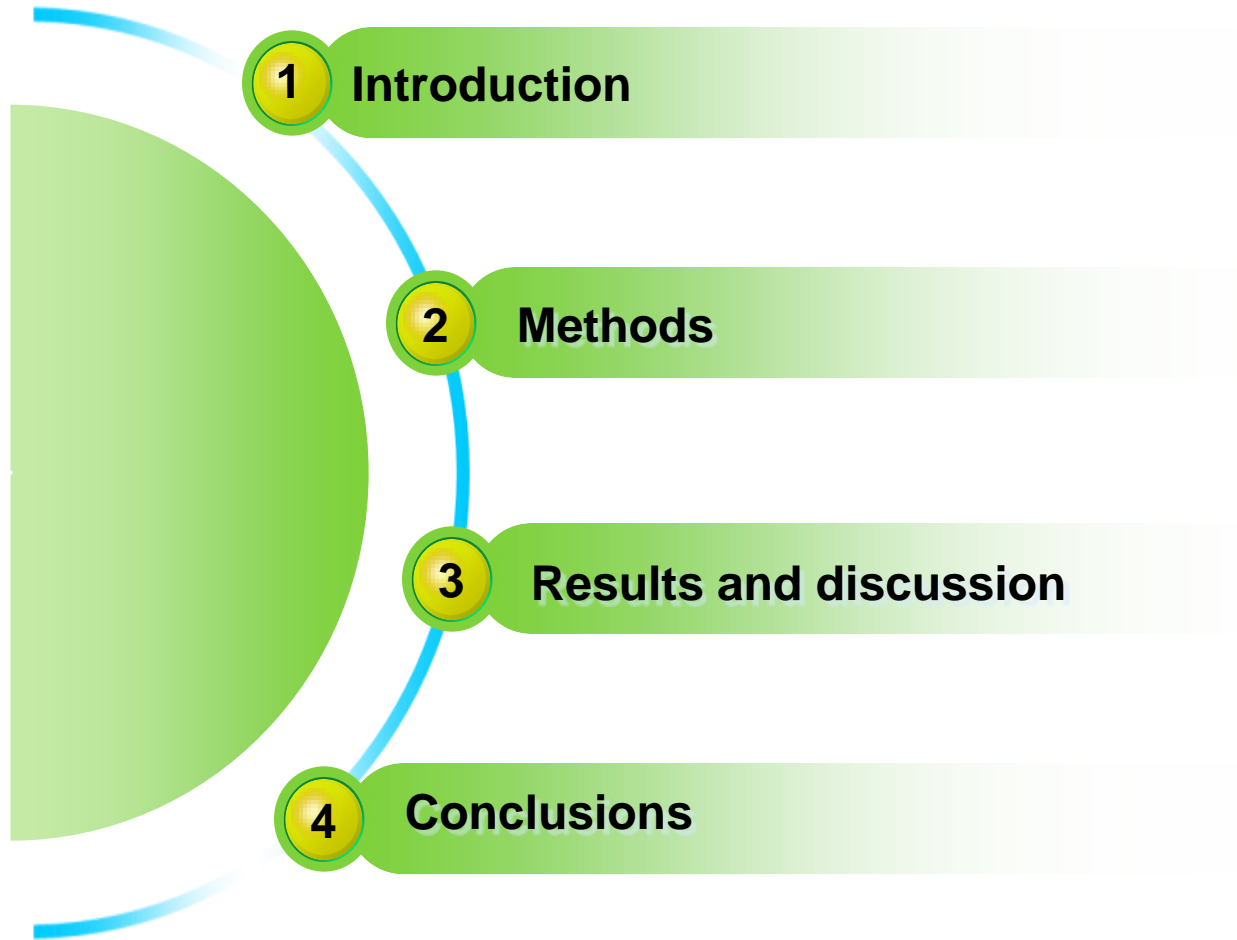


*Applications of High Efficient Vertical Flow
Constructed Wetland for Treatment and Reuse of Dom
estic Sewage in Residential Community*

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Advantages of High Efficient Vertical Flow Constructed Wetland

Advanced process

Reliable technology

High efficiency

Saving engery

Convenient in operation

Saving investment

Lower running cost

Improving landscape



2 Methods

High efficient vertical flow constructed wetland had been applied in treatment and reuse of wastewater in residential community including domestic wastewater treatment system and lake water circulating treatment system.

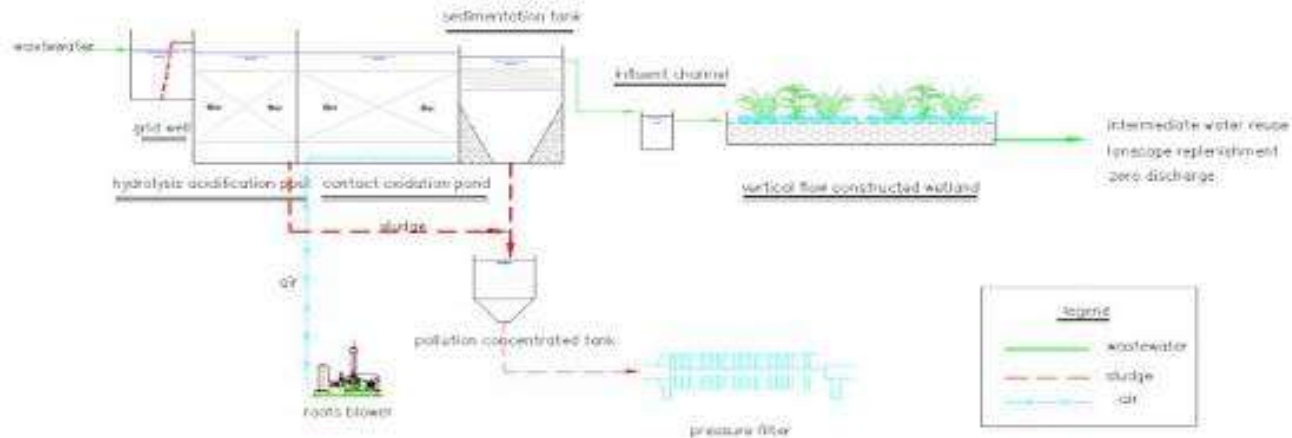


Fig. 1 CWs for domestic sewage treatment



2 Methods

The System consists of 2 parts:

- 1 - The Pre-Treatment System
- 2 - The Constructed Wetland System.

The Pre-Treatment System includes 3 parts:

- 1 - Hydrolysis Acidification Pool
- 2 - Contact Oxidation Tank
- 3 - Sedimentation Tank

The Hydraulic Retention Time (HRT) are all 3h in the hydrolysis acidification pool and in the contact oxidation tank. The Bio film was hung in the tanks with 3m high. The air/water ratio was 3:1 in the contact oxidation tank. The reaction time in the sedimentation tank was 30 minutes. The pre-treatment system removed about 50% of the pollutants, which ensures the water quality to flow into the constructed wetland system. The hydraulic capacity in the wetland was about $0.3 \text{ m}^3/\text{m}^2\text{d}$.



2 Methods

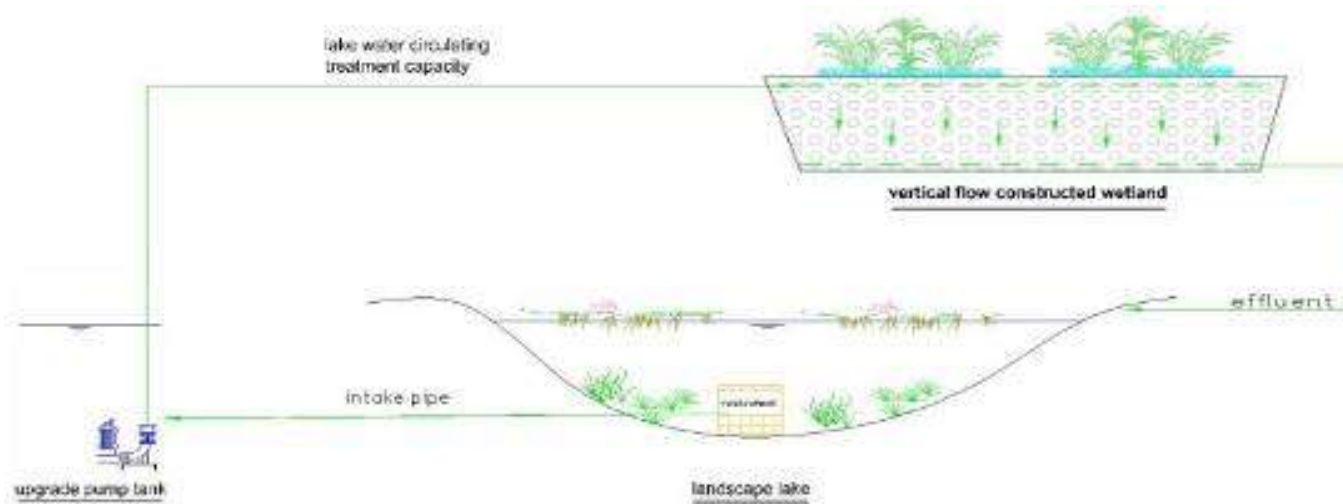


Fig. 2 CWs for lake water circulating treatment

Lake water flows through the intake pipe into the pump tank, and then the water is pumped up into the constructed wetland. Effluent from the constructed wetland flows back into the landscape lake and is thereby re-circulated. No pre-treatment is needed in this system. The hydraulic capacity in the wetland was about $1\text{m}^3/\text{m}^2\text{d}$.

3 Results and discussion

Table 1. Major design parameters of HEVFCW systems applied in China.

	Tiger Apartment CW	Gemdale CW	Vanke City CW
Start of operation	10/2005	3/2006	5/2006
Design wastewater treatment capacity(m ³ /d)	30	5000	500
Type of influent	Domestic sewage	Domestic sewage	Lake water
Pretreatment	①+②(*)	①+②+③(*)	None(*)
HEVFCW area(m ²)	90	10000	500
HC(m/d)	0.33	0.5	1.0
HRT(h)	43.2	34.5	11.5
Filtration material(size in mm)	Sand,Gravel (1-40,layer laying)	Sand,Gravel (1-40,layer laying)	Sand,Gravel (1-40,layer laying)
Function of effluent	Greening water	Greening water	Lake water circulating

(*)①: Hydrolysis acidification pool,②: Contact oxidation tank,③: Sedimentation tank

3 Results and discussion



Tiger Apartment System

Treatment capacity of the constructed wetland system for sewage purification in Tiger Apartment is 30m³/d. The effluent water is reused for watering the lawn irrigation of the area.

Table 2 Treatment effect of Tiger Apartment constructed wetland system for domestic wastewater

Index	SS(mg/L)	COD(mg/L)	BOD ₅ (mg/L)	NH ₄ -N(mg/L)	TP(mg/L)
Influent quality	78	176	86	32.8	3.07
Effluent quality	5	15	2	7.4	0.08
Regulation limits ^a	--	--	20	20	--
Removal efficiency (%)	93.5	91.4	97.6	77.4	97.3

^a Water quality standard for urban miscellaneous water consumption (GB/T18920-2002) urban greening standard.



Gemdale Lihucheng CW

Gemdale Lihucheng, a small residential community, is located in Guangzhou city. This community occupies a large area but there is no municipal drainage service. To protect the aquatic ecosystem of the lake in the area, a constructed wetland system was built for the treatment and reuse of the domestic sewage water. The system consists of 20 dispersed constructed wetlands. The total treatment capacity is 5000m³/d. All the effluent water is reused for watering the lawn irrigation of the area and replenishing the lake.

Table 3 Treatment effect of Gemdale constructed wetland system for domestic wastewater

Index	SS(mg/L)	COD(mg/L)	BOD ₅ (mg/L)	NH ₄ -N(mg/L)	TP(mg/L)
Influent quality	95	200	88.6	21.7	2.2
Effluent quality	14	26	1.1	6	0.1
Regulation limits ^b	20	40	20	10	0.5
Removal efficiency (%)	85.3	87	98.7	72.3	95.4

^bPollutant emission limit value for wastewater (DB44/26-2001) Grade I standard.

3

Results and discussion



Vanke City is a residential community. There is a landscape lake of 10000m² in the community. We designed and built the constructed wetland for lake water circulating purification, for treatment of the collected rainwater. Treatment capacity of this system is 500m³/d. 500m³/d lake water flows through constructed wetland and then returns to the lake. Meanwhile, 500m³/d of lake water flows directly back into the lake without treatment to keep water flowing.

Vanke City CW

Table 4 Treatment effect of Vanke City constructed wetland system for lake water

Index	SS(mg/L)	COD(mg/L)	NH ₄ -N(mg/L)	TP(mg/L)
Influent quality	10	17	0.45	0.29
Effluent quality	6	16	0.08	0.02
Regulation limits ^c	--	30	1.5	0.1
Removal efficiency (%)	40	--	82.2	93.4

^cEnvironmental Quality Standards for Surface Water (GB 3838-2002) Grade IV standard.

4

Conclusions

Results from the application of the HEVFCW revealed that this new CW with the pre-treatment system can achieve a high pollutant removal efficiency. Effluent concentration could all meet the discharge regulation limits for reuse of recycling water for urban in China.

Up to date, all the constructed wetland water treatment systems have been operating effectively and achieved desirable treatment effects. These successful application cases demonstrate that the technology has matured and should be applied more and more widely.



Thank You for Your Attention!

