Conference Abstract

2018 International Conference on Aeronautical, Aerospace and Mechanical Engineering

AAME 2018

With the workshop

2018 3rd International Conference on Green Composite Materials

ICGCM 2018

June 28-30, 2018

Venue: Faculty of Engineering and Science Building, Curtin University Malaysia, Malaysia
Address: CDT 250, 98009 Miri Sarawak, Malaysia

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Welcome Letter

Dear Participants,

Welcome to 2018 Sarawak conferences! The conferences aim to bring together international academicians, scientists and industrialists for knowledge sharing, ideas exchanging and outcomes collaborating and presenting in aeronautical, aerospace, mechanical engineering and green composite materials.

We wish to take this opportunity to express our heartfelt appreciation to Conference Chairs Prof. Vincent Lee Chieng-Chen from Curtin University Malaysia, Malaysia; Prof. Ir. Dr. Mohd Hamdi Bin Abd Shukor from University of Malaya, Malaysia; Our Steering Committees Prof. Ian Howard from Curtin University, Australia; Prof. Dr. Nawaf Hazim Saeid from Universiti Teknologi Brunei, Brunei; Prof. Dr. Rizalman Mamat from Universiti Malaysia Pahang, Malaysia; Our Program Chairs Prof. Sujan Debnath from Curtin University Malaysia, Malaysia; Prof. Andrew Ragai Henry Rigit from Universiti Malaysia Sarawak, Malaysia and Prof. Rosli Bin Ahmad from Universiti Tun Hussein Onn Malaysia, Malaysia.

Our special thanks is expressed to Sarawak Convention Bureau, who had kindly sponsored us. We much appreciate to Curtin University Malaysia, Malaysia, who had kindly given us support. We would like to thank the committee members and all Curtin University Malaysia participants for their hard work in making smooth running of the conferences. Many thanks to the reviewers for their excellent job to maintain the academic quality and scholarship.

Finally, we would like to thank you, our participants, for coming to Sarawak during your busy schedule to share your knowledge with the rest of us. We hope our conferences will prove to be intellectually stimulating to you as to us.

Hope you enjoy the conferences, the food, the hospitality, and the beautiful and charming environment of Sarawak!

Conference Organizing Committees

Instructions for Presentation

Oral Presentations

Time**:** a maximum of 15 minutes in total, including speaking time and discussion. Please make sure your presentation is well timed. Please keep in mind that the program is full and that the speaker after you would like their allocated time available to them.

You can use USB flash drive (memory stick), make sure you scanned viruses in your own computer. Each speaker is required to meet her / his session chair in the corresponding session room 10 minutes before the session starts and copy the slide file (PPT or PDF) to the computer.

It is suggested that you email a copy of your presentation to your personal in box as a backup. If for some reason the files can't be accessed from your flash drive, you will be able to download them to the computer from your email.

Please note that session room will be equipped with a LCD projector, screen, point device, microphone, and a laptop with general presentation software such as Microsoft Power Point and Adobe Reader. Please make sure that your files are compatible and readable with our operation system by using commonly used fronts and symbols. If you plan to use your own computer, please try the connection and make sure it works before your presentation.

Movies: If your Power Point files contain movies please make sure that they are well formatted and connected to the main files.

Poster Presentations

Maximum poster size is 36 inches wide by 48 inches high (3ft.x4ft.)

Posters are required to be condensed and attractive. The characters should be large enough so that they are visible from 1 meter apart.

Please note that during your poster session, the author should stay by your poster paper to explain and discuss your paper with visiting delegates.

Contact:

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9:50-10:30	**Speech II** Prof. Dr. Nawaf Hazim Saeid Universiti Teknologi Brunei, Brunei ***Speech Title:*** *Prediction of Sand Erosion in a Crude Oil Choke Valve*	
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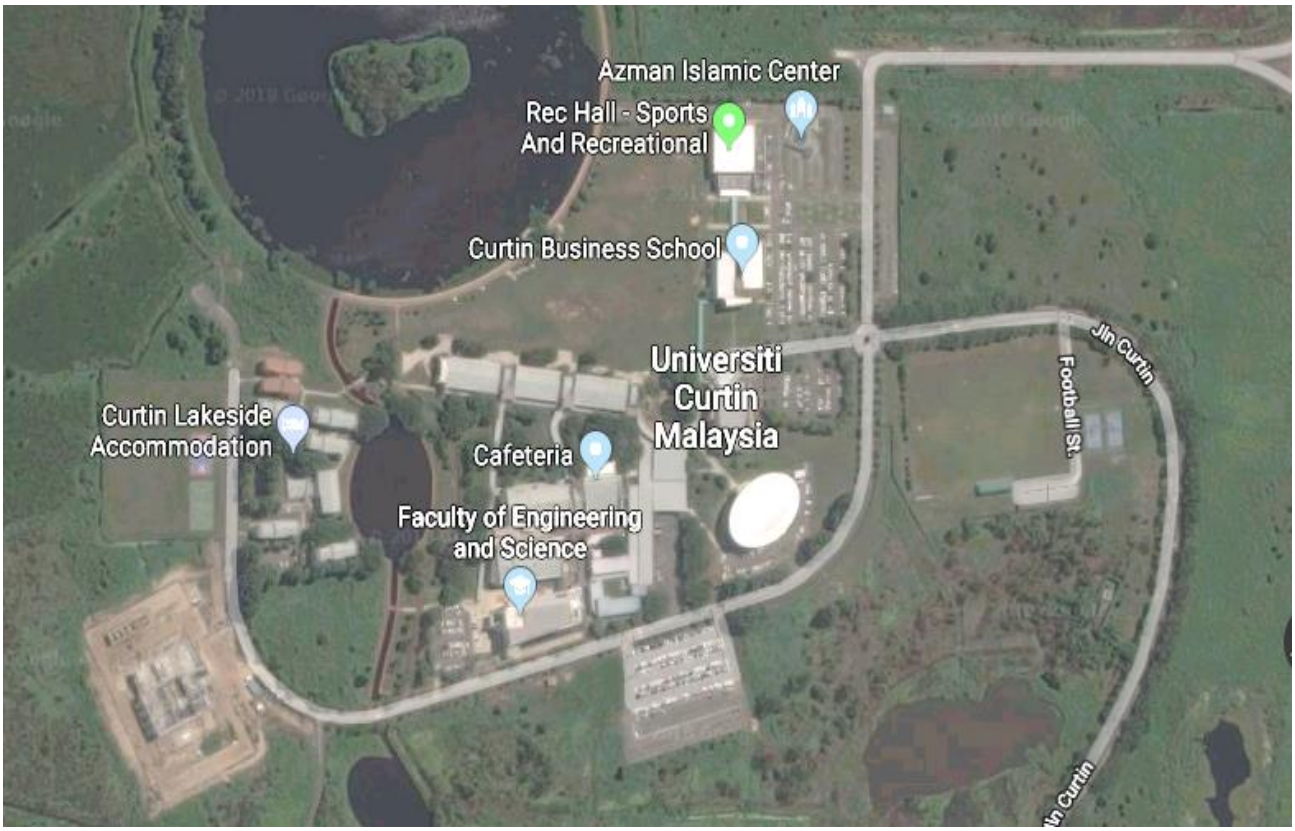
One Day Tour in Sarawak		
One-day Tour has been canceled due to no enough participants.		

Curtin University Malaysia Map

General information:

- Registration Desk: **SK3 104 Lecture 3**, Faculty of Engineering and Science Building
- Coffee Break, Lunch and Dinner: **SK3 foyer**
- Lecture Hall: **SK3 104 Lecture 3**



Introduction of Speakers

Speaker I

Prof. Ir. Dr. Mohd Hamdi Bin Abd Shukor, University of Malaya, Malaysia

Speech Title: Thin Film and Coating Development Using Physical Vapor Deposition Systems

Abstract: Several functional coatings (HAp, TiN, TiO2, Al2O3, CrAlN), were developed mainly for biomedical and automotive applications. The used of different Physical Vapor Deposition techniques like electron beam deposition, simultaneous vapour deposition and magnetron sputtering deposition, were utilized to deposit the coatings. The main objective of applying such coatings were to improve the overall mechanical performance of the parts or devices. Finite element method was carried out to ascertain the mechanical behaviour of the coating. Samples were subjected to relevant characterization analysis and physico-chemical tests. Tests were conducted to determine the mechanical properties of the coatings. Recently, a newly designed powder based magnetron sputtering system was successfully developed. A lot of exciting experiments were conducted using the system which is able to successfully sputter various type of ceramics, metallic and metallic alloy powders.

Biography: Prof. Dr. Mohd Hamdi bin Abd Shukor received his B.Eng. (Mechanical), with Honours from Imperial College, London and his M.Sc. In Advanced Manufacturing Technology & System Management from University of Manchester Institute of Science & Technology (UMIST). His Doctoral study was in the field of thin film coating for biomedical applications for which he was conferred Dr. Eng by Kyoto University. He is a Fellow of the Institution of Mechanical Engineering, UK. Prof Hamdi has devoted his career in nurturing research and innovation and has mentored over 130 postgraduate students, particularly in the field of machining, materials processing and biomaterials. He has authored more than 150 ISI journals and h-index of 20. He is also a director and founder of the Centre of Advanced Manufacturing & Materials Processing (AMMP Centre), in which has grown from modest-size team of researchers and engineers to an interdisciplinary research hub. Prof Hamdi has obtained recognition from various international and local organizations.

Speaker II

Prof. Dr. Nawaf Hazim Saeid, Universiti Teknologi Brunei, Brunei

Speech Title: Prediction of Sand Erosion in a Crude Oil Choke Valve

Abstract: Two-phase turbulent flow of crude oil and sand in a plug and cage choke valve is analysed in the present article using 3D computational fluid dynamics simulations. The discrete phase model is used to simulate the sand particles flow and its interaction with the oil flow in the system. Parametric study is carried out to identify the governing parameters to minimize the sand erosion in the system. The valve geometry and dimensions are taken from an industrial oil production project. The parameter considered in the present study are the valve opening and the pressure difference in the inlet and outlet pipes. The simulation results are presented to show the erosion rate as a function of the valve opening and the pressure difference. It is found that the erosion rate is high for small valve opening as well as large valve opening. Minimum erosion rate is found when the valve opening is between 20-30% for all the cases with various pressure differences. Locations of maximum erosion rate are predicted in the simulations. The accuracy of the erosion rate prediction is directly affected by the accuracy of the available erosion correlation.

Biography: Nawaf H Saeid is a professor of Thermofluid Engineering at the Universiti Teknologi Brunei. He is a Charted Engineer (IMechE) with wide experience and strong technical and theoretical background in different areas of Mechanical engineering discipline. He received his B.Sc. and M.Sc. degrees from University of Mosul in Iraq, and his Ph.D. degree from the University Politehnica Bucharest in Romania. Possess strong work ethics in 6 different universities, ensuring high performance standards in teaching, research and university administration. Area of expertise include: Thermodynamics, Computational Fluid Dynamics and Heat Transfer, Refrigeration and Air Conditioning, Thermal Energy Management, Acoustics and Noise control, Numerical Techniques and Computer Programming.

Speaker III

Prof. Sujan Debnath, Curtin University Malaysia, Malaysia

Speech Title: Themo-mechanical Interfacial Stress Analysis in Electronic Packaging at Different Temperature Conditions: A Review from Author's Work

Abstract: The study of thermal mismatch induced stresses and their role in mechanical failure is one relevant topic to composite materials, photonic devices and electronic packages. Therefore, an understanding of the nature of the interfacial stresses under different temperature conditions is necessary in order to minimize or eliminate the risk of mechanical failure. An accurate estimate of thermal stresses in the interfaces plays a significant role in the design and reliability studies of microelectronic devices. In the microelectronic industry, from a practical point of view, there is a need for simple and powerful analytical models to determine interfacial stresses in layered structures. This review paper summarizes the work conducted by the authors in relation to the bi-layered assembly with different temperature conditions on the determination of interfacial thermal stresses. The authors have extended the case of uniform temperature model by earlier researchers of two layered structure to account for differential uniform temperatures, linear temperature gradient in the layers. The presence of a heat source in one layer (die) is also presented. Finally, the effect of bond material properties and geometry on interfacial stresses and bond material selection approach are also considered in a simple way.

Biography: Dr. Sujan (CEng MIMechE) had joined Curtin University Malaysia in October 2008 as a Senior Lecturer and promoted to Associate Professor in 2013. He had served as the HOD of Mechanical Engineering from October 2014 to December 2017 in Curtin Malaysia. Dr. Sujan obtained his PhD Degree from the University of Science Malaysia in 2006 majoring applied mechanics and heat transfer with specific research focuses on interfacial thermal mismatch stress analysis in electronic packaging. Over the years, he has been working in the area of thermo-mechanical stress analysis, green composite materials, and polymer composite materials. Dr. Sujan has more than 75 publications in reputable international journals and conference proceedings. Dr. Sujan is a Registered/listed Level 1 supervisor in Curtin University, Australia for Doctoral and Master Thesis (PhD and Master).

Speaker IV

Prof. Andrew Ragai Henry Rigit, Universiti Malaysia Sarawak, Malaysia

Speech Title: Preliminary Design for a Tidal Power Plant at Kuching Barrage

Abstract: Tidal energy is one of most predictable and reliable source of renewable energy. It is also considered as the most certain and conscientious source of renewable energy that is not yet fully established in East Malaysia. The main aim of the study is to determine the potential site for tidal range power throughout East Malaysia by studying the tidal range distributions. The tidal range data was obtained from Sarawak Marine Department and documented by using ArcGIS version 10.3 to show the position of the sites. The study also evaluated a potential tidal power generation site, and thereafter the estimated energy output from the chosen site. The power can be generated from structured barrage, and Kuching Barrage is the only structure available, located at Pending among all estimated sites. Kuching Barrage is an environmentally friendly site and there are no security issues and it did not obstruct the published shipping lane. The mean tidal range of Kuching Barrage is 4.2m and the maximum flow rate over one gate is 226.9m3/s. In order to determine a suitable system to harvest the potential tidal energy from the site, a turbine selection chart was used. The bulb-type turbine with a rated power of 5.2MW is identified as a suitable turbine to be deployed at the site. The estimation of annual energy output is calculated based on a theoretical method, with the average daily potential energy estimated to be 2.8MW, or approximately 5TWh per year.

Biography: Professor Andrew Ragai Henry Rigit received his B.Eng. (Mechanical) from The City University, London, U.K. in 1995, M.Eng. (Mechanical) from Universiti Malaysia Sarawak in 1997, and Ph.D (Fluid Dynamics) from Imperial College London, U.K. in 2004. His doctoral study was in the field of charge injection electrostatic fuel atomizer and its spray characteristics. He is a practicing professional engineer registered with the Board of Engineers, Malaysia.

Speaker V

Prof. Rosli Bin Ahmad, Universiti Tun Hussein Onn Malaysia, Malaysia

Speech Title: New Lightweight Material for Automotive Application: Some Recent Developments and Potential Opportunities

Abstract: lightweight alloys are being increasingly used for applications, such as automotive and aerospace industries, where weight savings are critical. The strength of Magnesium alloy can be enhanced by adding proper amounts of certain alloying elements. In order to develop new alloy to achieve higher strength to compete with currently used metal alloys, it is important to understand the effects of alloying elements on the microstructure and mechanical properties. The addition of single Rare Earth (RE) to the alloy might result in great improvement in mechanical properties. Thus, the addition of proper amount of single RE into the alloy is one of the promising methods to improve the mechanical properties. Overall, the insights gained from this research will have a broad impact on understanding the strengthening behavior and microstructural evolution of RE-containing alloys, and such insights can serve as guidance for the development of new alloys and processes.

Biography: Dr. Rosli Bin Ahmad is an Associate Professor at the Universiti Tun Hussien Onn Malaysia (UTHM). He has strong technical and theoretical background in the area of Industrial and Manufacturing Engineering. He received his Bachelor degree in Aerospace from Universiti Putra Malaysia (UPM) in 1999, and his Doctorate degree from the University Wales, Swansea in 2006.

Oral Sessions

Tips:

Please arrive at conference room 15 minutes earlier, in case some authors are not able to make the presentation on time.

There will be a session group photo part at the end of each session.

The best presentation will be chosen after each session and the certificate will be awarded by the chair. Good Luck!

Session 1: Mechatronics and Control System—*8 presentations*
Chair: Prof. Andrew Ragai Henry Rigit, Universiti Malaysia Sarawak, Malaysia
Time: 14:00-16:00
Venue: SK3 104 Lecture 3

AM005 **14:00-14:15**	Design Optimization of Interior Double-Radial Synthetic Magnetic Field Permanent Magnet Generator for Electric Vehicle **Shilun Ma**, Xueyi Zhang and Wenjin Hu Shandong University of Technology, China Abstract-The Interior double-radial permanent magnent generator (IDRPMG) which composed by two groups of rectangular permanent magnets to provide parallel magnetic circuits of the rator and the sator core with less eddy current loss, low hormonic content and low cogging torque of the stator with fractional slot winding is developed. It has the advantages of remarkable magnetism gathering effect, strong magnetic field intensity and high space utilization.Combining Taguchi method and finite element method, the relevant parameters of the permanent magnet size and the angle between the first and second rectangle permanent magnets in rotor are optimized to get better the distortion rate of output voltage waveform, lower cogging torque and higer peak value of airgap flux density. Then finite element simulation is taken for the best optimization scheme through comparative analysis of the machine by before and after optimization.It showed that each performance index is improved after optimization. Finally, the prototype is manufactured, according to the optimization parameters and some experiments are conducted, which results verify the analys is preview well.
AM019 **14:15-14:30**	Theoretical Analysis on the Impact of Total Damping Ratio on the Power Output of an Electromagnetic Vibration Energy Harvester **Faruq Muhammad Foong**, Chung Ket Thein and Beng Lee Ooi Heriot Watt University Malaysia, Malaysia Abstract-Vibration energy harvesting has emerged as a promising source of sustainable energy to power small electronics. This study investigates the effect of total damping on the power output of an electromagnetic vibration energy harvester. Analytical results show that an increase in the effective mass of the harvester increases the mechanical damping but decreases the electromagnetic damping. The total damping of the harvester displayed an increasing trend with the effective mass when the electromagnetic damping is lower that the mechanical damping but changed into a decreasing trend when the electromagnetic damping becomes larger than the mechanical damping. Findings also suggest that there is an optimum proof mass to beam mass ratio where the harvester would produce maximum power in both cases of where a constant and varying optimum load resistance were considered.

AM023 **14:30-14:45**	Chatter Behavior in the Milling Process of Inconel 718: Effects of Tool Edge Radius Hoe Chen Hou, **Mohan Reddy Moola**, Lee Vincent Chieng-Chen and Sujan Debnath Curtin University Malaysia, Malaysia Abstract-Inconel 718 is widely used in various high end industries such as aerospace, nuclear plant, petrochemical plants etc. Inconel 718 is used for these applications due to unique mechanical properties such as high mechanical strength at elevated temperatures, high resistance to corrosion, and high strength to weight ratio. The unique properties of Inconel 718 made it difficult to be machined due to rapid work hardening and high cutting temperature. In addition, chatter vibration further increases the difficulty in machining of Inconel 718. In this paper, an experimental study on the effects of tool edge radius to the chatter behaviour was investigated. The dynamic responses of the milling process were recorded and analysed in both time domain and frequency domain. The results showed the variable helix and pitch end mill tool with larger tool edge radius able to mitigate chatter vibration at lower cutting speeds. Variable helix and pitch end mill with specific tool edge radius able to mitigate chatter vibration under the same cutting parameters. Experiments shows proper selection of tool edge radius improves the stability of end milling machining process.
AM024 **14:45-15:00**	Bond Layer Properties and Geometry Effect on Interfacial Thermo-Mechanical Stresses in Bi-Material Electronic Packaging Assembly **Sujan Debnath**, Lee Vincent Chieng-Chen and Pok Yik Wan Curtin University Malaysia, Malaysia Abstract-Thermo-mechanical mismatch stress is one of the reasons for mechanical as well as functional failure between two or more connected devices. In electronic packaging, two or more plates or layers are bonded together by an extremely thin layer. This thin bonding layer works as an interfacial stress compliance which is expected to alleviate the interfacial stresses between the layers. Therefore, it is very important to identify the suitable interfacial bonding characteristics for reducing the interfacial thermal mismatch stresses to maintain the structural integrity. This research work examines the influences of bond layer properties and geometry on the interfacial shearing and peeling stresses in a bi-material assembly. In this study a closed form model of bi-layered assembly is used with the up-to-date bond layer shear stress compliance expression. The key bond layer properties namely Young's modulus, coefficient of thermal expansion, Poisson's ratio, and physical parameters like temperature and thickness are considered for interfacial stress evaluation. It is observed that the Young's modulus, the thickness and the temperature of the bond layer have significant influence on the interfacial shearing and peeling stress. The results obtained are likely to be useful in designing bond layer properties in microelectronics and photonics applications.
AM026 **15:00-15:15**	Themo-Mechanical Interfacial Stress Analysis in Electronic Packaging at Different Temperature Conditions: A Review From Author's Work **Sujan Debnath**, Lee Vincent Chieng-Chen and Yik Wan Pok Curtin University Malaysia, Malaysia Abstract-The study of thermal mismatch induced stresses and their role in mechanical failure is one relevant topic to composite materials, photonic devices and electronic packages.

	Therefore, an understanding of the nature of the interfacial stresses under different temperature conditions is necessary in order to minimize or eliminate the risk of mechanical failure. An accurate estimate of thermal stresses in the interfaces plays a significant role in the design and reliability studies of microelectronic devices. In the microelectronic industry, from a practical point of view, there is a need for simple and powerful analytical models to determine interfacial stresses in layered structures. This review paper summarizes the work conducted by the authors in relation to the bi-layered assembly with different temperature conditions on the determination of interfacial thermal stresses. The authors have extended the case of uniform temperature model by earlier researchers of two layered structure to account for differential uniform temperatures, linear temperature gradient in the layers. The presence of a heat source in one layer (die) is also presented. Finally, the effect of bond material properties and geometry on interfacial stresses and bond material selection approach are also considered in a simple way.
AM027 **15:15-15:30**	Analysis on Rolling Damping of a Conventional Boat fitted with T-shaped Bilge Keels **Yam Ke San**, Gordon Chiew Chin Howe, Vincent Lee Chieng Chen and Sukanta Roy Curtin University Malaysia, Malaysia Abstract-This work presents a numerical study on the effect of T-shaped bilge keels on the roll damping of a conventional boat. A scaled boat model with the same dimensions as that of Irkal et al. [2] was fitted with two T-shaped bilge keels at the edges of the model. Computational Fluid Dynamics method was employed to simulate the roll decay motion of the boat. The motion of the boat is captured using a 6DOF model and the Overset grid approach. Comparison was performed on the damping characteristics of the conventional I-shaped and the T-shaped bilge keels. In addition, the impact of the aspect ratio of the keel bilges on the roll damping of the boat was evaluated. It was found that the bilge keel aspect ratio influences the damping coefficient non-linearly. Sufficiently large aspect ratio, i.e. an aspect ratio greater than 2, is necessary in order to obtain an effective damping on the peak angle
AM028 **15:30-15:45**	Performance Comparison of Organic Rankine Cycle and Vapour Compression Cycle Hybrid Cooling-Heating System using Subcritical or Supercritical Working Fluid **Yam Ke San**, Raja Wahiduzzaman Bin Raja Ismail, Vincent Lee Chieng Chen and Jung Hyung Chul Curtin University Malaysia, Malaysia Abstract-This paper presents a mathematical modelling on the evaluation of cooling, heating and power performance of a hybrid system of Organic Rankine Cycle and Vapour Compression Cycle. The system is assumed to be powered through solar parabolic trough collector and is able to generate a cooling power of 10 kW. Refrigerants R134a or R245fa are chosen as the working fluid of the system. The system is constructed using commercial energy modelling tool AspenPlus. Analysis is performed to determine the effect of changing the mass flow rate split ratio on the energy output. The effect of using subcritical and supercritical working fluid is also compared. Particular attention is paid toward the condition where the power output is equivalent to the energy consumption in view of creating a self-powered cooling and heating system. The result shows that the coefficient of performance for system using R245fa is higher compared to that using R134a. However, the systen using R134a allows a self-powered cooling and heating

	system to be achieved to be achieve at a much higher mass split ratio, resulting the system to be 35% more efficient in the performance.
AM030 **15:45-16:00**	Performance Evaluation of a Resonant-Integrated Pumping System **Lee Vincent Chieng-Chen** Curtin University Malaysia, Malaysia Abstract- Impedance pump is a simple valve-less pumping mechanism; it offers a low energy, low noise alternative at both macro- and micro-scale devices. It is also demonstrated to be a promising new technique for producing and amplifying net flow. There have been research studying the effects of series-connected impedance pump, where an increase in net flow is exhibited. In this study, an integrated system of conventional pump and impedance pump is introduced. This paper describes the performance evaluation of this integrated pumping system, with emphasis on the amount of amplification induced as a function of Womersley number (normalized excitation frequency) and normalized pressure head. Due to the nature of the resonant valve-less impedance pump, the integrated pumping system exhibits similar behaviour and characteristics as an impedance pump, such as the pulsatile nature of net flow. Results show positive outcomes where maximum amplification of 91.7% is demonstrated at resonance.

16:00-16:15

Session 2: New Functional Material Design and Analysis—*7 presentations*
Chair: TBA
Time: 16:15-18:00
Venue: SK3 104 Lecture 3

GM003-A **16:15-16:30**	Electrospun Biocomposite: Poly(Hydroxylalkanoate) Emulsified with Nanocellulose and Chitosan for Dye Removal **Chu Yong Soon**, Wei Chiang Eric Chan, Norizah Abdul Rahman, Choon Hui Tan, Rosnita A. Talib and Khalina Abdan UCSI University, Malaysia Abstract-Malaysia has fairly large textile industry that contributes to about 1.2% of the country's GDP, earning RM 13.9 billion in exports in 2016. This high productivity from textile industry generates large quantities of dyes which leads to pollution and endangers ecosystem. Electrospinning can be used to produce nanocomposite meshes in high surface-to-volume ratio to enhance the colour dye adsorption and removal from waste effluent prior to discharge into the environment. In our study, the nanocellulose suspension and acidified chitosan solution as active fillers for congo red dye adsorption were incorporated to the poly(hydroxylalkanoate) (PHA) that dissolved in chloroform. It was further emulsified by Tween 80 to ensure well dispersion of the mixture. The adsorption of congo red dye for both PHA-nanocellulose and PHA-chitosan biocomposite meshes fitted well with the Langmuir isotherm model and pseudo-second order kinetics, indicating a chemisorption nature. The biocomposite meshes were further characterized by Scanning Electron Microscope, X-ray Diffraction, and Thermogravimetric Analysis. This research shows the facile and inexpensive method to produce a homogenous electrospun bioadsorbent composite from different biodegradable and renewable organic polymers in immiscible solvents, which is suited for applications such as wastewater treatment.
GM006 **16:30-16:45**	Mode I and Mode II Delamination of Flax/Epoxy Composite Laminate Thamilarasu S. Rajendran, Mahzan Johar, Shukur Abu Hassan and **King Jye Wong** Universiti Teknologi Malaysia, Malaysia Abstract-In recent decades, natural fibres are getting their attention as reinforcement in composite materials. This is because natural fibres are environmental friendly. However, delamination is commonly recognised as one of the earliest failures in composite laminates. The objective of the present work is to investigate mode I and mode II delamination behaviour of flax fabrics reinforced epoxy composite. The delamination characterisation was carried out using double cantilever beam (DCB) and three point end notched flexure (ENF) tests. The fracture toughness were calculated using experimental calibration method (ECM). Results showed that the average fracture toughness was 485 N/m and 962 N/m, respectively. Finally, through scanning electron micrographs, it was observed that the ply/ply debonding and fibre/matrix debonding were the major fracture mechanisms in DCB specimen. As for ENF specimen, shear fracture dominated the energy dissipation process.

GM2001-A **16:45-17:00**	Effects of Cellulose, Hemicellulose, and Lignin on the Morphology and Mechanical Properties of Metakaolin-Based Geopolymer **Hanzhou Ye**, Yang Zhang, Zhiming Yu and Jun Mu Beijing Forestry University, China Abstract-Natural fiber-reinforced geopolymer has attracted wide attention in construction and building materials due to its low cost, low density, and excellent mechanical properties. Cellulose, hemicellulose, and lignin are the three basic components of natural fibres, and were investigated to reveal their influence on the metakaolin-based geopolymer. Comparative evaluations were investigated via morphology analysis and mechanical strength analysis. The results showed distinct microstructures and mechanical properties of the geopolymer-based materials with cellulose, hemicellulose, and lignin, respectively. A low content (5 wt %) of lignin, cellulose, and hemicellulose enhanced the flexural and compressive strength of pure geopolymer. Higher lignin and hemicellulose led to the porous morphology, lower density, and brittle fractures of geopolymer-based composites, which reduced the flexural and compressive strength in these geopolymer-based composites. It was noted that the degree of geopolymerization was clearly lowered by the alkaline degradation of hemicellulose. With the increase in cellulose content, in contrast, the denser structure and fewer pores of the geopolymer matrix were detected, as well as ductile failures of geopolymer-based composites. Good bonding was also shown between the geopolymer matrix and cellulose fibres without remarkable degradation. The results of this study will facilitate a better understanding of the effect of lignocellulosic biomass in natural fibre-reinforced geopolymers and should serve as the basis for further research and applications.
GM3001 **17:00-17:15**	Effect on the Formation of Magnetite Reduced Graphene Oxide with Controlled Stirring Duration **Xin Hui Yau**, Cheng Seong Khe, Mohamed Shuaib Mohamed Saheed and Chin Wei Lai Universiti Teknologi PETRONAS, Malaysia Abstract-Graphene is a promising material due to its fascinating properties, such as mechanical, electronic and thermal properties. Graphene based hybrids materials also have been widely studied due to its wide applications, such as sensors, energy storage and conversion, electronic device and others. The current study presents the synthesis of magnetite-reduced graphene oxide (M-rGO) nanocomposites through in situ chemical synthesis at different stirring duration. This synthesis process involves the redox reaction between the iron(II) salts and graphene oxide (GO) sheets. Various techniques were employed to characterize the synthesized M-rGO nanocomposites. From X-ray diffraction (XRD) results, the crystal structure of M-rGO was found to be independent on the stirring duration. Three magnetite vibrations, D band and G band were observed in Raman spectrum of M-rGO with 24 hours stirring duration. From Fourier transform infrared (FTIR) analysis, M-rGO with 24 hours stirring duration showed the strong intensity of Fe-O vibration. Thus, this indicated that a large amount of magnetite nanoparticles were covered on the surface of rGO sheets. This result is further supported by the morphology of nanocomposites from scanning electron microscopy (SEM) and the elemental analysis (EDX). A monolayer of rGO sheet (C= 33.79 atomic %) with full coverage of magnetite nanoparticles (Fe= 30.20 atomic %) was found for the M-rGO with 24 hours stirring duration. Overall, M-rGO require 24 hours of continuous stirring to ensure full coverage of magnetite nanoparticles on the surface of rGO sheets.

GM3002-A **17:15-17:30**	Hybrid-Interface Stiffness Dependency in Woven Natural-Synthetic Composites **Umeyr Kureemun**, L. Q. N. Tran and H. P. Lee National University of Singapore, Singapore Abstract-The performance of plant-derived natural fibre-reinforced composites can be significantly enhanced through hybridization with high performance synthetic fibers, e.g. carbon. Inter-laminar hybrid is the cheapest option of hybridizing long continuous fiber-reinforced composites. Businesses investing in green technologies are taking good advantage of this technique to advance sustainable fibers into a wider range of applications where natural fibers on their own would be unable to meet necessary stiffness and strength requirements. However, due to the largely dissimilar properties of natural and synthetic fibers, the proximity of these two fiber types in a hybrid composite may require additional considerations beyond simple rule of mixture theories. Supported by finite element mesoscale analysis and experimental works, we highlight the need for treating flax-carbon interface as a new variable in determining hybrid stiffness in woven fabrics, and that higher stiffness is possible with less hybrid interface in the composite, achievable through ply-blocking. Such findings are relevant to researchers developing modeling tools for carbon-flax woven composites, and to designers on a quest to further the potential of natural-synthetic hybrids.
AM008 **17:30-17:45**	Solidification, microstructure and mechanical properties of Mg-2.8Nd-1.5Gd-0.5Zn-0.5Zr cast alloy with Erbium addition. **R. Ahmad**, A.M.M. Elaswad, M.Z. Hamzah and N.R. Shahizan Universiti Tun Hussein Onn Malaysia, Malaysia Abstract-The thermal parameters of Mg-2.8Nd-1.5Gd-0.5Zn-0.5Zr cast alloy with 0.25 wt.% of erbium (Er) were evaluated by the computer-aided cooling curve thermal analysis(CA CCTA), whereas the microstructure analysis was investigated by the optical microscope and scanning electron microscopy. Results from the cooling curve and microstructure analysis showed that Er altered the grain size of the alloys. In addition, the grain size was reduced by approximately 19.6% with the addition of Er. Scanning electron microscopy results showed that Er formed an Mg-Zn-Nd-Er phase which distributed along the grain boundaries. Furthermore, the mechanical properties were investigated by hardness and tensile tests with Er addition. The addition of 0.25 wt.% of Er significantly improved the ultimate tensile strength and yield strength. In addition, the hardness value of Mg-2.8Nd-1.5Gd-0.5Zn-0.5Zr increased by 13.9% with Er addition.
AM025 **17:45-18:00**	Bond Layer Material Selection for Electronic Packaging **Sujan Debnath**, Lee Vincent Chieng-Chen and Yik Wan Pok Curtin University Malaysia, Malaysia Abstract-In electronic packaging, typically two or more thin dissimilar plates or layers are bonded together by an extremely thin adhesive bond layer. Electronic assemblies are usually operated under high power conditions which predictably produces a high temperature environment in the electronic devices. Therefore, thermal mismatch shear and peeling stress inevitably arise at the interfaces of the bonded dissimilar materials due to differences in Coefficient of Thermal Expansion (CTE) typically during the high temperature change in the bond process. As a result, delamination failure may occur during manufacturing, machining, and field use. As such, these

	thermo-mechanical stresses play a very significant role in the design and reliability of the electronic packaging assembly. Consequently, critical investigations of interfacial stresses under variable load conditions in composite structure can result in a better design of electronic packaging with higher reliability and minimize or eliminate the risk of functional failure. In order to formulize bond material selection, analytical studies are carried out in order to study the influence of bond layer parameters on interfacial thermal stresses of a given package. These parameters include Coefficient of thermal expansion (CTE), poison's ratio, temperature, thickness, and stiffness (compliant and stiff) of the bond layer. From the study, stiffness and bond layer thickness are identified as the key parameters influencing interfacial shearing and peeling stresses. The other parameters namely CTE, poisons ratio has shown insignificant influence on interfacial stresses due to the very thin section of bond layer compared to the top and bottom layers. The results also show that the interfacial stresses increases proportionally with the increase of temperature in the layers. Therefore, it is very important that the temperature is maintained as low as possible during the chip manufacturing and operating stages. Since only two parameters namely stiffness and bond layer thickness are identified as the key parameters, the interface thermal mismatch stresses can be reduced or eliminated by controlling these two parameters only. Therefore the identification of suitable bond layer parameters selection with reasonable accuracy is possible even without performing optimization process. Finally, this paper proposes a Metal Matrix Composite (MMC) bond material selection approach using rule of mixture material design. The outcome of this research can be seen in the forms of practical and beneficial tools for interfacial stress evaluation and physical design and fabrication of layered assemblies. The Engineers can utilize this research outcome in conjunction with guidelines for electronic packaging under variable thermal properties of layered composites.

Poster Session

Time: 9:00-18:00

AM012	Aircraft digital assembly process design technology based on 3D Model Chen Zhen and Tang Jianjun AVIC Chengdu Aircraft Industrial (Group) Co., Ltd. , China Abstract-In order to improve the quality, efficiency and cooperativity of aircraft assembly, based on the analysis of the characteristics of aircraft assembly process, a method for assembly process design, simulation and application based on three dimensional (3D) product model was proposed. The basic working process and system structure of the method were introduced, and the 3D digital assembly process planning, design and simulation optimization application mode was explored. This method has been applied in the design of aircraft assembly process, the efficiency and synergy of process design have been greatly improved.
AM1006	Study on valve strategy and fuel benefits of skip fire based on electromagnetic valve train Maoyang Hu and Siqin Chang Nanjing University of Science and Technology, China Abstract-Cylinder deactivation (CDA) is a fuel consumption reduction technology for gasoline engines. Skip fire is a new type of CDA because the load and the density of firing cylinder are in proportion to the torque demand. However, it is difficult to realize because valves need to be switched between valve deactivation and normal operation stroke by stroke. The Electromagnetic valve train (EMVT) provides a fully flexible control method to achieve skip fire. In the paper, a new skip fire strategy based on electromagnetic intake valve train (EMIV) is proposed. Then, the oxygen concentration of the exhaust pipe, energy losses, in-cylinder pressure of the skipped cycle and exhaust gas recirculation (EGR) rate of the firing cycle are studied by the 1D simulation in GT-Power. The results shows the majority of gas sucked into the skipped cylinder is exhaust gas by reasonable control of IVO and IVC, and the exhaust oxygen-rich can be avoided. Meanwhile, EGR rate of the firing cylinder and energy losses of the skipped cylinder are maintained at lower level. At the conditions of 1200 and 1600 rpm, fuel economy has been improved respectively 8.1%-16.6% and 6.4%-14.6% when the brake mean effective pressure (BMEP) ranges from 0.4MPa to 0.2MPa.

Dinner Time

18:00-20:00

Note