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(Energy Commission)

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**ENERGY
EFFICIENT
OFFICE**

INTRODUCTION

In the Eighth Malaysian Plan and the Ten-Year Outline Perspective Plan 3 (OPP3), Energy Efficiency (EE) has been recognised as important measure to increase the competitiveness of the country's goods and services. Steps to promote and integrate EE into the energy scene have been incorporated in these plans.

Towards promoting the implementation of EE programmes, the Energy Commission or Suruhanjaya Tenaga (ST) decided to retrofit part of its own conventional office with EE features. The office (of about 4,500 square feet) at Level 15, Menara TH Perdana, demonstrates a number of EE measures that can be introduced in existing buildings as retrofits, such as optimising the air-conditioning and illumination systems, which then can be monitored and demonstrated through an "on-line, energy management system", with the installation of appropriate metering devices.

The ST's demo office integrates EE features, which are cost effective, maintain the corporate identity and ensure a conducive environment for user comfort and as a "show case" for potential public and private sector visitors to the demo office.

ENERGY EFFICIENCY FEATURES



The EE features introduced includes:-

- Daylight optimisation
- Lighting control system
- EE lighting
- Comfortable office environment by resetting of air-conditioned area temperature/RH (Relative Humidity)
- EE office equipment
- Energy Monitoring & Management System

DAYLIGHT OPTIMISATION

The office layout is designed in such a way as to **maximise the penetration of daylight** into the inner space (working area). It has been proven that natural daylight is the preferred light source for human beings. It gives a **better environment** and **improves productivity** of the office personnel.

The challenge in daylight design of buildings is to design windows and shading which let daylight in, prevent

heat from entering the building, and reduce glare to the occupants. The office layout is designed such that as many of the occupant as possible have access to daylight.

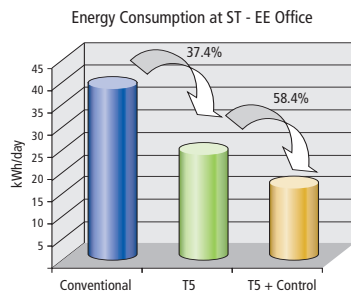
Apart from their role in natural daylight optimisation, the light coloured interior and glazed partitions play important roles in making the environment at the work place to be more lively and pleasing.



EE LIGHTING AND CONTROLS

In order to fully utilise daylight, artificial lighting has to be controlled so that it is automatically shut off when daylight is sufficient to satisfy the lighting needs, which is an illumination level of 300 - 400 lux (according to **MS:1525 - Code of Practice on Energy Efficiency and**

Use of Renewable Energy for Non-Residential Buildings). In the ST-EE Office, a daylight responsive control system on the lighting system is combined with a motion detector, which automatically shuts off lighting and reduces cooling once an office is unoccupied.



For comparison, ST - EE Office's lighting load density is about 6W/m² compared to the rest of ST office where it is about 10W/m². With lighting control system, the lighting load density is estimated to be reduced further to about 2W/m². The illumination level has been reduced from about 700 lux to approximately 350 lux, which is within MS 1525 requirements.

The graph shows the energy savings with an EE lighting system, with the supplementary controls installed. Up to 37.4% savings can be achieved just by changing the conventional design T8-light tube with the T5-light tube. However, almost 58% energy savings can be achieved with EE lighting and controls installed from the conventional design at other office levels of ST.



USER COMFORT - Air Conditioned Area Temperature/ RH setting

Air conditioning consumes the largest share of energy, usually 50% to 60%, used in an office. A comfortable environment for occupants is a temperature range of between 23°C and 26°C, with a relative humidity (RH) of about 60% to 70%. Lower temperature and RH can be uncomfortable, but are often found in typical office buildings. Changing an office air-conditioner setting from 20°C to 24°C, will save about 33% of energy!



EE OFFICE EQUIPMENT

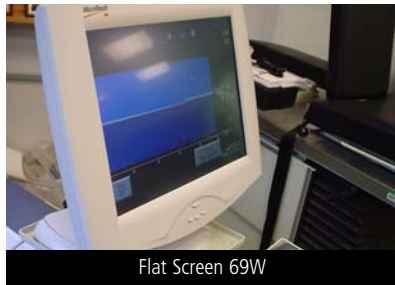
Office equipment such as computers, printers and photocopier machines consume electricity and they also need air-conditioning to dissipate the heat they generate. The main energy consuming office equipment in the modern office is the Personal Computer (PC).

The comparison between bulky CRT monitors, flat screen monitors and laptops in terms of energy consumed is as shown below.

PC Consumption



CRT 105W



Flat Screen 69W



Laptop 19W

Realising the savings and benefits of EE office equipment, the ST has already decided that all office equipment it procures will be energy efficient (with Energy Star labels). In addition, users are encouraged to switch off appliances instead of putting them in the "stand-by" mode, when appropriate.

ENERGY MANAGEMENT & MONITORING SYSTEM

A common cliché is "You cannot control what you cannot measure"

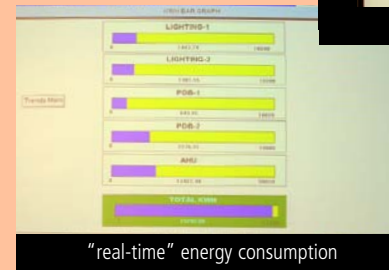
A comprehensive energy management system (EMS) is a prerequisite for actually



achieving efficiency of energy use in buildings. The EMS monitors on a continuous basis the energy consumption in the building. This allows for the comparison of actual energy consumption and monitoring predicted consumption



Historical trend



"real-time" energy consumption

with the consumption trend. Action can be taken if abnormally high energy consumption is registered. In short, savings can be achieved from effective management of energy use through the aid of EMS.

ENERGY SAVING SIMULATION

The Energy-10 computer software from National Renewable Energy Laboratory, Denver USA has been optimised in designing the new Ministry of Energy, Water and Communications, MEWC's office, at Putrajaya. The diagram below

shows the energy savings with energy efficiency features applied one by one in the Suruhanjaya Tenaga -Energy Efficiency Office. Up to 45% energy saving could be achieved by implementing those features.

