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การสัมมนาเกี่ยวกับความน่าเชื่อถือของเครื่องจักร

Tribology in Malaysia

ไทรโบโลยีในประเทศมาเลเซีย

THAI TRIBOLOGY ASSOCIATION (TTA)

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Tribology in Malaysia: General Perspective

ไทรโบโลยีในประเทศมาเลเซีย: มุมมองทั่วไป

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INTRODUCTION

Tribology was first coined in 1966 as documented in 'Jost Report'. The word 'tribology' has since gained a common usage for matters related to friction, wear, and lubrication in machine interactions. Since tribology is an engineering issue that goes beyond national boundaries, many tribology societies have emerged across the continents partly motivated by the pursuit for greener world via waste reduction. The move for improved tribology practices in industry has reached Malaysia and in 2007, Malaysian Tribology Society (MYTRIBOS) was established by local tribologists [1]. MYTRIBOS is responsible to promote proper practices in research and development related to the field of tribology in Malaysia and to facilitate collaborations between academia and industry in all possible endeavors. MYTRIBOS eventual vision and mission is to help reduce energy consumption by making machineries more energy efficient in order to reduce greenhouse gas emission. MYTRIBOS is contributing towards the improvement of the environment and to achieve a better quality of life and more sustainable world by creating awareness of the importance of practicing proper tribology. From a humble beginning in 2007, MYTRIBOS now can be proud of its current progress with 89 registered members, coming from different background and areas of interests, from local and international universities, industries and research institutes. Specifically, more than 80% of MYTRIBOS members are locals and the rest are expatriates working in Malaysia. The organizational structure of MYTRIBOS for the period of 2013 to 2015 is shown in Figure 1.

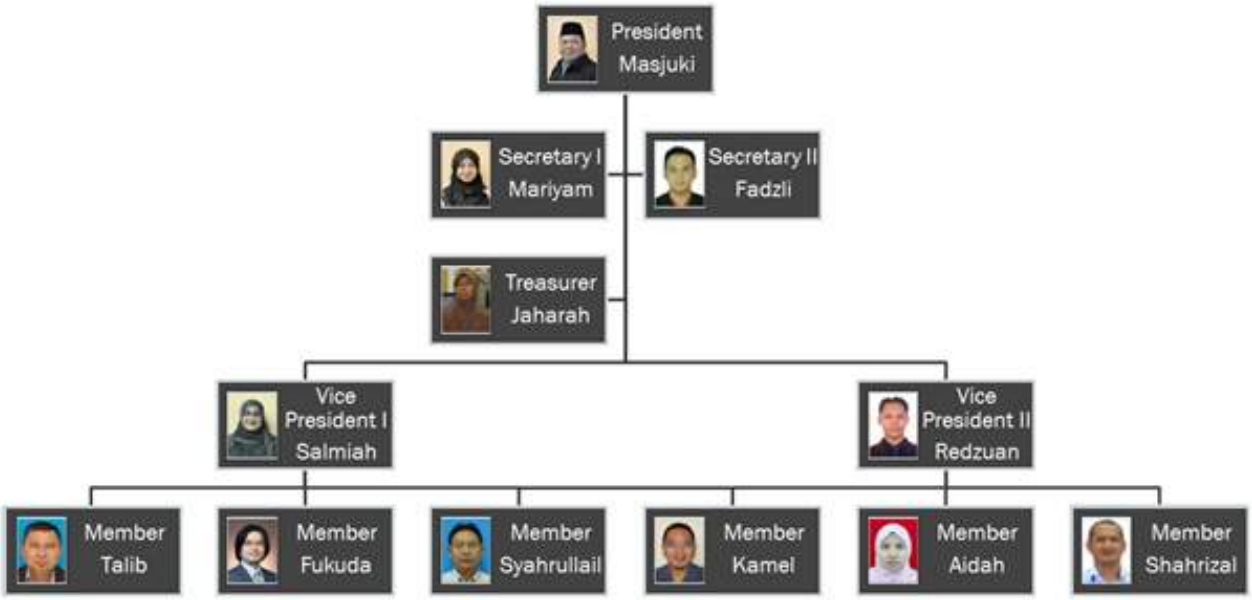

Figure 1. MYTRIBOS executive committee (2013-2015).

CURRENT TRIBOLOGY RESEARCH TRENDS IN MALAYSIA

The current tribology research trends in Malaysia can be classified into five main categories: (a) Green Tribology (b) Hydrodynamic lubrication in plain journal bearing (c) Tribology of waste materials (d) Surface and coatings technology, and (e) Biomimetics.

Green tribology involves research and development of bio-based lubricants, pioneered by Masjuki and his co-workers at University of Malaya in the early 1980's. In relatively recent years, the work by Zulkifli et al. [2] examined the lubricity of bio-based lubricant derived from different chemically modified fatty acid methyl ester. This bio based lubricant was synthesized using palm oil methyl ester, pentaerythritol, and trimethylolpropane. They have also investigated the effect of bio-based lubricant on coating and surface modification. In another group, Belinda and her co-worker work on improved friction and wear performance of micro-dimpled ceramic-on- ceramic interface for hip joint [3].

Many aspects of research work specifically in hydrodynamic lubrication of plain journal bearing have been published by Kasolang et al. [4] who started their work at the University of Sheffield. The work that started at the University of Sheffield has been further established at the Universiti Teknologi MARA through co-supervisions of postgraduate students between the two universities. One of the early highlights of the investigation is on the use of reflection measurement technique to measure film thickness and viscosity around the circumference of the journal bearing. In later work, other response parameters such as friction, temperature profile, and pressure profile were also reported. Kasolang and co-workers [5-6] have started working on other aspects of tribology namely wear and bio lubricants.

Nowadays, the need for engineering materials to be environmentally friendly is rising. Waste materials may be considered a secondary source of materials with an energetic advantage due to its high energy content. With regard to this research area, Abdollah and his co-workers strive at seeking innovative and sustainable solutions to these questions by developing a new potential self-lubricating and friction materials made from agriculture wastes [7-10]. This effort by young researchers from Universiti Teknikal Malaysia Melaka is expected to have large potential

for advancing a zero waste strategy in improving tribological properties at an affordable cost.

Surface treatments including coatings are rapidly developing areas in tribology that offer new methods and techniques to control friction and wear. In a series of research collaborations between researchers from Universiti Kebangsaan Malaysia and SIRIM Berhad resulted in more than a half dozen top-tier research publications since 2013. Ghazali and her co-workers have been working on oxide-ceramic materials for marine environments, particularly for tropical countries to mitigate corrosion and wear [11-14]. Identification on vital parameters in plasma sprayed coating including good surface textures had improved the quality of depositions and coatings on the substrates for severe conditions, in particular.

Gebeshuber is an Austrian Professor of Physics who has been living and working in Malaysia since 2009. As a nanotechnologist, she is well aware of the importance of the nanoscale in tribological applications, and her work bridges across scales, from nano to the device level. She has been working on bioinspired MEMS on diatom tribology and on green nanotribology. She introduces biology for tribologists and highlighted the benefits of biomimetics in her latest publication [15].

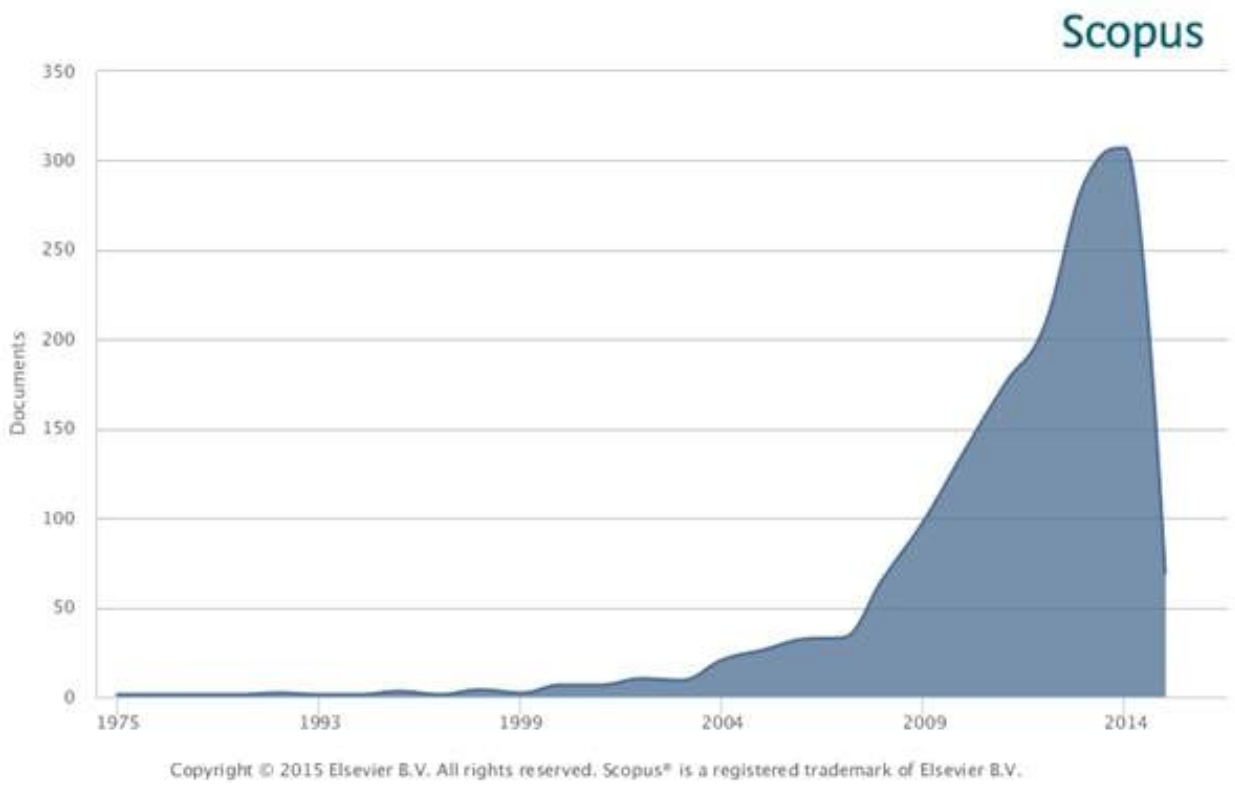

Figure 2. Number of papers affiliated to Malaysia, which fall in the field of tribology and published in Scopus database. The keywords used are tribology, wear, friction, lubrication [16].

MALAYSIAN PUBLICATION IN THE FIELD OF TRIBOLOGY

The publication record of various research organizations and academic organizations were tracked down from as early as 1975 to the current year 2015 and the publication profile obtained is given in Figure 2. The data shown in Figure 2 was based on Scopus database [16]. Scopus has practically made data searching and compilation on tribology progress in Malaysia easy which otherwise can be a daunting task to accomplish. Based on the number of published pa-

pers, it is uplifting to note that the intensity of research in tribology in Malaysia has increased tremendously since 2007, the year MYTRIBOS was born. It is worth noting that one of the MYTRIBOS objectives, to promote Malaysia in the field of tribology through publications, has been progressively achieved.

MYTRIBOS has moved one step further with the establishment of Jurnal Tribologi making its debut in 2014 [17]. Jurnal Tribologi is strategically written in Malay to signify local efforts but with global impact. This journal is an open access of peer-reviewed international journal, dedicated to the rapid publication of high quality papers on important subjects in the areas of tribology and other emerging fields related to friction, wear and lubrication. MYTRIBOS also regularly organizes international conferences and this year, Malaysian International Tribology Conference (MITC2015) will be held in Penang [18]. The presence of MYTRIBOS has been recognized and appreciated internationally with the recent appointment as the host of the coming ASIATRIB in 2018. Indeed, MYTRIBOS is committed and all geared for promoting the advancement of tribology in Malaysia as well as abroad in support of a more sustainable world.

TRIBOLOGY RELATED INDUSTRY

Tribology related industry may be defined as those companies that engage with friction, wear, and lubrication related products and technology. The role of industry in promoting tribology is tremendous. In Malaysia, this has yet to grow and MYTRIBOS has a major role to play. In the context of Malaysia, PETRONAS, as a strong local industry with global presence in more than 23 countries, is a force to reckon with. In downstream business, PETRONAS helps to enhance Malaysia's oil and gas resources. PETRONAS has a total refining capacity of 500,000 barrels per day and one of key petroleum products produced is lubricants. A subsidiary company known as PETRONAS Lubricants International Sdn. Bhd. (PLI) was established in 2008 to cater for lubricants global demand. Currently, some of the lubricants based products produced by PETRONAS include PETRONAS Syntium, PETRONAS Sprinta, and PETRONAS Urania for passenger vehicles, motorcycles, and commercial vehicles respectively. The commitment of PETRONAS in supporting national education agenda is evident from its engagements with education providers. Universiti Teknologi PETRONAS (UTP) and PETROSAINS are the mark of its commitment. In the case of Universiti Teknologi MARA, PETRONAS has also established collaborations with different faculties such as the Faculty of Mechanical Engineering and Faculty of Chemical Engineering. PETRONAS's engagement with universities come in different forms including research, industrial placement, training, and sponsorship [19]. Indeed PETRONAS is a pride of Malaysia in so many ways.

The roles of PETRONAS are also championed and complimented by other companies such as HYRAX Oil [20], Baseron (M) Sdn. Bhd., VICSON Sdn. Bhd., MEGA Energy Sdn. Bhd, HAKITA Engineering Sdn. Bhd., ZETA Scientific Sdn. Bhd., Lubeworld Holdings Sdn. Bhd., CBM Solutions Sdn. Bhd., Sumber Petroleum Cemerlang Sdn. Bhd., Tenaga Nasional Berhad, QES (Asia Pacific) Sdn. Bhd., PROEIGHT Sdn. Bhd., TOYO Grease Sdn. Bhd., SYNTOMAX Industries Sdn. Bhd., and FEOSO Group [21].

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