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Shaping UNIMAS as a Research University



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The FENG Research Bulletin is a publication of the Faculty of Engineering, Universiti Malaysia Sarawak (UNIMAS). It publishes current information on Research Activities, Research Publications, Research Fundings, Recent Research Equipment, Conferences, Seminars and Research Students of the Faculty of Engineering.

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The Message Board



Research and Development has always been a priority at the Faculty of Engineering. The present issue of FENG Research Bulletin reflects the effort we have put in to achieve this priority.

Prof Dr Wan Hashim Wan Ibrahim
Dean



I would like to congratulate the researchers working at the Faculty of Engineering on their remarkable achievements. Also, I would like to appreciate the excellent work done by the editorial team of this bulletin.

Dr Hushairi Zen
Deputy Dean (PG & Research)



The Editorial Team has worked very hard to successfully publish the present issue. It brings together diverse research activities conducted at the Faculty of Engineering.

Dr Delsye Teo Ching Lee
Editor



The format of FENG Research bulletin has been improved this time by incorporating the Research Equipment recently acquired and by adding information on PhD being conducted at FENG.

Prof Dr Amir Azam Khan
Co-Editor

Research Grants

List of Ongoing Research Grants

Fundamental Research Grant Scheme (FRGS), Ministry of Higher Education						
No.	Principal Researcher	Co-researchers	Field	Title	Funding Period (months)	Fund Amount (RM)
FRGS/03(07)/839/2012(79)	Norsuzailina Mohamed Sutan	Prof Dr Sinin bin Hamdan, Dr Delsye Teo Ching Lee, Dr Zainal Abidin Talib (UPM), Ir Dr Mohd Saleh Jaafar (UPM), Ibrahim Yakub	Engineering and Technology	Parametric study on Utilizing Waste Glass as a Finely Ground Mineral Adictive (FGMA) in a Modified Multi-Component Binder (MMCB) Durable Eco-friendly Cement System	24	60,750
FRGS/03(06)/803/2011(72)	Prof Madya Dr Hj Mohammad Omar Abdullah	Dr Tay Kai Meng, Dr Shanti Faridah Salleh, Prof Madya Dr Hussain H. Al-Kayiem (Universiti Teknologi Petronas)	Energy (Engineering and Technology)	Intelligent Performance Optimization Framework For Collaborative Hybrid Energy System (I-Porches) : Theoretical Development, Mathematical Formulation and Laboratory Verifications.	36	175,200
FRGS/03(02)/758/2010(44)	Dr Abu Saleh	Prof Dr Sinin Hamdan, Prof Madya Masjuki Hj Hassan, Dr Dayang Maryani Awg Hashim	Engineering and Technology	Biodiesel production from waste fat and oil as renewable energy sources	24	43,000
FRGS/03(03)/771/2010(52)	Ir David Bong Boon Liang	Prof Madya Dr Yap Vooi Voon, Prof Madya Ir Dr Andrew Ragai Henry Rigit, Dr Tay Kai Meng, Annie Ak Joseph	Engineering and Technology	Multilayer Bit-Plane Extraction Approach For Biometric Identification	24	52,000
FRGS/03(04)/772/2010(53)	Norsuzailina Binti Mohamed Sutan	Prof Dr Sinin Hamdan, Dr Zainal Abidin Talib (UPM), Dr Delsye Teo Ching Lee	Engineering and Technology	Parametric Study On The Effect Of Using Industrial By-Products And Polymeric Additives In Cement To The Development Of Efflorescence On Concrete Structures	24	56,000

Exploratory Research Grant Scheme (ERGS), Ministry of Higher Education						
No.	Principal Researcher	Co-researchers	Field	Title	Funding Period (months)	Fund Amount (RM)
ERGS/02(02)/853/2012(05)	Prof Madya Ir Dr Andrew Ragai Henry Rigit	Prof Madya Dr Jane Labadin, Prof Madya Dr Azhaili Baharun	Engineering and Technology	Mapping of Tidal Energy for Sarawak and Sabah	24	50,000
ERGS/02(07)/859/2012(11)	Prof Dr Ng Chee Khoon	Dr Tay Kai Meng, Chiew Fei Ha (UITM), Dr Delsye Teo Ching Lee	Engineering and Technology	Development of a Novel Musical-inspired Meta-heuristic Optimiser for Mix Proportion Design of High-Strength Concrete	36	50,000

ERGS/02(08)/860/2012(12)	Dr Md Rezaur Rahman	Prof Dr Sinin Hamdan, Dr Abu Saleh, Dr Rubiyah Bains, Dr Dyg Maryani Awg Hashim, Mohd Farid Atan	Engineering and Technology	Synthesis and Characterization of Mn ₃ O ₄ Nanoparticles and its Application on Oxidative and Antibacterial Activity	36	50,000
ERGS/02(01)/807/2011(02)	Dr Tay Kai Meng	Prof Dr Ng Chee Khoo, Prof Dr Lim Chee Peng (USM), Dr Neoh Siew Chin (UNIMAP), Siti Noor Ain Musa, Dr Nordiana Rajae	Electrical & Electronic (Engineering and Technology)	Development of a Novel Type 2- Fuzzy Logic Based-Group Decision Support Model For The Local (Sarawak) Food Industry	24	94,000

Prototype Research Grant Scheme (PRGS), Ministry of Higher Education						
No.	Principal Researcher	Co-researchers	Field	Title	Funding Period (months)	Fund Amount (RM)
PRGS/02(02)/829/2011(02)	Prof Madya Dr Mohammad Omar Abdullah	Dr Ivy Tan Ai Wei, Dr Leo Sing Lim (ICATS)	Energy (Engineering and Technology)	Bio-Chemical Adsorption Compressor (MY - 143033 - A) Upgrading For Automobile Air-Conditioning Real World Application	24	240,000

Dana Principal Investigator (DPI), UNIMAS					
No.	Principal Researcher	Co-researchers	Title	Funding Period (months)	Fund Amount (RM)
DPI08	Prof Dr Amir Azam Khan	Prof Dr Sinin Hamdan Prof Madya Ir Dr Andrew Ragai Henry Rigit	Synthesis of Ceramic Nano Powders through Sol Gel Process, Study of Morphology and Composition Changes with Post Treatment	24	54,000

Osaka Gas Foundation in Cultural Exchange (OGFICE) Research Grant Scheme (2012)					
No.	Principal Researcher	Co-researchers	Title	Funding Period (months)	Fund Amount (RM)
1	Dr Delsye Teo Ching Lee	Prof Dr Ng Chee Khoo, Prof Dr Md. Abdul Mannan, Nursuzailina binti Mohamed Sutan	An Investigation on Concrete from PVA Treated Waste Oil Palm Shell (OPS) Aggregate	12	6,000
2	Dr Hushairi Zen	Prof Madya Dr Al Khalid Othman, Dr Kartinah Zen, Ade Syaheda Wani Marzuki	Energy Harvesting Protocol for Wireless Sensor Network	12	5,250
3	Dr Nordiana Rajae	Ervina bt. Junaidi, Dr Siti Noor Linda Taib, Dr Magdalene Andrew Munot, Dr Shanti Faridah Saleh	Development of 'Sesar Unjur' (Smoked Shrimp) Production in Belawai, Sarawak	12	3,000
4	Hisammuddin Afifi Huspi	Mohd Fareez Edzuan Abdullah, Muhamad Fadzli bin Ashari, Ir Dr Mohammed Shahril Osman Mohd Azrin bin Mohd Said	The Study of Pre-Heated Liquid Fuel – Air Mixing Chamber	12	8,000

5	Asrani Lit	Hazrul Mohamed Basri, Abdul Hafiz Abdul Karim, Hazmi Hijazi Abd Halim, Dyg Nur Salmi Dharmiza Awg Salleh	The Development of Power Optimization in Network-on-chip by Multi Level Network Partitioning Technique	12	5,700
6	Abdul Hafiz Abdul Karim	Hazmi Hijazi Abdul Halim, Dr Tay Kai Meng, Hazrul bin Mohamed Basri, Kasumawati binti Lias	Study of Back to Back Power Converter Switching Topology for Doubly Fed Induction Generator	12	10,000
7	Martin Anyi	Ir Dr Mohammed Shahril Osman	Construction and Installation of a Simplified Reaction Turbine for Off-grid Communities in Sarawak, Malaysia	12	11,940

Osaka Gas Foundation in Cultural Exchange (OGFICE) Research Grant Scheme (2011)					
No.	Principal Researcher	Co-researchers	Title	Funding Period (months)	Fund Amount (RM)
1	Shirley Jonathan Tanjong	Dr Magdalene ak Andrew Munot	Modeling the Effect of High Product Mix on Factory Performances	12	6,860
2	Nor Azalina Bt Rosli	Prof FJ Putuhena, Rosmina Ahmad Bustami, Mohd Hafiz Zawawi	Ground Water and Surface Water Interaction Study at Pulau Salak	12	5,500
3	Mohamad Iskandar Jobli	Ir Dr Mohd Shahril Osman, Kertini Monir, Abg Mohd Nizam Abg Kamaruddin	Analysis of Multi-Scale Microbial Fuel Cell for Simple Electrification in Rural Areas	12	6,500
4	Mohd Farid Atan	Dr Rubiyah Bains, Nazeri Abdul Rahman, Norfamila Che Mat	Absorption of Toxic Heavy Metals Ions by Using Agricultural Wastes in Sarawak	12	3,500
5	Hazrul Bin Mohamed Basri	Prof Madya Dr Al-Khalid Bin Othman, Dr Wan Azlan Bin Wan Zainal Abidin, Dr Thelaha Masri, Kasumawati Lias, Asrani Lit	Development of Direct Power Control Space Vector Modulation (DPC – SVM) for Doubly Fed Induction Generator (DFIG)	12	4,000
6	Dr Mohd Danial Ibrahim	Ervina Junaidi, Ir Dr Mohd Shahril Osman, Prof Dr Amir Azam Khan	Improvement of Static and Dynamic Characteristics for High Performance Mobile Hard Disk Drives	12	9,500
7	Dr Ivy Tan Ai Wei	Dr Leonard Lim Lik Pueh	Feasibility Study of Oil-Palm Waste-Derived Adsorbent for Removal of Pesticides from Water and Wastewater	12	6,000
8	Nazeri Abdul Rahman	Dr Rubiyah Bains, Mohd Farid Atan, Norfamila Che Mat	Pelletization of Agricultural Residues for Power Generation	12	6,000
9	Dr Siti Noor Linda	Ervina Junaidi, Mahshuri Yusof	Design of a Household Device Utilizing Bio Fuel (Pelletized Peat)	12	7,000
10	Siti Nor Ain Musa	Ervina Junaidi, Mahshuri Yusof, Dr Siti Noor Linda	Thermophysical Properties of Oil Palm Fibre and Clam Shell Powder Reinforced in Thermoplastic Matrix Composite	12	5,000
11	Ervina Junaidi	Abg Mohd Nizam Abg Kamaruddin, Dr Siti Noor Linda, Mahshuri Yusof, Ir Dr Mohd Shahril Osman, Dr Mohd Danial Ibrahim	Improving Rice Milling Machine for Domestic Application	12	5,000

12	Dr Onni Suhaiza Selaman	Siti Nor Ain Musa, Dr Abu Saleh	Turning Agricultural By-Products into Solid Fuel for Energy Generation	12	6,000
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Small Grant Scheme, UNIMAS					
No.	Principal Researcher	Co-researchers	Title	Funding Period (months)	Fund Amount (RM)
02(S71)/799/2011 (05)	Dygpu Salma bt Awg Ismail	Prof Dr Kohilawatte Gamage Harry Chandra Nimal Seneviratne, Dr Siti Noor Linda Taib	Improved Determination of Physical Properties of Sarawak Fibrous Peat for Engineering Purposes	12	7,500
02(S84)/820/2011 (18)	Dr Leonard Lim Lik Puch	Dr Ivy Tan Ai Wei, Nor Azalina bt Rosli	Study of Waste as Low-Cost Adsorbent for Groundwater Treatment	12	10,000
02(S87)/826/2011 (21)	Dr Abdullah Yassin	Abg Mohd Nizam Abg Kamaruddin	On-line Cutting Edge Temperature Measurement in Machining	12	10,000

CoERE Consultancy Work				
No.	Funded by	Project Title	Period	Year
1.	Kementerian Kemajuan Luar Bandar dan Wilayah, KKLW (RM 1,645,600)	Development Hydro Project at Semulong Ulu, Sarawak	2011-2013	2011
2.	Kementerian Kemajuan Luar Bandar dan Wilayah, KKLW (RM 1,772,000)	Development Hydro Project at Nanga Sengaih, Sarawak	2011-2013	2011
3.	Kemeterian Tenaga, Teknologi Hijau dan Air, KeTTHA	Development Hydro Project at Bukit Assum, Punang Trusan dan Lio Matoh, Sarawak	2011-2013	2011
4.	1 IPTA 1 MENTERI (RM 10,000)	Prototype Development of Pico-Scale Wind Energy System for Rural Electrification	2011	2011
5.	SIRIM (RM 30,000)	Efficient Conversion of Crude Jatropha Oil (CJO) to Biodiesel, Characterization of CJO and Jatropha Biodiesel and Performance Study of Jatropha Biodiesel in a Diesel Engine	2011-2012	2011
6.	Kementerian Pengajian Tinggi, KPT (RM 171,954)	Knowledge Transfer Program	2012	2012
7.	MOHE/KeTTHA (RM 240,000)	Bio-Chemical Adsorption Compressor (MY-143033-A) Upgrading for Automobile Air Conditioning Real World Application	2012	2012
8.	CoE Grant Grant Under Energy Efficiency COERE/PK06/06/2012 (02) (RM 50,600)	Adaptive Energy Efficient Home Cooling System for Low Cost Housing	2012	2012
9.	EPC Synergy Sdn Bhd (RM 50,000)	Hydro Mini Project at Long Banga, Miri	2012	2012

Non-Funded Research, UNIMAS			
Principal Researcher	Co-researchers	Title	Approval Date
Prof Dr Selahattin Gultekin	-	Mass Transfer with Chemical Reactions in Porous Catalysts: A Discussion on the Criteria for Internal and External Diffusion Limitations	12-Mar-12
Norsuzailina Mohamed Sutan	Siti Nor Ain Musa, Asrani Haji Lit, Ibrahim Yakub	Building Information Modeling (BIM) - The Emerging Trend in Construction Industry	13-Apr-12
Dr Magdalene Andrew Munot	Tan Kang Ting (student)	Development and Analysis of a Simulation Model of an Automotive Assembly System	13-Apr-12
Dr Magdalene Andrew Munot	Wong Ling Kui (student)	Development and Analysis of a Simulation Model of Palm Oil Processing System	13-Apr-12
Dr Magdalene Andrew Munot	Ooi Shao Yin (student)	Simulation Model of Cars' Multimedia Production System: Development and Analysis	13-Apr-12
Kasumawati binti Lias	Hazrul Mohamed Basri, Dr Wan Azlan Wan Zainal Abidin, Prof Madya Dr Al-Khalid Haji Othman	Investigation on Metallic Jewelry Effect Towards Specific Absorption Rate (SAR)	20-Apr-12
Dr Shanti Faridah Salleh	Mohamad Farid Atan	Optimisation of Acid Catalysed Hydrolysis Oil Palm Empty Fruit Bunch Fibre in a Batch Reactor for Production of Xylose	20-Apr-12
Ngu Sze Song	-	Design of Robotic Roller Clamp Assembler	May 2012

Extended Abstracts of Selected Projects

Synthesis and Characterization of Mn_3O_4 Nanoparticles and its Application on Oxidative and Antibacterial Activity

Md. Rezaur Rahman, Sinin Hamdan, Abu Saleh Ahmed and Rubiyah Hj Baini
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Mn_3O_4 nanoscale materials have stimulated a great interest due to their special electronic and structural features with unique ion-exchange, molecular adsorption, catalysis, electrochemical, and magnetic properties. It has been reported that Mn_3O_4 is a promising electrochromic material of anodic coloration since it has a reversible color change from brown (colored state) to yellow (bleached state). Mn_3O_4 is also known to be an active catalyst in several oxidations or reductions, for example, it can be used as catalyst for the oxidation of methane and carbon monoxide or the selective reduction of nitrobenzene. These combustion-related catalytic technologies are of interest in relation to several air-pollution problems, allowing limitation of the emission of NO_x and volatile organic compounds from waste gases of different origins.

Manganese oxides are also powerful oxidants due to their high reducing potential. It has already been reported that Mn^{3+} and Mn^{4+} oxides and hydroxides can oxidize many inorganic compounds including $Co(II)$, $Cr(III)$, $As(III)$, $Sb(III)$ and $Se(IV)$ and also a variety of natural and xenobiotic organic compounds such as catechol, quinines, substituted phenols, aromatic amines, pesticides, and explosives (e.g. TNT). Mn_3O_4 (hausmannite) is a complex oxide of Mn containing both di- and tri-valent manganese. Redox potential and pH have been used extensively to evaluate equilibrium relationships between $Mn(II)$ activity in solution and various Mn compounds. Reducing potential of Mn_3O_4 is higher than that of the other Mn oxides.

Growing concern for public health and environmental quality has prompted a special interest in developing and implementing various materials and methods for removing the toxic organic and inorganic pollutants from water. Dyes from the effluent of various industries are the major sources of water contamination.

In this study, Mn_3O_4 nanoparticle, prepared by forced hydrolysis method, is a promising material for decolorization of MB and PR dyes from water. Decolorization of the dyes is believed to be occurred through oxidative degradation via a surface mechanism. pH of the decolorization medium exerts significant effect on the degree of dye decolorization. At lower pH, the Mn_3O_4 nanoparticles show superior capacity of decolorization; the degree of decolorization of MB by Mn_3O_4 nanoparticles reached more than 75% within 1min at the pH as low as 3 shown in Figures 1 and 2.

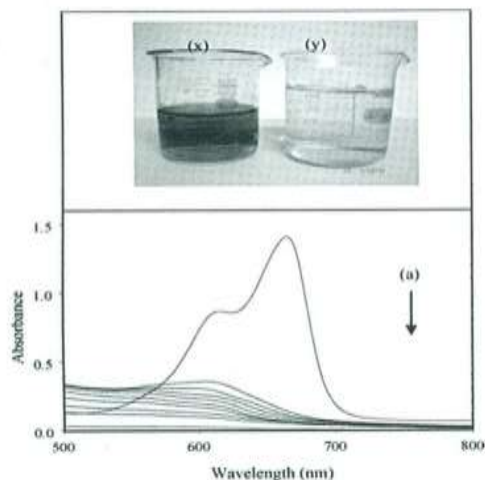


Figure 1: UV-vis spectra of 30_MMB dye solution before (a) and after (b-k) charging the Mn_3O_4 nanoparticles at pH 3. The spectra taken at different time intervals, viz., 1, 3, 5, 7, 10, 15, 20, 30, 60 min and 24 h after charging the nanoparticles correspond the spectra (b-k), respectively. Inset shows camera pictures of 30_M MB dye solution before (x) and after (y) charging the Mn_3O_4 nanoparticles.

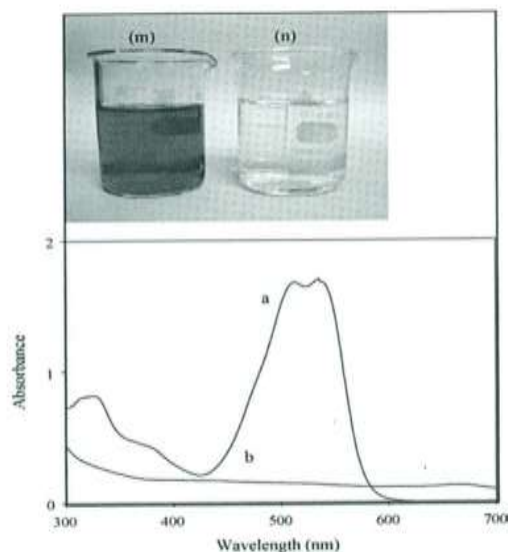


Figure 2: UV-vis spectra of 300_M PR dye solution before (a) and at 24 h after (b) charging the Mn_3O_4 nanoparticles at pH 3. Inset shows the camera pictures of 300_MPR dye solution before (m) and after (n) charging the Mn_3O_4 nanoparticles.

Synthesis of Ceramic Nano Powders through Sol Gel Process. Study of Morphology and Composition Changes with Post Treatment

Amir Azam Khan
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Ceramic metal composites (CMCs) have been subject of investigation for the last several decades, but mainly the focus of research remains the improvement of mechanical and thermal properties (fracture toughness, bend strength, thermal shock resistance). One very important aspect which is recently of interest is the Electrical Properties of CMCs. The metallic phase which is mixed in the form of a powder and co sintered together with the ceramic, can transform the composite into an electrical conductor once a composition threshold is achieved. This system can be modeled as a three dimensional distribution of spheres within a continuous matrix of ceramic. The reality is quite different than a simple model. The reaction between ceramic and metal at high temperature can modify the properties of the ceramic-metal interface and can play a significant role in controlling the electrical properties. A completely recent field of research is the use of nano particles for producing nano composites. The present work proposes the synthesis of ceramic nano particles using a sol-gel process. Nano particles of TiO_2 and TiC would be synthesized and compositional and morphological studies would be conducted after a prolonged Post Treatment process.

By sol-gel chemistry doped and undoped TiO_2 nano particles can be synthesized with well controlled morphological and structural features. This method provides control over reaction parameters, compositional homogeneity, grain size, particle morphology and porosity. We get mono-disperse spherical nano crystalline TiO_2 powders with high chemical purity, high surface areas, small crystallite size, by the hydrolysis and condensation of Titanium precursors in aqueous or non-aqueous medium at ambient temperature under atmospheric pressure. Through sol-gel process, the physico-chemical and electrochemical properties of TiO_2 can be modified to improve its efficiency.

The process involves the hydrolysis and polymerization of metal precursors (alkoxide or halides). The solutions of precursors are reacted to form irreversible gels that dry shrink to rigid oxide forms. The metal oxides are synthesized by the hydrolysis of reactive metal precursors, usually alkoxides in an alcoholic solution, resulting in the corresponding hydroxide. The titanium precursor in appropriate concentration is added to the selected solvent. The contents are stirred vigorously for various times. The precursors for TiO_2 are mostly Titanium alkoxides and Titanium chlorides, which undergo hydrolysis and polycondensation reactions to form either a network of "elastic solid" or a colloidal suspension (or dispersion) - a system composed of discrete (often amorphous) submicrometer particles dispersed to various degrees in a host fluid. Formation of a Titanium oxide involves connecting the metal centers with oxo (Ti-O-Ti) or hydroxo (Ti-OH-Ti) bridges during the reaction which is pH controlled, therefore generating metal-oxo or metal-hydroxo polymers in solution. Condensation of the hydroxide molecules by elimination of water leads to the formation of a network of metal hydroxide. When all hydroxide species are linked in one network like structure, gelation is achieved and a dense porous gel is obtained. The precipitate obtained as result of hydrolysis is mixed with activated charcoal, then hydrolyzed and gelatinized. Subsequently the gel is dried to obtain TiC in a tube furnace at 1400-1600°C under a flowing Argon gas. The powders obtained from this method are in the nano sizes, the size distribution is though sensitive to Ph, time and temperature parameters. A subsequent Post Treatment can drastically change the morphology and purity of the powders obtained. The samples are characterized using techniques such as TGS, DSC, SEM, particle size distribution, BET surface area analysis, before and after the post treatment process.

Bio-Chemical Adsorption Compressor (MY-143033-A) Upgrading for Automobile Air-Conditioning Real World Application

Mohammad Omar Abdullah, Ivy Tan Ai Wei, Leo Sing Lim
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In general, automobile air-conditioning systems are designed to provide comfort for the driver and the passengers during a journey. The conventional electrical-driven compression systems are widely used in almost all of the automobiles today. Currently, air-conditioning technology is required to evolve due to the new environmental regulations, notably Montreal protocol in 1987, Kyoto protocol in 1997 and European Commission Regulation 2037/2000. These regulations are concerning about the depletion of the ozone layer and also global warming, which decided to phase-out CFCs and followed by HCFCs and HFC-134a. As a result, this trend has led to a strong demand for a new air-conditioning technology. Among the existing air-cooling technologies, adsorption air-cooling

system has good energy-saving potential. The advantages of this system are: it can be powered by using waste heat from exhaust gas, long lasting, requires low maintenance cost, uses non-polluting refrigerants and friendly to environment. A laboratory prototype of exhaust heat-driven adsorption air-conditioning system (Figure 1) for automobile has been built successfully, commissioned and laboratory tested. The system consisted of two adsorbers, a blower, an evaporator with a blower, a condenser with a fan, orifice tube, valves and an engine. This prototype could produce cooling effect continuously, where two identical adsorbers were installed and operated intermittently. An engine was used to supply exhaust gas to heat one of the adsorbers during desorption phase. At the same time, a blower was used to blow air through the other adsorber to initiate adsorption phase. The cycle time of the system was set to approximately 20 minutes, where the desorption and adsorption phases was around 10 minutes, respectively. The average chilled air temperature that could be achieved was around 22.6°C when the average cooling coil temperature was around 11.4°C. The COP and SCP of the prototype were calculated to be approximately 0.2 and 400 W/kg of adsorbent, respectively. The prototype was working under laboratory conditions; there is a need to further the research for a new prototype that can be used for actual on-the-road applications. Also, we are expecting a new prototype that will exhibit better performance and compact in size.

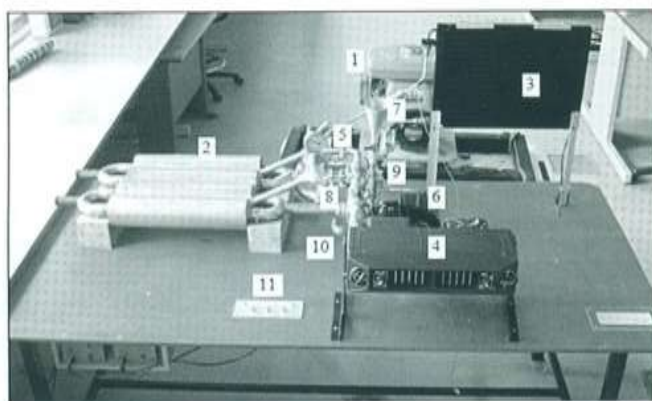


Figure 1: The laboratory scale prototype

Parametric Study on Utilizing Waste Glass as a Finely Ground Mineral Additive (FGMA) in a Modified Multi-Component Binder (MMCB) Durable Eco-friendly Cement System

Norsuzailina Mohamed Sutan, Sinin bin Hamdan, Delsye Teo Ching Lee,
Zainal Abidin Talib (UPM), Mohd Saleh Jaafar (UPM)
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Modified multi-component binder (MMCB) is a product composed of Portland cement, finely ground mineral additives (FGMA), high reactive powder component and superplasticizer. This study focus on using waste glass as finely ground mineral additive (FGMA) in a modified multi-component binder (MMCB) cement system. Past studies have shown waste glass from varying recycling processes is considered to be a material which could be used as binder and as aggregate replacement. The application of waste glass as a finely ground mineral additive (FGMA) in cement is a promising direction for recycling hence its potential of producing an eco-friendly durable concrete. In order to achieve adequate and solid understanding on the behaviour of Waste Glass Modified Multi-Component Binder cement system, this study will investigate, assess, design and model the physical and the micro structural properties of the optimal level of the cement matrix system through four (4) distinct yet related phases that will fully utilize nine (9) established and standardized methods and tests: SEM, TGA, FT-IR, EDX, XRD, ISAT, porosity, conductivity and compressive strength. The expected outcome is an extensive fundamental understanding of the system in terms of parametric data, optimal mix design and cement matrix model that will lead to a higher confidence in the use of waste glass in concrete.

Research Publications

Journal Publications in 2011/2012

1. A.A. Khan, J.C. Labbe, Advanced ceramic matrix composites for high energy X-ray generation, *Adv. Nat. Sci.: Nanosci. Nanotechnol.* 2 (2011) 045015 (8pp)
2. A.A. Saleh, H. Sinin, H.H. Masjuki, K. Makino, Efficient conversion of xylose and glucose as solid biomass to bioethanol by recombinant yeast, *J. IEM* 72(1) (2011) 36-44.
3. A.A. Saleh, M. Asri, H. Sinin, Electricity savings by implementing energy efficiency standards and labels for clothes washers in Malaysia, *J. Eng. Sci. Technol.* 6(1) (2011) 29-37.
4. A.A. Saleh, Y. Jong, S.C.H. Michael, K. Sarfaraj, H. Sinin, Performance study of a diesel engine by using biodiesel from waste fats and oil, *ASEAN J. Sci. Technol. Dev.* 28(1) (2011) 20-33.
5. A.J. Olarewaju, N.S.V.K. Rao, M.A. Mannan, (2011). Dimensionless response of underground pipes due to blast loads using finite Element Method, *Electron. J. Geotech. Eng.* 16 (2011) 563-574.
6. A.J. Olarewaju, N.S.V.K. Rao, M.A. Mannan, Behaviour of buried pipes due to internal explosion, *Malaysian Constr. Res. J.* 9(2) (2011) 32.
7. A.J. Olarewaju, N.S.V.K. Rao, M.A. Mannan, Simulation and verification of blast load duration for studying the response of underground horizontal and vertical pipes using finite element, *Electron. J. Geotech. Eng.* 16 (2011) 785-796.
8. A.Q. Jakhrani, A.K. Othman, A.R.H. Rigit, R. Bainsi, S.R. Samo, P.L. Law, Investigation of solar photovoltaic module power output by various models, *NED Univ. J. Res. (Thematic Issue on Energy)* (2012) 25-34.
9. A.Q. Jakhrani, A.K. Othman, A.R.H. Rigit, S.R. Samo, Assessment of solar and wind energy resources at five typical locations in Sarawak, *J. Energ. Environ.* 3 (2012) 8-13.
10. A.Q. Jakhrani, A.K. Othman, A.R.H. Rigit, S.R. Samo, Comparison of solar photovoltaic module temperature models, *World Appl. Sci. J.* 14 (Special Issue of Food & Environment) (2011) 1-8.
11. A.Q. Jakhrani, A.K. Othman, A.R.H. Rigit, S.R. Samo, Model for estimation of global solar radiation in Sarawak, Malaysia, *World Appl. Sci. J.* 14 (Special Issue of Food & Environment) (2011) 83-90.
12. A.Q. Jakhrani, A.K. Othman, A.R.H. Rigit, S.R. Samo, P.L. Law, R. Bainsi, Cost estimation of a standalone photovoltaic power system in remote areas of Sarawak, Malaysia, *NED Univ. J. Res. (Thematic Issue on Energy)* (2012) 15-24.
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Extended Abstracts of Selected Research Publications

Analysing Freeway Traffic Incident Duration using an Australian Data Set

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This paper investigates incident duration and identifies contributing variables for Australian conditions. The paper presents a new framework for comprehensive traffic-incident data mining and analysis towards an incident delay model and travel-time reliability modelling. Twelve months of data were collected, analysed and the results are presented in this paper. The findings suggest that debris, breakdown and multiple-vehicle crashes are the major sources of incidents on freeways. Furthermore, freeway incident duration varied across the types of incident and time of the day, and whether it was a week day or weekend day. However, there were no significant differences in relation to day, week or month of the year. Significant variables on incident duration were identified using an ANOVA test for each type of incident. In addition, the findings of this study reveal a high variance of incident duration within each incident type. A variety of probability distribution functions were employed to test the best model for the duration frequency distribution for each category of incident. Log-normal distribution was found to be more appropriate for crashes, but log-logistic distribution was more appropriate for hazards and stationary vehicle incidents.

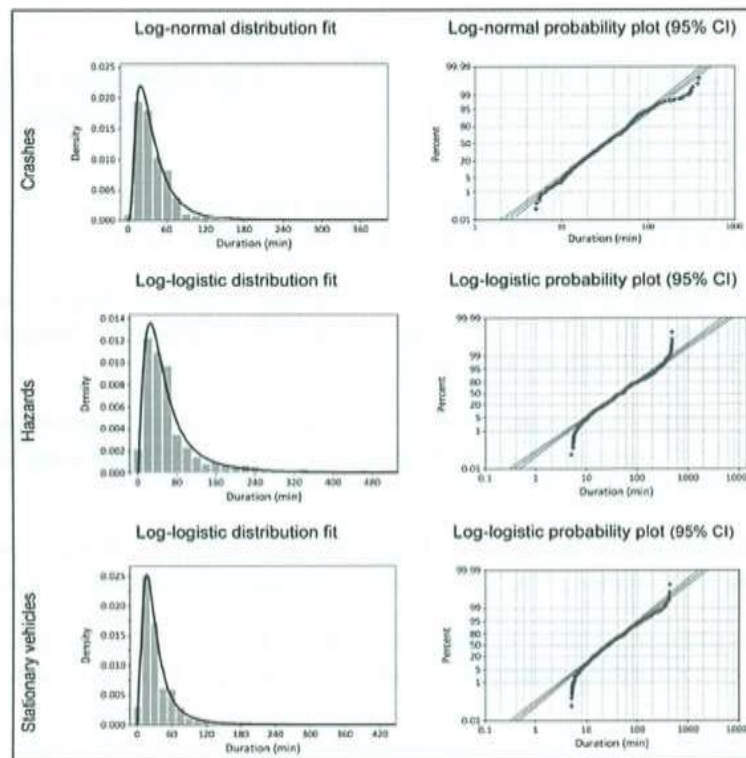


Figure 1: Freeway incident duration distributions and probability plot for different types of incidents on weekdays

Stabilization of Tropical Peat Soil from Sarawak with Different Stabilizing Agents

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This paper describes a study on tropical peat soil stabilization to improve its physical properties by using different stabilizing agents. The samples were collected from six different locations of Sarawak, Malaysia, to evaluate their physical or index properties. Out of them, sample having the highest percentage of organic content has been selected for stabilization purposes. In this study, ordinary portland cement (OPC), quick lime (QL), and class F fly ash (FA) were used as stabilizer. The amount of OPC, QL, and FA added to the peat soil sample, as percentage of dry soil mass, were in the range of 5–20%; 5–20% and 2–8%, respectively for the curing periods of 7, 14, and 28 days. The Unconfined Compressive Strength (UCS) test was carried out on treated/stabilized samples with the above mentioned percentages of the stabilizer and the result shows that the UCS value increases significantly with the increase of all stabilizing agents used and also with curing periods. However, in the case of FA and QL, the UCS value increases up to 15 and 6%, respectively with a curing period of 28 days but decreases rather steady beyond this percentage. Some UCS tests have been conducted with a mixture of FA and QL to study the combined effect of the stabilizer. In addition, Scanning Electron Microscope (SEM) study was carried out on original peat soil and FA, as well as some treated samples in order to study their microstructures.

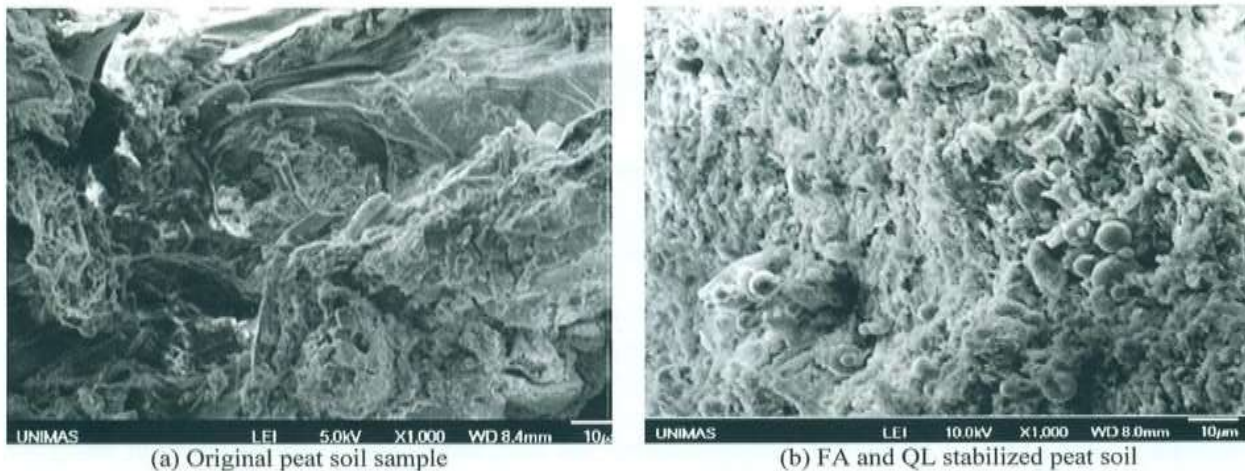


Figure 1: SEM images showing packed and highly bonded particles after stabilization.

Properties of EPS RHA Lightweight Concrete Bricks under Different Curing Conditions

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The depletion of non-renewable resources has become an alarming issue nowadays. Many environmentalists and researchers have been investigating the use of waste materials as a renewable resource especially as raw materials in construction. This paper reports on the potential use of waste rice husk ash (RHA) and expanded polystyrene (EPS) beads in producing lightweight concrete bricks. The RHA was used as a cementitious material since it is a lightweight reactive pozzolanic material. RHA was used as partial cement replacement, while the EPS was used as partial aggregate replacement in the mixes. For this research, five types of EPS RHA concrete brick samples were prepared. These samples differ from one another by the RHA content. The mix proportions were prepared by volume due to the lightweight nature of EPS. Sample A acts as a control sample. It contained only cement, sand and EPS. Samples B, C, D and E have RHA replacements of 5%, 10%, 15% and 20% respectively. Bricks of 215 mm x 102.5 mm x 65 mm in size were prepared in this study. The engineering properties of the bricks were investigated. Among the properties studied were hardened concrete density, compressive strength and water

absorption of the EPS RHA concrete bricks. Scanning electron microscopy (SEM) analysis was also performed on the brick samples. Four types of curing conditions were employed in this study. These include full water curing (C1), 3-day curing (C2), 7-day curing (C3) and air dry curing (C4). It was determined that Sample C with 10% RHA replacement showed the highest compressive strength at each age under different curing conditions. In general, it was found that the properties of the bricks are mainly influenced by the content of EPS and RHA in the mix and also the curing condition used.

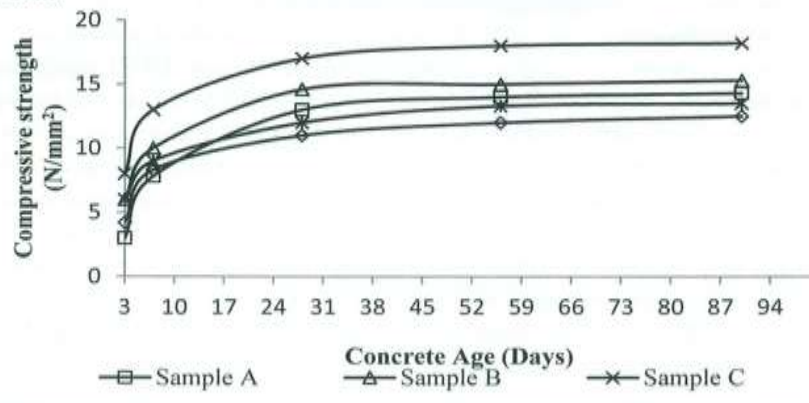


Figure 1: Relationship between compressive strength of the EPS RHA concrete bricks under C1 curing for different samples

Development of Adsorption Air-Conditioning Technology using Modified Activated Carbon – A Review

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Adsorption air-conditioning technology has attracted much attention recently due to its environmental friendly property. Some successes have been reported in the literature on the adsorption technology for air-conditioning applications. This paper presents an overview of the researches which had been carried out on adsorption refrigeration system with the commonly used adsorbent and adsorbate working pairs, solar adsorption refrigeration and adsorption technologies in automobile. Activated carbon has been widely used as the adsorbent in adsorption refrigeration system. However, one of the bottlenecks which prevent the improvement of the adsorption refrigeration technology using activated carbon is the use of the readily available commercial activated carbon without prior treatment, which has resulted in relatively lower performance as compared to the conventional absorption and vapour compression technologies. Various modification methods on activated carbon are thus discussed in this paper for future development and improvement of adsorption air-conditioning system.

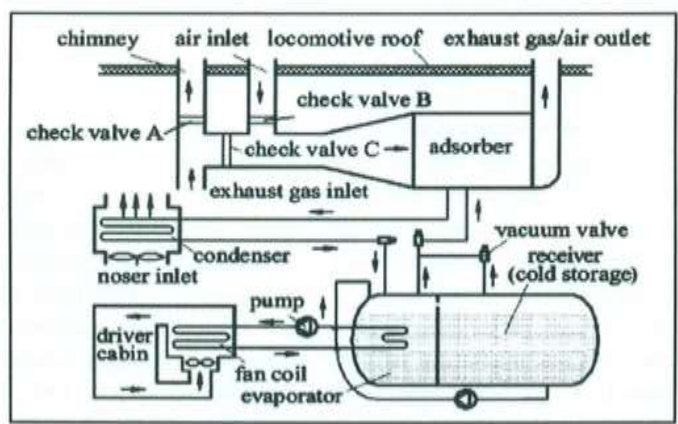


Figure 1: A schematic diagram of locomotive driver cabin air-conditioner

Feasibility Study of a Photocatalytic Reactor for In Situ Groundwater Remediation of Organic Compounds

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Remediation of groundwater contaminated by gasoline leakage from underground structures is usually complicated and costly. This work describes the use of an underground reactor, in a sand tank, placed downgradient from a simulated leakage of MTBE and other gasoline components. The reactor, Honeycomb I, is full scale in the horizontal plane. It tested the remediation of MTBE plumes at various velocities and in the presence of other gasoline compounds (toluene, ethylbenzene and o-xylene – TEO-X). The overall performance of Honeycomb I was evaluated and the efficiencies of two different experimental scales were compared. The MTBE plume was longer but narrower with increasing groundwater to MTBE velocity ratio. MTBE appeared to have a minor co-solvent effect on the TEO-X migration as TEO-X migrated at the MTBE migration rate but at significantly low concentrations. The MTBE removal efficiency decreased by about 8% in the presence of TEO-X. The scaled up Honeycomb I successfully treated 212 L of groundwater in 24 days and demonstrated its reliability over a 10-month period, achieving an overall 76% MTBE removal. In essence, this study demonstrated the potential of the immobilised photocatalytic reactor for in situ groundwater remediation, at the velocities tested in this study.

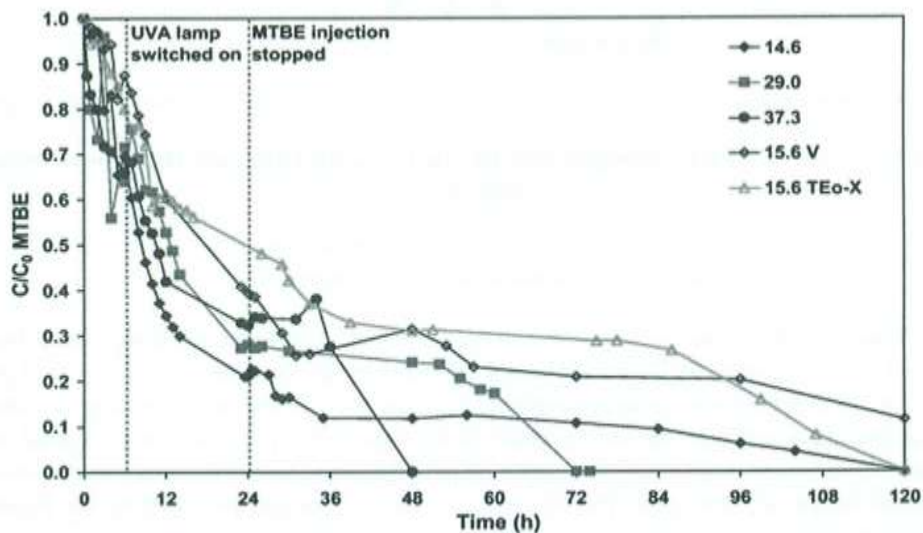


Figure 1: Reduction of MTBE concentration in the photocatalytic reactor at average linear velocities of 14.6, 15.6, 29.0 and 37.3 cm d^{-1} ; achieving at least 70% MTBE removal

Advanced Ceramic Matrix Composites for High Energy X Ray Generation

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The High Energy X ray targets are the anodes used in High Performance tubes, designed to work for long operating times and at high power. Such tubes are used in CT Scan machines. Usually the tubes used in CT Scanners have to continuously work at high temperatures and for longer scan durations in order to get maximum information during a single scan. These anodes are composed of a refractory substrate which supports a refractory metallic coating. The present work is a review of the development of a ceramic metal composites based on aluminum nitride (AlN) and molybdenum for potential application as the substrate. This composite is surface engineered to be coated with tungsten, the most popular material for High Energy X ray Targets. DC blown arc plasma is employed to spray metallic coatings on the surface of Ceramic Matrix Composites. The objective is to increase the performance and the life of an X ray tube. Aluminium nitride-molybdenum ceramic matrix composites were produced by uniaxial

hotpressing mixtures of AlN and Mo powders. These composites were characterized for their mechanical, thermal, electrical and micro-structural properties. An optimized composition was selected which contained 25 vol.% of metallic phase dispersed in the AlN matrix. These composites were produced in the actual size of an anode and coated with tungsten through DC blown arc plasma spraying. The results have shown that sintering of large size anodes is possible through uniaxial pressing, using a modified sintering cycle.

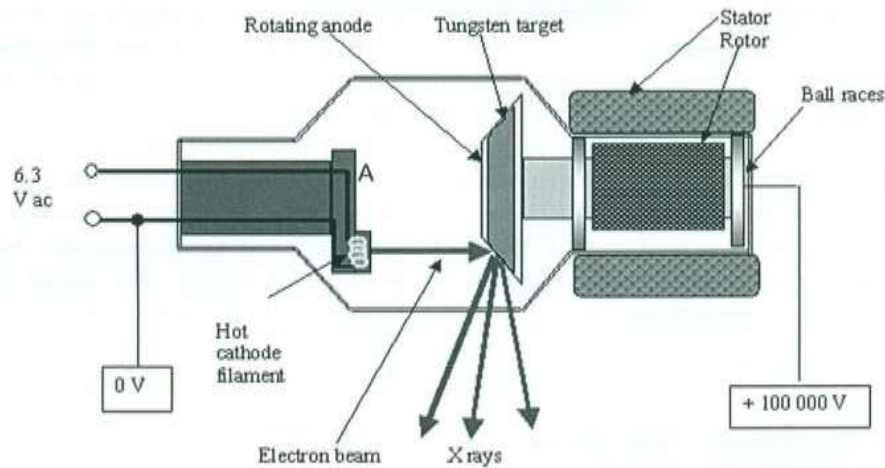


Figure 1: Schematic diagram showing major components of an X ray tube used for medical diagnostics

Flexural Performance of CFRP Strengthened RC Beams with Different Degrees of Strengthening Schemes

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Externally bonded carbon fiber reinforced polymer (CFRP) composite laminates have been successfully applied to reinforced concrete beams and other structural elements for the purpose of increase load carrying capacity of such elements. This paper presents the experimental results on the flexural strengthening of reinforced concrete beams by CFRP laminates attached to the tensile soffit of the beams by epoxy adhesive. A total of six reinforced concrete beams having different degrees of strengthening scheme were tested to failure under transverse bending over an effective span length of 1900 mm. The increase of ultimate strength provided by the bonded carbon fiber was assessed by varying the layers of composite laminates. The results indicate that the flexural strength of beams was significantly improved as the layers of laminate increased. No de-lamination of the superimposed CFRP plates was observed from the test. However, de-bonding of CFRP laminates from concrete surface was observed for the case of multi-layer strengthening of beam. It is concluded that the attachment of CFRP laminates with edge strip plates has substantially influenced the performance of CFRP strengthened beams. The paper also highlighted the beams failure modes due to the different level of strengthening scheme.

Conservation of Sarawak Peat Swamp in an Urban Landscape by Fuzzy Inference System

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Freshwater habitats are one of the planet's most important, yet most manipulated, environments. This is what happens in Sarawak that the environment has been radically changed due to urban developments. This paper is promoting the idea that we don't need a complicated but a simple tool like fuzzy inference system to strike a balance between the existence of peat swamp and the humans who live nearer and nearer to it. Conditions vital to the survival and continuity of a natural wetland system can be adapted as fuzzy rules. These rules are capable of providing indicators of how much wetland can be exploited, and at the same time, still allow the system to properly functioning as a wetland.

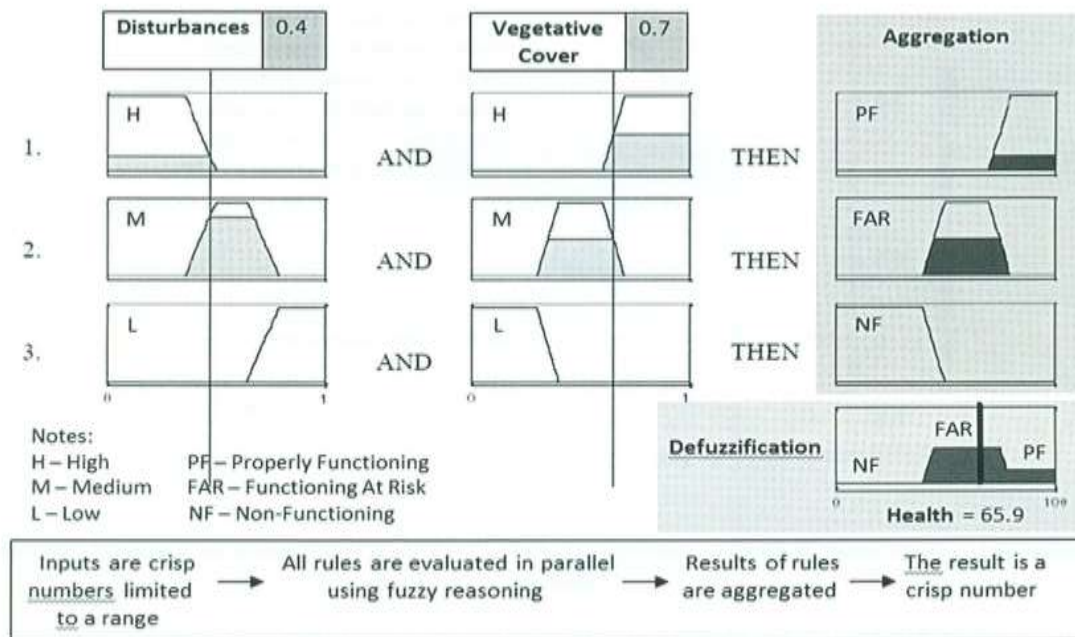


Figure 1: Fuzzy inference system diagram for wetland health

Dimensionless Response of Underground Pipes Due to Blast Loads Using Finite Element Method

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Underground structures are fully buried structures and partially buried structures. These can be any structures of diver's shapes, shelters, basement, silos, storage facilities, shafts, tunnels, pipes, etc. These structures are constructed of different materials such as steel, plain and reinforced concrete, timber, clay, fibre glass, etc. Underground pipes are used for water supply, drainage, oil and gas supply, irrigation, etc. Blast from terrorists, accidental explosion, war, accumulation of explosive gases in pipes, etc can create sufficient tremors to damage substructures over a large area. It has been reported that at blast wave of 138 kPa, reinforced concrete structures will be leveled. Consequent upon these phenomena are loss of lives and property while in the manufacturing industry, it leads to disruption in production, land degradation, etc. Blast constituent comprises of the ground media, intervening layer, structures, and blast. This study is aimed at determining the response of simulated empty underground pipes due to blast loads using finite element method. In this study, blast load parameters were determined using Unified Facilities Criteria (2008). Time integration technique in Abaqus/Explicit was used to solve the equation of motion. The soil and pipes materials were considered as elastic, homogeneous and isotropic. The material properties as obtained from different researchers and pipe manufacturers were used. Dimensional analysis was used to present the results. From the result of the dimensionless parameters, it was observed that depth of burial of pipes play a significant role in the response of underground pipes due to surface and underground blasts while coefficient of friction has little effect due to underground blast. Dimensionless pressure and deflection of underground pipes reduce as embedment ratios increase in surface and open trench blasts while this is not so in underground blast. Finally guidelines thus established would help in the design of underground pipes to resist effects of blasts. Consequently, the environmental risk and hazards caused by blasts will be reduced.

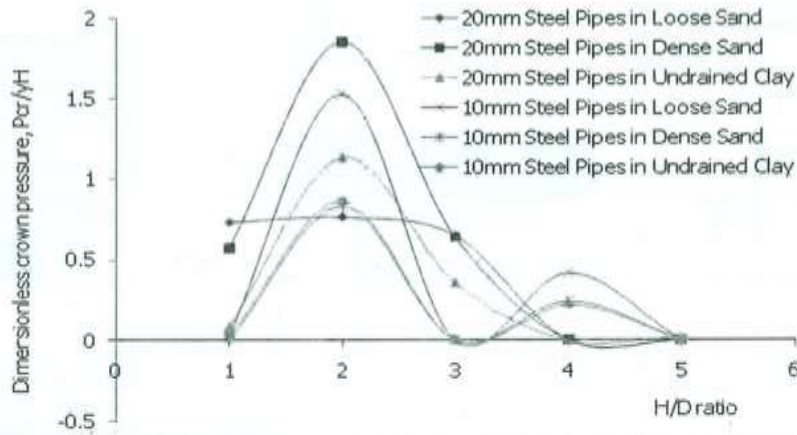


Figure 1: Dimensionless pipe pressure against embedment ratio for open trench blast

Evaluation of Incident Solar Radiation on Inclined Plane by Empirical Models at Kuching, Sarawak, Malaysia

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In this paper six different empirical models (three isotropic and three anisotropic sky models) were used for the estimation of available solar radiation on inclined surface at Kuching, Sarawak, Malaysia. Five year with monthly average solar radiation and meteorological data was used to compute the available radiation falling on the inclined plane. The tilt angle was fixed at 11°S towards the equator to obtain more energy from the sun in the worst months of the year. From the results of selected models, it is revealed that the Reindl et al. model displayed the highest estimated values among all models; while the Badescu model demonstrated the lowest results as compared to isotropic as well as anisotropic models. It is recommended that Liu & Jordan model is better model for cloudy weather conditions at Kuching. It can also be used for the estimation of solar radiation on tilted surfaces in overcast skies conditions.

Table 1: Amount of monthly mean daily incident solar radiation (MJ/m²) on tilted surface by different models at Kuching, Sarawak

MONTH	EXTRA-TERRESTRIAL SOLAR RADIATION	GLOBAL SOLAR RADIATION ON HORIZONTAL SURFACE	INCIDENT SOLAR RADIATION ON TILTED SURFACE					
			Liu & Jordan Model	Koronakis Model	Badescu Model	Hay & Davies Model	Reindl et al. Model	HDKR Model
Jan	35.60	12.80	14.25	14.28	14.19	14.71	14.99	14.71
Feb	36.98	14.24	14.55	14.57	14.48	14.66	14.89	14.66
Mar	37.70	15.87	15.81	15.83	15.73	15.82	16.03	15.83
Apr	36.90	16.21	15.65	15.67	15.58	15.56	15.76	15.56
May	35.24	16.63	15.58	15.60	15.51	15.41	15.60	15.41
Jun	34.03	15.82	14.63	14.65	14.56	14.43	14.62	14.43
July	34.47	16.77	15.81	15.84	15.75	15.68	15.87	15.68
Aug	35.99	17.21	16.55	16.57	16.48	16.46	16.66	16.46
Sep	37.20	16.51	16.28	16.30	16.21	16.26	16.47	16.26
Oct	37.00	15.28	15.40	15.42	15.32	15.45	15.68	15.46
Nov	35.76	14.59	14.97	14.99	14.9	15.08	15.31	15.09
Dec	35.04	13.42	13.85	13.87	13.78	14.00	14.23	14.00
Mean	35.99	15.44	15.28	15.30	15.21	15.29	15.51	15.29

The Fracture Properties of Environmentally-Friendly Fiber Metal Laminates (FML)

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The tensile and impact properties of environmentally-friendly composites and FMLs have been investigated. Of the four composites investigated here, a self-reinforced polypropylene composite offered superior properties to basalt, flax and hemp fiber reinforced polypropylene composites. Adding aluminum layers to the outer surfaces of the composites resulted in a significant enhancement in the tensile and impact properties of the laminates. The tensile strength and modulus properties of the FMLs obey a rule of mixtures approach, suggesting that simple procedures can be used to design these hybrid systems. Under low velocity impact loading, the SRPP, and its associated FML, offered the highest resistance to perforation, as a result of gross plastic deformation in the composite and metal plies. A semi-empirical model, previously employed to characterize metal plates, was used to characterize the low velocity impact response of the laminates investigated here. The model was capable of predicting the trends in the experimental data with reasonable success. This evidence suggests that environmentally-friendly fiber-based FMLs offer significant potential for use in engineering applications.

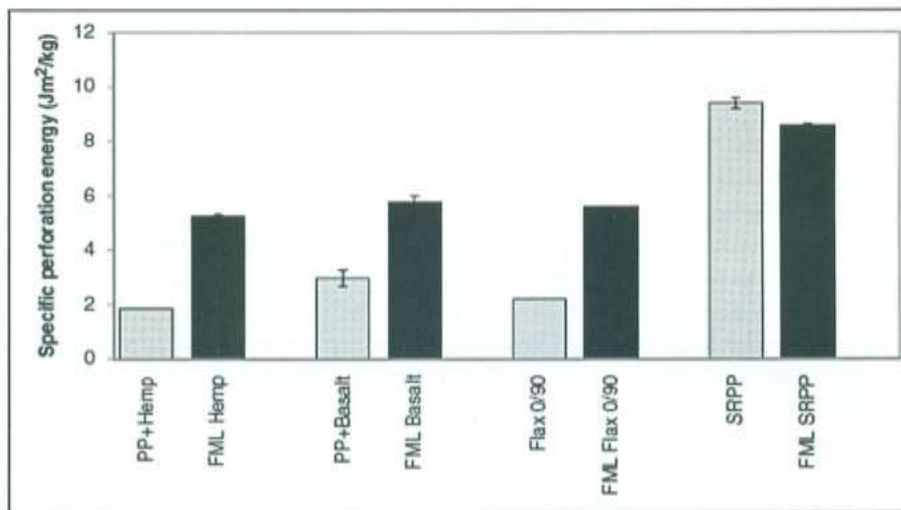


Figure 1: Bar chart of the specific perforation energy for the plain composites and the FMLs

Experimental Investigation of Vortex Breakdown in a Coaxial Swirling Jet with a Density Difference

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In this work we experimentally investigate the behavior of stable vortex breakdown taking place in a coaxial swirling jet with a density difference, highlighting the effect of the outer jet on the height of the stagnation point. With increasing bulk flow velocity of the outer jet, the degree of flow divergence decreases, resulting in an increase in the height of the stagnation point. This is due to a significant increase in the mean axial velocity along the centerline of the jet, which is clearly shown by particle image velocimetry (PIV). We proposed an equation to physically explain the height of the stagnation point in a coaxial swirling jet with a density difference undergoing vortex breakdown, by considering an estimate of the momentum balance in the flow, based on a simplified Navier–Stokes equation for coaxial jets with coannular flow. Even though the effect of the density difference on the height of the stagnation point is overestimated by the proposed equation, the increase with respect to the Reynolds number of the outer jet observed experimentally is in reasonably good qualitative agreement with the trend predicted by the theoretical model.

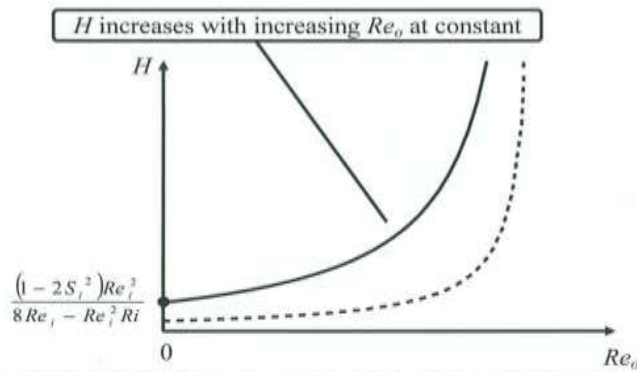


Figure 1: Schematic variation of the height of the stagnation point of the swirling inner jet obtained using the proposed equation. The solid line (—) represents an isodensity, jet, while the broken line (- - -) represents a high-density, low-viscosity jet.

The Effect of Alkali Pretreatment on Mechanical and Morphological Properties of Tropical Wood Polymer Composites

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In this study, mechanical and morphological properties of wood polymer composites (WPCs) from five kinds of selected tropical light hardwoods namely Jelutong (*Dyera costulata*), Terbulan (*Endospermum diadenum*), Batai (*Paraserianthes moluccana*), Rubberwood (*Hevea brasiliensis*), and Pulai (*Alstonia pneumatophora*) were investigated. Methyl methacrylate (MMA) and styrene (ST) vinyl monomer mixture (50:50; volume:volume) was used in preparation of WPCs. Before being impregnated with an MMA/ST monomer mixture, wood species were chemically pretreated with 5% sodium hydroxide (NaOH) solution for the reduction of hydrophilic hydroxyl groups and impurities from the cellulose fibre in wood and to increased adhesion and compatibility of wood fibre to polymer matrix. Monomer mixture (MMA/ST) was impregnated into raw wood and NaOH pretreated wood specimens to manufacture WPC and pretreated wood polymer composite (PWPC). Mechanical tests and microstructural analysis were conducted. Comparison has been made among the properties of raw wood, WPC and PWPC. The result reveals that PWPC yielded better mechanical and morphological properties compared to WPC and raw wood.

Table 1: Compressive strength of raw wood, WPC and 5% NaOH PWPC

Wood Species	Composite Type	Compressive strength (GPa), at 10% MC ^a		
		Mean	St.dev.	HG ^b
Jelutong	Untreated (raw)	2.85	0.57	A
	WPC	4.41	0.33	B
	PWPC	5.30	0.13	C
Terbulan	Untreated (raw)	3.82	0.63	D
	WPC	5.50	0.29	E
	PWPC	6.50	0.2	F
Batai	Untreated (raw)	3.58	0.83	G
	WPC	5.20	0.3	H
	PWPC	6.30	0.38	I
Rubber	Untreated (raw)	2.68	0.83	J
	WPC	3.75	0.26	K
	PWPC	4.45	0.2	L
Pulai	Untreated (raw)	2.42	1.17	M
	WPC	3.70	0.21	N
	PWPC	4.40	0.28	O

Mean value is the average of 10 specimens.

^a = Moisture content.

^b The same letters are not significantly different at $\alpha = 5\%$. Comparisons were done within the each wood species group. (St.dev. = Standard deviation, HG = Homogeneity Group)

Research News

Conferences, Workshops and Seminars

1. EnCon 2011

Engineering Conference 2011 (EnCon 2011), the 4th in the series of EnCon Conferences, was organised successfully from 29 November to 1 December 2011 at Riverside Majestic Hotel in Kuching. EnCon is the flagship conference of the Faculty of Engineering and since its inception in 2007, it has attracted academicians and professional in the engineering field from Malaysia and abroad. The Department of Electronics, Faculty of Engineering was given the honour to organise the conference. The theme selected was “Advance and Innovations in Electrical Electronics and Telecommunications and Computing Technologies” which was very relevant and timely as it reflected the accelerating growth of electronics and telecommunication technology. The objective of EnCon 2011 was to provide an avenue for researchers, scientists, engineers, academicians as well as industrial professionals to present the results of their research and development activities.

Jointly organized with Institution of Engineers Malaysia, IEM (Sarawak Branch), and co-sponsored by Science and Information Organization (SAI), the conference received more than 100 papers of which 78 were presented at the conference. The participants came from as far as United Kingdom, Australia, Canada, Germany, Korea, India, Pakistan, Iran and Kuwait. Two interesting keynote speeches were delivered by Professor Datuk Dr Khairuddin Ab. Hamid, Vice-chancellor of UNIMAS's and Dato' Ir Abang Jemat bin Abang Bujang, Managing Director and CEO of SACOFA Sdn Bhd. YB Datuk Amar Abang Haji Abdul Rahman Zohari bin Tun Datuk Abang Haji Openg, Minister of Housing and Minister of Tourism, Sarawak officiated the conference. A total of 18 parallel sessions covering areas such as Electrical and Electronics, Signal Processing, Control Engineering, Communication System, Network and Protocol, Antenna and Propagation, Modeling and Simulations, and Energy were hosted.

2. EnCon 2012

The 5th Engineering Conference (EnCon 2012) was held from 10 to 12 July 2012 at Pullman Kuching, Sarawak and was officiated by the Chief Minister of Sarawak, Y.A.B Pehin Sri Haji Abdul Taib Mahmud. The conference was organized by UNIMAS and co-organized by Institution of Engineers Malaysia, IEM (Sarawak Branch) with the theme “Engineering Towards Change - Empowering Green Solutions”. EnCon 2012 served as a platform for discussion among researchers, academicians, engineers, industrial professionals and postgraduate students to promote cooperation and technological research progress in Green Engineering. The conference featured 3 prominent keynote speakers namely Professor Simon Beecham from University of South Australia, Professor Tan Kiang Hwee from National University of Singapore (NUS) and Datuk Ir Hamzah Hasan, CIDB Malaysia Chairman. A workshop on “Geoenvironmental Engineering for Sustainable Development” was also held on the last day of the conference. The speakers for this workshop were Professor Shenbaga Rajaratnam Kaniraj Jeyachandran, Dr Siti Noor Linda Taib and Dr Leonard Lim Lik Pueh from the Department of Civil Engineering, Faculty of Engineering, UNIMAS.

The conference accepted 82 full papers for presentation. Among the topics discussed in the 20 parallel technical sessions were Sustainable Building and Structure System, Transport System, Geotechnical and Geoenvironmental Engineering, Sustainable Water and Waste Management, Energy Efficiency, and Advanced Manufacturing and Technology. The conference was attended by about 100 participants not only from Malaysia but also from other countries around the globe.



EnCon 2011 Opening Ceremony



EnCon 2011 Opening Address



EnCon 2012 Opening Ceremony



EnCon 2012 Conference Workshop

3. Workshop on Surface Engineering

A one day workshop on Surface Engineering was conducted at the Faculty of Engineering on the 28 August 2012. The workshop was organised by the Department of Mechanical and Manufacturing Engineering for its continuing education program within the Strategic Planning Framework. It was attended by 15 participants from different departments of the Faculty including two participants from the Faculty of Resource Science and Technology. Professor Dr Amir Azam Khan from Department of Mechanical and Manufacturing Engineering conducted the workshop which was divided in three sessions. Group discussions and Q&A were carried out in each session.



Workshop on Surface Engineering

The topics covered during the workshop included Surface Treatment and Surface Coatings, Vapor Deposition Process, Surface Phenomena, Thermal Barrier and Wear Resistant Coatings, Atomic, Molecular and Particulate coatings, Assisted Chemical and Physical Vapor Deposition. A few case studies of plasma sprayed coatings were also presented and discussed. The workshop was concluded with discussion and comments from the participants about the necessity and the role of Surface Engineering in the industrial and manufacturing sector of the region.

4. Talks and Seminars

The Faculty of Engineering, UNIMAS encourages collaboration with different industries and one such way is by organising talks and seminars. A number of interesting talks and seminars were given by prominent researchers and practitioners from around the globe. Below is a list of talks and seminars organised in collaboration with the Faculty of Engineering in 2012:

1. Biodiesel Presentation by Eco-Green Technology on 8 February 2012
2. Seminar on 'Engineer's Role in Environmental Management in Malaysia' by Ir Dr Shamsudin Ab Latif on 13 April 2012
3. Talk on 'From Student Engineer to Professional Engineers' by Prof Dr David Scott from Curtin University on 20 April 2012
4. Talk with Mechanical & Electronic Engineering Students by Tokuyama Corporation on 28 April 2012
5. Talk on 'Constructive Alignment' by Prof Ir Dr Mohd Sobri Takriff on 3 May 2012
6. Talk from the Mechanical and Manufacturing Department's Industry Advisory Panel (IAP) representative, Dato' Che Mat Bin Che Wanikon 30 May 2012
7. Talk on 'Marginal Engineering: Harvesting Technology for Affordable Economy' by Ir Dr Shakor Ramat Badaruddin on 12 June 2012
8. Seminar by Dr Yoshiaki Miyajima from Sumitomo Electric Industries, Japan on 19 July 2012
9. Talk by Dr Azman Osman and Delegates from School of Information Science, JAIST, Japan on 24 September 2012

5. Faculty of Engineering Seminar Series

The Faculty of Engineering is actively involved in holding seminar series which showcase the research work conducted by members of the faculty throughout the year. The seminar series held this year includes:

1. Effect of Ultrasonic Pre-treatment on Low Temperature Acid Hydrolysis of Oil Palm Empty Fruit Bunch by Dr Shanti Faridah Salleh on 11 January 2012
2. A Geotechnical and Geo-Environmental Overview of Sarawak by Prof Dr Shenbaga Rajaratnam Kaniraj Jeyachandran on 1 February 2012
3. Flow Past Spillway Aerators by Assoc Prof Dr N.R. Afshar on 21 March 2012
4. Creation, Innovation, Science and Technology by Assoc Prof Dr Hj. Mohammad Omar Abdullah @ Mak Khoon Ling on 22 February 2012
5. Nature Sensitive Water Engineering Design by Dr Darrien Mah Yau Seng on 29 February 2012
6. Boolean Matrix Implementation with DNA Computing by Dr Nordiana Rajae on 25 April 2012
7. Pile Head Cyclic Lateral Loading by Dr Norazzlina bt M. Sa'don on 23 May 2012
8. Performance Improvements for Hard Disk Drive Vital Components: Bearings and Actuator Armslow by Dr M. Danial Ibrahim on 18 July 2012
9. Enhancing Service Life of RC Structures for Chloride Belt Area through Performance-based Concrete Specifications - A Guideline for Sarawak Construction Industry by Prof Dr Md. Abdul Mannan on 1 August 2012
10. Three Phase Converter Switching Via Direct Power Control Technique by Mr Hazrul Mohamed Basri on 13 August 2012
11. Seismic Assessment of Wall-Diaphragm Connections in New Zealand Unreinforced Masonry Buildings by Dr Abdul Razak Abd Karim on 19 September 2012
12. Latest Regulation of Chemicals in Europe by Mr Mohd Farid b Atan on 26 September 2012
13. Performance Optimization for Networks-on-Chip Architectures using Multi-Level Network Partitioning by Mr Asrani Lit on 31 October 2012
14. Dynamics of Green Energy Extraction from In-Stream Water: An Attempt with Cross Flow Micro Hydro Turbine by Assoc Prof Dr M. Shahidul Islam on 21 November 2012
15. Solar Dryer with Biomass Backup Burner for Drying Pepper Berries by Assoc Prof Ir Dr Andrew Ragai ak Henry Rigit on 28 November 2012
16. Hydrokinetic Turbine Design for Remote Community Electric Power Supply by Mr Martin Anyi on 19 December 2012

Recent Research Facilities at the Faculty of Engineering

Faculty of Engineering (FENG), UNIMAS has procured a number of new laboratory equipment for teaching and learning as well as research activities. Among some of the sophisticated and state-of-the-art analytical equipment purchased in year 2011/2012 are the Fourier Transform Infrared (FTIR) Spectrometer, Gas Chromatography Flame Ionization Detector (GC-FID), High-Performance Liquid Chromatography, Atomic Absorption Spectrometer (AAS) and Differential Thermal-Thermogravimetry Analyser (DTA-TG). All these analytical equipment are located in the Analytical Laboratory, Department of Chemical Engineering and Energy Sustainability.

Infrared spectroscopy is an analytical technique for chemical identification. The FTIR spectrometer available at FENG is manufactured by Shimadzu, Japan, model IRAffinity-1. This equipment has a relatively high S/N ratio of 30000:1, 1-minute accumulation, neighbourhood of 2100 cm^{-1} , peak-to-peak, a maximum resolution of 0.5 cm^{-1} , and wave number range from $7800\text{ to }350\text{ cm}^{-1}$. Furthermore, this equipment is useful for applications in various fields such as analysis of food products, metals, chemical polymers, medicine, cosmetics and others. The instrument is equipped with a software for ease of application and the software contains a library of spectra for over 300 highly-selected inorganic substances, organic substances and polymers that are often detected as contaminant, therefore making identification process easier.

GC is a type of chromatography that is commonly used in analytical chemistry for separating and analyzing compounds that can be vaporized without decomposition. There are different types of detectors for GC. The detector for GC available at FENG is flame ionization detector (FID). This equipment is manufactured by Shimadzu, Japan, model GC-2010. FID is the most common and widely used detector as it has the best sensitivity and a wide dynamic range. The FID is also relatively non-selective; therefore it can detect almost all compounds with C-H bond. The carrier gas for this instrument is hydrogen, nitrogen and purified air. This instrument is also equipped with autosampler for ease of application and with software which allows controlling, monitoring and analysis.

Another type of chromatography commonly used in analytical chemistry is the high performance liquid chromatography (HPLC). HPLC can handle non-volatile samples and thermally sensitive samples which cannot be analysed with GC. The HPLC equipment available at FENG is manufactured by Perkin Elmer, USA, model Flexar-LC equipped with UV detector. Unlike GC which is using gas as the mobile phase, the HPLC is using liquid as the mobile phase. Currently, there are 33 columns for different types of applications available in the laboratory. This equipment is equipped with software which allows user to control, monitor and carry out post-analysis.

Atomic absorption spectrometer (AAS) is an analytical equipment mainly used for measurement of metal elements. The operating principle involves the use of flame or electrical heating so that each of the heated and atomized elements absorb unique wavelength light. The AAS unit available at FENG is manufactured by Shimadzu, Japan, model AA-7000. This unit has two types of atomizer which are flame and graphite furnace. The advantage of flame atomizer is that it gives high stability, quick analysis and measurement at ppm level while graphite furnace atomizer gives measurement at sub ppb level. This AAS unit is equipped with autosampler for ease of application. There is also software included which allows controlling, monitoring, analysis and post-analysis.

The DTA-TG equipment available at FENG is manufactured by Shimadzu, Japan, model DTG-60H. This instrument is able to perform thermogravimetry analysis (TGA) and differential thermal analysis (DTA). The DTA is carried out to measure temperature differences between a reference and a sample as a function of time in specified atmosphere. Meanwhile, the TGA is carried out to measure mass of a sample by a thermobalance as a function of temperature. The thermobalance design for this instrument is top loading style which enables simultaneous TGA and DTA measurement. Software is provided for this instrument which allows user to control, monitor, conduct analysis and post-analysis.



Figure 1: Fourier Transform Infrared Spectrometer



Figure 2: Gas Chromatography Flame Ionization Detector



Figure 3: High-Performance Liquid Chromatography



Figure 4: Atomic Absorption Spectrometer



Figure 5: Differential Thermal-Thermogravimetry Analyser

Research Collaboration

Faculty of Engineering has entered into an agreement of joint collaboration with University of Limoges France. Under this collaboration one PhD student would be jointly supervised by Professors from each University. Professor Dr Amir Azam Khan visited University of Limoges in July 2011 and this collaboration proposal initiative took place after this visit. The laboratory of "Science des Procédés Céramiques et de Traitements de Surface" (SPCTS) is doing research in the field of renewable energy for the last several years. Precisely, the active research domain is the development of ceramic layers with high ionic conductivity, to be used inside the solid oxide fuel cells. The solid oxide fuel cells as manufactured presently, work at temperatures higher than 500 °C. This is a point of concern as high temperatures not only create the problem of preheating the cell but also a security risk. At these temperatures leakage of hydrogen from the system can create an explosion. Hence, there is a continuous research going on to develop ceramic materials capable of conducting at lower temperatures. These ceramics should be stable and inert to the atmosphere. Any phase change as a function of time and temperature would render these ceramics useless. One option is to deposit layers of different composition so as to create what we call as "smart materials". These ceramic layers are engineered to provide a low temperature ionic conductivity for a safe operation of solid oxide fuel cells.

The theme of "Advanced Materials for Renewable Energy" has gained importance as the natural and classical sources of energy are getting depleted day by day. Moreover, the laboratories and research equipment available at the University of Limoges is of highest caliber and state of the art. The candidate will also have an opportunity to work under qualified supervisors, with a rich experience of research on the subject. All this is expected to develop novel research, publishable in renowned journals.

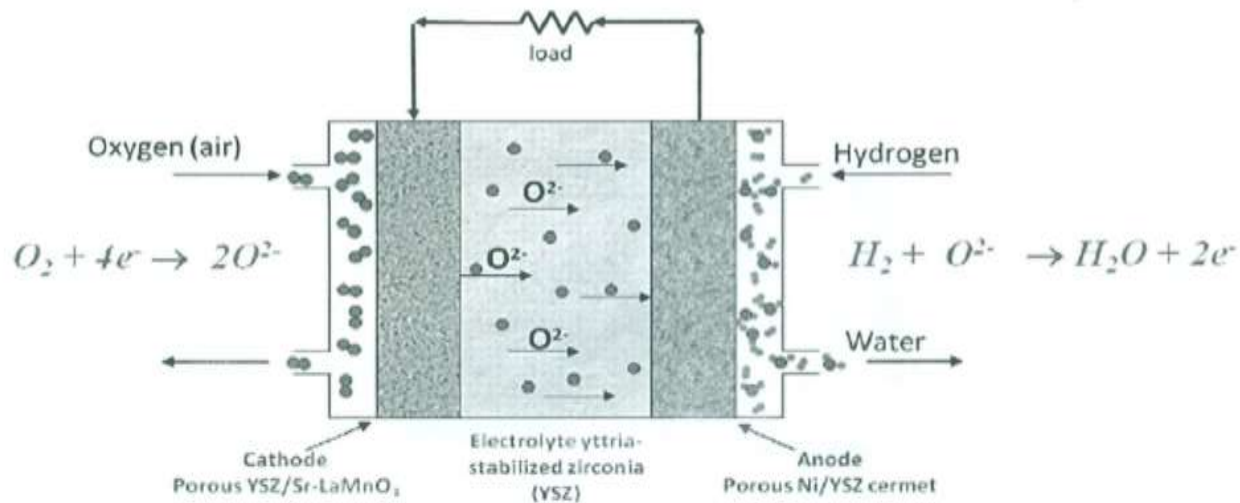


Figure 1: Schematic of a ceramic fuel cell or solid oxide fuel cell (SOFC)

Research Students

Civil Engineering

Name	Level	Type	Supervisor	Co-supervisor(s)	Title
Lim Su Boon	Master	Full Time	Prof Ir Dr Law Puong Ling	Prof Madya Ir Dr Andrew Ragai Henry Rigit	A Novel Separator for Palm Oil Kernel Shell Cracked Mixture
Ting Sie Yew	Master	Full Time	Prof Dr FJ Putuhena	-	Securing Instream Flow for Sarawak River Basin Development
Nur Afnie Faryisha binti Mohamad Hamzah	Master	Full Time	Rosmina binti Ahmad Bustami	Prof Dr Salim bin Said	Design of Long Storage for Excess Water and Development of Hydrological Framework in Sungai Sarawak Kanan Sub-Basin
Joan Dolly Chung Zie Wei	PhD	Full Time	Prof Ir Dr Law Puong Ling	Prof Dr FJ Putuhena	Trickling Filter for Domestic Wastewaters
Tay Chiaw Teck	Master	Part Time	Prof Dr Wan Hashim bin Wan Ibrahim	-	Analyzing Two-Way Two-Lane Highways Based on Malaysian Road Condition
Zamhuri Drahan	Master	Part Time	Prof Dr Wan Hashim bin Wan Ibrahim	-	Malaysia Airports Pavement Management System
Ting Huong Siong	Master	Full Time	Prof Ir Dr Law Puong Ling	Nor Azalina binti Rosli	Characterization of Municipal Solid Waste Generated from Kuching, Sarawak
Jacqueline Lam Wan Hwa	Master	Full Time	Dr Siti Noor Linda Haji Taib	Prof Madya Dr Prabir Kumar Kolay / Prof Dr K.G.H.C. Nimal Seneviratne	The Characteristics of Drained and Undrained Triaxial Compression Tests in Sarawak
Sii Hee Yew	Master	Full Time	Dr Siti Noor Linda Haji Taib	Prof Madya Dr Prabir Kumar Kolay / Prof Dr K.G.H.C. Nimal Seneviratne	A Study on Geotechnical Behavior of Stabilized Peat Soil with Finite Element Modeling
Wilson Jih Ren Chang	Master	Part Time	Prof Dr FJ Putuhena	Prof Madya Dr Prabir Kumar Kolay / Dr Siti Noor Linda Haji Taib	Peat Soil Improvement for Better Abode in Sibul, a Geotechnical and Hydraulic Perspective
Oon Yin Wee	PhD	Full Time	Prof Ir Dr Law Puong Ling	Dr Lim Soh Fong / Prof Dr Kopli Bujang	A Novel Oil and Grease (O&G) Removal Apparatus with Curved Coalescence Frustums and Triangular Surface Restraints
Ling Ing Hock	Master	Full Time	Dr Delsye Teo Ching Lee	Norsuzailina binti Mohamed Sutan	Properties of Polystyrene Concrete Bricks Containing Rice Husk Ash (RHA)
Chong Kok Hing	PhD	Full Time	Prof Ir Dr Law Puong Ling	Prof Madya Ir Dr Andrew Ragai Henry Rigit / Dr Rubiyah binti Haji Bani	Biomass-to-Heat Energy Converter for Drying Purpose in the Production of Paper Egg Trays

Quay Wei Kwang	Master	Full Time	Ir Ting Sim Nee	Prof Ir Dr Law Puong Ling	Amelioration of Occupational Safety and Health (OSH) Practices in Malaysia
Kueh Kim Meow	Master	Part Time	Ir Ting Sim Nee	-	Improving the System and Guideline for Value Management Practice using the Value Practice using the Value Engineering Processes for Construction Management Projects in Malaysia
Kabiru Musa Ayagi	Master	Full Time	Dr Siti Halipah binti Ibrahim	Prof Madya Dr Azhaili bin Baharun	An Investigation Analysis of the Effectiveness of Site Management Functions in Nigeria Case Study of the Kano State Construction Industry
Lai Sze Ying	Master	Part Time	Ir Ting Sim Nee	Prof Ir Dr Law Puong Ling	A Critical Analysis of Construction Contract Form - CIDB Standard Form of Contract for Building Work 2000
Norsuzailina binti Mohamed Sutan	PhD	Part Time	Prof Dr Sinin Hamdan	Prof Madya Dr Azhaili bin Baharun	Effects of Modified Cement Systems on Efflorescence
Freddy Kho Wee Liang	PhD	Full Time	Prof Ir Dr Law Puong Ling	Prof Madya Ir Dr Andrew Ragai Henry Rigit	Carbon Monoxide Levels Along Roadway
Wennie Blantaw anak Enggu	Master	Part Time	Prof Dr Wan Hashim bin Wan Ibrahim	-	Investigating the Performance of Signalized Intersection Along an Arterial Road in Sibul
Bong Chien Chai	Master	Full Time	Prof Madya Dr Azhaili bin Baharun	Abdul Azim bin Abdullah / Rosmina binti Ahmad Bustami	Turbine Float System and Anchorage Design
Franklin Simon	Master	Full Time	Ron Aldrino Chan @ Ron Buking	Ir Ting Sim Nee / Dr Tay Kai Meng	The Use of Fuzzy Inference System for Risk Assessment and Decision Making for Sarawak River Transport
Arkin Kong Chung King	PhD	Full Time	Prof Madya Dr Azhaili bin Baharun	Ir Ting Sim Nee	An In Depth Study on Supply Chain Management (SCM) in the Construction Industry in Sarawak
Lau See Hung	PhD	Full Time	Prof Dr Ng Chee Khoo	Dr Tay Kai Meng	Development of a Data Driven Fuzzy System for Evaluating Ultimate Tendon Stress and Flexural Strength of Externally Prestressed Beams
Chiew Fei Ha	PhD	Full Time	Prof Dr Ng Chee Khoo	Dr Tay Kai Meng	Optimization of Mix Proportion for High Strength Concrete Based on Harmony Search
Sim Yeong Liang	PhD	Full Time	ProfDr FJ Putuhena	Prof Madya Dr Azhaili Baharun / Prof Ir Dr Law Puong Ling	Development of Construction Quality Assessment Model that Applicable to Malaysian Construction Industry
Aliyu Haliru Hong	PhD	Full Time	Prof Ir DrLaw Puong Ling	Dr Onni Suhaiza Selaman	Wastewater Reuse and Its Health Implication on Irrigated Vegetable at Lake Geriyo Irrigation Project, Yola, Adomawa Estate, Nigeria
Mohammad Fadzli bin Jawawi	Master	Part Time	DrSiti Noor Linda Taib	-	Stabilization of Peat Soil Using Fly Ash and Sago Ash at Kampung Sau, Mukah
Lee Lin Jye	PhD	Full Time	Prof Dr Shenbaga Kaniraj Rajaratnam	Dr Siti Noor Linda Haji Taib	Analyse the Lateral Movement on Soft Riverbank
Jane Lau Sze Sze	Master	Full Time	Prof Dr Wan Hashim bin Wan Ibrahim	-	Investigating the Impact of using Malaysian Highway Capacity Manual for Traffic Impact Assessment Purpose
Lai Phui Hua	PhD	Part Time	Prof Madya Dr Haji Mohd Ibrahim Safawi Mohd Zain	Dr Siti Noor Linda Haji Taib	A Proposed Design Procedure for Replacement of Saturated Peat Soil with Foamed Concrete

Muhammad Abdul Syahid bin Saari	Master	Full Time	Prof Madya Dr Mohd Ibrahim Safawi Mohd Zain	-	The Roles of Constituent in Achieving Self-Compactability Criteria for Self-Compacting Concrete
Erie Yong Pik Kwong	Master	Full Time	Dr Delsye Teo Ching Lee	Norsuzailina Mohamed Sutan	The Engineering Properties of Concrete Containing Waste From the Oil Palm Industry
Thong Chia Chia	Master	Full Time	Dr Delsye Teo Ching Lee	Prof Dr Ng Chee Khoon	Structural and Durability Properties of Concrete with Polyvinyl Alcohol (PVA) Coated Oil Palm Shell (OPS) as Lightweight Aggregates Under Different Curing Conditions

Electronics Engineering

Name	Level	Type	Supervisor	Co-Supervisor(s)	Title
Sharifah Fatimah binti Tuanku Abdullah	Master	Part Time	Sakena binti Abdul Jabar	Nurdiani binti Zamhari	Fiber to the Home Based Over WDM for Dynamic Bandwidth in The Malaysian Environment
Siti Syafinah binti Ahmad Hassan	Master	Full Time	Ir David Bong Boon Liang	Dr Mallika Premsenthil (FPSK)	Automatic Detection of Diabetic Retinopathy Including Neovascularization Based on Morphological Operations
Patrick Teo Tien	Master	Part Time	Ir David Bong Boon Liang	Annie ak Joseph	Analysis and Modeling of Technical Losses in Distribution Networks
Guo Junwei	Master	Part Time	Ir David Bong Boon Liang	Dr Tay Kai Meng	Development of Efficient and Accurate Model for High Voltage Mosfet Transistor
Gabriel anak Jatu	Master	Part Time	Dr Hushairi Zen	Prof Madya Ir Dr Andrew Ragai Henry Rigit	Design and Implementation of Micro-Hydropower System for a Stand-Alone Rural Village Electrification
Bong Voon Pai	Master	Full Time	Dr Wan Azlan bin Wan Zainal Abidin	Dr Hushairi bin Zen / Dr Thelaha bin Haji Masri	Open Space Modeling for the Mobile Satellite L-Band Signal in Sarawak
Saleem Ahmad Saleem Jayousi	PhD	Full Time	Prof Madya Dr Mohd. Saufee bin Muhammad	-	Computerized Maintenance for Electronic Instrument
Jee Tze Ling	Master	Full Time	Dr Tay Kai Meng	Prof Dr Ng Chee Khoon	Development of an Intelligent Failure Analysis Tool with Case Studies Relating to Manufacturing and or Structural Engineering
Krishna Veni a/p Selvan	Master	Full Time	Prof Madya Dr Mohd. Saufee bin Muhammad	Sharifah Masniah binti Wan Masra	Design and Development of DNA Sequences Based on Multi-Objective Particle Swarm Optimization for DNA Computing
Abdul Qayoom Jakhrani	PhD	Full Time	Prof Madya Dr Al-Khalid bin Haji Othman	Prof Madya Ir Dr Andrew Ragai Henry Rigit / Dr Rubiyah binti Haji Baine / Prof Ir Dr Law Puong Ling	Design and Development of Solar Wind Hybrid System

Azzyati binti Basrol	Master	Full Time	Dr Wan Azlan bin Wan Zainal Abidin	Dr Kismet Hong Ping	L-Band Mobile Satellite Signal Performance Using Handheld GPS Receiver on Building Effects
Wong Teck Kwong	Master	Part Time	Prof Madya Dr Al-Khalid bin Haji Othman	Dr Wan Azlan bin Wan Zainal Abidin / Dr. Hushairi bin Zen	Underwater Wireless Protocol
Liew Hon Choi	Master	Full Time	Dr Wan Azlan bin Wan Zainal Abidin	Prof Madya Dr Al-Khalid bin Haji Othman / Dr Kismet Hong Ping	Turbine Smart Sensor Design for Monitoring Purpose
Ashriff Abdul Jalil	Master	Full Time	Prof Madya Dr Al-Khalid bin Haji Othman	Dr Thelaha bin Haji Masri / Dr. Hushairi bin Zen	Design of River Flow Water Energy Data Logger for the Measurement of Kinetic Energy from River Stream (Wanergy Meter)
Michelle Lu	Master	Full Time	Dr Wan Azlan bin Wan Zainal Abidin	Kasumawati binti Lias	The Modernization of the Transmission Grid: Smart Grid
Lee Tain Sang	Master	Full Time	Dr Wan Azlan bin Wan Zainal Abidin	Prof Madya Dr Azhaili bin Baharun / Ade Syaheda Wani binti Marzuki	Development of Small Wind Energy System for Rural Electrification in Sarawak
Elizabeth Kho Ching Tee	PhD	Part Time	Dr Wan Azlan bin Wan Zainal Abidin	Ng Liang Yew / Dr Alexander Hoelke	Design of Super Junction Devices
Ting Kung Chuang	PhD	Full Time	Dr Tay Kai Meng	Prof Madya Dr Haji Mohd. Omar Abdullah	Optimization of a Hybrid Energy System with Artificial Intelligent Technique
Chai Nee Ping	PhD	Full Time	Dr Wan Azlan bin Wan Zainal Abidin	Prof Madya Dr Al-Khalid Haji Othman / Dr Hushairi Zen	Real-Time Heavy Vehicle Monitoring using GPS and GIS Technology
John Tin Yuan En	PhD	Full Time	Dr Wan Azlan bin Wan Zainal Abidin	Prof Madya Dr Azhaili bin Baharun / Prof Madya Dr Al-Khalid Haji Othman	Adaptive Solar Energy System for Low-Cost Home Cooling System
Ng Liang Yew	PhD	Part Time	Dr Hushairi Zen	Prof Madya Dr Al-Khalid Haji Othman	Tracking with Non-Line-of-Sight (Nlos) Mitigation in Indoor Environment
Jong Chian Haur	Master	Full Time	Dr Tay Kai Meng	-	Development of a Single-Input-Rule-Module Fuzzy Inference System-Based Failures Prioritization Technique for Edible-Bird's Nest Processing
Marta a/p Elizabeth	Master	Full Time	Dr Kismet Hong Ping	Dr Wan Azlan bin Wan Zainal Abidin / Dr Nordiana Rajae	Time-Domain Inverse Scattering Technique for Early Breast Cancer Detection
Chai Kok Chin	Master	Full Time	Dr Tay Kai Meng	-	Development of Type 2 Fuzzy Logic Based Decision Making Support Model/Software Prototype for the Application in Local (Sarawak) Industries
Chang Wui Lee	Master	Full Time	Dr Tay Kai Meng	-	Development of an Evolving Fuzzy Rule-Based System for Object Detection in Video
Puteh Munawwarah binti Ibrahim	Master	Full Time	Dr Kismet Hong Ping	Dr Nordiana Rajae / En Martin Anyi	Reconstruction of Breast Composition Utilizing Filtered Forward-Backward Time-Stepping (FBTS) Inverse Scattering Technique
Faisal Rehman	Master	Full Time	Dr Hushairi Haji Zen	Prof Madya Dr Azhaili Baharun / Dr Kismet Hong Ping	Integration of Power System Through Smart Grid
Kang Chia Yang	Master	Part Time	Dr Hushairi Haji Zen	Prof Madya Dr Al-Khalid Haji Othman / Hazrul Mohamed Basri	Cause and Effect of Low Power Quality in Homes and Industries in Sarawak
Yong Guang	PhD	Full Time	Dr Kismet Hong Ping	Prof Madya Dr Al-Khalid Haji Othman / Dr Thelaha Haji Masri	Filtered Forward-Backward Time-Stepping Inverse Scattering Technique for Buried Object Detection and Shape Reconstruction

Ng Shi Wei	PhD	Full Time	Dr Kismet Hong Ping	Dr Hushairi Haji Zen / Dr Wan Azlan Wan Zainal Abidin	Microwave Imaging Reconstruction of Breast Composition Utilizing Filtered Forward-Backward Time-Stepping Technique for Breast Cancer Detection
Andrew Sia Siew Chie	Master	Full Time	Dr Kismet Hong Ping	Dr Nordiana Rajae	Detection of Buried Objects in Dispersive Medium Utilizing Filtered Forward-Backward Time-Stepping Inverse Scattering Techniques
Therry Lee Zee	Master	Full Time	Ir David Bong Boon Liang	-	Multimodal Biometric Recognition Based on Bil-Plane Extraction
Nurliyana binti Hussaini	Master	Full Time	Dr Thelaha Haji Masri	Dr Wan Azlan Wan Zainal Abidin / Dr Kismet Hong Ping	Performance Enhancement of Microstrip Antennas Using Electromagnetic Band Gap Structures

Mechanical and Manufacturing Engineering

Name	Level	Type	Supervisor	Co-Supervisor(s)	Title
Prashobh Karunakaran	PhD	Full Time	Ir Dr Mohd. Shahril bin Osman	-	Optimization of a Flexible Manufacturing System (FMS) for High Technology Product Producing Factory via the Modularization of Production System
Peter Yek Nai Yuh	Master	Full Time	Prof Madya Dr Haji Mohd. Omar bin Abdullah	Ervina binti Junaidi	Computer Simulation Analysis for Statics Stability of Airboat in Sarawak Riverine Application
Voon Chun Yung	Master	Full Time	Prof Madya Dr Haji Mohd. Omar bin Abdullah	-	The Study of a Combined Solar Hydro Energy System for Powering e-Bario ICT Centre
Md. Saiful Islam	PhD	Full Time	Prof Dr Sinin bin Hamdan	Dr Ismail bin Jusoh / Prof Madya Dr Mohamad Rusop bin Mahmood (UITM Shah Alam)	Physical, Mechanical and Chemical Characterization of Tropical Wood Polymer Composite and Its Application
Cheong Yaw Hong	Master	Part Time	Prof Madya Ir Dr Andrew Ragai Henry Rigit	-	Harnessing Tidal Energy for Electricity Generation at Sejingkat, Kuching, Sarawak
Ijen anak Dakek	Master	Part Time	Prof Madya Ir Dr Andrew Ragai Henry Rigit	-	Electrical Performance and Flow Characterization of Dielectric Barrier Discharge Plasma Actuator
Mohd. Narzam bin Jaafar	Master	Part Time	Prof Madya Dr Haji Mohd. Omar bin Abdullah	Dr Abu Saleh Ahmed	Design, Materials Selection, Development and Specific Characteristics Study of a New Cooling Water Power Generator
Tian Chuan Min	Master	Full Time	Prof Madya Dr Haji Mohd. Omar bin Abdullah	Dr Abu Saleh Ahmed	Custom Design, Development and Techno-Economical Study of a Small Cooling Water Power Generator for Sejingkat Power Corporate Sdn. Bhd
Muhammad Abdul Mun'aim bin Mohd. Idrus	Master	Full Time	Prof Dr Sinin bin Hamdan	Dr Abu Saleh Ahmed	Mechanical and Thermal Behavior of Liquefied Tropical Wood Polymer Composites
Ghazali bin Tambi	PhD	Part Time	Prof Madya Dr Haji Mohd. Omar bin Abdullah	Puan Ervina binti Junaidi / Prof. Datuk Dr. Khairudin Ab. Hamid	Axiomatic Design for Improvement of UNIMAS's District Cooling System
Jong Yang	Master	Full Time	Dr Abu Saleh Ahmed	Prof Dr Sinin bin Hamdan	Biodiesel Production from Waste Fat and Oil as a Renewable Energy Source

Chiong Meng Chuong	Master	Full Time	Prof Madya Ir Dr Andrew Ragai Henry Rigit	-	Design and Flow Simulation of Electrohydrodynamics Ion Drag Micro Pump for Cooling Application
Sarfaraaj Khan	Master	Full Time	Dr Abu Saleh Ahmed	Prof Dr Sinin bin Hamdan / Dr Rubiyah binti Haji Baini	Biodiesel Production from Macro Algae as a Renewable Energy Source
Md. Nurul Hoque	PhD	Full Time	Prof Dr Sinin Hamdan	-	Studies on Polypropylene Composite Reinforced with Chemically Modified Sawdust
Cheong Wai Loon	Master	Full Time	Dr Syed Tarmizi bin Syed Shazali	-	Motion Detection and Simulation Study on Human Walking Behavior
Chua Swee Ning	Master	Full Time	Prof Madya Ir Dr Andrew Ragai Henry Rigit	-	Ion-Drag Electrohydrodynamic Micropump for Drug Delivery of Microfluidic Application
Akmal Hisyam bin Raduan @ Ruduan	Master	Full Time	Dr M. Shahidul Islam	Dr Syed Tarmizi bin Syed Shazali / Dr Thelaha bin Haji Masri	Mechanical Transmission System for Sustainable Instream Horizontal Micro Hydro Turbine Generator
Hafiza Ramji	Master	Full Time	Dr Syed Tarmizi bin Syed Shazali	Dr Saiful Bahari bin Mohd. Yusoff (FSGK) / Abang Mohd. Nizam bin Abang Kamaruddin	Turbine Frame Design for Sustainable Instream Horizontal Micro Hydro Turbine Generator
Ahmad Shahir bin Jamaluddin	Master	Full Time	Dr Abdullah bin Haji Yassin	Ir Dr Mohd. Shahril bin Osman	A Study of Cutting Tool Temperature by Milling with the Application of Finite Element Method
Malisa binti Sahari	Master	Full Time	Prof Dr Sinin Hamdan	-	Mechanical Properties of Chemically Modified Bamboo / Nanoclay / Polypropylene Nano Composites
Khairul Amri bin Sayuti	Master	Full Time	Rosmina binti Ahmad Bustami	-	Potential Stream Kinetic Energy Mapping in Kapit, Sarawak for Implementation of Sustainable In Stream Horizontal Micro Hydro Turbine
Voon Choon Siong	Master	Full Time	Ir Dr Mohd. Shahril bin Osman	Nur Tahirah Razali / Aidil Azli Alias	Harnessing Vibration into Electrical Energy
Siti Mas Arena Liakbar	Master	Full Time	Dr M. Shahidul Islam	-	Optimization of Energy Transmission System on In-Stream Micro Hydro Turbine
Tracy anak Dickie	PhD	Part Time	Ir Dr Mohd. Shahril bin Osman	Mahshuri Yusof	Fabrication and Mechanical Measurement of Nipah Palm Fiber Material
Harunal Rejan bin Ramji	Master	Full Time	Prof Madya Dr Haji Mohd. Omar Abdullah	-	Study of Heat-Driven Adsorption Air-Conditioning System Using Biomass-Based Activated Carbon-Mehanol for Vehicle Application
Alan Bong Kim Ming	Master	Part Time	Ir Dr Mohd. Shahril bin Osman	-	Evaluation of a Modified Conversion of a Pump as Turbine
Teo Chong Yaw	Master	Full Time	Dr Abdullah bin Haji Yassin	-	Temperature Measurement of High Speed Milling
Sebastiano Mike anak Atet	Master	Part Time	Prof Dr Amir Azam Khan	-	Characterization of Natural Fiber Reinforced Foam Core/Carbon Fabric Laminates Sandwich Composite Subjected to Mechanical Testing
Christopher Jantai anak Boniface	Master	Full Time	Ir Dr Mohd. Shahril bin Osman	-	A Radiant Times Series Method for Cooling Load Calculation for Dewan Tunku Abdul Rahman (DeTAR PUTRA UNIMAS)

Joseline Adong anak Francis	Master	Part Time	Prof Dr Sinin Hamdan	Dr Md Rezaur Rahman	Development of Particle Board from Tropical Fast Growing Species for Acoustic Panel
Patrick Low Tiong Kie	PhD	Part Time	Prof Madya Ir Dr Andrew Ragai Henry Rigit	-	A Thermal Conversion System for Converting Oil Palm Fronds into Biochar for Oil Palm Plantation
Elammaran Jayamani	PhD	Part Time	Prof Dr Sinin Hamdan	Dr Abu Saleh Ahmed / Prof Madya Dr Saad A. Mutasher (Swinburne)	Absorption and Impedance Measurements of Lignocellulosic Particle Composite for Sound Absorbing Wooden Construction Materials
Kiew Kwong Siong	Master	Full Time	Prof Dr Sinin Hamdan	Dr Md Rezaur Rahman / Prof Madya Dr Saad A. Mutasher (Swinburne)	An Investigation of Dielectrical and Thermal Properties of Chicken Feather Unsaturated Polyester Composites
Taharah binti Edin	Master	Full Time	Dr Abu Saleh Ahmed	Dr Md Rezaur Rahman	Biodiesel Production from Jatropha Oil as an Alternative Fuel for Diesel Engine
Md Faruk Hossen	PhD	Full Time	Prof Dr Sinin Hamdan	Dr Md Rezaur Rahman	Crystal Structures and Growth Mechanisms of Nanoparticles Prepared by Polyol Method with Different Couples of Metal

Chemical Engineering and Energy Sustainability

Name	Level	Type	Supervisor	Co-Supervisor	Title
Tracy Yeo Hui Cheng	Master	Full Time	Dr Ivy Tan Ai Wei	Prof Madya Dr Haji Mohd. Omar bin Abdullah	Formulation of Novel Adsorbent for Application in Chemical Driven Air-Conditioning System Powered by Waste Heat
Nazeri Abd Rahman	PhD	Part Time	Dr Rubiyah binti Haji Baini	Prof Madya Dr Haji Mohd. Omar bin Abdullah	Sustainable Utilisation of Pelletised Plantation Biomass Wastes in Sarawak for Power Generation
Jong Yik Jia	Master	Full Time	Prof Madya Dr Haji Mohd. Omar bin Abdullah	-	Energy Performance Study of A Chip Fryer

Abstracts of Selected Postgraduate Research Projects

Name: Jee Tze Ling

Supervisor: Dr Tay Kai Meng Co-supervisor: Prof Dr Ng Chee Khoon

Similarity Reasoning-Driven Evolutionary Fuzzy System For Monotonic-Preserving Models

Fuzzy Inference System (FIS) is a popular computing paradigm which has been identified as a solution for various application domains, e.g. control, assessment, decision making, and approximation. However, it suffers from two major shortcomings, i.e., the “curse of dimensionality” and the “tomato classification” problem. The former suggests that the number of fuzzy rules increases in an exponential manner while the number of input increases. The latter is an important fuzzy reasoning problem while a fuzzy rule base is incomplete. The focus of this research is on fuzzy rule base reduction techniques, fuzzy rule selection techniques, Approximate Analogical Reasoning Schema (AARS), evolutionary computation techniques and monotonicity property of an FIS, in order to overcome these two shortcomings. The main contribution of this research is to formulate the fuzzy rule selection problems to facilitate the AARS and FIS modeling as an optimization problem. An optimization tool, i.e., genetic algorithm (GA), is further implemented. The applicability of the proposed framework is demonstrated and evaluated with two real problems, i.e., education assessment problem and failure analysis problem. The empirical results show the effectiveness of the proposed framework in selecting fuzzy rules and reconstruct a complete rule base with the selected fuzzy rules. However, it is observed that the results obtained do not always fulfill the monotonicity property. Hence, the proposed framework is further extended, and a set of mathematical conditions are adopted as governing equation. Again, the applicability of the extended framework is demonstrated and evaluated with an education assessment problem and a failure analysis problem.

Name: Krishna Veni A/P Selvan

Supervisor: Assoc Prof Dr Mohd Saufee Muhammad Co-supervisor: Sharifah Masniah Wan Masra

Design and Development of DNA Sequences Based on Multi-Objective Particle Swarm Optimization for DNA Computing

The performances of a multi-population optimizer, vedepso as well as the proposed m-vedepso are evaluated using standard zdt test functions. As a result, both algorithms perform better than vepso. Furthermore, the modified version produces improved fitness distributions among its particles/individuals. Since the two vedepso approaches are still new and yet to be applied in any application areas, they are applied into dna code words designing. The dna code words designing are a multi-criteria combinatorial optimization task. In this research, the dna code words designing approach implied concurrent minimizations of four objective functions, h-measure, similarity, hairpin and continuity. The designations are subjected to a predefined range of melting temperature and gc-content. The two new multi-population optimizers, vedepso and m-vedepso are employed to design sets of dna strands. The two algorithms run for 10 times and their average fitness for each population is analyzed. The results obtained from the algorithms are indicated by 12 non-dominated particles and individuals. These solutions are obtained via pareto dominance concepts.

Name: *Elammaran Jayamani*

Supervisor: *Prof Dr Sinin Hamdan*

Co-supervisor: *Dr Md. Rezaur Rahman*

An Investigation of Sound Absorption Coefficients of Kenaf Fiber Reinforced Urea-Formaldehyde Polymer Matrix Composite

Noise pollution has been an issue for decades. Wood being the initial solution for noise reduction due to their sound absorption characteristics was in heavy demand until they ran short in supplies. Then substitute materials like synthetic polymer composites replaced raw wood until environmental concerns were raised against their production process. This turned the focus of material researchers into natural fibres. Nowadays, it can be seen that the study about natural fibres like rice husk, kenaf, sisal, oil palm, jute and others were carried out. A lot of research had been done especially on kenaf due to its light weight, low cost, high sustainable strength and eco-friendly. This research is based on kenaf core fibre with adhesive of high emission Urea Formaldehyde Resin (HN100) with 51.6% solid content. The fabrication of the particleboard was done using a hot press for 6 minutes under the pressure of 40 Ton at 180°C for different fibre lengths of 1 mm and 0.6 mm with weight fraction of 80 % of fibre. This research investigates the sound absorption coefficients of two types of kenaf core fibre reinforced urea formaldehyde composites. Sample A was made of kenaf fibre particle board with the weight fraction of 80% and fibre length of 1 mm and sample B was made of kenaf fibre particle board with the weight fraction of 80% and fibre length of 0.6 mm. The sound absorption coefficient was measured according to American society for Testing Materials (ASTM E1050 10) two microphone method. The sound absorption coefficients of both specimen increase with frequency and the sound absorption coefficient of Sample A (kenaf fibre particle board with the weight fraction of 80% and fibre length of 1 mm) showed less sound absorption coefficients compared with sample B with the fibre length of 0.6 mm.

Name: *Mohammad Nurul Hoque*

Supervisor: *Prof Dr Sinin Hamdan*

Study on Vibration and Sounds from Floors by Human Impact

The generation of the impact sound by the act of the human walk involves two factors, the character of the footfall and the shape of the induced floor vibration. High levels of vibrations can occur in floor systems due to excitation from human activities such as walking and aerobics. In building floors, excessive vibrations are generally not a safety concern for building floor system but a cause of annoyance and discomfort. The footfall noise is created by the impact excitation where the character of the footfall depends on the foot-ware: the heels and the frequencies of the footfall. The shape of the floor deflection depends rather on the geometrical walking pattern and construction of the floor structure. Two types of floors are used for this experiment, (1) profiled steel sheet concrete floor (PCF) and (2) composite concrete floor (CCF). Since the excitation is assumed to be deterministic, differences between the excitation masses, acting forces and damping are determine from Bruel & Kjaer vibration analyzer machine. The goal of this investigation is to determine the differences of the floor nature by human effect depending on various positions on floors.

Name: *Mohammad Fadzli b. Jawawi*

Supervisor: *Dr Siti Noor Linda Hj Taib*

Stabilizing Sarawak Tropical Peat Using Various Admixtures (OPC and Local By-Products)

The use of additives in soil stabilization application has been widely used at present. Peat or highly organic soils are well known for their compressibility, natural moisture content, low shear strength and long term settlement. In this study, peat soil has been collected from the town of Mukah, Sarawak to evaluate its index/physical properties and geotechnical properties. Mukah is one of the coastal towns in Sarawak and is a developing educational hub in the state. With the many educational institutions located in the area, it is of no surprise that other infrastructures are fast developing. However, Mukah, as in the most part of Sarawak, is of no exception when it comes to difficulty in constructing on peat. This research is to investigate the physical and geotechnical properties of Mukah peat and to further look into the perspective of chemically stabilizing the soil. Various admixtures have been opted for as stabilizing agents such as Ordinary Portland Cement (OPC), Fly and Pond Ashes from Mukah Coal Power Plant and Rumbia or Sago Ash. Prior to preparation of samples, compaction tests will be conducted on mixtures of soil and the different admixtures where admixture was added at 5%, 10%, 15% and 20% of the total dry mass of the samples. Compaction will also be performed on natural peat as a control sample. The purpose of carrying out this compaction is to obtain the maximum dry density and the optimum moisture content of each mixture with different percentage of admixtures and the values will be used in the preparation of soil samples for unconfined compression strength (UCS) test. All samples will be cured for 7, 14 and 28 days. Results of this investigation shall be highly beneficial to the construction industry in utilizing chemical stabilization technique using various admixtures of either commercially available or locally available by products.

Name: *Lee Lin Jye*

Supervisor: *Prof Dr Shenbaga Rajaratnam Kaniraj Jeyachandran*

Co-supervisor: *Dr Siti Noor Linda Hj Taib*

Investigation on Lateral Movement of Piles in Sarawak Soft Riverbank

This research focuses on the behavior of pile that is subjected to lateral forces that are caused by soil movement in soft riverbank. Field instrumentation will be installed at several sites which are difficult for construction of riverine structures due to existence of thick soft soil deposit along its banks and high water fluctuation. A 3-D finite element analysis software will be used to simulate several models based on the boundary conditions on sites. In-situ and laboratory tests will also be carried out to determine the soil properties and suitable parameters to be used in the finite element analysis. These finite element models are to be benchmarked against the data obtained from the field instrumentation data. Agreeable results from the simulated models to the data collected from the field will then lead to parametric studies which are carried out in order to produce simplified design charts for the design of piles subject to river bank induced lateral soil movement.

Name: *Quay Wei Kwang*

Supervisor: *Ir Ting Sim Nee*

Co-supervisor: *Prof Ir Dr Law Puong Ling*

Incentives as a Tool for OSH Amelioration in the Malaysian Construction Industry

Occupational Safety and Health (OSH) forms an integral part of the Malaysian Construction industry. The construction industry records a significant number of casualties every year. This is due to the severity of the nature of construction sites where chances of an accident leading into death is higher when compared with other sectors. Since its enactment in 1994, the Occupational Safety and Health Act has been an instrumental platform to encourage self-regulation amongst corporations instead of requiring constant enforcement from authorities. Punitive action seems to become irrelevant and is losing its bite, since there are always loopholes. Furthermore, a lackadaisical attitude towards the importance of OSH is present. When cost and time factors are weighed in, safety often takes a back seat. What is often ignored is the amount of savings that could have been made, when accidents are prevented in terms of avoided cost and delays. Recognising the importance of self-regulation, steps to encourage this attitude amongst corporations and workers are vital towards creating a sustainable OSH system. Therefore, a renewed effort to provide incentives is being delved into. Current practices such as insurance premiums reduction and tax breaks although present, are not robust enough to propel desirable behaviour. Governmental policies are important to push forward any form of incentives to avoid from them turning tokenistic. In regions like the European Union and America, various outcomes of incentives, both positive and negative are being considered. Also, the possibility of transferring those policy implementations is investigated. Trends are then looked into to measure the plausibility of execution of incentives in Malaysia.

Name: *Dayang Salyani binti Abang Mahmud*

Supervisor: *Prof Dr Amir Azam Khan*

Co-supervisor: *Prof Dr Jean Claude Labbe*

Low Temperature Solid Oxide Fuel Cells: Synthesis, assembly and testing below 600 K

A fuel cell is classified principally on the basis of the type of electrolyte. It can also be differentiated by the material of fabrication, fabrication techniques and system requirements. There are several types of fuel cells which are polymer electrolyte membrane fuel cell (PEMFC), direct methanol fuel cell (DMFC), alkaline fuel cell (AFC), phosphoric acid fuel cell (PAFC), molten carbonate fuel cell (MOFC) and solid oxide fuel cell (SOFC). The present work is concentrated on the improvement in SOFC, through making an attempt to bring down the working temperature. This can be achieved through the use of solid ceramic ionic conductors, which are capable of conducting electricity at relatively lower temperatures (below 600 K). Most common SOFC electrolytes are Zirconia and Ceria. Solutions include optimization of the electrode microstructure which would reduce polarization at the grain level, hence improved conductivity. Other option is to use a material, which has the potential to be studied further, such as SiO_2 together with ZrB_2 -SiC ceramic composites, titanium carbide etc. The idea is to use extremely fine powder, sintered with some porosity and coated with a glassy phase. In-depth study of such phases is required as performance should match the stability over the period of use. Phase changes at high temperatures can degrade such ceramic properties very quickly.



1st-4th JULY 2013, Kuching, Sarawak, MALAYSIA

CONFERENCE DATES

Pre-conference Workshop

1st JULY 2013

Conference Session

2nd - 4th JULY 2013

IMPORTANT DATES

Extended abstract deadline

1st MARCH 2013

Notification of abstract acceptance

15th MARCH 2013

Full paper submission deadline

1st MAY 2013

Notification of full paper acceptance

20th MAY 2013

Early bird registration deadline

30th MAY 2013

VENUE

Kuching, Sarawak, MALAYSIA

CONFERENCE FEES

Student & Early Bird:	RM 900
Regular Conference:	RM 1100
Regular Conference & Pre-conference workshop:	RM 1300
Pre-conference workshop only:	RM 300

*All fees are inclusive of social visit.

INTRODUCTION

The Engineering Conference (ENCON) has been and still is the flagship international conference organized for the last several years by the Faculty of Engineering, Universiti Malaysia Sarawak. In the year 2013, 6th ENCON would be organized in the beautiful city of Kuching. In the recent past the issues of green technology and sustainable development have been the major regional and global issues. The theme of ENCON 2013 has therefore been set as "ENERGY AND ENVIRONMENT". Selected papers will be published in indexed journals.

TOPICS OF INTEREST

The following topics of interest are included but not limited to:

- I. Advanced Manufacturing Technology
- II. Conventional and Renewable Energy Research and Application
- III. Energy Efficiency Improvement
- IV. Energy Policy and Environment
- V. Green Technology
- VI. Modeling and Simulation
- VII. New technology in Power Generation and Distribution
- VIII. Smart Materials for Energy Efficiency
- IX. Special topics on Closing the Energy and Environment Cycles
- X. Thermal Engineering
- XI. Water and Waste Management

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