Foreword

Various initiatives have been designed and implemented at the ministerial level to enhance the innovation among students and graduates. At the university level, I hope International Integrated Engineering Summit IIES2014, Innovators X6 and Regional Techrural 2014 programs will provide the convenience of the innovations produced by students and graduates to be showcased at the international level. Through these programs, I believe that it will facilitate the creativity, products and workforce from rural areas. However, these products may require value-added in terms of processing, manufacturing or production that I believe the existence of such programs can make rural products became more competitive and able to penetrate the domestic and international markets.

Universities and industries need to work together with experts in various fields to overcome limitations of some aspects, such as expertise and technological knowledge. This is where workshops, testing facilities, professional skills and research available in the institutions of higher learning can be utilized and offered. These efforts should be continued and enhanced the quality of education. Furthermore, hopefully it will be in line with globalization as the country is now underway to raise the country's name to the world. Therefore, technologies developed have to cover various areas of technologies in the fields of construction industry, manufacturing, production, transmission technology, electrical and electronics, food processing and packaging technology as well as others.

I would like to urge the participants involved in this program to take the opportunity to enhance their ability to develop creative ideas that can equally develop the society toward the era of globalization.

Prof. Dato' Dr. Mohd Noh Dalimin
Vice-Chancellor
Universiti Tun Hussein Onn Malaysia
Patron
International Integrated Engineering Summit (IIES2014)

On behalf of the organizing committee, I would like to warmly welcome all participants to the International Integrated Engineering Summit (IIES2014), held in Universiti Tun Hussein Onn Malaysia, from December 1 to 4, 2014.

This is the first conference in Malaysia that combines three major engineering disciplines, namely Mechanical and Manufacturing Engineering, Civil and Environmental Engineering, and Electrical and Electronic Engineering. It consists of THIRTEEN conferences from above engineering fields and TWO exhibitions that makes the IIES2014 is really unique and able to attract more than 500 participants to register with the system at first. Out of this number, after undergoing several stages, about 350 participants have submitted the full paper and participated in this conference. In terms of the exhibitions, more than 71 products will be displayed which involved more than 300 project members. We would like to thank to all reviewers who have given their full commitment in ensuring the completeness of the review process.

In line with the conference's theme which is "Driving Ideas Towards New Horizon", IIES aims to bring all prominent scientists and researchers as well as industrial players together in one place so that they can share and exchange ideas, knowledge and expertise, widen networking among each other and promote new technology towards the new brighter future. As a second largest city in Johor state, Batu Pahat is chosen to be the organizing venue as it is believed to be able to provide a different view and experience in enjoying the rural life compared to other city in Malaysia.

Finally, special gratitude to the Honourable Deputy Minister of MOSTI, all participants, reviewers, keynote speakers, national and international collaborators, conference committees, UTHM management and all parties that involved directly or indirectly in making this conference successful. We are hoping that this conference can provide something meaningful to all participants and we are looking forward to seeing you again in the future.

Prof. Dr. Wahid Razzaly
Deputy Vice-Chancellor (Research and Innovation)
Universiti Tun Hussein Onn Malaysia
Executive Chairman
International Integrated Engineering Summit (IIES2014)

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Keynote 1

Functionally Graded Materials: Fundamentals and Applications

Prof. Dr. Yoshimi Watanabe
Nagoya Institute of Technology, Japan

Functionally graded materials (FGMs) are the advanced composite materials characterized by spatial variations in composition and/or microstructure that change over the volume. The coated-type or joined-type composite is a type of macroscopically inhomogeneous material with *material A* at one end and *material B* at the other. The most serious problem with the coated-type or joined-type composite is a macroscopic interface. Since the functions of this material change discretely from the *material A* part to the *material B* part at the macroscopic interface, cracking and/or delamination should occur near/at the interface during processing or use of the part. This problem can be overcome by eliminating the macroscopic interface where the composition and/or microstructure vary gradually. Thus, the properties should be changed continuously by the absence of a macroscopic interface in the FGMs.

In general, there are three approaches to fabricate FGMs. The first one is to eliminate the interface of coated-type or joined-type composite, eliminating discontinuities in the properties at the interface,. Compositional gradient can be formed by elimination of the sharp interface by diffusion. The second one is to induce non-uniform distributions of dispersoids in a homogeneous particle-composite, creating multiple functions within the material. One example is centrifugal method. In the centrifugal method, a centrifugal force applied to a homogeneous molten composite assists the formation of the desired gradation. The composition gradient is then achieved primarily due to the difference in the centrifugal force produced by the difference in density between the molten metal and solid particles. The third one is carried out by sequential build up of layers. Powder processing, thermal spray processing, chemical vapor deposition (CVD), and physical vapor deposition (PVD) are the typical examples. Today, I will first describe some fabrication methods of FGMs, and then discuss some recent results about the mechanical and physical properties of FGMs fabricated under the centrifugal force.

Keynote 2

The Implementation of Green Transportation in Malaysia: Issues and Challenges

Prof. Ir. Dr. Riza Atiq Abdullah bin O.K. Rahmat
Universiti Kebangsaan Malaysia

The concentration of greenhouse gases is increasing in the past 50 years at the alarming rate. The gases rise into the atmosphere and trap the sun's energy, causing global warming and climate change. In industrialized countries such as the US, motorized vehicles accounted for 23.6% of the total greenhouse gases emission and passenger cars accounted for almost half of the total emission. Malaysia is committed to reduce greenhouse gas emission by adopting multi prongs strategies, including in the transport sector which comprises of electric vehicle (EV), modal shift from private to public transport and active transport initiatives. There are issues and challenges in implementing the initiatives such as limited resources, political hurdle and lack of motivation. Inadequate charging stations and high price of EV are the main reasons of its very limited used in Malaysia. Inadequate funding is delaying the implementation of rail based public transport. Politically, initiatives to influence a modal shift from private vehicles to public transport such as transferring fuel subsidy to public transport is a suicide for the ruling party. The same goes with increasing parking charges. Creating dedicated bus lane is also facing strong resistance from road users and car industry players. The bus lane is perceived as the cause of a massive traffic jam as one lane at each direction is taken away from the special lane. To the car industry, the bus lane is perceived as stumbling blocks to car sale. Lack of motivation is another challenge in implementing green transport. Most car users do not realize that every time they use their cars, they are actually contributing to global warming, climate change and air pollution. As a result, they are not cooperating for any initiative to discourage them from using private cars. In the part of local authorities, encouraging commuters to use public transport or adopt active transport means reducing their income from parking charges. As for now Malaysia is subsidizing fuel amounting more than RM 20 billions a year that producing greenhouse gases. This must be stopped or reduced by having an integrated plan of action involving every stakeholder.

Keynote 3

Spintronic - Technology for Future Energy Generation

Prof. Dr. Hashim bin Saim
Universiti Tun Hussein Onn Malaysia

The future energy sources should be clean and free from carbon emission. Therefore, fossil fuel is not an option. Solar cell is one of the renewable and green energy sources. A natural approach in the solar cell fabrication is using organic materials which offer lower manufacturing cost and lightweight for rooftop installation. However, due to electron-hole recombination, it suffers efficiency degradation. The exciton diffusion length and Van der Waal's force are the main parameter contributing to the low efficiency. An alternative effort of using spintronic theory is proposed to manipulate the electron spin to prevent recombination or at least minimizing it. Among the ferromagnetic materials, (ZnO) based layer employed into the organic structure will induce electron spin. With the electron spin, the recombination of electron-hole could be minimized and enhancing its performance. Therefore, power conversion efficiency (PCE) of the solar cell could also improve. This approach is the future technology for solar cell.

Keynote 4

Integrated Engineering and Green Technology For A Sustainable Future

Prof. Ir. Dr. Amir Hashim bin Mohd Kassim
Universiti Tun Hussein Onn Malaysia

It is always of utmost concern to look into the future well-being of our fellow engineers. The practice of engineering in the future can no longer be a single discipline. A multi-and inter-disciplinary approach is much to be required. From the choice of materials to the technique of construction methods, Green Philosophy is very much the norm from now on. The engineers of the future must be much more interdisciplinary-therefore lines between the conventional engineering disciplines must be much more flexible.

Future engineers will need to understand the equal importance of society, economy and the environment- i.e. the three underlying principles of sustainable development. We must be forward looking at allowing engineering degree programmes in new emerging engineering fields such as Green Technology, Nano Technology, Internet Engineering, Information Engineering, etc. Engineers will also have to join forces with physicists, biologists, chemists, economists, planners, political scientists, and community leaders in unprecedented ways to lead society on a sustainable path. Therefore, we must dramatically reduce the resource and energy throughput of our economy and minimize our ecological footprint to maintain the life support system that will make a sustainable future possible.

Keynote 5

Producing Biodiesel from Jatropha Curcas Oil Using Ultrasonic Process

Prof. Dr. Sulaiman bin Hj Hasan
Universiti Tun Hussein Onn Malaysia

This study was conducted to obtain biodiesel from jatropha curcas oil (JCO) by ultrasonic method. In this study, jatropha curcas oil (JCO) was converted to biodiesel as JCO is easily available and does not disturb the food chain. To produce biodiesel from jatropha curcas oil (JCO), it needs two-stage process. The first stage is the esterification process; in this process free fatty acids of jatropha oil are lowered to 0.402% with a ratio of 18:1 methanol to jatropha oil and 1% catalyst sulfuric acid (H_2SO_4) at a temperature of 65^{o}C with a 20 minutes reaction time. The next stage is transesterification conducted with 6:1, 9;1 and 12:1 molar ratio methanol to jatropha for reaction times of 3, 5 and 7 minutes for 1% catalyst sodium hydroxide (NaOH) at a temperature of 65^{0}C.

The standard physical properties test to determine the biodiesel qualities are flash point, water content, acid value, density and dynamic viscosity. From the test, 89% yield biodiesel was obtained with molar ratio methanol to oil 6:1 at 7 minutes reaction time. Ultrasonic method has potential to be an attractive technology to produce biodiesel because it reduced processing time from 38 hours using conventional method for 4 to 5 hours. This saves cost and time.