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LED TECHNOLOGY FOR BUILT AND ENVIRONMENT OF MALAYSIA

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ABSTRACT

Increasing the country population and the trend of industrialization caused increasing Malaysia's electricity consumption. Light Emitting Diode (LED) is a new sustainable technology that has taken over the conventional lighting in built and environment in a few developed counties in the recent years. However, Malaysia is left behind in using this technology due to unfamiliarity of the decision makers on its advantages. The research is using a mixed qualitative and quantitative method for finding advantages of LED for lighting the streets and built and environment. A group of scholars traveled to Canada and USA and observed seven factories and interviewed 40 professional of LED and discussed use of this technology in the context of Malaysia. The result of those observation and interview is synthesized and presented in this paper. The conclusion of this research confirms despit all LED advantages, it is very high cost in term of replacement, primary investment and maintenance.

Keywords: LED, Built and Environment, Malaysia

1. INTRODUCTION

Going towards sustainable development and being green is the main concern of today world (Saadatian *et al*., 2013). Increasing the country population and the trend of industrialization caused increasing Malaysia's electricity consumption. This trend urges the government to look towards new energy saving policies (Bakhtyar *et al*, 2013). Light-Emitting Diodes (LEDs) have already found widespread use in developed countries (Held, 2011). This technology is regarded as a very promising candidates for future energy-saving light sources suitable for built and environment (Graves and Ticleanu, 2011). Today, the entire visible spectrum can be covered by light-emitting semiconductors (Cangeloso, 2012). In built and Environment two approaches exist for white light sources. The combination of one or more phosphorescent materials is the first one and the multiple LEDs emitting at complementary wavelengths is the second one (Li *et al*., 2004). White LED offers advantageous properties such as high brightness, reliability, lower power consumption and long lifetime (Elpel, 2005). LED is not a very complicated electrical device (Lenk and Lenk, 2000). It has only 6 simple components (**Fig 1**).

White LEDs are a good lighting system that can be expected to serve the built and environment of Malaysia in future. LED is suggested for not only illuminating of built and Environment but also for an optical wireless communication system of cities (Mottier, 2010). The color of LED can change the characteristics of this technology and can be used for different purposes of built and environment (Khanh and Bodrogi, 2012) (**Fig 2**).

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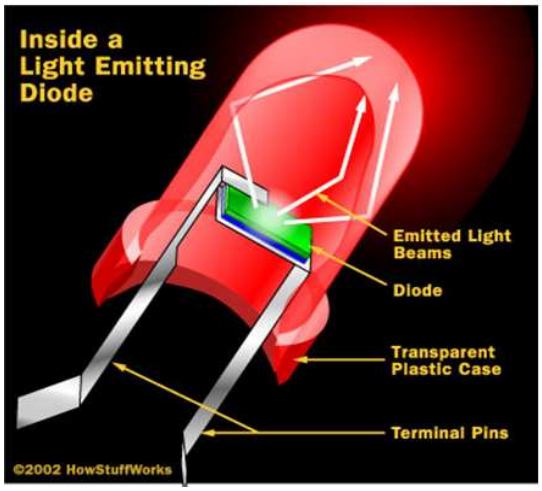

Fig. 1. Components if LED

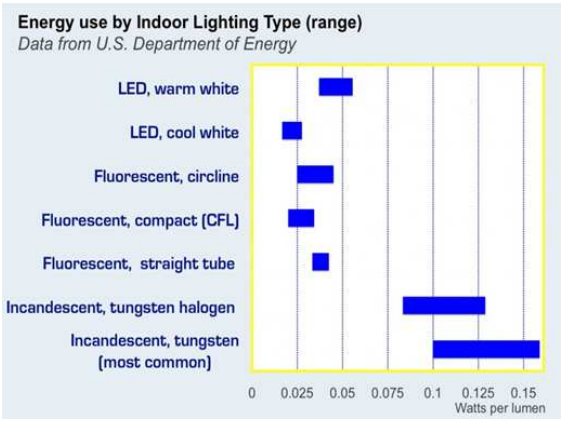

Fig. 2. Characteristics of different LED

Although this technology contributes to having more green built and environment status, many developing countries including Malaysia are still skeptical in using of this technology. It might be due to unfamiliarity of the decision makers on its advantages. This paper is the result of interviews and observation of a group of scholars who traveled to Canada and USA in 2012 for 60 days. This paper has summarized the advantages and disadvantages of LED.

2. MATERIAL AND METHODS

The main research methodology used in this study was interview and observation**.** Interview protocol was made to prevent the wrong interpretation and bias in the procedure of research. Interview followed seven following steps: Step one: "Thematization the interview"; which was formulating the purpose of interview. Step two: Design the interview questions and the type of questions, Step three: Conducting the interview (inclusive of getting permission, tape recording, or writing). Step four: Transcript of recording verbatim. Step five: Analyses; this study utilized "Interview analyses focusing on meaning as the style of interpreting and the "Meaning Condensation" as the mode of interpretation which is "very prevalent and valid technique in analyzing the interview. Step 6: Verifying; which is checking the reliability of the analyses. In this regard, the research has verified the analyses of the interview by resending the interpretation to interviewees via email. Step 7: Reporting is the last stage of the interview.

The saturation point theory was utilized in sampling the interview. The fact that the interview and observation are forms of the qualitative research and the issue of sampling is therefore, not very significant and thus, it is better to employ saturation method. This means that in a qualitative research, it is not necessary to determine the extent of the diversity, while the qualitative aspect only supports the archival research. Hence, the interview was kept on conducting upon the time no new knowledge was gained.

The study also used the benefits of observation techniques for its strong validity whereby it has been enumerated as the best available approximation to the truth of or conclusion. Unobtrusive Observation has been selected in order not to affect the behavioural of individual. The type of Unobtrusive Observation has been Behaviour Trace studies. The type of recording has followed Descriptive Variable Analyses, which is to observe a phenomenon and to write it down.

3. RESULTS

For protecting any risk, such as fluctuated price of oil and mitigation carbon dioxide in the country the Malaysian government plans to support investment in new mitigation policies such as renewable energy and LED (Bakhtyar *et al*., 2012). Advances in (LED) technology havebeen remarkable in the last decade, opening up arealm of new applications. A company based in the city of Victoria in British Colombia of Canada namely Carmanah Technologies Inc has taken advantage of LED performance improvements to producethe first fully enclosed, solar-powered LED navigation lights.

The particular of these lights is that those are more rugged and require less maintenance than conventional marine navigation lights. As a result they can be

commonly used by coast guards, navies and other marine authorities aroundthe world. Those are also suitable lights for tropical climate countries which have high humidity such as Malaysia, Singapore, Vietnam, Thailand, Hong Kong, etc.

The company record shows that they have already utilized this technology for the built and environment of the Mexico, Indian port of Kandla, Ha Long Bay and Hai Phong Harbour of Northern Vietnam with success (**Fig. 3**).

This company has expanded its core technology for land-based lighting applications that require durable, self-powered lights. The company is optimistic that these new products (**Fig. 4**) may become important in making the built and environment greener on short. Six more factories in New York, Chicago, San Antonio, Denver, Milwaukie, Plano, has also presented the similar result. They have extensive use of LED for built and environment in different places of the world and the results were satisfactory.

Fig. 3. Use of LED in built and environment of Mexico

Fig 4. A Canadian company replaces 72,000 existing street lights with LED

4. DISCUSSION

Interviewing the companies that were in charge of lighting up Canadian Built and environment for more than 80 years, it was found out they have proven the advantages of LED for lighting the streets and built and environment.

They said that although time has passed; technology has evolved; their goal had always been to provide safe, reliable electricity for Canadian built and environment. They presented an efficiency study of LED that can be seen in **Fig. 5a.**

The results of the interview showed that factory owners in line with the goals of customers are looking for ways to improve energy efficiency and use of materials that are less harmful to the environment. They believe that Light-Emitting Diode (LED) technology is a new option for streetlights and built and environment. They anonymously declared that LED has the potential to increase energy efficiency and reduce fixture replacement and maintenance costs.

One of the interviewee based on Chicago exclaimed that “from an energy efficiency perspective, LED offer many benefits over conventional lights.” He believed that LED uses less electricity than traditional lights to light the same area.

A product manager of a factory in New York imparted that they expect more than energy efficiency from LED streetlights for Built and environment. They expect produce the right amount of light across the right area and at the same time have a technology which is easy and inexpensive to install, maintain and replace for built and environment. Those can be found in LED. Another interviewee based in Denver, not only confirmed all of previous statements but also added the aestheticalstandards are a concern of using new technologies for built and environment (**Fig 6 to 9**).

The result of the observations and interviews also indicated that the energy savings of LED fixtures do not necessarily translate into significant cost savings for built and environment. The reason is that the amount of energy consumed is just one factor that influences the cost of lighting the built and environment. Capital cost, installation, maintenance, energy use and end-of-life costs must also be considered.

The right option for illuminating the built and environment of Malaysia will balance several criteria. It includes energy use and energy costs. In detail we need to consider initial and replacement costs. LED lamp replacements are anticipated to occur every 10 to 20 years, but the technology hasn’t been around long enough to prove that.

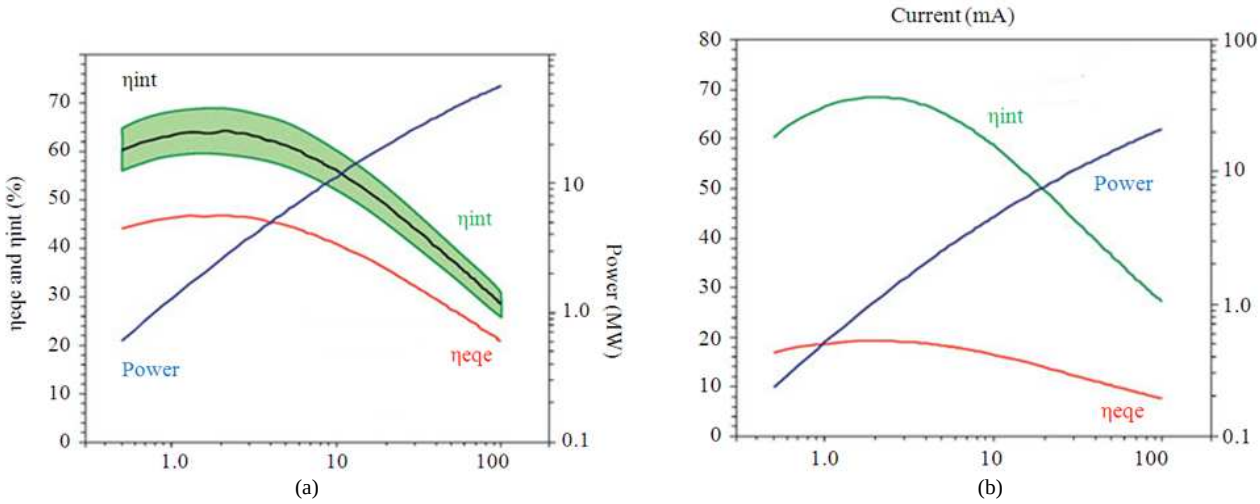

Fig. 5. Efficiency of normal light and LED for Canadian built and environment

Fig. 6. Industrial designers has solved the aesthetical concerns of LED by new design in florida

Fig. 7. Use of LED for aesthetical purpose in Austria

Fig. 8. LED provided aesthetic values and save 80% power in Germany (Bracker and Jan-Patrick, 2011)

Fig. 9. LED in Hong Kong saves millions of dollars

5. CONCLUSION

LED technology is rapidly improving. Advances in colour quality, energy efficiency and manufacturing costs might help make the choice easier. There are advantages to being on the leading edge of technology and there are risks, too. Malaysians are familiar with the LED lights that decorate a christmas trees in shopping malls, but LED lighting is a relatively unproven way to illuminate Malaysian built and environment. The main limitation regarding using LED in Malaysia is its high primary cost. The initial investment to change over to LED is also significantly higher than the cost of traditional High-Pressure Sodium (HPS). The advantages of LED are: It reduces energy use, uses fewer heavy metals, replaces fewer units over time and reduces maintenance over time. In contrast: It has higher initial costs, it has higher replacement costs, it has unproven performance and reliability for Malaysian context and it has unproven long term maintenance costs for Malaysian context.

It is suggested that a laboratory research is being conducted for use of LED in Malaysian built and environment context. If the results show that they are functional, awareness rising should be done immediately.

This research suggests further research economic aspects such as low cost LEDs. It seems the main barrier for developing LED is its high primary cost in compare with the other approaches.

6. ACKNOWLEDGMENT

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