

CELEBRATING  
COMMERCIALISATION  
YEAR 2014

# iiindex 2014

AN INTERNATIONAL EXPOSITION ON RESEARCH AND INNOVATION

invention  
innovation  
& design  
exposition 2014

INNOVATEUR  
wannabe!  
2014

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UNIVERSITI TEKNOLOGI MARA  
MALAYSIA

*Bridging  
the valley of death :  
advancing the  
commercialisation  
of research*

RESEARCH BOOK

# iiindex2014

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innovation  
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## FOREWORD

The Honourable Minister of Science, Technology and Innovation (MOSTI) has launched 2014 as Malaysia Commercialisation Year 2014 (MCY2014) with the theme Science Technology and Innovation (STI) for Wealth Creation. In line with this theme, Invention, Innovation, Design & Exposition 2014 (iidex2014) is an annual exposition organized by UiTM and is the ultimate platform to highlight and commercialise new inventions and innovations. Researchers and inventors will exhibit their products which cater to the needs and wants of the community and the country.

The iidex2014 creates a new dimension by fusing two competitive concepts, a competition among innovative products and a competition to invite Innovateur Wannabes to perform live pitching of their products to the audience. The iidex2014 focuses on comprehensive commercialization and creating opportunities for entrepreneurs to carry out R&D as well as to provide avenue to commercialise their products. Through expositions such as iidex2014, MOSTI hopes to inculcate the culture of commercialisation of new technology designed and created by Malaysians.

I wish to congratulate all the participants of the iidex2014 and this is the opportunity for all researchers to show their ideas and exhibits their products and creativity. Apart from showcasing their products, innovators will have the opportunity to provide a window to the industry for business matching during the exposition.

Tan Sri Dato' Sri Sallehuddin Mohamed  
Pro-Chancellor, Universiti Teknologi MARA

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## **GASIFICATION OF OIL PALM BIOMASS TO PRODUCE CLEAN PRODUCER GAS FOR HEAT AND POWER GENERATION**

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This project is related to the gasification of biomass to produce clean producer gas, a mixture of hydrogen, carbon monoxide, methane, nitrogen and carbon dioxide. This gas mixture can be used as a fuel for internal combustion engine, turbine and fuel cell for power generation. The producer gas can also be used for chemical and liquid hydrocarbon fuels synthesis via Fischer-Tropsch synthesis method. Since, biomass produces renewably every year, the biomass based energy is renewable, sustainable and cost effective. The conventional fuels such as petroleum, coal and natural gas are limited as well as their extensive utilization causes carbon dioxide emission which ultimately causes global warming. To increase the fuel sustainability and security and to reduce the adverse effects related to fuel combustion, it is essential to develop alternative fuel sources which must be renewable, sustainable, cost effective and environmentally friendly. Biomass is such an alternative fuel which is abundantly available everywhere in the world and the utilization of biomass based fuels can reduce the carbon dioxide emission. This is because the amount of carbon dioxide released from the combustion of biomass based fuels is exactly the same as the amount consumed during their growth by photosynthesis reaction. Therefore, the net release of carbon dioxide from producer gas combustion is zero. However, since it reduces the consumption of fossil fuel, the emission of total carbon dioxide emission is even negative. The gasification of biomass is one of the most promising technologies to produce useful form of biomass based fuels, such as producer gas. However, the existing gasification technologies produces producer gas with unusually high concentration of impurities such as tar, dust and acidic gases including SO<sub>x</sub>, NO<sub>x</sub>. and HCl. Therefore, the raw producer gas cannot be utilized in the downstream applications as mentioned. The novelty of our technology is that, it can simultaneously remove all these impurities and can produce clean gas which is applicable for the downstream processes. In addition, the equipment involved in our technology is compact with high throughput, reducing significant capital investment. Besides, the catalyst used in this technology for gas cleaning is unique in terms of activity and resistivity against deactivation. The technology developed in this project utilizes the waste biomass as a feedstock, especially oil palm biomass and produces value added product such as fuels and chemicals as mentioned, and thus it has impact in socio-economic development. For example, it can establish new industries for fuel and chemical production based on oil palm biomass, and thus can generate revenue and new jobs. In addition, this project utilizes waste as a feedstock and thus, can help manage wastes and maintain the environment. Since Malaysia produces huge amounts of biomass, especially oil palm biomass, which is supposed to use in this technology for renewable energy production, it has huge commercial potential. The project described herein opens a new route for producing high quality producer gas from waste biomass. The producer gas based power generation, liquid fuel and chemical production have huge demand nationally and internationally.