Talk on Sustainable Building- What can an Electrical Engineer do?2

by Dr Siow Chun Lim

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On 26th January 2019, the Electrical Engineering Technical Division (EETD) has successfully organised a talk on "Sustainable Building- What can an Electrical Engineer do?" The talk was attended by more than 50 participants. The speaker was Ir. Chong Chew Fan who is the chair of EETD for 2018/2019.

He first identified two main energy guzzlers in the world namely the transportation and building sector. Based on recent studies, building sector accounts for 14% of the total energy consumption in Malaysia. The underlying fundamental of sustainable development are the society, economy and environment. Sustainable development involves site planning, indoor environment quality, water efficiency, energy efficiency, eco material and resources. A sustainable building shall be able to operate at high performance with minimal emission, discharge of solid waste and liquid effluents. It shall have minimal negative impact on the ecosystem and maximum quality of indoor environment. Ir. Chong also pointed out that each building has a life cycle i.e. each building is designed for a certain period of usage.

An electrical engineer is directly and indirectly involved in the design, construction and operation and maintenance of a sustainable building. In Malaysia, MS1525 (non-residential) and MS2680 (residential) are the common reference standards for green building. Electrical engineer is expected to utilise MS1525 more as it involves the design of more active elements which consumes higher power as opposed to MS2680. Of late, certain provisions of MS1525 have been incorporated into the Uniform Building By Law (UBBL).

To ensure sustainability in buildings, electrical engineers have to carefully design the lighting, sub-metering, equipment as per Minimum Energy Performance Standards (MEPS), Variable Speed Drive (VSD) and renewable energy systems. Criteria to be considered when designing lighting includes lighting level, lighting power density (LPD), lighting zoning and control. The approach to lighting design for energy efficiency shall consider daylight or natural lighting availability, lightning requirement, glare, lighting selection and control. Daylight factor is defined as the ratio of lux inside and lux outside. Hence, it is impertinent to simulate daylight penetration into the building. Technical standards for lighting design includes MS/ISO 8995, MS 1525, CIE 29.2, CIE 40, CIE 52 and CIE 55. Lighting power density is defined as the total lighting load and floor area. Selection of lighting depends on lux level requirement and ambient lighting, high efficacy fixture, desired Colour Rendering Index (CRI) and glare from light fixture. Lighting control should be done according to space use and using photosensor controlled lighting is an example quoted by Ir Chong.

Sub-metering for power and lighting, major mechanical loads such as chillers and pumps are to allow measurement for monitoring for further improvement of the system if necessary. MEPS is introduced for the regulation of fan (MS2574), television (MS 2576), fridge (MS 2595), air-conditioner (MS2597) and lamps (MS 2598). Electric motor, transformer, lighting, chillers/cooling towers, pump and air compressors are currently under review for MEPS. Suruhanjaya Tenaga is also pushing for MEPS for motor to be at least IE2.

Variable Speed Drive (VSD) is used for motors serving fluctuating loads to reduce energy consumption by adjusting motor speeds to cater for variable torque loads like fan and pump which traditionally vary output by energy consuming mechanical means. However, VSD may increase harmonic and provision of harmonic filter is needed.

Ir. Chong then introduced the hierarchy of construction waste management namely reduce, reuse, recycle and landfill as the lowest priority. Proper sizing of cable may avoid odd sized cable which leads to wastage of cables. Reduction of construction waste can be done as per ISO 9001, Industrialised Building System (IBS), Building Information Modelling (BIM) and construction waste management plan.

The speaker concluded his talk by highlighting several challenges in implementing sustainable approaches namely financial constraints, lack of awareness, lack of database on lifecycle assessment for mechanical and electrical material as well as lack of facility to manage electrical waste.

Figures below summarise the entire talk.

Figure 1: The speaker

Figure 2: The audience