazing material

ICMIEE18-327

Stress Analysis of Welded Joint Portions at Rear-side Footrests of Public Transportation like Human Hauler

Mohammad Asheful Alam, M S Rabbi, Sama-E-Shan and Md. Shamim Hasan
Dept. of Mechanical Engineering, Chittagong University of Engineering & Technology, Chittagong, BANGLADESH

ABSTRACT

Public transportation like Human Hauler (also called as ‘Leguna’) has footrest at the rear side, which is built for purpose of getting into or out of the vehicle. It is not any integral part of the vehicle, so welded with the main frame. However, it is frequently used to carry passengers in our densely populated country. As a result, extra stress is continuously generated on these portions. This research paper highlights how much stress is generated on these welded joint portions. For this evaluation, first of all continuous load data are taken by a strain gauge based load sensor setup in which an Arduino is used as controlling device. All the data was stored in an external SD card. Then using these data, stress at various welded joint portions is calculated. After that, a comparison shows which welded joint portion is the most vulnerable and which is the least.

Keywords: Stress, Welded Joint, Strain Gauge, Public Transportation

ICMIEE18-328

Wear Behavior of Different Impeller Materials for Pumping Various Slurry

Sandip Karmokar, Sohaban Mia and Md. Abdul Hasib
Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna-9203, BANGLADESH

ABSTRACT

Slurry erosion tester is ordinarily used to study the comparative erosion behavior of different materials at moderate solid concentrations which are used in our civilization life. In the present work, a pin mill type slurry-pot wear tester has been made. Flat type and impeller type sample material has been tested by this tester. By this testing apparatus different types of material can be tested at various speed and concentration. Total four types of material such as Aluminum, Brass, Mild Steel and Cast Iron has been tested by taking different types of slurries to find out the wear characteristics of the material by measuring the rate of mass loss with respect to various parameters like slurry concentration, speed of rotation, distance traversed, impact angle and time. The machine has been tested by taking slurry of silica sand in a GI container to find the rate of mass loss of aluminum, brass, mild steel, cast iron sample.

Keywords: slurry-pot, pin mill, slurry-erosion, silica sand and speed control box.

ICMIEE18-329

Experimental Investigations of Phase Change Material (PCM) Based Pin Finned Heat Sinks for Cooling Electronic Equipment

Md. Ponir Hossain Talukder and Kazi Afzalur Rahman
Dept. of Mechanical Engineering, Chittagong University of Engineering & Technology, Chittagong, BANGLADESH

ABSTRACT
This experimental investigation is carried out to study the passive cooling of electronic component using Phase Change Material (PCM). This study emphasis to find out the effect of square pin fin in the performance of the heat sink of different power input. Paraffin Wax, classified as organic phase change material, has been highly recommended in the energy storage system due to its excellent thermal combination of high latent heat, chemical stability and nontoxicity. A constant volume fraction of 10 % of square pin-fins is selected and the input heat was provided from 8 watts, 16 watts and 24 watts. Three volume fractions of PCM ψ = 0, ψ = 0.5, ψ = 1 are poured for fined and without fin configuration. A heat sink with no fin is chosen as a reference heat sink to find the effect of PCM and square fin. It concludes that volume faction has an effect on performance, volume fraction ψ = 1 is better than ψ = 0.5 and combine effect of paraffin wax and fin is more effective than only paraffin wax at ψ = 1. Effect of fin is more effective for heat input 16 watt and less effective for high heat input 24 watt and also enhancement ratio is more for 16 watt power input of this study**.**

Keywords: Phase change material (PCM); Thermal conductivity enhancer (TCE); Paraffin wax; Heat sink.

ICMIEE18-330

Influence of Interlayer Thickness on the Singular Stress Field in 3D Three-Layered Bonded Joints using FEM

Md. Jahangir Hossain and Md. Shahidul Islam
Dept. of Mechanical Engineering, Khulna University of Engineering & Technology, Khulna-9203,BANGLADESH

ABSTRACT
Bonded joint is widely used in different fields of science and technology, especially in making electronic chip. Every bonded joint may have vertex at the interface which is the region where joint may fail under mechanical or thermal loading due to propagation of stress singularity. The propagation of stress singularity is highly governed by interlayer thickness. It is necessary to investigate the influence of interlayer thickness on the propagation of stress singularity at the vertex to avoid stress singularity to prevent bonded joint from being deboned. In the present paper, a tri-material bonded joint composed of SiC, Resin (interlayer) and SiN is used to investigate the phenomenon. This model has better electro-mechanical property than a chip made by silicon only. The interlayer thickness is varied to analyze its influence on stress singularity through FEM using ABAQUS 6.14 software. It is found from the analysis that stress singularity increases with the increase in interlayer thickness and vice versa.

Keywords: Finite Element Method, Interlayer thickness, Interface, Stress singularity, External load.

ICMIEE18-331

Productivity Enhancement of Single Basin Solar Still using Al_2O_3 Nanoparticles

Muhammad Sharif Uddin, Md. Mehdi Masud Talukder and Md. Tansirul Islam
Dept. of Mechanical Engineering, Chittagong University of Engineering & Technology, Chittagong,BANGLADESH

ABSTRACT

Solar still is one of the prominent and basic sun oriented refining techniques to get fresh water from saline water. This paper investigates the enhancement in productivity of single basin solar still using Al_2O_3 nanoparticles in the base fluid. Nanofluids with high thermal conductivity are perfect heat transfer fluids for gathering thermal energy in solar thermal applications. In this work, the modifications are accomplished into a conventional solar still using nanofluids of varying concentration (0.1% and 0.2%) which ultimately increased the distillate water productivity. The inclusion of nanoparticles on the base fluid have significantly boosted the evaporation and condensation rates as well as the daily yield of the solar still. A maximum increase in productivity of 33.1% is achieved with a 0.2% concentration of Al_2O_3 nanoparticles when added to the base fluid.

Keywords: Solar still, Desalination, Minimum water depth, Al_2O_3 Nanoparticles, Nanofluid.

ICMIEE18-332

Life Cycle Analysis of Lead Acid Battery used in Electric Vehicles (3 Wheeler) in Bangladesh

Md. Raquibul Hasan[1,*] *and Dr. Nirendra Nath Mustafi*[2]
[1] Department of Civil Engineering, Pabna University of Science & Technology, PUST-6600, BANGLADESH
[2] Department of Mechanical Engineering, Rajshahi University of Engineering & Technology, RUET-6204, BANGLADESH

ABSTRACT

Lead acid batteries have been rapidly used in electric vehicles (3 wheeler) in Bangladesh with typical environmental problems such as consumption of resources and heavy metal pollution. Thus to conduct a comprehensive analysis of the environmental impact of the battery to reduce environmental pollution is urgent. In this paper a life cycle analysis conducted by SimaPro software is applied to analyze and compare the environmental impact of lead acid battery (LAB) within the system boundary of "cradle-to gate". The results showed that the overall impact of LAB production on environment is the smallest. The key substances that causes the environmental impact of LAB is production stage (12.56 %) & use stage of (85.56 %) the batteries. This research work will provide a quantitative assessments of the environmental impact of battery which will be very important to take necessary prevention measures during disposals. This can obviously create scopes of further research in this area.

Keywords: Lead acid battery (LAB), Electric vehicle, Life cycle analysis (LCA), Sima Pro 8.5, Environmental impact

ICMIEE18-333

Productivity Enhancement of Single Basin Solar Still using Nanoparticle and Phase Change Material

K.M.Mine Uddin Emon and Md. Mehdi Masud Talukder
Dept. of Mechanical Engineering, Chittagong University of Engineering & Technology, Chittagong, BANGLADESH

ABSTRACT

This experiment is based on enhancing the productivity of a conventional solar still by using techniques that have newly materialized. The modifications include using Aluminum Oxide (Al_2O_3) nanoparticle to produce Nanofluid (0.2% concentration) and Paraffin Wax as Phase change material (PCM) together in the still which is expected to facilitate production of more fresh water. The outdoor performance of modified solar still is studied to assess its potential for real application. It is compared with the results of a conventional solar still to better understand the effects of the modifications. It was observed that, on consecutive days, the conventional still had an efficiency of 10.15% whereas the modified still had a daily efficiency of 13.15%, 16.40% and 14.47% for three consecutive days under similar conditions of environment.

Keywords: Desalination, Solar still, Nanofluid, Phase change material (PCM).

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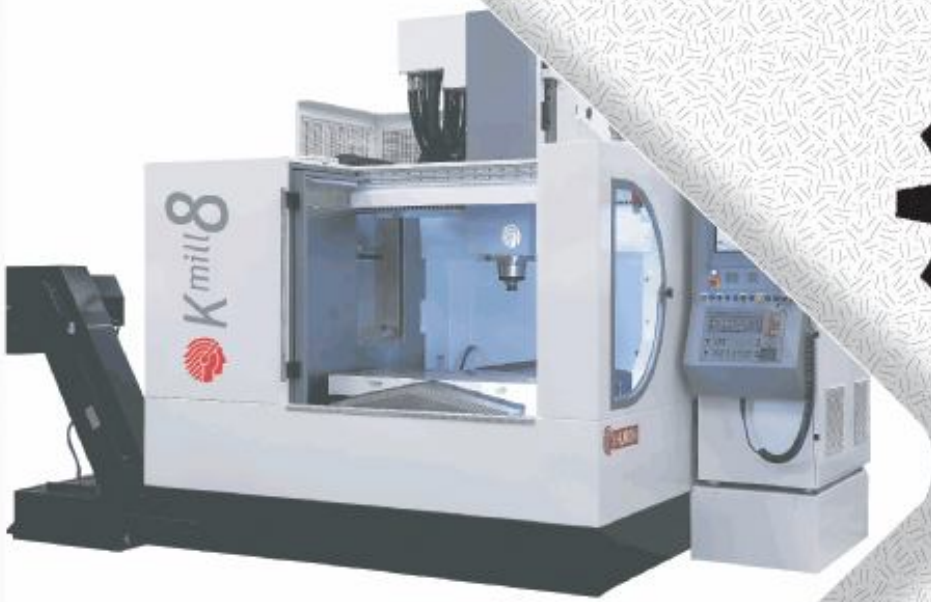
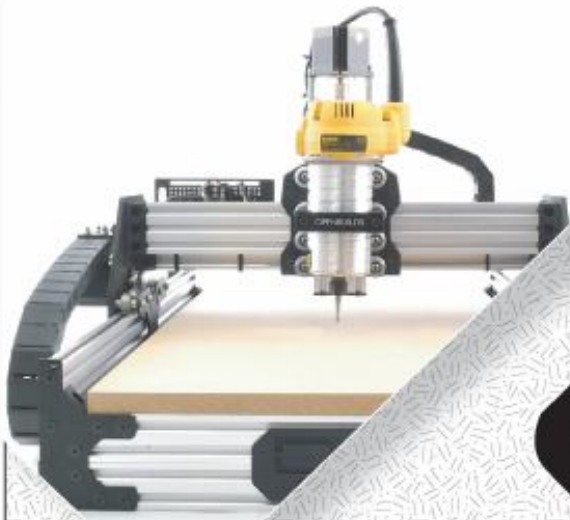
Experimental Investigation of Different Wick Materials to Enhance the Productivity of Single Slope Single Basin Solar Still

Laxman Chandra Das[*] *and Md. Mehdi Masud Talukder*
Department of Mechanical Engineering, Chittagong University of Engineering & Technology, Chittagong-4349, BANGLADESH.

ABSTRACT
The objective of this research work was to augment the productivity and efficiency of conventional single slope single basin solar still by adding various wick materials with brackish basin water. The wick materials enhanced the evaporation rate of water due to capillary action by raising the temperature distinction of basin water and inclined glass cover surface of the solar still. During the night session, the portion of daytime heat energy retained within the wick materials was liberated which causes an accumulation of a noticeable quantity of distillate water. Distillate output of conventional solar still (CSS) was 374 ml/day with a solar thermal efficiency of 11.47% at 2 cm optimum water depth which was modified with five distinct wick materials independently. Maximum enhancement in productivity was obtained 56.15% with an increase in solar thermal efficiency of 39.84% when CSS was modified with the black cotton as wick material.





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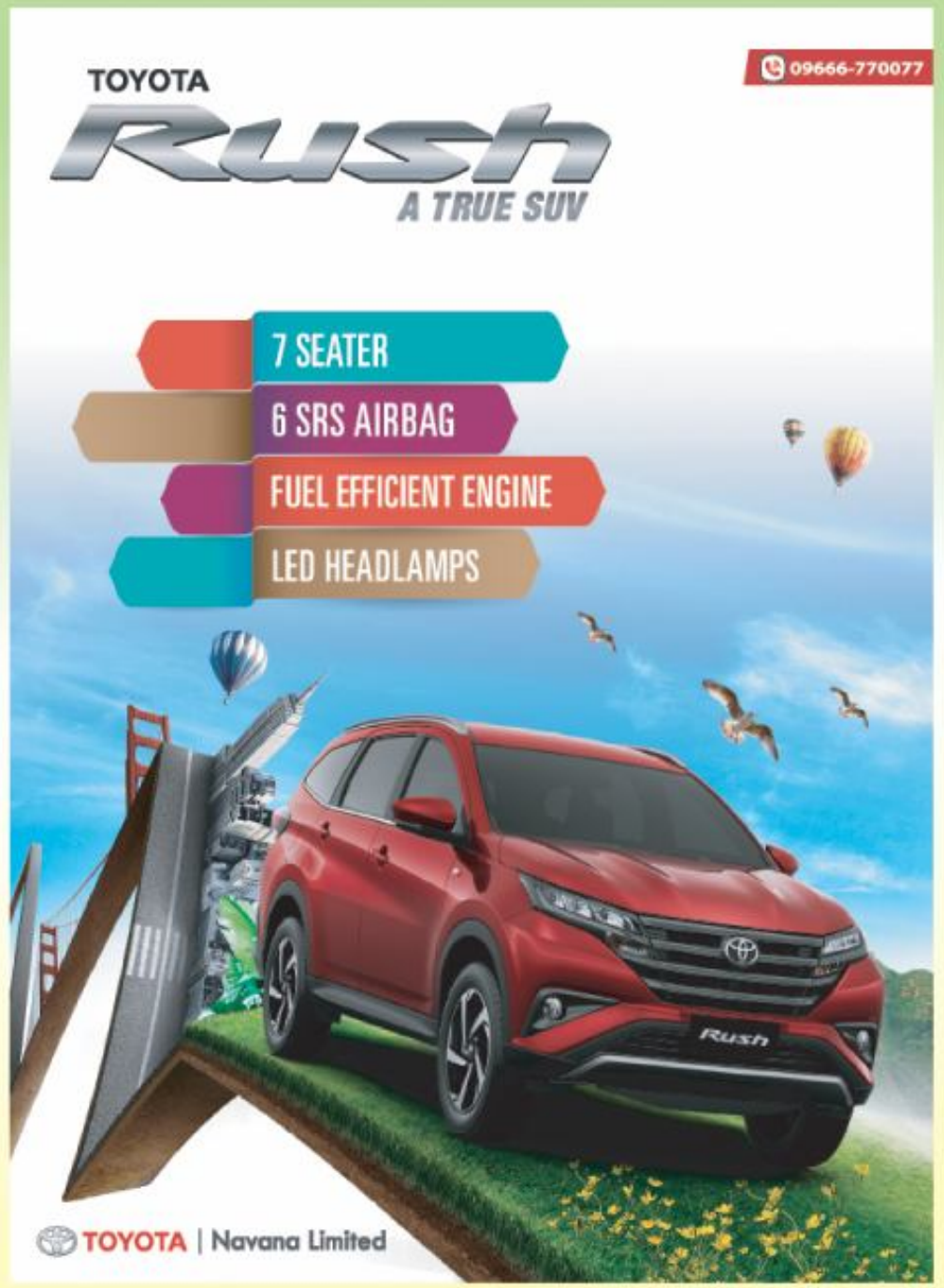
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