

CELEBRATING  
COMMERCIALISATION  
YEAR 2014

# iiindex 2014

AN INTERNATIONAL EXPOSITION ON RESEARCH AND INNOVATION

invention  
innovation  
& design  
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

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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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## HYBRID LAMINATED BAMBOO VENEER BOARD FOR FURNITURE COMPONENT

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Bamboo is categorized as non-timber forest product and is a potential substitute for wood in wood based industry. Bamboo in its engineered form has received much attention and now is widely recognized as structural materials to replace wood in several applications. In Malaysia utilisation of indigenous tropical bamboo as veneer has not yet being explored. For this reason, Betong bamboo (*Dendrocalamus asper*) was chosen for making bamboo veneer due to its fast growth, large diameter, high flexural and renewability. Currently, the technology on producing bamboo veneer in Malaysia especially from local bamboos is not fully explored due to the lack of suitable peeler and technical know-how. Thus, this study explores the new potential of bamboo as veneer for the production of furniture components. Sesenduk (*Endospermum diadenum*) wood species were incorporated in the bamboo lamination to produce the hybrids so called the Hybrid Laminated Veneer Bamboo (HLVB). The production of HLVB has a high potential as material for interior design and furniture such as table top, chair seat, chair slat, arm rest and panelling to name a few. Sesenduk is pioneer under utilised species and its potential as substitute material for veneer is not yet being exploited. Apparently veneers are produced from wood with minimum diameter of 8 inches. In China, rotary peeling of bamboo to get veneers to make plyboard has been successfully produced. Realising their potential in China, a preliminary work on bamboo peeling was initiated at Timber Technology Centre, Forest Research Institute Malaysia FRIM Malaysia and results had showed that this technique can be applied to peel small diameter logs and branches of pioneer wood species in Malaysia (Anis, T, N et al 2013) provided that improvising and fabrication of this peeler machine is done. The novelty of using technique of rotary peeling is applied to produce veneer in this study. Currently, technique of slicing is used to produce Laminated Bamboo Veneer (LBV). This conventional technique is costly and tedious due to extra processing involved in converting bamboo sticks into larger dimension laminates. This involves the cost of gluing and jointing. Both flat and moulded furniture panels have been successfully produced for non-commercial use using veneers of this peeling technique (MTE, 2014). Applying the technique of bamboo peeling to small diameter logs realised the "waste to wealth" approach whereby small diameter logs or branches is value added into interior design used. This approach is in line with the National Timber Industry Policy, NATIP (2009-2020) and related government policy to promote the utilisation of underutilised pioneer wood species like Sesenduk, Kelempayan, Ludai, Jelutong and Mahogany. In this study two types of board lamination were produced at different parameters. Lamination was done by flat platen press at 1500 psi and 2500 psi. Time and temperature of 20 minutes and 110 C were applied for both pressures. Urea formaldehyde was used as glue during pressing to ensure adhesion between veneer substrates. Two types of lamination namely Lamination 1 and Lamination 2 were produced; where both bamboo and sesenduk veneers were alternately laminated. Recovery, physical and mechanical properties were carried out. Results showed that the recovery rate is 50%, density for lamination 1 and Lamination 2 are 755 kg/m<sup>3</sup> and 736 kg/m<sup>3</sup> respectively. For Lamination 1, bending results showed MOE and MOR values of 4321 MPa (MOE) and 52.7 MPa respectively while for Lamination 2, results showed MOE and MOR values of 5663 MPa and 65.9 Mpa respectively. Both mechanical and physical test were in accordance to BS:EN 39 1993.