# The Implementation of Energy Saving Practices Optimizing Consumption and Reduction of Carbon Dioxide Emissions

Buddhist Tzu-Chi Dialysis Centre, Penang Branch, Malaysia

**GGHH Agenda Goals**

- Energy

**Organization Goal**

- Reduction of carbon dioxide emissions through reduction of electricity usage and consumption
- Reducing electric consumption through utilization of optimal and energy efficient equipment and facility
- Lessened electricity cost and wastage through efficient use of equipment and facility

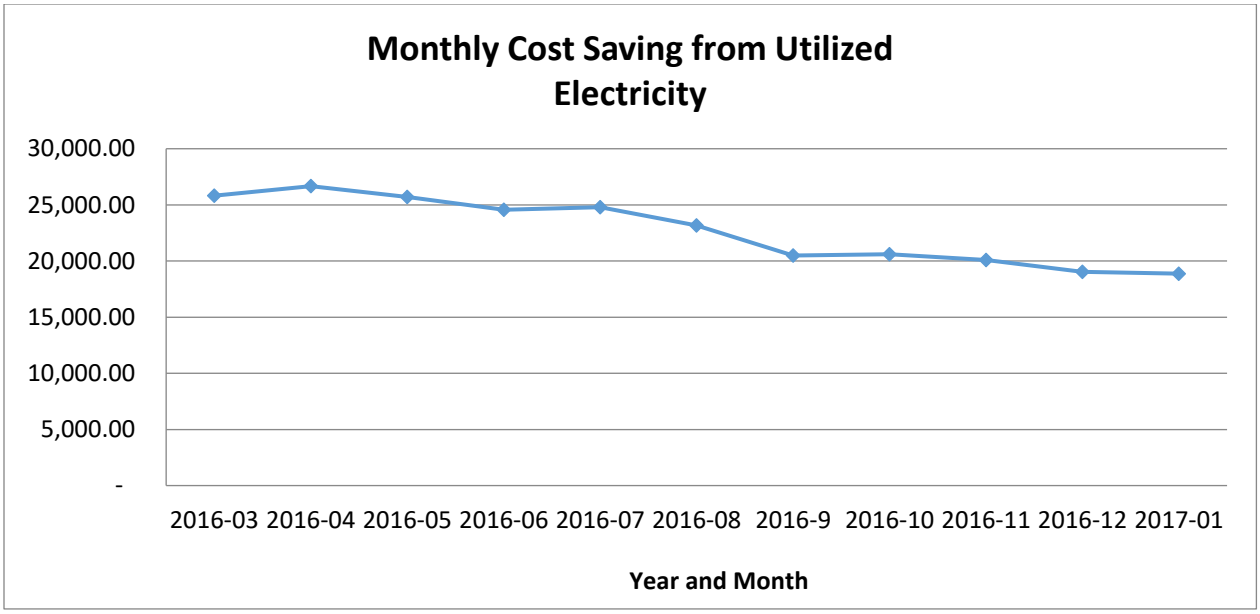
**Progress Achieved**

**Purchase of Energy Efficient and Optimal Equipment and Facility**

- A total of six sets of water dispensers were purchased. They were installed with pre-filters purchased at RM 75 ($USD 17.05), which prolonged the usage of sediment and carbon filters by three months. These water dispensers are also timer controlled, lowering electric consumption.
- The air conditioners installed are equipped with Variable Refrigerant Flow (VRF) which provides precise temperature comfort control in different zones in this building. This type of air conditioner is energy efficient. Moreover, the air conditioners are equipped with timers which ensure that they are switched off during specific times of the day. Allowing optimal and efficient energy use.
- Lamp lights situated in car parks are all solar powered, a renewable energy which reduces carbon emission
- Rewiring done to the current electrical structure enable the staff to individually switch on and off office lights to save energy
- Doors are auto locked which automatically closes all doors when not in use. This action contains cool air from the air conditioners inside the room. This practice minimizes electricity used in cooling the rooms of the dialysis center.
- Conventional light bulbs such as compact fluorescents (CFLs) were not used in the new centers constructed. Instead, light emitting diodes (LED) were procured, after conducting a comparative study on brightness level

**Reduced Electricity Consumption and Expenditure**

The graph below shows the decrease in electricity expenditure from March 2016 to January 2017. This reduction took place after the implementation of the changes and further intensifying “frugality behaviors and principles” in the dialysis center. It may be noted that from the average USD $5683 (RM 25,000) monthly expenses from electricity, the cost was reduced to USD $4546 (RM 20,000) per month.




**Electricity Cost and Carbon Emission Reduction Calculation**

***The reduction in electricity cost and emission is based on the activity presented in "*Implementation Process*" found under entry two (2).**

- Power rating / energy usage of light
  - 40 W x 10 sets = 400 W
  - 8 W x 72 pcs = 576 W
  - Total Energy saved = 976 W
- Number of hours you use the appliance (Average of 9 hours/day)
- The electricity tariff (TNB) = Rm 0.509 ($USD 0.12) /kWh

| **Calculation for energy consumption in kWh:** | **Calculation for energy cost:** | **Calculation for CO2 emission:** |
|---|---|---|
| kWh = Power(watt) x Hours of operation /1000<br><br>976 watt x 9 hours / 1000 = **8.78 kWh per day** | Cost per day = kWh x TNB Tariff<br>Rm x 30 days = Energy cost of the month<br><br>8.78 kWh x 0.509 = **Rm 4.47 ($USD 1.02) per day** | 8.78 X 0.684 = **6.0 Kg of carbon emission reduction per day** |

**Information, Education Communication Campaign**

In conspicuous and strategic areas, reminders for turning off lights were placed. When the incorporation of the habit of being more frugal on the electricity utilization was first implemented, the nurses were given cards. The nurses marked the cards on the date when they needed to turn off unused lights. This practice was used for a quarter, until most nurses found turning off unused lights became part of their natural behavior. Encouraging messages to use the stairs were also used.

**The Issue**

The consumed electricity accounts for most of our energy expenditure. We faced significant challenges in managing and balancing energy consumption with expenditure and energy conservation.

Energy saving awareness is still low in this country. Many Malaysians are unaware that their indifference to prudent energy consumption is detrimental to the environment. Each kilowatt hour (kWh) used releases 0.684 (kilogram) kg of carbon dioxide (CO2) emission, a gas which contributes to the greenhouse effect.

One can measure his or her own CO2 pollution by multiplying monthly (electric) usage stated on the bill with 0.684. The result of this represents the amount of CO2 released in the air. On average, Malaysia's per household electricity consumption is 251 kWh per month. This means one household releases 171.68 kg of CO2 per month. ***(Bernama.com Malaysian National News Agency, June 29, 2012).***

**Sustainability Strategy Implemented**

Many projects had been carried out to improve energy efficiency and reduce utilization. These projects were complemented by a frugality campaign done to reduce energy consumption. The maintenance team and nurses are working hand in hand to uphold these activities and further develop and inculcate prudence and frugality among staff and patients.

**Implementation Process**

Several measures were undertaken to reduce energy consumption and promote efficiency in utilization. Among them are:

1. Water Dispenser
    - Pre filter before the carbon filter helps to save by pro-longing the sediment filter and pre carbon filter by 3 months. This also cut down on the servicing and maintenance of the dispensers, which cost Rm 3442 ($USD 782.45)/year.
    - A controlled timer for all dispensers to prevent wastage of electricity when not in used.

2. Lighting:
    - The rewiring for lights, which takes into consideration of the staff sitting positions, to ensure maximum brightness with minimum lights. This enables reduction of 10 sets of lights at 40 W each.
    - At the new Dialysis Center, the lights had been changed to LED and enabled the removal of one panel light from each set – Total of 72 pieces were removed after studying the brightness level. Energy saved per one panel is one LED light which consumes 8W per piece.
3. Rewiring helps to control the amount of light and air conditioning, reducing wastage. The lights and air conditioners are positioned parallel with the staff sitting positions, which can be controlled by individual switches. Previously, the lights and air conditioner were turned on with

single or minimal switches, including areas, which have no activity or person occupying them.

4. The air conditioners with VRF moves refrigerant to the zone to be cooled, allowing the temperature of that area to be more precisely controlled. It can simultaneously cool zones or just provide comfort cooling to zones that are in use. Zones are single or multiple room spaces that are conditioned to a set temperature and are operated independently from other rooms within the same structure. This allows reduction of energy consumption.
5. The problem with condensation at the air conditioner grill had been rectified. A coating was applied to reduce condensation, decreasing the energy used.
6. Implementation of environmentally consciousness raising activities for staff members and patients are carried out regularly. Patients and employees including the volunteers are advised to use the lift together or in a group instead of using it alone (one person per elevator trip). Regular talks and orientations are conducted to educate employees and patients on energy-saving ideas and their incorporation to daily routines. Employees are also encouraged to share their ideas on how to further incorporate practices of prudence and frugality in energy conservation.
7. Better plan of work flow for delivery of stock, including loading and unloading. This process not only controlled the usage of the elevators, but also enabled monitoring of the vendor for security and safety purposes. This was done based on elevator break down data, which shown improper stopping of the elevator causing it to shut down.

**Tracking Progress**

The electricity bill was reduced by 16.5% since implementation of the energy saving campaign and activities. These campaigns and activities, involved all nurses, administrative staff, patients and volunteers since beginning of this year.

**Challenges and Lessons Learned**

Cultural and attitude changes are always difficult. A handful of employees and patients find it difficult to incorporate the advocated changes into their habits. Reducing Greenhouse Gas emissions requires behavioral modification, but personal habits were proven difficult to change. Continuous education and campaigning is the key, to support and encourage changes and to develop good habits.

The Buddhist Tzu Chi Dialysis Center lacks management indicator models and monitoring systems to evaluate energy efficiency of different departments. The center wishes to address this concern in the future.

**Next Steps**

Computerized monitoring and routine maintenance are key elements to successfully prevent over-usage. More importantly, public education and continuous support are significant factors in helping the center reduce energy use and continually help to protect our natural resources.

**Demographic Information**

Buddhist Tzu Chi Dialysis Center was the first dialysis center to provide free dialysis treatment, EPO injection, blood tests and regular specialist checkup for all patients irrespective of race, religion or creed. Presently we have three Tzu-Chi Dialysis centres in Malaysia, Penang (PGDC), and Butterworth (BWDC) and in Alor Star (KDC).

As of March 2017, Buddhist Dialysis Centers in Penang have the following profiles:

- PGDC has 54 Hemodialysis machines, total of 129 Patients and 45 Staff

- BWDC has 40 Hemodialysis machines, total of 103 Patients and 26 staff
- KDC has 24 Hemodialysis machines, total of 78 patients and 20 staff

Buddhist Tzu Chi Dialysis Centre also provides free basic screening under the CKD awareness and prevention program

**Links**
http://tzuchi.org.my

**Quotes:**
*A person's happiness stems not from how much he owns but from how little he complains.*
*One must overcome difficulty instead of being overcome by difficulty. (Jing Si Aphorism: Still Thoughts by Master Cheng Yen)*

**Keywords / Topic:**
Energy – Electricity consumption reduction/ carbon emission.

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