TECHNICAL PROGRAMME BOOK

ESTCON 2018

Conference: 6th International Conference on Production, Energy & Reliability (ICPER)

Title Page

Theme: Embracing Industrie 4.0 for Sustainable Futures

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Foreword

Associate Professor Dr Puteri Sri Melor Bt Megat Yusoff
Chairman of Mechanical Engineering Department, Universiti Teknologi PETRONAS

On behalf of the Organising Committee, I have the pleasure to welcome you to the 6th International Conference on Production, Energy & Reliability at KLCC, Malaysia, 13 – 14 Aug 2018. The conference includes four technical sessions: Production, Energy, Reliability and Materials. These sessions will disseminate the latest research results and findings among participating researchers, academics and industrialists from various parts of the world. In this sixth conference, 1xx papers were submitted by authors from various countries, with the majority being local authors. Of these, about 71% the papers were accepted and are to be presented at the conference. The conference also accepted several papers from industries.

In this year's conference, the theme of the conference is focused on embracing Industrial Revolution 4.0 (IR 4.0). Industry 4.0 is the information-intensive transformation of manufacturing and other industries in a connected environment of data, people, processes, services, systems and IoT-enabled industrial assets with the generation, leverage and utilization of actionable information as a way and means to realize smart industry and ecosystems of industrial innovation and collaboration. The new capabilities of Industry 4.0 lead to the 'smart anything' phenomena which often get most attention: from smart grid, smart energy and smart logistics to smart facilities, including smart buildings and smart plants, and smart services to the mentioned smart manufacturing, smart factories, smart cities and so on.
This year we are truly honoured to have prominent figures as the plenary speaker and forum panellists. Mr Chris Reeves, Head of Connected & Autonomous Vehicles at HORIBA MIRA Ltd will deliver plenary speech on "Impact of IR 4.0 on Engineering Research Ecosystem". We will also have forum discussion "Adapting Business Operations to IR 4.0: Readiness and Challenges" lead by Datuk Ir. (Dr.) Abdul Rahim Hj. Hashim, Vice chancellor, University of Malaya.

I would like to thank all the authors who contributed their papers to the conference and all reviewers for their effort to review the papers. We would also like to thank to sponsors for their financial support. Finally, I would like express my special appreciation to the members of ICPER2018 organising committee and the Advisory committee for their efforts and contribution to make the conference a grand success.

Thank you very much.

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ICPER2018 PROGRAMME

Day 1 • Monday (13th August 2018)

Time	Event	Venue
07:30	Registration	Kuala Lumpur Convention Centre
09:00	Opening Ceremony of ESTCON2018	Plenary Hall
09:30	Morning Tea Break	
10:00	Keynote Address 1, 2, 3	Plenary Hall
13:00	Lunch Break	
14:00 14:30 15:00 15:40 15:45	**Plenary Session** **Plenary Talk 1**: *Challenges Facing ADAS and CAV from a Validation Perspective* by Mr. Chris Reeves (Horiba Mira Ltd) **Plenary Talk** 2: *Industry 4.0 – Engineering the Future Mobility System* by Prof. Neville Jackson (Ricardo Plc) **Forum** : *Adapting Business Operations to IR 4.0 – Readiness and Challenges* Q & A Souvenir Presentation / Group Photo	Room 409
16:00	Afternoon Tea Break	
16:20	Technical Sessions (G1, G2, G3)	Room 401, 402, 403
18:20	End of Day 1	

Day 2 • Tuesday (14th August 2018)

Time	Event	Venue
07:30	Registration	Kuala Lumpur Convention Centre
08:00	Technical Sessions (G4, G5)	Room 405, 406
10:30	Morning Tea Break	
10:45	Technical Sessions (G6, G7)	Room 405, 406
13:00	Lunch Break	
14:00	*Technical Sessions (G8, G9)	*Room 401, 402
16:30	Closing Ceremony / Keynote Address 4, 5	Plenary Hall
17:20	Awards Presentation / Tea Break	Plenary Hall
18:00	End of ICPER2018	

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ICPER2018 PLENARY SESSION

Plenary Speaker #1
Mr. Chris Reeves
Head of Connected & Autonomous Vehicles
HORIBA MIRA Ltd., UK

Title: "**Challenges Facing Advanced Driver Assistance System (ADAS) and Connected Autonomous Vehicles (CAV) from a Validation Perspective**"
Monday | 13-08-2018 | 14:00 – 14:30
Room 409

Short Bio:
Chris Reeves is the Head of Connected Autonomous Vehicles Technologies at HORIBA MIRA Ltd. His focus is in the field of intelligent and connected vehicles and intelligent mobility and a recognised international 'thought leader' in CAV technologies. He has extensive experience in sensors, embedded electronics, communications and the test and validation of CAV and related technologies. His is a highly experienced technical manager with a proven record of developing and delivering high technology solutions to the automotive, defence, security and telecommunications sectors, working for HORIBA MIRA Ltd, QinetiQ Ltd and BT Group plc.

Plenary Speaker #2
Professor Neville Jackson
Chief Technology and Innovation Officer
Ricardo PLC, UK

Title: "**Industry 4.0 – Engineering the Future Mobility System**"
Monday | 13-08-2018 | 14:30 – 15:00
Room 409

Short Bio:
Neville Jackson has been with Ricardo for thirty-six years and was appointed as Chief Technology and Innovation Officer in 2009. He is responsible for the future vision for transport & energy technologies at Ricardo and the associated roadmaps and research agenda to deliver this vision. A visiting Professor at the University of Brighton since 2007, he also serves as Vice Chair of the European Road Transport Research Advisory Council (ERTRAC) and a member of the Advisory Board for the European Green Vehicles Initiative (EGVI). He is also Chair of the UK Advanced Propulsion Centre Advisory Board and Deputy Chair of the UK Automotive Council Technology Group. He is a Fellow of the UK Royal Academy of Engineering and a Fellow of the US SAE and has produced over 140 technical papers, keynote presentations or invited lectures in the US, Europe and the Far East.

Technical Forum:
Title: Adapting Business Operations to IR 4.0: Readiness and Challenges
Monday | 13-08-2018 | 15:00 – 15:40
Room 409

Forum Moderator

1. Datuk Ir. (Dr.) Abdul Rahim Haji Hashim
   Vice-Chancellor
   Universiti of Malaya (UM)

Datuk Ir. (Dr.) Abdul Rahim Hj. Hashim is currently the Vice-Chancellor of the University of Malaya (UM). Prior to this appointment, he was the Vice Chancellor of the Universiti Teknologi PETRONAS from November 2012 to November 2017.He graduated in Electrical and Electronics Engineering from the University of Birmingham, United Kingdom in 1976 and later received an Honorary Doctorate in Engineering from the same university in 2006.He worked for PETRONAS for 32 years from September 1976 to December 2008 and held some important and key positions.

Forum Panelists

1. Mr Chris Reeves
   Head of Connected Autonomous Vehicles Technologies
   HORIBA MIRA Ltd., UK

2. Professor Neville Jackson
   Chief Technology and Innovation Officer (CTIO)
   Ricardo PLC, UK

Technical Session 1
Date: 13th August 2018 (Monday)
Time: 16:20- 18:20
Venue: Room 401
Chair: G1 (Prof. Hussain H. Al-Kayiem)

Paper ID	Title/*Author(s)*
11	The Effect of Engine Throttle Position on the Performance Characteristics of a Crank-Rocker Engine Fitted with Conventional Engine Cylinder Head Ramtin Kardan; Masri Bin Baharom; Salah Eldin Mohammed; A. Rashid A. Aziz
88	The Heavy Metal Free-Near Infrared "CuInSeS/ZnS" Core/Shell Quantum Dot and Its Application in Luminescent Solar Concentrator Shokoufeh Bakhoda; Morteza Khalaji Assadi; Hussain H. Al-Kayiem
136	Estimation of Carbon Stock Changes Incorporating Agricultural Land-Use Conversion for Producing Palm Oil-Derived Biofuels in Malaysia Nazar Azly Zaberi; Faradiella Mohd Kusin
137	Study for the Optimum Uptake Capacity of Silica Gel Used in a Solar Adsorption Chiller Rifat Ara Rouf
98	Comparison of Different Turbulence Models in Pipe Flow of Various Reynolds Numbers Desmond Chin Yoong Lim; Hussain H. Al-Kayiem; Jundika Chandra Kurnia
106	Numerical Investigation on the Heat Transfer of Wellbore Heat Extractor Sharon Cheng; Jundika Chandra Kurnia
22	Development of Multi Chamber Technique to Improve the Uniformity in Drying Application Shaymaa Husham Abdulmalek; Morteza Khalaji Assadi; Hussain H. Al-Kayiem; Ali Ahmed Gitan
56	Performance and Emissions of a Single Cylinder Diesel Engine Using Blend Biodiesel Enhanced with Nanoparticles Hussain H. Al-Kayiem; Hasanain Abdul Wahhab; Elena, Magaril, A. Rashid A. Aziz

Technical Session 2
Date: 13th August 2018 (Monday)
Time: 16:20- 18:20
Venue: Room 402
Chair: G2 (AP Ir Dr Mohd Amin Abd Majid)

Paper ID	Title/*Author(s)*
60	Study on the Performance Analysis of Stratified Thermal Energy Storage System of a District Cooling Plant Mohd Amin Abd Majid
89	Simulation of Swirling Wet Steam Flow Through a Supersonic Nozzle Harrivin Vijayakumaran; Tamiru Alemu
48	Simulation Study on Impact of Fine Sand Particle to 90° Steel Elbow in Pipe. Hamdan Ya and William Pao; Nguyet Tran Ngo; Muhammad Khan and Muhammad Othman.
72	Corrosion Under Insulation Prediction Model for Piping by Two Stages of Artificial Neural Network Nurul Rawaida Ain Burhani; Masdi Muhammad; Mokhtar Ismail
160	Experiences and Lessons from an Anomaly Root Cause Analysis in a Large District Cooling Plant Xiaoming Zhang; Mohd Amin Abd Majid; Hidetaka Aoki; Zakaria Hassan; Zainal Ambri Abdul Karim; Masdi Muhammad
21	Strategies and Methods of RCCI Combustion: A Review Ibrahim Dalha; Mior Azman Said; Firmansyah Firmansyah; Zainal Ambri Abdul Karim
86	A Review on the Operating Characteristics of Free Piston Engine and Its Recent Developments Evelyn Evelyn; A. Rashid A. Aziz; Firmansyah Firmansyah; Ezrann Zharif Zainal Abidin
27	Model for Simulation Based Investigations of Fuel Systems for CNG Powered Engines Dirk H. Hübner; Harald Ortwig; Uwe Zimmermann

Technical Session 3
Date: 13th August 2018 (Monday)
Time: 16:20- 18:20
Venue: Room 403
Chair: G3 (AP Dr Patthi Hussain)

Paper ID	Title/*Author(s)*
1	A Generic Control, Simulation and Hardware Toolkit for Free Piston Engine Developers Sam Cockerill
38	CFD Based Investigation on Effect of Classifier Blade Length to Coal Particle Distribution in Coal Pulverizer Firas Basim Ismail Alnaimi; Elaine Kuan; Hasril Hasini; Mohammad Nasif
34	Design and Implementation of Solar Powered Stirling Engines: Review Firas Basim Ismail Alnaimi; Ranjani Vasu; Mohammad Nasif
67	Performance Investigation on an Integrated Multi-Stage Cylindrical-Tank Solar Water Heater Tadahmun Yassen; Mousa M. Waes; Omer Ahmed; Tahseen Ahmad Tahseen, T. A. Tahseen; Masri Bin Baharom
61	Characterization of the Effect of Pressure Difference on In-Cylinder Flow Field Using Proper Orthogonal Decomposition (POD) Mohammed El Adawy; Morgan Heikal; A. Rashid A. Aziz; Mhadi Ismeal; Hasanain A. Abdul Wahhab
30	Wind Resource Forecasting Using Enhanced Measure Correlate Predict (MCP) Firas Basim Ismail Alnaimi; As'ad Zakaria
12	Heat Transfer Enhancement with Nanofluids A Review on Recent Applications and Experiments Izza Ismail; Mohd. Zamri Yusoff; Firas Basim Ismail Alnaimi; Prem Gunasegaran
300	Unleash The Potential of Additive Manufacturing with Topology Optimization Seng Tat lim and Tze Thong Wong

Technical Session 4
Date: 14th August 2018 (Tuesday)
Time: 8:00-10.30
Venue: Room 405
Chair: G4 (AP Dr Srinivasa Rao Pedapati)

Paper ID	Title/*Author(s)*
100	Two-phase Slug Flow Separation at T-Junction with Regular and Reduced Vertical Side Arm Zeeshan Qadir Memon; Minh Tran; William Pao; Fakhruldin Mohd Hashim
102	Enhancing Surface Quality of Zr-Cu-Ni-Ti-Be Through Hydroxyapatite Mixed EDM for Potential Orthopedic Application Sri Hastuty
94	Investigation of Late Fuel Injection Position on the Combustion of Free Piston Engine Salah Eldin Mohammed; Nur Amalina Ramlan; A. Rashid A. Aziz; Firmansyah Firmansyah; Ezrann Zharif Zainal Abidin
112	A Review on Free Piston Linear Engine (FPLE) Siti Norazilah Ahmad Tamili; A. Rashid A. Aziz; Shaharin Anwar Sulaiman; Ezrann Zharif Zainal Abidin; Firmansyah Firmansyah
117	Bouncing Effect on Free Piston Linear Generator at Starting Process Muhammad Noraiman Mohd Jaffry; Zainal Ambri Abdul Karim; A. Rashid A. Aziz; Firmansyah Firmansyah; Ezrann Zharif Zainal Abidin
113	Microstructural Analysis on Underwater Friction Stir Welded 5052 Aluminium Alloy Srinivasa Rao Pedapati; Dhanis Paramaguru; Mokhtar Awang
59	Developing Renewable Energy Alternative Resources Evaluation Model Based on Multiple Criteria Abraham D Woldeyohannes; Dereje Engida Woldemichael
159	The Effect of Unstable Emulsion of Water-in-diesel on Micro-Explosion Phenomena Mahadi Ismael; Morgan Haikel; A. Rashid A. Aziz; Cyril Cura; Mohammed El Adawy
104	Effects of Fluoropolymer and Calcium Stearate on Melt Flow Index and Mechanical Properties of High Density Polyethylene Mohamad Zaki Abdullah; Hamdan Ya; Muhammad Mahmud

Technical Session 5
Date: 14th August 2018 (Tuesday)
Time: 8:00-10.30
Venue: Room 406
Chair: G5 (AP Dr Ainul Akmar)

Paper ID	Title/Author(s)
152	Study the Effect of Plasma Jet on the Gas Dynamic at the Jet-Substrate Contact Surface Asma Begum; Mohammad Pervez; Tatsuo Ishijima
55	Design and Development of Casted Stainless Steel Y-Tee Joint for Oil & Gas Application Amir Ahmad, Faizul Azly Dzubir, H.H. Ya, M. A. Sudin, Romzee Ismail, Malek Faiza
115	Performance Characteristics of Free Piston Linear Generator on Different Equivalence Ratio Wan Noor Azleen Nadhari; A. Rashid A. Aziz; Ezrann Zharif Zainal Abidin; Firmansyah Firmansyah
119	Effect of Intake Manifold Volume in Free-Piston Engine Linear Generator Muhammad Muzani Masri; A. Rashid A. Aziz; Ezrann Zharif Zainal Abidin; Firmansyah Firmansyah; Evelyn Evelyn; Siti Norazilah Ahmad Tamili
108	Effect of Back Rake Angle and Shape on Wear Rate of PDC Cutter in Hard Formation. Azri Hamim Ab Adzis; Ahmad Majdi Abdul-Rani; Yien Yi Kong; Belladonna Maulianda
128	Performance Investigation of a Roof Top Solar Chimney at Various Inclinations Sundus S. Al-Azawiey; Mahmoud M. Mahdi; Mohammed Jawad Mohammed
150	The Effect of CO2-H2S on Corrosion of Low Alloy Steel 3%Cr in High Partial Pressure CO2 Environments Ahmad Zaki Abas; Mokhtar Che Ismail; Kok Eng Kee
17	Energy Harvesting and Power Generation from Stairs Turki Al Qadhi; Asim Al-Baser; Fawaz Sammani; Mahmoud Elsayed; Tahmid Jamil
10	Life Extension Program and Refurbishment of Gas Turbine Parts After 100 EOH Thanaraj Sanmugham
145	Diesel-Natural Gas Engine Emissions and Performance Wan Nurdiyana Wan Mansor

Technical Session 6
Date: 14th August 2018 (Tuesday)
Time: 10:45-13:00
Venue: Room 405
Chair: G6 (AP Dr Mohammad Shakir Nasif)

Paper ID	Title/Author(s)
50	Numerical Investigation on the Utilization of Phase Change Material (PCM) to Reduce Building's HVAC Energy Consumption Mohammad S. Nasif; Ahmad Fakhri Shah Mohd Samsudin; Firas Basim Ismail Alnaimi; Desmond Chin Yoong Lim
51	MHD Bubbly Flow in Horizontal Pipe New Criteria Through CFD Simulation Hasanain A. Abdul Wahhab; A. Rashid A. Aziz; Hussain H. Al-Kayiem; Mohammad S. Nasif; Mohammed El Adawy
78	Numerical Simulation of the non-Newtonian Blood Flow Through Aortic Bileaflet Mechanical Heart Valve Using Fluid-Structure Interaction Approach Samar Abbas; Mohammad S. Nasif; Mior Azman Said; Rafat Al Waked
42	Underfloor Air Distribution Technology A Review Firas Basim Ismail Alnaimi; Sures Sambathan; Mohammad Nasif
99	Numerical Investigation on the Effect of Fire Compartment Opening Width down Stand Depth and Heat Release Rate on the Horizontal Projection of Smoke Plume in a Full Scale Atrium Mohammed Mutafi; Mohammad S. Nasif; William Pao; Firas Basim Ismail Alnaimi
131	The Malaysian Government Immovable Asset Management Practices Through the Application of the FM Organisational Performance Model Ahmad Firdauz Abdul Mutalib
37	Design and Development of Mini Hydropower System Integrated for Commercial Building Firas Basim Ismail Alnaimi; Wei Ziet Fong
81	CFD Simulation of Liquid-To-Air Membrane Energy Exchangers (LAMEE): Flat Plate Exchanger Effectiveness Rozanna Roslan; Mohammad S. Nasif
43	Experimental and Numerical Analysis of Different Flow Modifier on the Reversal Flow Region in S-shaped Aggressive Diffuser Raed Jessam; Hussain H. Al-Kayiem; Mohammad S. Nasif
225	Characterization of Tin Oxide (SnO2) Nanostructures Prepared by Thermal Oxidation Nuraini Abdullah, Noor Mazni Ismail, Dewan Nuruzzaman

Technical Session 7
Date: 14th August 2018 (Tuesday)
Time: 10:45-13:00
Venue: Room 406
Chair: G7 (AP Dr Mokhtar Awang)

Paper ID	Title/Author(s)
71	Prediction of Performance Parameters of Stratified TES Tank Using Artificial Neural Network Afzal Soomro; Ainul Akmar Mokhtar
101	Nano-Silica Effect on the Poly (1 8-Octanediol Citrate) Composite Properties for Bone Plate Application Abdullahi Mahmud; Puteri Sri Melor Megat-Yusoff; Faiz Ahmad
120	Effect of Pressure in Crossover Port to the In-Cylinder Flow of Split-Cycle Engine Firmansyah Firmansyah
122	OMNI Oil Technologies: Manufacturing a Malaysian-made PDC Bit Zulkefly Abdul Manan; Ahmad Majdi Abdul-Rani
18	Color-based Oil Spill Image Segmentation Osman Abu Bakr Mohmmed Ahmed; Mark Ovinis; Ibrahima Faye; Fakhruldin Mohd Hashim; Mahadi Ismael
80	Effect of Bauxite Residue on the Corrosion Resistance of an Intumescent Paint Coated Steel Plate Puteri Sri Melor Megat-Yusoff; Adiat Ibironke Arogundade; Lukman Afolabi; Rasheed Muriana
140	Influence of Silica and Chemical Modification on Dispersion of Carbon Black Nanoparticles in Epoxy Resin Raphael Joshua; Othman Mamat
132	Physical and Mechanical Properties of Heat Affected Zone of Dissimilar Welds Between Duplex Stainless Steel and Low Carbon Steel Nsikan Etim Dan, Patthi Hussain, Muhammad Shazwan Mahmud, and Hamed Mohebbi
130	Ultrafast-Contactless Plasma Arc Sintering Mohsin, Husam; Albarody, Thar M. Badri; Muhsan, Ali Samer
105	Effect of Dispersing Agent on the Thermal Properties of Basalt Fibre Reinforced Intumescent Coating Muhammad Yasir; Norlaili Binti Amir; Faiz Ahmad; Ahmad Afiq Afif Ab Kadir; Zeeshan Baig

Paper ID 11
Title The Effect of Engine Throttle Position on the Performance Characteristics of a Crank-Rocker Engine Fitted with Conventional Engine Cylinder Head

Author Ramtin Kardan; Masri Bin Baharom; Salah Eldin Mohammed

This paper presents the investigation on the effects of throttle position variations on the performance characteristics of a single-piston curved-cylinder four-stroke SI Crank-Rocker (CR) engine fitted with conventional engine cylinder head. The CR engine is a new alternative IC engine which performance characteristics are still being investigated. All the experiments were conducted at engine speed of 2000 rpm with ignition timing set at 6.5° CA BTDC. The throttle position, or the load, was varied from 25% to 100%. The best engine performance was found to be at 75% throttle position where the torque, power and thermal efficiency are at maximum rates of 4.16 Nm, 0.87 kW, and 18% respectively, while the brake specific fuel consumption is at the minimum value of 423 g/kw-h. All the result trends for emissions of CO, NOx and Unburned Hydrocarbon (HC) were found to be in-line with conventional engines up till 75% throttle position. For the loads higher than 75%, the CR engine behaved the opposite to the emission characteristics of the conventional engines. The reason behind the inverse behavior of the CR engine after 75% load is due to the 'choke' phenomena at the intake valve. The study revealed that larger inlet ports are required for further improvement of this engine performance. The results are advantageous in comparing the performance and design parameters of CR engine with a conventional engine having the same capacity.

Paper ID: 88
Title: The Heavy Metal Free-Near Infrared "CuInSeS/ZnS" Core/Shell Quantum Dot and Its Application in Luminescent Solar Concentrator

Author: Shokoufeh Bakhoda; Morteza Khalaji Assadi; Hussain H. Al-Kayiem

The near infra-red CuInSeS/ZnS core/shell quantum dots have been investigated toward luminescent solar concentration applications. This quantum dots possess advantages of Stocks shift as large as more than 0.43eV and high photoluminescence quantum yield of 70%. The paper presents the effect of large stock shift CuInSeS/ZnS quantum dots on reducing the reabsorption losses in Luminescent solar concentrators by using experimental investigation. The Luminescent solar concentrators sheet was fabricated in dimension of 40 mm × 30 mm × 3mm by dispersing 0.03 wt. % CuInSeS/ZnS quantum dots particles in a polymethylmethacrylate waveguide and their optical properties (absorptions/emissions) were characterized. Results are showing that the CuInSeS/ZnS quantum dots - Luminescent solar concentrators provides a promising way for the reduction of reabsorption losses in Luminescent solar concentrators.

Paper ID: 136
Title: Estimation of Carbon Stock Changes Incorporating Agricultural Land-Use Conversion for Producing Palm Oil-Derived Biofuels in Malaysia

Author: Nazar Azly Zaberi; Faradiella Mohd Kusin

The area of oil palm plantations in Malaysia is expanding to fulfil a high demand for palm oil around the world including for producing palm oil-derived biofuels. Planting and expanding oil palm plantations have led to conversion of various land-uses. This study aims to estimate the carbon stock changes (ΔCS) due to conversion of agricultural land-uses, such as rubber plantation, coconut plantation, cocoa plantation, rice field, and black pepper farm to oil palm plantation based on soil organic carbon stock as well as vegetation carbon stock information. The results show that land-use conversion scenarios that changed carbon stock negatively (increased carbon stock) the most was rice field to oil palm plantation (ΔCS: -334.83 ± 10.78 t CO2-eq ha-1) followed by black pepper farm to oil palm plantation (ΔCS: -268.67 ± 11.40 t CO2-eq ha-1) and coconut plantation to oil palm plantation (ΔCS: -42.67 ± 10.78 t CO2-eq ha-1). Meanwhile, land-use conversion scenarios that changed carbon stock positively (decreased carbon stock) the most was conversion of tropical primary forest to oil palm plantation (ΔCS: 283.97 ± 3.11 t C ha-1), followed by rubber plantation to oil palm plantation (ΔCS: 734.46 ± 10.82 t CO2-eq ha-1) and cocoa plantation to oil palm plantation (ΔCS: 11.39 ± 10.8 t CO2-eq ha-1). Carbon stock changes were significantly different between different groups of conversion age for all land-use conversion scenarios. However, rubber plantation was the only agricultural land-use investigated in this study that indicates no carbon savings after more than 20 years conversion to oil palm plantation. Findings from this study suggested that careful selection of agricultural land-use conversion has to be considered in future oil palm plantation development so as to ensure sustainable energy supplies production.

Paper ID: 137
Title: Study for the Optimum Uptake Capacity of Silica Gel Used in a Solar Adsorption Chiller

Author: Rifat Ara Rouf

Adsorption technology is one of the alternatives to reduce usage of fossil fuel. Among the variety of adsorbent adsorbate pairs, silica gel and water are the most desired one due to its preferred properties. This pair is widely available, environmentally benign, can be activated with lower temperature heat source. In order to utilize silica gel-water pair in a solar heat driven adsorption chiller, one needs to study the operating conditions for the maximum utilization of the entropy of the adsorbent.

Paper ID 98
Title Comparison of Different Turbulence Models in Pipe Flow of Various Reynolds Numbers

Author Desmond Chin Yoong Lim; Hussain H. Al-Kayiem; Jundika Chandra Kurnia

Most fluid transportation in engineering industries are turbulent flows, which result in high pressure drop across the transport channels due to high friction factor at wall. In recent years, researchers have adopted different turbulence models to study turbulent flows in wall-bounded channels using computational fluid dynamics (CFD) approach. Therefore, the performance comparison of turbulence models in wall-bounded turbulent flow against theoretical equations or experimental data has to be studied to provide a better insight for future application of turbulent models in wall-bounded flow. The

aim of this study is to compare the performance of different turbulence models through numerical analysis of friction factor and turbulence intensity of fully developed turbulent pipe flow. Finite volume method (FVM) solver with three widely studied Reynolds-averaged Navier-Stokes equations (RANS) turbulence models are adopted to investigate friction factors and turbulence intensity of fully-developed water flow in smooth pipes at various Reynolds numbers. A pipe length which is sufficiently long is adopted to neglect the effects of entrance region. The simulated results are validated against analytical equations at various inlet Reynolds number. Results shown that RNG k- ϵ turbulence model with enhanced wall treatment is the most superior model in predicting friction factor, which is an important parameter in study of pressure drop in wall-bounded flow. In addition, SST k-ω turbulent model gives the closest prediction of turbulence intensities by area (T.I), which will provide good estimation of T.I at the boundary conditions in pipe flow using CFD.

Paper ID: 106

Numerical Investigation on the Heat Transfer of Wellbore Heat Extractor

Authors: Sharon Cheng; Jundika Chandra Kurnia

Retrofitting depleted oil wells into geothermal wells can potentially solve the main issues in conventional geothermal wells: high capital costs for drilling geothermal wells and high risk of environmental consequences. For this application, the understanding of the temperature change is crucial as it affects the performance of the wellbore heat exchanger and the power generated from this well. Therefore, the current study is focused on the evaluation of oil wellbore's feasibility as a geothermal energy resource via investigating the heat transfer in the wellbore using computational fluid dynamic (CFD) approach based on actual measured thermal parameters of cement specimen. A two-dimensional axis-symmetry model for fluid flow and heat transfer in a wellbore is developed. The properties of the cement casing were obtained experimentally. The effect of downhole temperatures and velocities of the heat transfer fluid (oil) on the heat transfer and temperature distribution is evaluated and discussed in view of numerical results. The results revealed that the downhole velocity and temperature plays an insignificant role in affecting the cement outer wall temperature, justifying that the heat transfer within the wellbore is consistent. This indicates the potential of oil wellbores as sustainable geothermal energy resources. This study serves as a guideline for future researchers to design wellbore heat exchangers from depleted oil wells by highlighting the temperature distribution of the cement outer wall and the effects of downhole velocity and temperature.

Paper ID 22
Title Development of Multi Chamber Technique to Improve the Uniformity in Drying Application

Author Shaymaa Husham Abdulmalek; Morteza Khalaji Assadi; Hussain H. Al-Kayiem; Ali Ahmed Gitan

Multi tray solar dryer is commonly used for thin layers drying type due to its ease of manufacturing and economical aspects. However, the drawback of this dryer design is the non-uniformity in the required moisture content of end product. This work presents the development of multi chamber solar drying cabinet using numerical analysis. The main objective is to ensure uniform Drying of product which need uniform velocity of the heated air velocity distribution inside the multi chamber dryer. This aim has been achieved by series of modifications of design concepts based on the aerodynamic behavior of air flow. The results showed that four design phases to come out with optimum design configuration of the multi chamber drying cabinet. The velocity above the splitter has a significant difference of around 0.1 m/s at the end of splitters among the chambers. It is concluded from this result that the cross section flow area has an impact on the uniformity of velocity and a further modification is recommended.

Paper ID 56
Title Performance and Emissions of a Single Cylinder Diesel Engine Using Blend Biodiesel Enhanced with Nanoparticles

Author Hussain H. Al-Kayiem; Hasanain Abdul Wahhab; A. Rashid A. Aziz

The aim of the present paper is to do a several tests of engine performance and emissions using diesel and biodiesel blended with nanoparticles and to compare that with the diesel and biodiesel. The effect of iron oxides (Fe3O4) nanoparticles additive to biodiesel and neat diesel fuels in terms of engine performance and emission characteristics is experimentally investigated in a single cylinder diesel engine. The additive iron oxide nanoparticle was mixed in diesel and 20%, 40% palm biodiesel blend with diesel (BD20, BD40) using ultra-sonication probe. These modified fuels were termed as D+10N, BD-20+10N, and BD-40+10N, respectively. Initial results indicate that the properties such as: density, viscosity, and calorific value of the fuel blends tend to increase with the addition of nanoparticles in the blends. Enhancement in engine performance has been perceived with the addition of Fe3O4 nanoparticles. Break thermal efficiency has been enhanced by about 3.16%, 4.66% for BD-20 and BD-40, and about 2.06%, 3.34%, 4.89% for D+10N, BD-20+10N, and BD-40+10N on the pure diesel, respectively. Similarly, BSFC has been lowered by 3.07% for D+10N, 1.55% for BD-20+10N, and 1.33% for BD-40+10N, on these samples without nanoparticles. From the results presented in this study, the need for more technique examination on nanoparticles is clear. In addition to engine experiments, there is a need to develop and use better and rapid screening tests. In vitro studies are likely to provide initial data on nanoparticles, with the findings having to be followed up in vivo studies on several engines.

Abstract Technical Session #2

Paper ID 60
Title: Study on the Performance Analysis of Stratified Thermal Energy Storage System of a District Cooling Plant

Author Mohd Amin Abd Majid

This study focuses on the performances analysis of a stratified cooling thermal energy storage tank at Universiti Teknologi PETRONAS district cooling plant during the charging operation mode. From the observation, it is noted that problem arises when the chilled water scheduling became inconsistent which led to low performance of the tank due to uneven demands. The objective of the study is to analyze the thermal energy storage tank performance using two methods; thermocline thickness and half cycle figure of merit. Operating data from October 2015 until January 2017 were used for performance assessment. The S-curve temperature profiles were obtained from simulation on temperature distributed in thermal energy storage tank by using the function of sigmoid dose-response and nonlinear regression curve fitting in order to obtain the best fit of the curve. Among the findings; on 11th January 2016 and 11th January 2017, the thermocline thickness results were 5.1591m and 7.2156 m respectively. While for monthly analysis the thermocline thickness for October 2015 was 3.8293 m and October 2016 was 5.0454m. Based on the results from thermocline thickness and half cycle figure of merit values, the stratified cooling thermal energy storage tank was experiencing deterioration in performance.

Paper ID: 89
Title: Simulation of Swirling Wet Steam Flow Through a Supersonic Nozzle

Author Harrivin Vijayakumaran; Tamiru Alemu

[The subject matter of this study is the swirling flow of wet steam through a supersonic nozzle. Various 2D nozzle designs were studied to find the best model to be used in this study. Multiple simulations were created using computational fluid dynamics and parameters were assigned to manage constraints and variables. A benchmarking process was then carried out in order to ascertain the truthfulness of the design. The results obtained were analyzed and measured against pre-defined results to determine its legitimacy. The chosen convergent - divergent nozzle with verified geometry was subsequently modelled in 3D. Wet steam is simulated to flow normally through the convergent - divergent nozzle. Swirl is then introduced to the flow of wet steam by means of an angled inlet. Various wet steam flow parameters were measured at the inlet and outlet of the Laval nozzle. It was observed that liquid mass fraction, droplet average radius and droplets per unit volume are the main parameters which changes when swirl intensity was varied.]

Paper ID: 48
Title: Simulation Study on Impact of Fine Sand Particle to 90° Steel Elbow in Pipe

Author: Hamdan Ya; William Pao; Nguyet Tran Ngo; Muhammad Khan; Muhammad Othman

[Erosion has caused a lot of troubles and challenges in oil and gas industry. Erosion caused by solid particles in 90° pipe bends is one of the major concern in this industry. This problem may result in equipment malfunction and failure which needs to be maintained and replaced. Until today, there is no comprehensive solution on how to overcome this problem. Continuous simulation and experimentation are needed to reduce the rate of erosion. In this paper, the erosion effect is studied through simulation process. The simulation studied the effect of fine sand particles on the 90° carbon steel elbow in the pipeline. The result of this simulation is investigated and analyzed and the rate of erosion is correlated with the particle mass flow rate, particle size and elbow ratio. This study will be limited to two phases of flow and fine particles are used. The simulation is done using the computational dynamic software which is ANSYS Fluent. The results show that mass particle flow rate will give the significant effect on the erosion rate. The erosion rate will increase exponentially when the particle mass flow rate increases.]

Paper ID 72
Title Corrosion Under Insulation Prediction Model for Piping by Two Stages of Artificial Neural Network

Author Nurul Rawaida Ain Burhani; Masdi Muhammad; Mokhtar Ismail

This work proposes an improved quantitative prediction model for corrosion under insulation (CUI) for oil and gas piping in equatorial climate zone, using real-world data and integrated with experimental work using modified two stages of Artificial Neural Network. Investigation into the effect of single type

of data source and different type of fitting line analysis on the final CUI model are also discussed with the goal for Risk Based Inspection (RBI) to be more effective. Results from the CUI prediction model exhibits high R2 of 0.9919 and RMSE of 0.0087.

Paper ID 160
Title Experiences and Lessons from an Anomaly Root Cause Analysis in a Large District Cooling Plant

Author Xiaoming Zhang; Mohd Amin Abd Majid; Hidetaka Aoki; Zakaria Hassan; Zainal Ambri Abdul Karim; Masdi Muhammad

The Theory of Constraints was used as a method in a root cause analysis (RCA) to identify system performance bottlenecks, wherein the constraint with the strongest correlation with system performance is identified as the bottleneck. In the present study, this method was applied in a large district cooling plant to diagnose steam absorption chillers' performance anomalies including performance deterioration, spikes, large variation, etc. Many root causes were identified through a ten months' continuous diagnosis, such as drastic reduction in chilled water flow rate, faulty steam control valve, cooling demand reduction, etc. More than 30 anomalies were diagnosed and more than 80% diagnosis accuracy was achieved. The diagnosis results were verified by the plant operator, which proved the effectiveness of the Theory of Constraints as a method for root cause analysis in diagnosing anomalies in district cooling plant operations. It was however discovered that even though the operational component identification accuracy was high, the determination of the actual root cause still presents lots of challenges, due to the large set of domain knowledge and operation conditions required. A knowledge-based supporting tool may be needed as part of the RCA to facilitate a speedy and complete analysis to enable these anomalies to be resolved

Paper ID 21
Title Strategies and Methods of RCCI Combustion: A Review

Author Ibrahim Dalha; Mior Azman Said; Firmansyah Firmansyah; Zainal Ambri Abdul Karim

RCCI is found promising low temperature combustion mode that has recorded tremendous success towards improving thermal efficiency and reducing NOx and soot emissions to nearly zero but has high specific fuel consumption, UHC and CO emissions. Besides, RCCI requires combustion phasing control and loads extension to higher levels. Numerous researchers employed different strategies like use of EGR rate and dual fuel control to improve RCCI combustion performance and emission characteristics but little attention was paid to some strategies such as use of dual direct injection, oxygenated biofuels, and fuel additives. In addition, most of the researchers do consider one strategy without exploring the combined effects of many strategies at a time; hence, the technique requires combined strategies and methods for effective control and improved performance. This paper reviewed previous research activities and recent reviews on RCCI engine performance and emission characteristics with the view to finding information on current RCCI combustion methods and strategies while identifying its shortcomings. Eventually, some challenges of RCCI that affects its adaptability for effective commercialization were identified with respect to strategies integration meanwhile areas that require more efforts for more advances in the combustion mode were suggested.

Paper ID 86
Title A Review on the Operating Characteristics of Free Piston Engine and Its Recent Developments

Author Evelyn Evelyn; A. Rashid A. Aziz; Firmansyah Firmansyah; Ezrann Zharif Zainal Abidin

With the increasing global interest to convert energy sector to be more environmentally friendly and reduce dependency on fossil fuels, there is a demand for a method of energy conversion with higher efficiency and lower harmful emission. Free piston engine (FPE) is a promising alternative to conventional internal combustion engine (ICE) as it has the potential to operate with higher efficiency and produce lower emission. The absence of a crankshaft mechanism is what differs FPE from conventional ICE and provide advantages such as less friction losses and adjustable positions as well as accelerations of its dead centers. This paper aims to provide a better understanding on the operating characteristics of FPE and the recent researches that have been done on this engine.

Paper ID 27
Title Model for Simulation Based Investigations of Fuel Systems for CNG Powered Engines

Author Dirk H. Hübner; Harald Ortwig; Uwe Zimmermann

One of the essential parts of Compressed Natural Gas (CNG) powered engines is the pressure regulator which reduces the storage pressure (up to 250 bar) from the tank system to a near constant outlet pressure of approximately 2 up to 10 bars within the fuel injection system. To generate fundamental data for the scientific project described in this paper a standard mechanical pressure regulator for CNG-powered engines was investigated theoretically and practically. Thereto the particular components of such a system were modelled, simulated and verified by comparison of measured and simulated results. Experiments and Simulations are aligned here to validate the model. In the next step the modelled state of the art mechanical pressure regulator was investigated based on simulation.

Abstract Technical Session #3

Paper ID 1
Title A Generic Control, Simulation and Hardware Toolkit for Free Piston Engine Developers

Author Sam Cockerill

Free Piston Engines (FPEs) have the potential to generate electrical power from a wide range of low carbon and renewable fuels with high efficiency, low emissions and low operation and maintenance costs. However to date only a small number of developers have moved beyond lab-based research and simulation activities toward commercialisation. A number of common technical challenges have been identified across multiple FPE development programmes. These typically manifest as a lack of motion control stability and result in poor efficiency and emissions compared to theoretical FPE performance. The objective of work presented in this paper is the development of a generic control, simulation and hardware toolkit to resolve these challenges. This toolkit will be made available through 'OpenFPE', an open innovation developer group, and so provide a robust basis for industrial research and experimental development that will in turn accelerate the widespread commercialisation of Free Piston Engine-generator systems for multiple distributed power applications.

Paper ID 38
Title CFD Based Investigation on Effect of Classifier Blade Length to Coal Particle Distribution in Coal Pulverizer

Author Firas Basim Ismail Alnaimi; Elaine Kuan; Hasril Hasini; Mohammad Nasif

Classification of fine coal dust is very important in thermal power plant, in order to ensure complete combustion of fuel in the burner. Fine coal particulate is able to provide higher combustion efficiency as compared to coarse coal particulate, due to high surface area. In this investigation, modification of coal pulverizer classifier with new geometries were proposed, by extending the classifier blades in specified range of length. Computational fluid dynamics (CFD) modelling was used to investigate the effects of classifier blade length to coal particles size. CFD simulation of coal classifier model based on original design was initially done and validated by plant data. Next, three other different blade length at a common fixed angle were tested, and the effects to resulting coal fineness were recorded. The simulation studies showed that the optimum blade length was found to be 12.36", which is additional 8" based on original length design. The simulated classifier is able to achieve 71.5% of particles passing 75 µm sieve, with 57% classifier efficiency. A coal fineness improvement of 11% is achieved by the new design as compared to original design of the classifier model.

Paper ID 34
Title Design and Implementation of Solar Powered Stirling Engines: Review

Author Firas Basim Ismail Alnaimi; Ranjani Vasu; Mohammad Nasif

This paper covers literature review on Solar Powered Stirling Engine technology. In this paper, development of traditional Stirling Engine will be discussed on earlier part. The second part covers integration of solar power with Stirling Engine and application of this combined system in industry. There were many researches and studies carried out previously on the development and application of traditional Stirling Engine. This paper is focus on development and performance of Solar Powered Stirling.

Paper ID 67
Title Performance Investigation on an Integrated Multi-Stage Cylindrical-Tank Solar Water Heater

Author Tadahmun Yassen; Mousa M. Waes; Omer Ahmed; Tahseen Ahmad Tahseen, T. A. Tahseen; Masri Bin Baharom

[The aim of this work is to study the performance of a multiple-tank integrated-solar collector storage heater. A prototype of the heater having a capacity of 300 Liter was constructed and experimentally tested outdoors to observe the variation of water temperature in the storage tanks. A Fluent program is used to predict the storage water temperature. The experimental data was verified and found to be in good agreement with the simulation model. In vice versa, the simulation model was validated using the experimental data. Two cases have been studied, namely with and without flow rate. The results show that the maximum water temperature exited from the storage tanks during February month of 2010 was 48℃. The results illustrated that the present integrated solar water heater was a success in providing hot water suitable for day time use by households during the winter in Iraq.

Paper ID 61
Title Characterization of the Effect of Pressure Difference on In-Cylinder Flow Field Using Proper Orthogonal Decomposition (POD)

Author Mohammed El Adawy; Morgan Heikal; A. Rashid A. Aziz; Mhadi Ismeal; Hasanain A. Abdul Wahhab

The velocity vector fields resulted from high speed time-resolved particle image velocimetry (PIV) of the flow field inside an engine cylinder under steady-state conditions were investigated by proper orthogonal decomposition (POD) with the objective to compare the in-cylinder flow structures evolution and variation at different pressure differences 300, 450 and 600 mmH2O. The result demonstrated that mode 1 flow pattern was a good estimate of the ensemble-averaged tumble pattern. Moreover, there was a good correlation between mode 1 coefficients and the applied pressure difference.

Paper ID 30
Title Wind Resource Forecasting Using Enhanced Measure Correlate Predict (MCP)

Author Firas Basim Ismail Alnaimi; As'ad Zakaria

The enhancement of Measure Correlate Predict (MCP) using Principal Component Analysis (PCA) is a new wind prediction method based on studying the patterns of historical wind data. The method is trained based on past wind data to predict the wind speed using an ensemble of similar past events. The method is tested based on Meteorological Office (MET-Office) wind speed from a reference site that spans from 2000 to 2010. The last two years (2008 to 2010) were used as training years where the MCP - PCA algorithm learns the wind patterns between the reference(s) and target(s) site. The prediction result is then compared to the actual wind speed distribution at the target site of the training years. The method is further tested with an increase in number of reference sites for predictions. The new prediction results show that the prediction error improves to 23.1 % in average in comparison to a standard linear regression method.

Paper ID 12
Title Heat Transfer Enhancement with Nanofluids A Review on Recent Applications and Experiments

Author Izza Ismail; Mohd. Zamri Yusoff; Firas Basim Ismail Alnaimi; Prem Gunasegaran

Since the 1990's, nanofluids have been one of the abundantly preferred newcomer technology invented to assist in electronic and heat transfer purposes. Their thermophysical properties and heat transfer performance make nanofluids highly demanded to overcome the current issues in the world. In this paper, a vast number of applications using nanofluids are reviewed as well as an epitome on the challenges in their respective areas. Additionally, recent research papers for specific applications of nanofluids in improving heat transfer efficiency were outlined while the experimental and theoretical methods were discussed in the articles and journals is summarized in this paper including the effects of thermal properties on the performance of nanofluids. In a nutshell, this review of experimental research extracted from most recent papers, published from 2011 to 2016, is a review on the latest updates in the nanofluids and heat transfer community to help anyone in concern of the topic and enough information to select nanofluids based on their needed applications.

Paper ID 300

Unleash The Potential of Additive Manufacturing with Topology Optimization

Author Seng Tat Lim and Tze Thong Wong

Markets dig innovation, and rapid innovation requires technologies that provide the creative freedom without compromising on the lead times, volumes and costs. And it is not a single technology that can help, but a combination of best-of-the-breed that achieves this. This paper highlights two such technologies – topology optimization and 3D printing - their individual strengths and shortcomings, as

well as how when used in a combination they meet all the parameters necessary for a successful innovation. It will show case the experiment undertaken using solid Thinking Inspire, a globally leading tool for topology optimization from Altair Inc. and the mass savings it brings about without compromising on displacement or stress; and meeting all the criteria of manufacturing constraints.

Abstract Technical Session #4

Paper ID 100
Title Two-phase Slug Flow Separation at T-Junction with Regular and Reduced Vertical Side Arm

Author Zeeshan Qadir Memon; Minh Tran; William Pao; Fakhruldin Mohd Hashim

In petroleum engineering applications, T-Junction is used as a flow separation device. The division of gas/liquid flows at T-junction results in separation of phases. However, uneven distribution of phase and excessive liquid carryover happens frequently, causing significant liquid choke for downstream equipment. To date, the most of experimental work conducted on two phase separation has been performed on the horizontal regular and reduced T-junction at stratified and annular flows. This research paper reports the investigations of two phase flow (water and air) in regular and reduced T-Junctions in slug flow regimes. The diameter ratio of 1, 0.67 and 0.50 have been selected. The gas superficial velocity is 0.33 m/s, six liquid superficial velocities has been varied from 0.47 - 0.54 m/s. comparison has been made by increasing the liquid superficial velocities and also by changing the diameter of the side arm under slug flow regime. It has been observed that liquid carry over can be reduced by reducing the diameter of the side arm by keeping the side arm at vertical direction.

Paper ID 102
Title Enhancing Surface Quality of Zr-Cu-Ni-Ti-Be Through Hydroxyapatite Mixed EDM for Potential Orthopedic Application

Author Sri Hastuty

The surface hardness of the Zr-based BMG was greatly improved from 49.9 HRC to about 85.5 HRC. The peak current, pulse duration and their interaction have a major influence on the machined surface roughness. Increasing these parameters resulted in high surface roughness. The lowest roughness of 1.976 µm were achieved at current of 5 A and durations of 4 µs. However, the highest roughness of 24.33 µm at interaction of current and the pulse duration was achieved. On the other hand, increasing the HA powder concentration reduces the surface roughness. Elements such as Ca, P and K, which are essential for tissue growth and cell adhesion were deposited on the machined BMG surface. The cracks disappeared and micropores reduced to nano scale in size when HA powder was added to the dielectric fluid.

Paper ID 94
Title Investigation of Late Fuel Injection Position on the Combustion of Free Piston Engine

Author Salah Eldin Mohammed; Nur Amalina Ramlan; A. Rashid A. Aziz; Firmansyah Firmansyah; Ezrann Zharif Zainal Abidin

The effect of late fuel injection positions on the combustion characteristic of a two-stroke free piston linear generator engine were conducted experimentally. Three fuel injection positions namely 39, 42 and 45 mm from the cylinder head were selected. The ignition position was set at 12mm from the

cylinder head, while the equivalence ratio was fixed as 1.0. The fuel was injected at 18 bar for all the three injection positions. The results from the experimental work show that the maximum peak cylinder pressure is 40.59 bar which occurs at about 4.2 ms (time after the start of the ignition) at the injection position of 39 mm. Also the fastest rate of heat release and shorter duration of combustion occurs at the same injection position. At 45 mm injection position, the cylinder gas pressure and the rate of heat release were low, and this is due to the longer ignition delay period.

Paper ID 112
Title A Review on Free Piston Linear Engine (FPLE)

Author Siti Norazilah Ahmad Tamili; A. Rashid A. Aziz; Shaharin Anwar Sulaiman; Ezrann Zharif Zainal Abidin; Firmansyah Firmansyah

Free piston engine generator (FPEG) is a linear energy conversion system and one of the strategy has been proposed which is a cascade control for the piston stable operation level and PID controllers are used for both the outer and inner loop. Free piston engine has no crankshaft and piston move freely in the cylinder which easily adjust the compression ratio and optimize the combustion process.

Paper ID 117
Title Bouncing Effect on Free Piston Linear Generator at Starting Process

Author Muhammad Noraiman Mohd Jaffry; Zainal Ambri Abdul Karim; A. Rashid A. Aziz; Firmansyah Firmansyah; Ezrann Zharif Zainal Abidin

In this paper, rebound phenomena of FPLG and its influence on dynamic and combustion performance of FPLG during the starting process. Using Simulink, FPLG was simulated by injecting compressed air at combustion chamber and the piston has allowed expanding until rebound phenomena occur. The inlet pressure of compressed air was varied and it is shown that the combustion pressure and frequency of FPLG are increased when the inlet pressure increase.

Paper ID 113
Title Microstructural Analysis on Underwater Friction Stir Welded 5052 Aluminium Alloy

Author Srinivasa Rao Pedapati; Dhanis Paramaguru; Mokhtar Awang

Underwater friction stir welding (UFSW) has been conducted on 5052-aluminum alloy in of 6-mm thickness plate at various tool rotational speeds, welding speeds and type of welding tools. The welding speed varied from 50 mm/min to 150 mm/min while the rotational speed varied from 500 rpm to 2000 rpm with three different type of welding tools viz., square, tapered cylindrical and taper threaded cylindrical. The exploration discussed the effect of different parameters on the microstructural features of the weld joint. The results discovered that weld joints produced by the taper threaded cylindrical tool display defect free stir zones due to well composed of heat generation and balanced material flow. Both the heat input and the material deformation dominant the grain size in weld joint when using square tool. The material deformation essentially dominant the grain size via tapered cylindrical welding tool, and the heat input dominant the grain size by means of taper threaded cylindrical welding tool.

Paper ID 59
Title Developing Renewable Energy Alternative Resources Evaluation Model Based on Multiple Criteria

Author Abraham D Woldeyohannes; Dereje Engida Woldemichael

The variation in cost to develop renewable energy resources and the interest from stakeholders to consider various evaluating criteria before implementing renewable energy alternatives is attracting interest from researchers. Though cost is the leading factor to be considered for the selection of renewable energy alternatives, it is also equally important to address other criteria such as useful life of the project, operation and maintenance of the given alternatives, the impact of alternatives to the society and other factors. The number of alternative renewable energy resources to be considered and the number of evaluating criteria depends on the involvement of various stakeholders. This paper focuses on developing renewable energy alternative resources evaluating model considering multiple criteria. The proposed model optimize each renewable energy alternative resources considering cost as prime factor and evaluate the alternatives under different criteria using Simple Additive Weighting (SAW) method for generating comprehensive ranking for all alternatives. The model has been tested based on a region having a demand of 620 MWh per year. Five alternative renewable energy resources have been evaluated based on six criteria. The alternative which includes a combination of wind to supply 72.58% and biomass to supply 27.42% of energy requirement ranked as the best option considering all criteria. The model can also be extended to any regions taking into account the local data and availability of resources for the selected areas.

Paper ID 159
Title The Effect of Unstable Emulsion of Water-in-diesel on Micro-Explosion Phenomena

Author Mahadi Ismael; Morgan Haikel; A. Rashid A. Aziz; Cyril Cura; Mohammed El Adawy

Water-in-diesel emulsions are known to lead to micro-explosions when exposed to high temperatures, thereby offering a technology that could improve the mixing of fuels with the ambient gas. Several factors such as the surfactant type, dispersed water droplet size, water content and coalescence rate play a key role in the onset of micro-explosion occurrence. Although these factors are likely to alter the properties of emulsion stability, however the effect of unstable emulsion on the micro-explosion occurrence is not well addressed. To address this issue, we prepared stable emulsion (SE) and unstable emulsion (UE) with 10% water content by volume and visualized during Leidenfrost effect. Our measurements indicate that the strength of micro-explosion affected by coalescence rate, which probably arises from decomposition of the emulsion. UE has a positive influence on micro-explosion occurrence, which probably again due to thermal conduction of coalesced water droplets. The study suggested that the micro-explosion caused due coalescence of a few big droplet (in case UE) rather than evaporated and cooperative of fine droplets to explode the droplet (in case SE). The temperature of micro-explosion was found to be lower in case of UE compared to SE.

Paper ID 104
Title Effects of Fluoropolymer and Calcium Stearate on Melt Flow Index and Mechanical Properties of High Density Polyethylene

Author Mohamad Zaki Abdullah; Hamdan Ya; Muhammad Shazwan Mahmud

Thermoplastic polymer such as high density polyethylene (HDPE) can be troublesome to manufacture due to its high viscosity of molten resin. To improve the manufacturability, polymer additive is a preferred method due to its low cost compared to changing the die geometry, process control setting and molecular weight of the resin. However, the influence of the additive to the mechanical and physical properties of HDPE was not fully understood. Therefore, the aim of this paper was to evaluate the effects of fluoropolymer and calcium stearate on melt flow index (MFI) and mechanical properties of HDPE. Twin screw extruder was used for compounding and injection molding was

employed to produce the specimens. MFI, tensile and flexural tests were carried out according to their respective ASTM standards. An improvement of 20% in MFI was observed when 0.1% of fluoropolymer was added to HDPE. Adding calcium stearate to the mixture did not make any significant impact to MFI and mechanical properties. Tensile properties of HDPE remained almost the same with and without the additives. However, flexural property of HDPE reduced quite significantly with the additives.

Abstract Technical Session #5

Paper ID 152
Title Study the Effect of Plasma Jet on the Gas Dynamic at the Jet-Substrate Contact Surface

Author Asma Begum; Mohammad Pervez; Tatsuo Ishijima

In this work, feed gas modification by plasma jet is visualized by Schirlen imaging and the spreading of the plasma is observed by digital imaging and by Optical Emission Spectroscopy (OES). It has been shown that the long and short lived excited species and ions strongly modify the gas propagation and the spreading pattern of the plasma on the contact surface. Electro hydrodynamic momentum established in the plasma due to the effective applied voltage in the feed gas enhance the surrounding air induces in to the gas channel. It has a great importance in the biomedical application and in the surface treatment. The spreading of the plasma jet on agar gel, metal and teflon is observed and the quasi uniform plasma species distribution on the target surface is identified. Intensity of excited nitrogen and OH is higher than the other species present on the target surface and the intensity of different species on metal surface is higher than the teflon surface. The turbulence is higher at the outer radius of the plasma contact area and for higher operating voltage.

Paper ID 55
Title Design and Development of Casted Stainless Steel Y-Tee Joint for Oil & Gas Application

Author Amir Ahmad; Faizul Azly Dzubir, H.H. Ya, M. A. Sudin, Romzee Ismail, Malek Faiza

Pressure drop or head loss, occurs in all piping systems because of elevation changes, turbulence caused by abrupt changes in direction, and friction within the pipe and fittings. T-joint is commonly used in pipeline or piping system to transport the liquid or gas from one place to another places depending on the demand and application. A liquefied natural gas (LNG) plant in Malaysia is taken a step forward in putting an effort to replace some of Straight-T fitting component with new Y-Tee joint component in their plant. The main purpose to implementing of Y-Tee is to reduce vibration on the piping system. Y-Tee joint is an engineered fitting component with some special characteristic to overcome some engineering problem like pressure loss, vibration, flow efficiency etc. The design and development of unlisted component, Y-Tee joint had been carried out for oil and gas industry plant. This special item is considered as engineered pipe fitting component with some special characteristic to overcome some engineering problem such as pressure loss, flow efficiency etc. Implementing of Y-Tee joint to the piping system will enhance the plant efficiency and optimum the plant in operation. SIRIM BHD together with the Group Technical Solutions (GTS) has been designing and developing the Y-Tee stainless steel jointly adhering to the ASME standard code. By using the facilities in SIRIM, three (3) numbers of Y-Tee were produced, tested and installed at LNG plant successfully.

Paper ID 115
Title Performance Characteristics of Free Piston Linear Generator on Different Equivalence Ratio

Author Wan Noor Azleen Nadhari; A. Rashid A. Aziz; Ezrann Zharif Zainal Abidin; Firmansyah Firmansyah

The free piston linear generator (FPLG) is a kind of linear free-piston engine and has many advantages over the traditional reciprocating engines (TRE). In this study, a novel two-stroke free piston linear generator prototype equipped with a linear electric generator is presented to achieve efficient conversion of mechanical work to electricity during expansion process. Different features of the prototype and their influence on the system performance are discussed. The ignition position set at 30mm, the injection position was fixed at 0 mm, i.e. middle of stroke, the injection pressure was set at 18 bar, and equivalence ratio for all experimental observations. The highest velocity and current produced are at equivalence ratio 1.1 while the highest power produced at equivalence ratio 1.3.

Paper ID 119
Title Effect of Intake Manifold Volume in Free-Piston Engine Linear Generator

Author Muhammad Muzani Masri; A. Rashid A. Aziz; Ezrann Zharif Zainal Abidin; Firmansyah Firmansyah; Evelyn Evelyn; Siti Norazilah Ahmad Tamili

The effect of intake manifold depends on design pattern which in this paper following the concept of cyclone design in order to obtain minimum turbulence and lower pressure drop between intake manifold volume and free-piston engine volume. The pressure output to intake manifold was constant to 1.2 bar where the effect same such as turbocharge concept in conventional engine due to the stroke length. The experimental has been conducted in order to validate the method of theory with experimental PIV.

Paper ID 108
Title Effect of Back Rake Angle and Shape on Wear Rate of PDC Cutter in Hard Formation

Author Azri Hamim Ab Adzis; Ahmad Majdi Abdul-Rani; Yien Yi Kong; Belladonna Maulianda

Owing to excellent properties, graphene nanoplatelets (GNPs) have great reinforcing ability to improve the mechanical and tribological properties of Al nanocomposites for many automotive applications. In this work, GNPs dispersion and reinforcing effect was testified by developing GNPs/Al nanocomposite using solvent dispersion via tip sonication and facile low energy ball milling (tumbling milling). Two ball milling speed (200 and 300 rpm) were applied to study their effect. GNPs/Al nanocomposite powders were cold compacted followed by pressure less sintering at two temperatures (550oC and 620oC) to investigate sintering response of sintered samples. The effects of GNPs content, milling rotation speed and sintering temperature on the density, hardness and wear properties of the nanocomposite were investigated. The results indicate that relative density decreases with increasing GNPs content due to possible re-agglomeration. The highest hardness of 35.6% and wear rate of 76.68 % is achieved in 0.3wt%GNPs/Al nanocomposite processed at 300 rpm and at 620oC as compared to pure Al due to uniform dispersion, higher diffusion rate at higher temperature and effective lubrication effect.

Paper ID 128
Title Performance Investigation of a Roof Top Solar Chimney at Various Inclinations

Author Sundus S. Al-Azawiey; Mahmoud M. Mahdi; Mohammed Jawad Mohammed

The solar chimney has been used on the roof of housing for ventilation purpose. The inclination angle is an influencing parameter on the performance of the roof top solar chimney. A small-scale prototype

with adjustable roof angle was designed, fabricated and setup in Universiti Teknologi PETRONAS, Malaysia. The analysis of results showed that there is a difference in the absorptivity of the two sides facing north and south. This difference is changing according to the solar time in the day and the inclination angles of the absorber plates. Highest temperature rise of the air flow in the collector has been achieved when in two sides of the absorbers are set around 45^{o}.

Paper ID: 150

Title: The Effect of CO2-H2S on Corrosion of Low Alloy Steel 3%Cr in High Partial Pressure CO2 Environments

Author: Ahmad Zaki Abas; Mokhtar Che Ismail; Kok Eng Kee

The corrosion behaviour of low-alloy steel 3%Cr was investigated under high pressure carbon dioxide environments, containing small amount of hydrogen sulfide, to simulate the condition of high carbon dioxide containing natural gas transporting offshore pipeline. It was systematically studied under high pressure carbon dioxide (range from 80 and 120 bars) with variation in other key parameters (temperature and hydrogen sulfide concentration). The corrosion rates were tested using High Pressure and High Temperature (HPHT) Autoclave and measured using the techniques such as linear polarisation resistance (LPR), electrochemical impedance spectroscopy (EIS), iron count and weight loss (WL). The surface morphology and the composition of the corrosion product layers were analysed by using scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDS), X-ray diffraction (XRD), Raman spectroscopy and Infinite Focus Microscope (IFM). The results showed that in the CO2-saturated water phase, the addition of 200 ppm hydrogen sulfide (H2S) instantaneously decreased the corrosion rate of low-alloy steel 3%Cr at both 25°C and 80°C.

Paper ID 17
Title Energy Harvesting and Power Generation from Stairs

Author Turki Al Qadhi; Asim Al-Baser; Fawaz Sammani; Mahmoud Elsayed; Tahmid Jamil

Nowadays, energy and power are vital aspects in todays' modern world. The demand for it is increasing day by day, and non-renewable energy sources such as petroleum is massively being used in daily life, such as in transportation, electric stations and generation. However, petroleum as the non-renewable energy will not be able to be formed or replenished in such a short period of time. Therefore, renewable energy such as solar, wind and tidal power are the only options that this world can survive on in the future. In this study, we propose a mechanism to generate power while stepping on the stairs which can be stored and used. The utilization of the energy wasted by a human foot power is important as it must be considered to contribute in todays' modern world. The system can be installed in any highly populated area, such as stations, malls, colleges and buildings where there are constant movements of people. The system requires no fuel, it is pollution free, and most importantly, it does not depend on external factors that occur in particular times throughout the year, such as wind, waves and sun. Energy is available all year round. The methodology showed excellent results, and according to the design and calculation performed.

Paper ID: 10
Title Life Extension Program and Refurbishment of Gas Turbine Parts After 100 EOH

Author: Thanaraj Sanmugham

The 50Hz SGT5-2000E Engine (V94.2), a four stage turbine, has been in operation in the world since 1981. The first version of 105MW SGT5-2000E was installed in Tenaga Nasional Berhad (TNB) owned base load power plant in 1983/4 and has clocked 264,004 Equivalent Operating Hours (EOH) in 2015. In 2015, the last stage stationary vanes (Tule 4) needed replacement as per Original Equipment Manufacturer (OEM) manual and involved of millions of Ringgit investment. In order to reduce cost, TNB power plant had engaged TNB REMACO Repair Centre to perform repair by using Reverse Engineering and Remaining Life Extension (RLE) method. This technical paper described

the technique that has been implemented by TNB REMACO Repair Centre to ensure these components able to extend their life for one (1) more cycle in operation.

Paper ID 145
Title: Diesel-Natural Gas Engine Emissions and Performance

Author Wan Nurdiyana Wan Mansor

Exhaust emissions from compression ignition engine such as particulate matter and nitrogen oxides pollute the environment and contributes to global warming, smog and health problem. One of the strategies to overcome this problem is the diesel derivative dual fuel engine with natural gas as supplement fuel. These engines are originally sold as diesel engines. They are converted to dual fuel (diesel-natural gas) operation with an aftermarket dual fuel kit. Natural gas is blended with the intake air. As natural gas is mixed with air intake, the amount of diesel used is reduced. By substituting a portion of diesel fuel with natural gas, this engine is capable to give optimum combustion and minimum emissions. However, this creates another problem with other emissions such as higher carbon monoxides and unburned hydrocarbons. Thus, the main purpose of this research is to quantify the emission reductions with diesel-natural gas engine and its performance. In this research a John Deere 6068H diesel engine is converted to dual fuel operation. The engine is a Tier II, 6 cylinder, 6.8 liter, 4-stroke compression ignition engine with a compression ratio of 17:1 and a power rating of 168 kW at 2200 rpm. The engine operates at 1800 rpm through five different load points in diesel and dual fuel operating modes. Data for thermal efficiency, in-cylinder pressure, and net heat release rate are presented in this study. Additionally, fuel consumption and pollutant emissions are also measured. The maximum natural gas substitution is limited by knock/engine stability or emissions of carbon monoxide and total hydrocarbons.

Abstract Technical Session #6

Paper ID 50
Title Numerical Investigation on the Utilization of Phase Change Material (PCM) to Reduce Building's HVAC Energy Consumption

Author Mohammad S. Nasif; Ahmad Fakhri Shah Mohd Samsudin; Firas Basim Ismail Alnaimi; Desmond Chin Yoong Lim

The potential of utilization of PCM in storing energy through latent heat energy storage (LHTES) can be employed to provide free cooling. In this research, Phase Change Material (PCM) is used and coupled with Liquid to Air Membrane Energy Exchanger (LAMEE) and Underfloor Air Conditioning System to achieve thermal comfort of occupant by supplying cooled air into an office room. Computational Fluid Dynamics (CFD) simulation has been used to investigate the above system potential in provide thermal comfort instead of conventional air conditioning system by achieving the same thermal comfort. PCM coupled heat exchanger with the flat slabs and room office model have been constructed in this research. The heat gain inside and outside of the office room with the global position of Kuala Lumpur was included in the CFD simulation to illustrate the real environment. Humidity ratio of ambient air after passing through the LAMEE was included as the boundary inlet condition at the office room. It was found that the thermal comfort of occupant in an office room which are in the temperature between 21oC - 24oC and relative humidity of 40% - 60% can be achieved for duration of 1 hour and 30 minutes.

Paper ID 51
Title MHD Bubbly Flow in Horizontal Pipe New Criteria Through CFD Simulation

Author Hasanain A. Abdul Wahhab; A. Rashid A. Aziz; Hussain H. Al-Kayiem; Mohammad S. Nasif; Mohammed El Adawy

The volume of fluid model is used to simulate MHD for CNG-Diesel bubbly flow through a horizontal pipe. The modelling is carried out in ANSYS environment and the simulation was used FLUENT MHD Module for solving and post processing as MHD bubbly flow problem. This study divided into two models: in the first model, the dynamics of CNG bubbles formation emanating from nozzle in mixer under influencing of magnetic field is explained. While, in second model, the dynamics of bubbly flow through horizontal pipe under influencing of a magnetic field is explained. The simulation analysis was able to investigate well the MHD effects on bubble formation in liquid/gas mixers with different conditions and the two-phase MHD flow line effect. The influence of magnetic field on the axial fuel velocity, gas volume fraction along horizontal pipe were been simulated. The results showed that gas bubbles move toward the upper wall under the buoyancy force effect and these bubbles expand vertically in the fuel flow, and the gas volume fraction values increased with increasing the magnetic field density. Also, the axial fuel velocity decreases and the behavior tend to flatten with increasing of the magnetic intensity.

Paper ID 78
Title Numerical Simulation of the non-Newtonian Blood Flow Through Aortic Bileaflet Mechanical Heart Valve Using Fluid-Structure Interaction Approach

Author Samar Abbas; Mohammad S. Nasif; Mior Azman Said; Rafat Al Waked

Numerical simulation of blood flowing through Bileaflet Mechanical Heart valves (BMHV) has been widely performed in the past to achieve the unprecedented details of the cardiac mechanics of BMHV and the associated blood flow field. However, most of the past studies have assumed the blood to be Newtonian. Although in large arteries like aorta, blood behaves as Newtonian fluid, however the Non-Newtonian effects become important as it passes through regions with low shear rates. This paper has modelled blood as a non-Newtonian incompressible fluid and complete physiological cardiac cycle has been simulated. Arbitrary Lagrangian Eulerian approach is employed to establish blood-leaflet interaction. The results indicate a 58% higher average wall shear stress on the fully closed leaflets when modelling blood as non-Newtonian fluid compared to Newtonian modelling.

Paper ID 42
Title Underfloor Air Distribution Technology A Review

Author Firas Basim Ismail Alnaimi; Sures Sambathan; Mohammad Nasif

The underfloor air system is a new concept that was introduced for its fairly exceptional advantages for its advantages in terms for design flexibility, improve indoor thermal comfort (ITC), indoor air quality(IAQ), reduces life cycle cost and energy efficient by producing conditioned air and ventilation to commercial buildings and data centres. Despite its advantages, the reliability of the UFAD system is still limited due lack of understanding of the control of thermal stratification, and the analysis of energy consumption which are still difficult for building designers to apply the UFAD system as a daily driver. The purpose of this paper is to review the past studies that was done on the UFAD system to determine the gaps that still exist and suggestion that can be done to facilitate further study on the system.

Paper ID 99
Title Numerical Investigation on the Effect of Fire Compartment Opening Width down Stand Depth and Heat Release Rate on the Horizontal Projection of Smoke Plume in a Full Scale Atrium

Author Mohammed Mutafi; Mohammad S. Nasif; William Pao; Firas Basim Ismail Alnaimi

Atrium is a modern architectural design of buildings that has an open space at the middle and contains multiple floors. In case of a fire in an atrium, the movement of the smoke plume is influenced by several factors. A CFD simulation using fire dynamic simulator (FDS6) software is conducted to investigate the effect of fire compartment opening width and heat release rate on horizontal Projections of smoke plume in a full scale atrium with down stand depths of 1m and 0.75m. It was found that, when the fire compartment opening width is small the smoke plume tends to flow away from the atrium structure. However, when the heat release rate is small the smoke plume flows closer to the atrium structure.

Paper ID 131
Title The Malaysian Government Immovable Asset Management Practices Through the Application of the FM Organisational Performance Model

Author Ahmad Firdauz Abdul Mutalib

A few years back, there are several incidents of frequent mishaps happening like severe leaking, ceilings or roofs of public buildings collapsed, and other public amenities were badly maintained. Thus, there was a call for proper setup of governance to seriously look into the numerous issues which have affected service deliveries. Therefore, several actions have been taken to the level of strategic, tactical and operational in government organisations. It was started with managing the knowledge in asset and facilities management properly to create an effect to the organisational performance. The research conducted by Ir Dr Ahmad Firdauz Abdul Mutalib has developed a model that showed the relationship between knowledge elements, mediating constructs, and organisational performance in the model of FM organisational performance. The model used in this research was tested using empirical data collected from a survey involving practitioners in the organisation that practising Facilities Management (FM). The collected data were analysed by using structural equation modelling. The research showed that it was highly recommended to use this model as an approach to any organisation that involved in asset and facilities management. Therefore, this model was the complement of the Total Asset Management implementation in Malaysia Government. The relationships between each of the construct in the model of FM organisational performance and the initiative taken by the Government Asset Management Committee shows the innovation of developing new knowledge in the total asset management that's contributed in creating new industrial needs in Malaysia.

Paper ID 37
Title Design and Development of Mini Hydropower System Integrated for Commercial Building

Author Firas Basim Ismail Alnaimi; Wei Ziet Fong

In this power generation system, the abundant rainfall in Malaysia will be fully utilized through a gutter roof system, down into a series of pipelines which leads to a power generation system through turning of the mini hydro turbine. The particular system consists of several subsystems which make up the entire system, which shows the rainwater flow and usage from the beginning to disposal. 3D designs

of the system was done utilizing the Solid Works 2015 software, and its site of interest is located at the College of Engineering(COE) BN-Building of Universiti Tenaga Nasional (UNITEN). Through usage of Solid Works 2015 and ANSYS FLUENT 16.0, the project has been able to simulate rainwater flow in the system which leads to the study of the rainwater characteristics alongside stress-strain analysis on the entire structure of the system. Finally, cost analysis was performed which sums up to an initial investment of RM 250k. The project will break-even at the 19th year, and is expected to yield a net profit of RM 145k at the end of its peak performance life.

Paper ID 81
Title CFD Simulation of Liquid-To-Air Membrane Energy Exchangers (LAMEE): Flat Plate Exchanger Effectiveness

Author Rozanna Roslan; Mohammad S. Nasif

A numerical model has been developed to study the latent effectiveness of the liquid to air membrane energy exchanger (LAMEE). The heat exchanger consists of two channels separated by a semi permeable membrane, which only allows water vapor transfer. The mass transfer across the membrane from the hot air to the cold liquid desiccant is investigated while employing different membrane types and different liquid desiccant solutions to predict the exchanger latent effectiveness. The LAMEE was configured in a cross flow configuration where the latent effectiveness of the exchanger was observed. Results indicated that the latent effectiveness is more influenced by desiccant solution type by 3.4% compared to changing the membrane type which has minor effectiveness increment by 1.3%. The cross flow heat exchanger having LiBr as a desiccant coupled with a MCA membrane have improved overall latent effectiveness of 4.75% compared to that of LiCl desiccant solutions coupled with a CA membrane. The simulation results are product of the early development stage and require refining to ensure the accuracy and replicability.

Paper ID 43
Title Experimental and Numerical Analysis of Different Flow Modifier on the Reversal Flow Region in S-shaped Aggressive Diffuser

Author Raed Jessam; Hussain H. Al-Kayiem; Mohammad S. Nasif

This paper presents an experimental and numerical investigation on the flow modification in an air intake S-shaped aggressive diffuser. The selected diffuser has an actual geometry of 45o subsection from annular cross section, with implementing flow modifiers. The S-shaped diffuser had an area ratio 3.1 and turning angle of 35°/35°. The investigation is performed with three types of passive flow control flow modifiers. 3D CFD simulation was performed through ANSYS-FLUENT 15 software. The experimental results showed a good agreement with the numerical results. The measurements were conducted inside annular subsection at inlet Reynold number 40 × 104 and turbulence intensity 4.8%. The performance parameters, static pressure recovery and distortion coefficient, used for performance evaluation. Implementing flow modifiers type 2 gives maximum static pressure recovery of 0.77, 0.83 and minimum distortion coefficient of 0.086, 0.077 for experimental and numerical results, respectively. While the less improvement was produced with implementing flow modifiers type 3.

Paper ID 225
Title Characterization of Tin Oxide (SnO2) Nanostructures Prepared by Thermal Oxidation

Author Nuraini Abdullah, Noor Mazni Ismail, Dewan Nuruzzaman

Tin oxide (SnO2) nanocrystals and nanowires were successfully synthesized on Si (100) substrate by thermal oxidation method at different oxidation temperatures 450 oC, 500 oC and 550 oC. The synthesized nanostructures were characterized by FESEM, Uv-Vis and Photoluminescence spectrum. The morphology of the samples was confirmed by FESEM. Meanwhile, the optical properties were obtained from Uv-Vis and photoluminescence (PL) spectrum. Tin oxide nanowires were obtained at oxidation temperatures 500 oC with energy band gaps of 1.21 eV. PL emission spectra results showed that tin oxide nanowires at 500 oC exhibit first maximum peak at 450 nm (2.76 eV), second maximum peak at 500 nm excitation (2.48 eV) and third maximum highest peak at 650 nm excitation (1.91 eV). In this work, we investigate the right oxidation temperature to synthesize tin oxide nanowires. The structural and optical properties of the synthesized tin oxide thin film can be improve by oxidation temperature

Abstract Technical Session #7

Paper ID: 71
Title: Prediction of Performance Parameters of Stratified TES Tank Using Artificial Neural Network

Author: Afzal Soomro; Ainul Akmar Mokhtar

Various performance measures have been developed for performance evaluation of the stratified Thermal Energy Storage (TES) tank. There are many methods which have been developed including Numerical, Analytical to determine the TES tank efficiency using Figure of Merit (FOM) and Thermocline Thickness (WTC) parameters as the performance indicators. However, these methods are more complicated and need more technical data. Therefore, a simple and easy method is required to predict the performance of TES tank. In this paper, a comparative study using results from analytically solved sigmoid dose response function and artificial neural network (ANN) is conducted to determine the parameters

Paper ID 101
Title Nano-Silica Effect on the Poly (1 8-Octanediol Citrate) Composite Properties for Bone Plate Application

Author Abdullahi Mahmud; Puteri Sri Melor Megat-Yusoff; Faiz Ahmad

The continuous occurrence of bone fracture cases requires attention in solving the problem of meeting the necessary criteria for the bone fracture repair devices aimed at that purpose. Taking this into consideration, a nano silica (SiO2) polymeric composite was developed for bone plate production. Bio-composites were prepared from nano silica which was developed from rice husk, and poly (1, 8-octanediol citrate) (POC) polymer which was polymerized from octanediol and citric acid. The composite was successfully produced by compounding and curing method. For optimization purposes, the loading percentage of SiO2 into the POC matrix has been varied from 20, 30, 40, and 50wt.%. The current research focused on the optimization of the developed composite as affected by nano silica loadings and distribution. Fourier-transform infrared spectroscopy (FTIR) was employed in characterizing the developed POC - Silica nanocomposites for variation in surface chemical structure. Thermal degradation properties were assessed by using Thermogravimetric analyzer (TGA) while mechanical properties were ascertained by Tensile strength. Enhancement in terms of mechanical properties was achieved through incorporation of up to 50wt.% nano silica particles in the POC matrix. Promotion of thermal degradation properties of the composite was evident with the inclusion and dispersion of silica nanoparticles in the POC matrix

Paper ID: 120
Title: Effect of Pressure in Crossover Port to the In-Cylinder Flow of Split-Cycle Engine

Author: Firmansyah Firmansyah

Increasing concern on the environment and energy security boosts the technological development of internal combustion engine with the main objectives are higher overall efficiencies and lower emissions. Split cycle engine is one of the unconventional solution for the current established engine technology. However, its high pressure ratio intake between the crossover port and power cylinder creates a supersonic intake flow that are difference from the existing in-cylinder flow behavior. Therefore, in this report, the effect of crossover port pressure to the in-cylinder flow is investigated using simulation tools. It was found that the swirl intensity in the cylinder is increasing with higher pressure ratio as well as the tumble.

Paper ID: 122
Title: OMNI Oil Technologies: Manufacturing a Malaysian-made PDC Bit

Author: Zulkefly Abdul Manan; Ahmad Majdi Abdul-Rani

Predominantly engineering companies from USA and Europe are the major palyers in design and fabrication of PDC Polycrystalline Diamond Compact bits (PDC) while a few players from China and India are emerging in the last decade. Malaysian companies have been limited to refurbishment of worn or broken PDC bits. OMNI Oil Technologies, took on the challenge to be the first Malaysian-owned company to design and fabricate a local made PDC drill bit using local technology and expertise. The prime objective of this project is to demonstrate that steel body PDC bit can be manufactured and produced in Malaysia. The goal is to penetrate the Southeast Asia market with this capability, thus placing Malaysia as a key Oil and Gas manufacturer in the region. Software upgrades for SolidWorks to allow for Computational Fluid Dynamics (CFD) and Finite Element Analysis (FEA) is also being solicited to allow simulation done locally. A team of experienced local drilling experts, designers and engineers were formed as a team to design, simulate, validate and fabricate a PDC bit. SolidCAM and FeatureCAM was used to design PDC bits head and shank. which was then machined using a 5-axis CNC Machining center together with a few other turning centers to fabricate the first Malaysian-made PDC it. This effort resulted with success of fabricating the first PDC bit prototype which will soon be manufactured using steel AISI4145H. This shows that Malaysian-based drilling experts, designers and engineers have the technical know-how and expertise to design and fabricate a PDC bit.

Paper ID 18
Title Color-based Oil Spill Image Segmentation

Author Osman Abu Bakr Mohmmed Ahmed; Mark Ovinis; Ibrahima Faye; Fakhruldin Mohd Hashim; Mahadi Ismael

Oil spill image segmentation is an important task for quantifying the total amount of spill volume. However, segmentation of oil region from image is challenging. This is due to the un-defined edge and the weather conditions. This paper proposes a novel approach based on color. The color-based method segments the oil spill region based on clustering the object colors at image to various groups, from which the oiled region can be segmented. A k-mean cluster was applied to the image color and segment the oil spill region. As a result, the accuracy of color-based method outperformed the classical Otsu thresholding method.

Paper ID 80
Title Effect of Bauxite Residue on the Corrosion Resistance of an Intumescent Paint Coated Steel Plate

Author Puteri Sri Melor Megat-Yusoff; Adiat Ibironke Arogundade; Lukman Afolabi; Rasheed Muriana

In previous work, bauxite residue was successfully used to improve the heat shielding effect of an epoxy based intumescent coated steel system. In this work, the effect of the ceramic filler on the corrosion resistance of the intumescent coated steel was investigated using static weight loss immersion test in 5% NaCl solution. Incorporation of BR led to 45% reduction in corrosion rate due to the passivation effect of the metal oxide on the steel-moisture interface. Modification of BR by ball milling further reduced the rate of corrosion by 79%. Increased concentration of NaCl to 15% gave a negative effect due to increasing interaction with the surface hydroxyl groups. The ball milled BR IC system however maintained good corrosion resistance due to lower concentration of surface hydroxyl content.

Paper ID 140
Title Influence of Silica and Chemical Modification on Dispersion of Carbon Black Nanoparticles in Epoxy Resin

Author Raphael Joshua; Othman Mamat

The addition of nanoparticles into organic polymers provides an efficient means to advance the properties of the host polymer. The properties of such polymer nanocomposites are built upon the nanoparticles that are dispersed within the polymer matrix. However, as a consequence of inaptness, the dispersion of synthesized inorganic nanoparticles in polymer matrices is very challenging; this paper reports the synergistic effect of the use of silica, thermal and chemical modification to improve the dispersion of carbon black (CB) nanoparticle in epoxy resin. The properties of the nanoparticles and the epoxy nanocomposite were investigated using XRD, XPS, FESEM, FTIR, BET/SAP and particle size zetasizer. The addition of silica and the use thermal and chemical modification proved a FESEM image with a well dispersed CB nanoparticle within the host epoxy resin.

Paper ID 132
Title Physical and Mechanical Properties of Heat Affected Zone of Dissimilar Welds Between Duplex Stainless Steel and Low Carbon Steel

Author Nsikan Dan, Patthi Hussain, Muhammad Shazwan Mahmud, and Hamed Mohebbi

The joining of duplex stainless steel and low carbon was performed using gas tungsten arc welding (GTAW) with aid of argon gas a shield. Sample was welded using ER308L weld wire and physical and mechanical properties of the heat effect zone and the welded joint were investigated using optical microscope (OP), scanning electron microscope (SEM), Electron dispersive spectroscopy (EDS), hardness test and ultimate tensile test (UTS). The OP and SEM, at the HAZ revealed precipitation of new phase such martensitic which is responsible for the increase in hardness. UTS conducted also showed a plastic deformation of welded sample which is an indication ductile property of HAZ and welded point.

Paper ID 130
Title Ultrafast-Contactless Plasma Arc Sintering

Author Mohsin, Husam; Albarody, Thar M. Badri; Muhsan, Ali Samer

This paper introduces an innovative alternative for spark sintering, in which contactless plasma sintering (CPS) is accomplished by means of plasma arc. In this arrangement, arc current will not

pass through the sample to be sintered allowing sample to not contact the arc plasma electrodes. Consequently, this method provides continuous sintering. SiC whiskers was chosen to characterize sintering parameter. The SiC refined by ball-milling to promote densification. Characterization of Silicon Carbide (SiC) were carried out with Field Emission Scanning Electron Microscope (FESEM) and X-Ray Diffraction (XRD). The effect of the sintering-agent Fe addition on the sintered SiC-Fe composites were investigated based on the microstructure, densification.

Paper ID 105
Title Effect of Dispersing Agent on the Thermal Properties of Basalt Fibre Reinforced Intumescent Coating

Author Muhammad Yasir; Norlaili Binti Amir; Faiz Ahmad; Ahmad Afiq Afif Ab Kadir; Zeeshan Baig

Intumescent coating is a method of passive fire-proofing that is applied to structural member of building and helps prevent the fire heat from reaching the structure. The issue with fibre reinforced intumescent coating was that the fibre tend to coagulate when the coating was applied to the structure and they did not have a good dispersion. The coating was prepared with basic components of ammonium polyphosphate-APP, expandable graphite, and melamine-MEL in an epoxy resin base with boric acid as additive. Basalt fibres were used as reinforcements with BYK-9920 as the dispersing agent and their effects on thermal properties were investigated. The coating was applied by brushing onto steel substrates of 100 cm2 and 25 cm2. The effects of different weight percentage of the reinforcements were studied by performing fire test and furnace test for heat shielding effect and char expansion. Further analysis was performed by thermogravimetric analysis (TGA) for residual weight and thermal stability. From the TGA, the formulations showed increase in final weight residual. The coatings were able to expand up to 635% and reduce the substrate temperature from 1000°C to 180°C.