

Water – A Precious Commodity: Conserving and Reducing Water Consumption Using Recycled Reject Water Processed from Water Treatment System Buddhist Tzu-Chi Dialysis Centre (Penang Branch), Malaysia

GGHH Agenda Goals

- Water

Organization Goal

- To reduce the volume of utilized water through limiting water consumption and wastage
- To fully utilize the recycled reject water from the water treatment system for non-critical water use such as toilet flushing, watering plants and cleaning the premises
- To create a tranquil and calming atmosphere at the lobby from the soothing water flow sound made by the “water curtain” which utilizes recycled reject water

Progress Achieved

Penang Buddhist Dialysis Center moved to a new building on 14 January, 2015. After transferring, a more advanced and improved water treatment system was used in processing the water for hemodialysis treatment

With this water treatment system we are able to:

1. Re-use the reject water or recycle the reject water after passing through the Reverse Osmosis (RO) membrane without compromising the water quality in terms of chemical composition, bacteria and endotoxin count. The mentioned indicators comply with ISO 13959, standard requirement for processing hemodialysis water
2. The installed water treatment system has energy saving features which uses inverter control. This technology only produces dialysis water based on demand through the RO pump.
3. Collect and store the “dump water” (final reject water) from the water treatment system for toilet flushing, cleaning of the building premises, watering the plants and the “water curtain”. In addition to the Water Treatment System which allows us to utilize reject water, we are also implementing controls to reduce water consumption. These controls are as follows: Volume Controlled Faucets:
 - typical taps discharge 15 to 18 liters per minute compared with low-flow and aerating models which
 - Taps with an aerator or flow restrictor may reduce flow to less than one third of the standard taps.
4. Dual Flush Toilets
 - an old-style single flush toilet can use up to 12 liters of water in one flush, whereas more water efficient dual flush toilets average less than four liters

By using the controlled flow tap and dual flush toilets, on average of each visit to the washroom enable us to save 9.9 L of water. With the total occupant of 100 people and on average of 5 visits per person to the washroom, we are able to save 4,950 L of water per day, which is equivalent to USD \$0.68 (Ringgit Malaysia-RM 2.87) /day (USD \$0.13/ RM 0.58 - per 1000L). This enable us to save as much as USD \$ 247 (RM 1033.20)/year.

In hemodialysis, on every treatment, each patient uses up 150 Liter of RO (Reverse Osmosis) water which mean raw water consumption is 300 liters based on 50% recovery from the conventional RO system (Advance water treatment system which we are using uses much less raw water); which means each patient would require only 200 liter of raw water per treatment. By reusing the reject water from the water treatment system we reduce water consumption and tremendously reduce the cost and water wastage. With the current 120 patients, we will be able to save 12,000L = USD \$16.63 (RM69.60) and with average of 12 treatments for each patient per month, we save USD \$200 (RM 835.20).



The table below presents savings on water consumption and expenditures. The computation is based on constants such as average time for washing hands (10 seconds), tap flow (2.5 L per wash for typical tap flow and 0.6 L per wash for controlled tap flow), volume of water for flushing (12 L for single flush and 4L for dual flush system) and volume of recycled water through the water recycling system.

Table 1.0 Comparison of Water Consumption and Expenditure Base on Water Control System Installed

Water Taps and Toilet Flush

Water Control System	Average Daily Usage	Total Water Usage	Water Saved	Total Water Saved (for 100 persons)	RM Saved Daily
Standard Tap (15 L/Min)	5 times (10 secs) / person / day	12.5 L	9.5L	950 L	USD \$0.13 (RM 0.551)
Controlled Flow Tap (4L/Min)		3.0 L			
Single Flush System (12L/ Flush)	5 times / person / day	60 L	40L	4000 L	USD \$0.55 (RM 2.32)
Dual Flush System (4L/ Min)		20 L			

Reverse Osmosis Water Treatment System

Water Control System	Average Daily Usage	Total Water Usage for 120 patients	Water Wasted (as reject water)	Total Water Saved (per 100 patient for one treatment)	RM Saved
Previous Water Treatment System	36000	18000	18000	the calculation is based on dialysis treatment of 4 hours-each patient using 120 L of RO water per treatment	
New RO Water Treatment System	24000	18000	8000	10000L from raw water and 8000 L from the reject water are fully recycled. A total of 18000	USD \$ 2.49 (RM 10.44)

The Issue

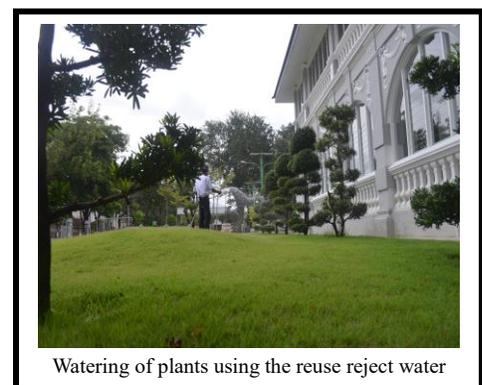
Malaysians' water consumption per person is over 200 L per day which contributes great impact on the environment. Much more can be done in environment protection by saving and reducing water wastage.

Sustainability Strategy Implemented

The water treatment system enables the reuse of reject water and improves the recovery of the water 90% (conventional water treatment systems recover only 40 – 60%). With this specially designed system, we are able to fully reuse the reject water for flushing the toilets, cleaning the building premises and watering the plants allowing us to conserve water

Malaysia is blessed to have plenty of rain water but we need to be more conscientious in using water as environment conservation is one of Tzu Chi's missions.

We have also placed posters or messages for staff/volunteers to conserve water.



Watering of plants using the reuse reject water

Implementation Process

The old water treatment system had the reject water being discarded. This was replaced by a new one, the Reverse Osmosis (RO) Water Treatment System. The new water treatment system is able to reduce consumption and wastage of water.

Water Treatment is mandatory for hemodialysis treatment and RO water is very critical in hemodialysis treatment. Hemodialysis cannot be carried out without RO water, making it an imperative for the Dialysis

Center to install the equipment.

Tracking Progress

Assuring the high quality of purified water (permeate), it is regularly tested as part of quality assurance and to note possible actions for improvement. The recommendations are based on the Association for the Advancement of Medical Instrumentation Standards (AAMI Standards) and adhere to the guidelines by the Ministry of Health (Malaysia).

Challenges and Lessons Learned

Many people are still unaware of the substantial water consumption for hemodialysis treatment and amount of water being “wasted” as the reject water are being discarded from the water treatment system. Employees and volunteers learned about the reuse of reject water. Awareness on substantial water consumption enabled them appreciate the resources.

Next Steps

We are looking forward to ensuring that the water consumption at the center are limited and conscientiously used; optimizing reuse of processed water while maintaining its high quality. We will continue to monitor and abide to the required guidelines.

We also plan to check with the technical staff on how we can monitor the water consumption at different areas e.g. clinical for hemodialysis treatment, general area like the hall and the office premises.

Demographic information

Buddhist Tzu Chi Dialysis Center was the first dialysis centre 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 3 Tzu-Chi Dialysis centres in Malaysia, Penang (PGDC), Butterworth (BWDC) and in Alor Star (KDC).

As at 15th of August 2016,

- PGDC has 36 Hemodialysis machines, a total of 126 patients and 32 nursing staff
- BWDC has 33 Hemodialysis machines, a total of 94 patients and 21 nursing staff
- KDC has 22 Hemodialysis machines, a total 69 patients and 21 nursing staff

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

Links

<http://tzuchi.org.my>

Quotes:

Water is a precious commodity and every drop counts - Teoh Bee Ling

Keywords / topics:

Reuse of Reject Water from water treatment system/Water-the precious commodity

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