Workshop of „Tisa-Tisza Project”

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A COMBINED CONSTRUCTED WETLAND FOR TREATMENT OF MILK HOUSE EFFLUENTS IN HÓDMEZŐVÁSÁRHELY, HUNGARY

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Constructed wetlands in Hungary

- Water pollution control – many technological alternatives – environmental aims - economical opportunities
- The agriculture needs to decrease the free water pollution and groundwater pollution of sector
- Constructed wetlands: cost effective technological opportunity
- TOKAI-project
  - Local University
  - Katholieke Hogeschool Kempen Geel (Belgium)
- Aim of research

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– Horiz
– Stabilization p
– Drain-field

Sampling and analysis

Parameters and analyzing methods

Parameters	Methods/Instruments
COD	Photometric Method/ PC-Multidirect
TN	Photometric Method/ PC-Multidirect
NH_4-N	Photometric Method / PC-Multidirect
TP	Photometric Method / PC-Multidirect
PO_4-P	Photometric Method / PC-Multidirect
pH	Standard method / OP-264/1 pH-meter

Water samples were analyzed in the lab of University of Szeged, College of Agriculture

Description of sampling points

Sampling points	Description
I.	In pump chamber
II.	Effluent of vertical flow SF-CW
III.	Effluent of horizontal flow SF-CW
IV.	Effluent of stabilization pond

Characterization of influent

- Wastewater is transported to the septic tank of pilot plant from the collection chamber of cow milk house
- Amount of wastewater is 1m^3/day
- Quality after mechanical pre-treatment:

	COD [mg/l]	TN [mg/l]	NH_4-N [mg/l]	TP [mg/l]	PO_4-P [mg/l]	pH
Min.	223	55	28.0	18	17.6	6.8
Max.	678	98	49.8	37	29.0	7.3
Av.	453	71.8	39.3	25.8	23.6	7.1
PE*	3.8	6.5	4.4	8.6	-	-

- Higher COD, TN and TP concentration than commercial wastewater
- BOD:COD ratio is 1:5.3 – low biodegradibility
- Strong anaerobic condition

Experiences of vertical flow bed

Experiment results and some calculated parameters of vertical flow bed

		COD [mg/l]	TN [mg/l]	NH_4-N [mg/l]	TP [mg/l]	PO_4-P [mg/l]	pH
calculated parameters	Min. conc. of effluent	48	18	17.1	17.0	15.7	7.1
	Max. conc. of effluent	620.0	67.0	65.0	34.0	24.0	7.5
	Av. conc. of effluent	247.4	44.7	37.5	25.3	19.8	7.2
	Av. efficiency (%)	45.4	37.8	4.6	2.1	16.3	-
	Specific area (m^2/PE)	2.2	1.3	1.9	1.0	-	-
	Av. loading (g/day)	453	71.8	39.3	25.8	23.6	-
	Specific loading rate (g/m^2,d)	53.9	8.5	4.7	3.1	2.8	-
	Hydraulic loading rate (mm/d)			119			

Experiences of horizontal flow bed

Experiment results and some calculated parameters of horizontal flow bed

		COD [mg/l]	TN [mg/l]	NH_4-N [mg/l]	TP [mg/l]	PO_4-P [mg/l]	pH
calculated parameters	Min.	33	17	10.6	5.9	5.2	7
	Max.	430.0	58.0	27.2	29.0	22.8	8.0
	Av.	177.1	32.2	17.5	20.8	15.9	7.5
	Av. efficiency (%)	28.4	28.1	53.2	17.7	19.5	-
	Specific area (m^2/PE)	3.8	2.2	3.3	1.7	-	-
	Av. loading (g/day)	247.4	44.7	37.5	25.3	19.8	-
	Specific loading rate (g/m^2,d)	17.4	3.1	2.6	1.8	1.4	-
	Hydraulic loading rate (mm/d)	70					

Experiences of stabilization pond

Experiment results and some calculated parameters of stabilization pond

		COD [mg/l]	TN [mg/l]	NH_4-N [mg/l]	TP [mg/l]	PO_4-P [mg/l]	pH
calculated parameters	Min.	74	5	0.22	3.9	3.4	7.04
	Max.	177.0	25.0	12.4	22.0	7.2	8.2
	Av.	115.5	13.8	5.0	10.7	4.6	7.6
	Av. efficiency (%)	34.8	57.0	71.6	48.7	71.1	-
	Specific area (m^2/PE)	3.2	1.8	2.8	1.4	-	-
	Av. loading (g/day)	177.1	32.2	17.5	20.8	15.9	-
	Specific loading rate (g/m^2,d)	14.8	2.7	1.5	1.7	1.3	-
	Hydraulic loading rate (mm/d)	83					

Comparison of Hungarian ELV and effluent quality

Component	ELV (mg/l)	Quality of effluent from pond			Total efficiency (%)
		min.	max.	av.	
COD	300*	74	177	115.5	74.5
NH_4-N	20*	0.22	12.4	5	87.3
TN	55*	5	25	13.8	80.7
TP	10*	3.9	22	10.7	58.7

*ELV under 600 PE (Hungarian law number: 28/2004 (XII.25) KvVM r.)

CONSCLUSIONS

- The efficiencies are very good for the complete system especially if it is noted that values do not contain the removal of mechanical pre-treatment.
- The pilot plant hadn’t overrun the ELV for COD, TN and NH_4-N.
- The TP removal efficiency is adequate too, but not enough to keep the Hungarian ELV for free surface water.
- The efficient of COD and NH_4-N removal can increase with higher specific area of VF-SFCV
- Because of low number of data, need to make a more detailed measuring program focused on the long-term and winter time processes

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Thank you for your attention!