

CELEBRATING
COMMERCIALISATION
YEAR 2014

iiindex 2014

AN INTERNATIONAL EXPOSITION ON RESEARCH AND INNOVATION

invention
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exposition 2014

INNOVATEUR
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2014

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UNIVERSITI TEKNOLOGI MARA
MALAYSIA

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

RESEARCH BOOK

iiindex2014

AN INTERNATIONAL EXPOSITION ON RESEARCH AND INNOVATION

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RESEARCH INNOVATION BUSINESS UNIT
UiTM-MTDC Technopreneur Centre, Universiti Teknologi MARA
40450 Shah Alam, Selangor Darul Ehsan, MALAYSIA
Tel : +603-5544 2747/2748/2750
Fax : +603-5544 2790

Web : www.iiindex.com.my
Email : iiindexuitm@gmail.com



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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RAPID PRODUCTION OF BIOGAS BY HIGH FREQUENCY SONICAL WAVE CHAMBER

Ku Halim Ku Hamid, Rusmi Bin Alias, Mohibah Bin Musa, Siti Raihanah Binti Abd Rahman
Faculty of Chemical Engineering, UiTM Shah Alam, Selangor.
Email: kahalim@salam.uitm.edu.my

The invention relates to the enhancement of the ability of hydro mechanical shear forces by cavitation effects, subject to material in rapid production of biogas using the power of high frequency sonical wave. A 25 MegaHertz high frequency sonical wave chamber at low power level was invented to treat the material. In this case, the subject material is Palm Oil Mill Effluent, wastewater from palm oil mill. POME is a thick brownish colloidal suspension contains high solids, oil and grease. Each year, POME is produced in huge quantities and treatment is required before it is discharged to the environment. The anaerobic digestion process is the most preferred treatment, while it produces biogas. However, pre-treatment is required to overcome the rate limiting stage, where bacterial consortia responsible for the degradation process requires time to adapt to the new environment before they start to consume on organic matters to grow during anaerobic digestion process. Sonical wave is an emerging technology as pre-treatment prior to anaerobic digestion process. This wave involves the use of sonical frequency generated by a vibrating probe. As the sonical wave propagates through the OOME, it generates a positive pressure to push molecules together. Due to high energy transfer, this compression zone tends to pull the molecules apart from one another thus creating a negative pressure. This negative pressure in the rarefaction zone causes formation of micro vapour bubbles that is very unstable to collapse violently. As they reach a critical size, they collapse and the shock waves are produced at high temperature and pressure to create an extreme sport. This cavitation phenomenon causes high shearing forces in the surrounding liquid phase and acts on the particles inside the POME that is subjected to treatment. When the particles inside the POME are subjected to shear stress it increase the speed of collision causing friction and turbulence, thus cause partial denaturation that significantly affects the physical and structural properties of POME. Conventional way use low frequency sonical wave irradiation normally from 25 kiloHertz to 200 kiloHertz as wastewater pre-treatment to break out the cell walls and membranes to release the extra and intra cellular substances into the aqueous phase of the POME. However, a subsequent anaerobic digestion treatment is required to produce biogas. Therefore, in this invention, POME was fed and exposed to high frequency sonical wave in a cylindrical chamber without subsequent anaerobic digestion treatment. The use of high frequency was to create high physical effects inside the POME by enhancement of hydromechanical shear forces. Interestingly, a rapid production of biogas was observed inside the chamber during sonication process. For gas analysis, the gas components inside the chamber were online channelled from the top chamber to a gas chromatography. FID chromatograms from gas chromatography responded an interesting finding of methane and methanol gases, while TCD chromatograms responded of hydrogen gas from this process. Hydrogen gas was a major product in this analysis with 41% average mole percentage. These results prove that high frequency sonic technology has the potential to be commercialised in wastewater treatment and energy recovery industries to improve the current available technologies.