

Greywater Treatment Pilot Study-4 Barrel system at CED

Pilot study background

- Being Centre of Excellence on Solid and Liquid waste Management, CED is investigating alternative methods for greywater treatment that can be suitable for treating greywater from households/flats/hotels/hospitals/service stations & other major water consumers and assuring that the quality of effluent will be suitable for many recycling/reuse options

Source and quantity of greywater

- Utensil wash water from kitchen and lunch box wash water by the staff.
- The quantity of greywater generated is 120 l/day
- The methods adopted are bucketing method and analytical method

Characteristics of greywater

Characteristics analyzed	
TSS (mg/L)	480
ACIDITY as CaCO ₃ (mg/L)	82.5
ALKALINITY as CaCO ₃ (mg/L)	120
CHLORIDE (mg/L)	35.98
HARDNESS as CaCO ₃ (mg/L)	19
BOD (mg/L)	430
COD (mg/L)	456.7
OIL & GREASE (mg/L)	78
SULFATE (mg/L)	45
TEMPERATURE (°C)	31.2
pH	7.28
CONDUCTIVITY (μs)	258
TDS (ppm)	128
TURBIDITY (NTU)	264
NITRATE-N (mg/L)	0.0997
NITRITE-N (mg/L)	0.026
AMMONIA-N (mg/L)	1.354
PHOSPHATE (mg/L)	0.12
MPN (MPN/100 ml)	Nil

4 Barrel system

- Simple, Low cost method
- Low O&M and less land requirement
- No skilled labour required
- Easily available raw materials
- Minimal construction and implementation time

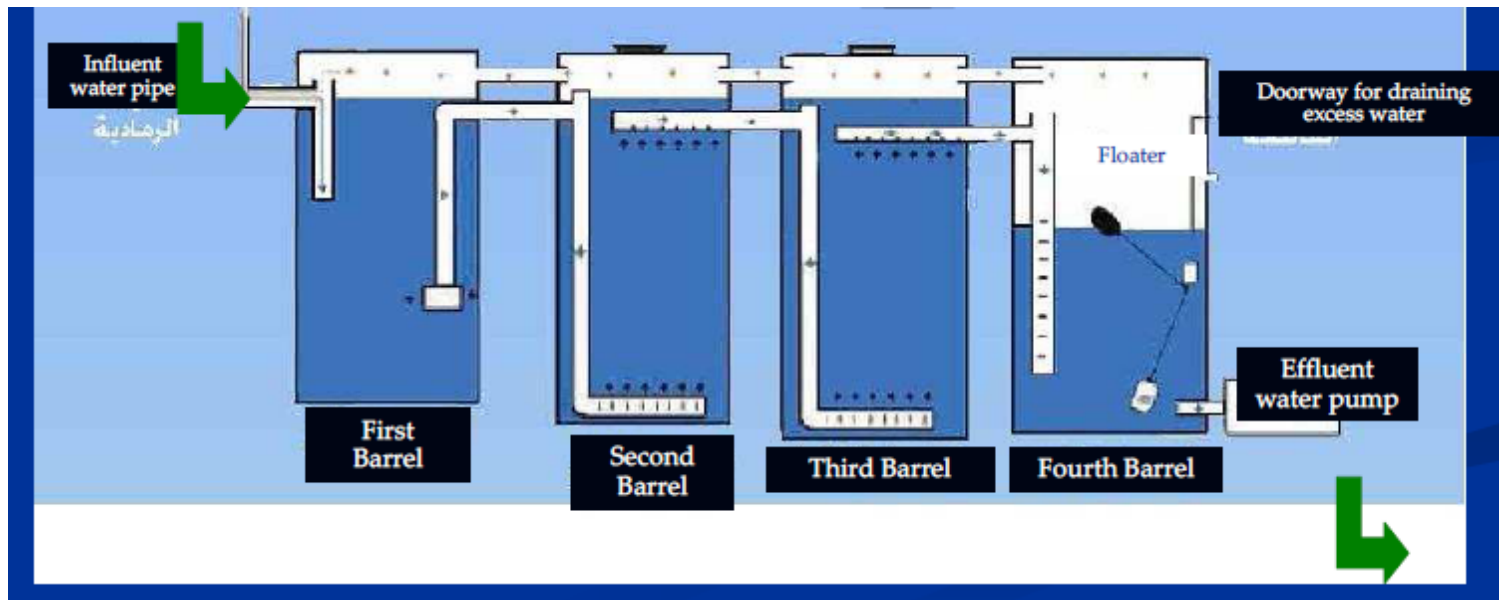
Materials used

- Four recycled polyethylene (PE) plastic barrels of 200 l capacity
- polyvinyl chloride (PVC) pipes (4")
- Filter media – crushed plastic materials of 2-3 cm size
- Filter bag – nylon net to hold filter media

Treatment process

- Pre-treatment: Equalization tank to reduce turbulence in the settling tank
- Settling tank: grease, oil and settled solids are removed by flotation and gravity effects
- Intermediate filter tank: The second and third barrels were filled with media of size 2–3 cm, which acts as a submerged attachment surface for micro organisms under anaerobic conditions.
- Flow in the second and third barrels is directed in such a way that grey water passes in an up-flow direction through the medium so as to achieve biological treatment over a retention time of two to three days.
- Final Collection tank: Treated water holding tank with an overflow arrangement prior to treated water use

Design of 4 barrel system



4 barrel system installed at CED





Results from literature reviewed

(Al-Beiruti S.N 2003)

Sample type	pH	TSS	O&G	BOD5	ABS
11-6-02	6.8	183	31	844	110
14-8-02	4.7	165	7	564	95
14-12-02	6.3	76	44	369	NT
17-02-03	7.4	128	40	246	170
29-05-03	8.2	88	NT	225	NT
^a NT= Not tested					

Characteristics of greywater (28/04/2010)

Characteristics of sample		
Parameter	Inlet	Outlet
pH	5.02	6.12
Conductivity	117.3 μ S	321 μ S
TDS	58.1 mg/L	169 mg/L
Temperature	29.8 ^o C	29.7 ^o C
TSS	210 mg/L	20 mg/L
Turbidity	188.1 NTU	25.5 NTU
Alkalinity	90 mg/L	145 mg/L
Acidity	110 mg/L	65 mg/L
Hardness	40.5 mg/L	65 mg/L
Chloride	58.15 mg/L	75.435 mg/L
Sulphate	426 mg/L	170.4 mg/L
Phosphate	25.59 mg/L	24.95 mg/L
Nitrate – N	3.6752 mg/L	0.0097 mg/L
Nitrite – N	0.1348 mg/L	0.1322 mg/L
NH ₄ - N	0.367 mg/L	0.680 mg/L
BOD	387 mg/L	247.5 mg/L
COD	441.728 mg/L	315.52 mg/L

Monitoring and modifications

- Regular monitoring of effluent quality till achieving stabilization
- Based on the performance necessary modifications will be made
- Impacts of greywater use for irrigation on the environment
- Health impact on contact with treated water

Constraints

- Existing plumbing connections are not meant for any treatment so that in order to ensure gravity flow, earth excavation was needed
- Pumping of treated water required for reuse/recycle

Activity chart	
Date	Activity carried out
10/04/2010	Detailed drawing and instruction to plumber
13/04/2010 – 14/04/2010	Purchase of barrel and other materials required and fabrication
19/04/2010 – 20/04/2010	Site clearing and excavation at CED
21/04/2010	Installation and inlet connection to treatment system
22/04/2010	Filter media insertion and earth covering
26/04/2010	Treated water on collection tank
28/04/2010	Sample collection for analysis

Expenses	
Material cost	
Barrel	3600/-
Plumbing materials	2500/-
Labour charge including plumbing work	2800/-
Transportation charge	500/-
Total	9400/-