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Reed Bed Treatment System

Sewage treatment plant
Lahstedt-Gadenstedt

Owner:
Municipality Lahstedt
Am Breiten Tor 1
D-31246 Lahstedt, Germany

Optimization of a trickling filter
for domestic sewage treatment with
planted artificial wetlands

Population equivalent:
3000 PE in Gadenstedt

Planning: 1995-1996
Construction: 1997-1998

Presented as registered project of world exhibition
Expo 2000 Hannover

Wastewater treatment plant from 1959:
- trickling filter

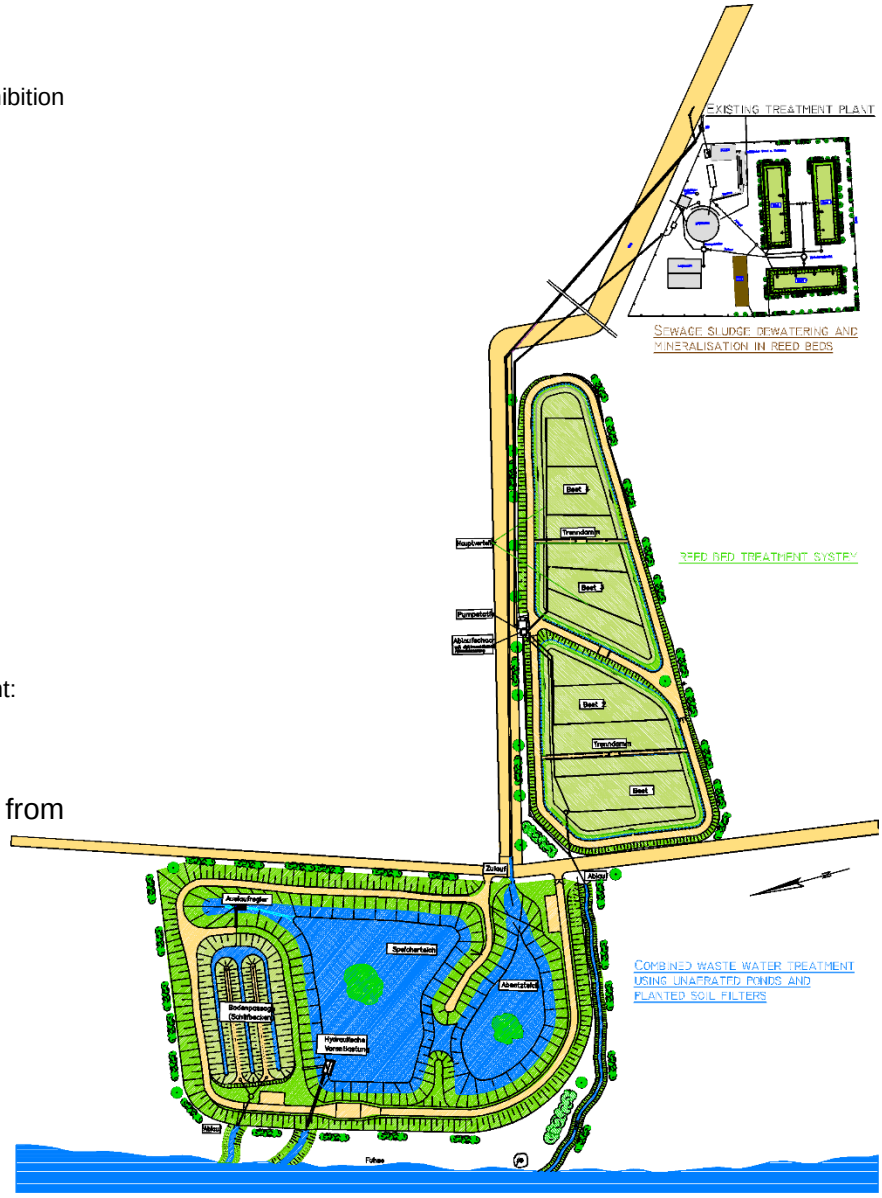
Structural alteration measure:
- new grit chamber and screen
Enhancement of the old trickling filter:
- 4 reed planted artificial wetlands
- 3 reed planted sludge drying beds
- storm water treatment biotope

Space requirement for artificial wetlands:
10.000 m² gross; 6.500 m² net
Design parameters:
500 m³/d (dry weather) – 2000 m³/d
(stormwater)

Space requirement for storm water treatment:
- 17.000 m² with green areas around

Design parameters:
123.000 m³/a and 19.250 kg COD/a from
38,5 hectare paved area

Special features:
- successful operation
  of the artificial wetland
  as secondary
  treatment step
  (shutdown of trickling
  filter, see results
  on the next page)



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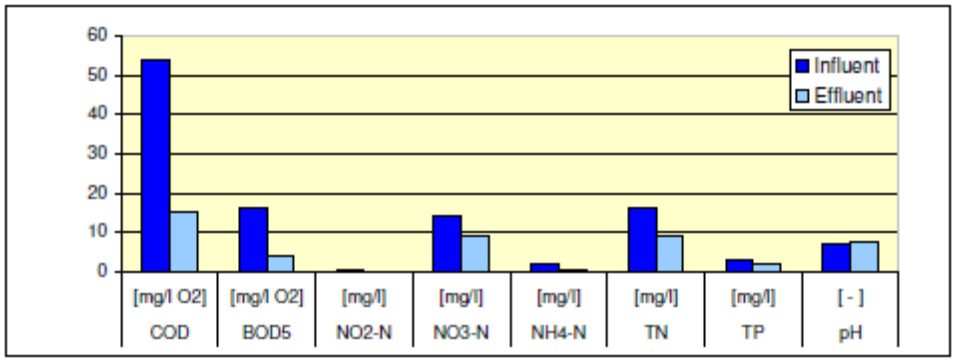
Performance of the reed bed treatment system in Lahstedt-Gadenstedt

Tertiary treatment of trickling filter effluent

October 2004 - September 2005
Primary/secondary treatment: fine screen, aerated grit chamber, primary sedimentation, trickling filter

Mean values	COD [mg/l O2]	BOD_5 [mg/l O2]	NO_2-N [mg/l]	NO_3-N [mg/l]	NH_4-N [mg/l]	TN [mg/l]	TP [mg/l]	pH [-]	n *
Influent	54	16	0,3	14,0	2,0	16,0	3,0	7,3	50
Effluent	15	4	0,1	9,0	0,7	9,0	2,0	7,4	50



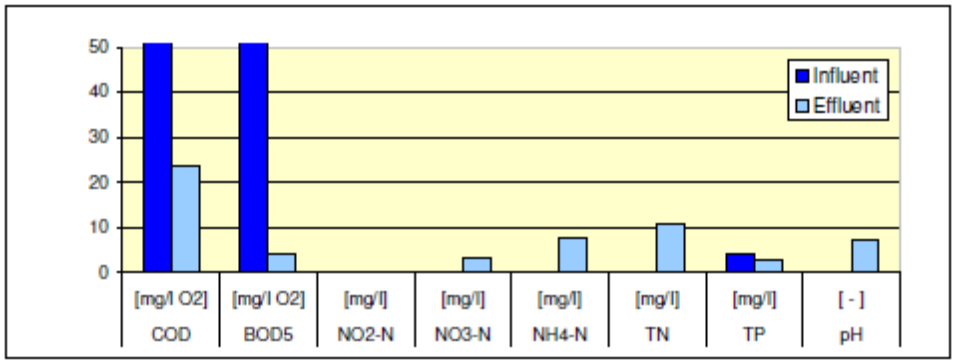
Average hydraulic loading rate: 128 l/m²xd

Table 1

Secondary treatment of municipal wastewater

December 2001 - April 2002
Primary treatment: fine screen, aerated grit chamber, primary sedimentation

Mean values	COD [mg/l O_2]	BOD_5 [mg/l O_2]	NO_2-N [mg/l]	NO_3-N [mg/l]	NH_4-N [mg/l]	TN [mg/l]	TP [mg/l]	pH [-]	n
Influent	301	165	0,6	9,8	13,4	22,1	4,1	7,5	19
Effluent	24	4	0,1	3,1	7,5	10,7	2,9	7,3	19



Average hydraulic loading rate: 137 l/m²xd

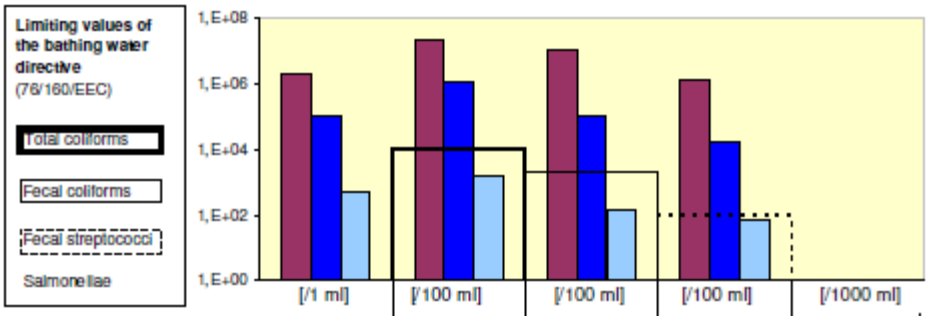
Table 2

n * = number of samples

Pathogen removal of the reed bed treatment system in Lahstedt-Gadenstedt

Tertiary treatment of trickling filter effluent

July 1998 - November 2001
Primary/secondary treatment: fine screen, aerated grit chamber, primary sedimentaion, trickling filter



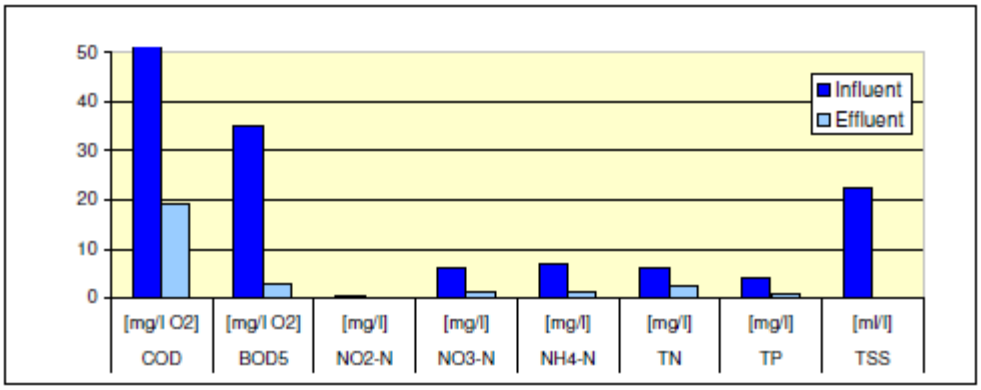
	[/1 ml] Cfu 20°C	[/100 ml] Total coliforms	[/100 ml] Fecal coliforms	[/100 ml] Fecal streptococci	[/1000 ml] Salmonellae	n*
Trickling filter influent	2,0E+06	2,4E+07	1,1E+07	1,4E+06	0,0	1
Trickling filter effluent	1,0E+05	1,1E+06	1,1E+05	1,8E+04	0,0	4
Reed bed effluent	4,9E+02	1,5E+03	1,5E+02	7,0E+01	0,0	5
Limiting value (76/160/EEC)		1,0E+04	2,0E+03	1,0E+02	0,0	

Table 3

Performance of the combined wastewater biotope in Lahstedt-Gadenstedt

July 1998 - September 2001

	COD [mg/l O2]	BOD_5 [mg/l O2]	NO_2-N [mg/l]	NO_3-N [mg/l]	NH_4-N [mg/l]	TN [mg/l]	TP [mg/l]	TSS [ml/l]	n*
Influent	279	35	0,5	6,1	7,0	6,4	4,1	23	22
Effluent	19	3,0	0,0	1,3	1,3	2,5	0,9	0,0	47



n * - number of samples

Table 4

	Cfu 20°C [/1 ml]	Total coliforms [/100 ml]	Fecal coliforms [/100 ml]	Fecal streptococci [/100 ml]	Salmonellae [/1000 ml]	n
Trickling filter influe	2,0E+06	2,4E+07	1,1E+07	1,4E+06	0,0	1
Trickling filter efflue	1,0E+05	1,1E+06	1,1E+05	1,8E+04	0,0	4
Reed bed effluent	4,9E+02	1,5E+03	1,5E+02	7,0E+01	0,0	5
Badegewässerrichtlinie						
Leitwert		5,0E+02	1,0E+02	1,0E+02	-	
Limiting value (76/160/EEC)		1,0E+04	2,0E+03	1,0E+02	0,0	