



VĮ STATYBOS PRODUKCIJOS SERTIFIKAVIMO CENTRAS
Linkmenų str. 28, LT-08217 Vilnius, Lithuania
Notified body No. 1397



BANDYMAI
ISO/IEC 17025

LIETUVOS
NACIONALINIS
AKREDITACIJOS
BIURAS

Nr. LA. 01.103

Waste water treatment plant laboratory

TEST REPORT No. 1397-CPR-105/B

According EN 12566-3:2005+A2:2013 annex B (Treatment efficiency test)
2015-02-18

1. **CLIENT:** AQUATECH Ltd, address Poznanska street 148A, 18-400 Lomza, Poland, Wojciech Babiński address Polowa street 15/46, 18-400 Lomza, Poland, PESEL 76062506437, Beata Babińska address Polowa street 15/46, 18-400 Lomza, Poland, PESEL 76101904141. Contract No. NVI-31_2012.
2. **MANUFACTURER:** AQUATECH Ltd, address Poznanska street 148A, 18-400 Lomza, Poland.
3. **SAMPLE:** Small wastewater treatment plant (WWTP) VORTEX 3, nominal hydraulic load 0,9 m³/d. Material – Polyethylene. Biological waste water treatment process with activated sludge, with solenoid valve for floating sludge. Detailed WWTP description and technical information provided in the Annex I: Vortex Operation Manual, 10 pages.
4. **SAMPLE DELIVERY DATE:** 2012-11-28.
5. **TESTING LOCATION, ADDRESS AND DATE:**
 - Wastewater treatment plant laboratory Maišiagala, Vilnius district.
 - The date presented in the Table 2.
6. **SAMPLING:** Sampling was made by the Client. Sampling report No. 031-AQUATECH.
7. **THE TEST MADE ACCORDING TO:**
EN 12566-3:2005+A2:2013 Small wastewater treatment systems for up to 50 PT — Part 3: Packaged and/or site assembled domestic wastewater treatment plants, items 6.3 and Annex B.
8. **TEST SPECIFICATIONS:**
During the test inlet and outlet samples were taken flow-bases composites over 24 hours. During the test in the aeration chamber were measured temperature, pH and dissolved oxygen concentration.
The following parameters were measured in the Table 1.

Table 1. Parameters measured during the test *

	Parameter	Abbreviation	Measurement method	Units
1	Biochemical oxygen demand	BOD ₅	EN 1899-1:2000	mg/l
2	Chemical oxygen demand	COD	ISO 6060	mg/l
3	Suspended solids	SS	EN 872	mg/l
4	Kjeldahl Nitrogen	N _{kj}	EN 25663:2000	mg/l
5	Phosphorus	P	EN ISO 6878	mg/l
6	Ammonium nitrogen	NH ₄ -N	ISO 7150-1	mg/l
7	Nitrate	NO ₃ -N	ISO 7890-3:1998	mg/l
8	Nitrite	NO ₂ -N	EN 26777:1999	mg/l
9	Total nitrogen	N _{tot}	N _{tot} = N _{kj} + NO ₃ -N + NO ₂ -N	mg/l

*Work made by subcontractor. Reports are kept at Waste water treatment plant laboratory. WWTP VORTEX 3 test was started after biomass establishment sequence. The test was performed with 0,9 m³/d hydraulic flow.



VĮ STATYBOS PRODUKCIJOS SERTIFIKAVIMO CENTRAS
Linkmenų str. 28, LT-08217 Vilnius, Lithuania
Notified body No. 1397



LIETUVOS
NACIONALINIS
AKREDITACIJOS
BIURAS

BANDYMAI
ISO/IEC 17025

Nr. LA. 01.103

Waste water treatment plant laboratory

The test schedules are listed in the Table 2:

Table 2. The test schedules

Sequence	Sequence name. Characteristic	Time elapsed, weeks
	Start after biomass establishment	2012.12.20
2	NOMINAL. Nominal daily flow	6
3	UNDERLOADING. 50% nominal daily flow	2
4	NOMINAL – POWERBREAK DOWN. Nominal daily flow	6
5	LOW OCCUPATION STRESS. No flow	2
6	NOMINAL. Nominal daily flow	6
7	OVERLOADING 150 % nominal daily flow	2
8	NOMINAL – POWERBREAK DOWN. Nominal daily flow	6
9	UNDERLOADING. 50% nominal daily flow	2
10	NOMINAL. Nominal daily flow	6
	End of test	2013.11.28

The daily flow pattern used for testing in Table 3:

Table 3. Daily flow pattern (EN 12566-3:2005+A2:2013 B.3.3)

Period h	Percentage of daily volume %
3	30
3	15
6	0
2	40
3	15
7	0

There were no deviations from standard EN 12566-3:2005+A2:2013 annex B procedures.



VĮ STATYBOS PRODUKCIJOS SERTIFIKAVIMO CENTRAS
Linkmenų str. 28, LT-08217 Vilnius, Lithuania
Notified body No. 1397



LIETUVOS
NACIONALINIS
AKREDITACIJOS
BIURAS

BANDYMAI
ISO/IEC 17025

Nr. LA. 01.103

Waste water treatment plant laboratory

9. TEST RESULTS.

The tested organic daily load 0,335 kg/d (mean value of the 20 organic daily loads measured during the nominal sequences).

Efficiency ratios and mean values for each parameter obtained during nominal sequences (with and without power breakdown) is listed in the Table 4.

The individual values for UNDERLOADING and OVERLOADING sequences listed in the Table 5.

The efficiency ratios for UNDERLOADING and OVERLOADING sequences listed in the Table 6.

All measured values during the test are listed in the Table 7.

Table 4. Efficiency ratios and mean values for each parameter obtained during nominal sequences (with and without power breakdown)

Parameter	Unit	Value
BOD ₅	%	98,2
COD	%	94,0
SS	%	97,0
N _{kj}	%	94,7 (94,7*)
N _{tot}	%	22,0 (30,0*)
P	%	43,1
NH ₄ -N	%	98,9 (99,0*)
BOD ₅	mg/l	6,2
COD	mg/l	42,9
SS	mg/l	10,5
N _{kj}	mg/l	4,2 (4,2*)
NO ₂ -N	mg/l	0,7 (0,5*)
NO ₃ -N	mg/l	54,0 (56,0*)
N _{tot}	mg/l	58,8 (62,5*)
P	mg/l	4,3
NH ₄ -N	mg/l	0,8

* - values if temperatures in aeration chamber below 12 °C from calculations are excluded.



VĮ STATYBOS PRODUKCIJOS SERTIFIKAVIMO CENTRAS
Linkmenų str. 28, LT-08217 Vilnius, Lithuania
Notified body No. 1397



LIETUVOS
NACIONALINIS
AKREDITACIJOS
BIŪRAS

BANDYMAI
ISO/IEC 17025

Nr. LA. 01.103

Waste water treatment plant laboratory

Table 5. The individual values for UNDERLOADING and OVERLOADING sequences

Sequence No		3	3	7	7	9	9
Flow rate		50%	50%	150%	150%	50%	50%
Date		2013-02-06	2013-02-13	2013-05-29	2013-06-05	2013-07-31	2013-08-07
Parameter							
Outlet							
<i>t</i>	°C	3,3	4	14,7	16,5	21	21,1
BOD ₅	mg/l	3,3	4,1	3,8	3	6,5	4,8
COD	mg/l	19	37	45	42	61	61
SS	mg/l	1,8	3,1	3,9	6,2	32	29
N _{kj}	mg/l	1,2	1,2	3,36	2,24	3,92	5,6
NO ₂ -N	mg/l	0,213	0,236	0,381	0,489	0,28	0,302
NO ₃ -N	mg/l	55,1	56,4	55,9	58,6	65,6	79,9
N _{tot}	mg/l	55,3	56,6	59,641	61,329	69,8	85,802
P	mg/l	4,24	4,84	3,59	5,2	8,01	8,05
NH ₄ -N	mg/l	0,203	0,157	0,158	0,423	0,153	0,134
pH	-	7,69	7,79	7,63	7,53	7,71	7,58

Table 6. The efficiency ratios for UNDERLOADING and OVERLOADING sequences

Parameter	Unit	Flow rate	
		50%	150%
BOD ₅	%	98,9	98,9
COD	%	95,7	93,5
SS	%	97,3	98,5
N _{kj}	%	96,4	96,4
N _{tot}	%	21,9	24,2
P	%	32,6	39,3
NH ₄ -N	%	99,7	99,5

Table 7. Measured values

Sequence No.	Inlet				Outlet			
	Flow rate	2	2	2	2	2	2	2
Date	2013-01-03	2013-01-09	2013-01-16	2013-01-23	2013-02-06	2013-02-13	2013-02-20	2013-02-27
Outdoor temp.	1	-5	-6	-15	1	0	-5	1
Temperature	°C	8,2	7,9	7,7	7,2	6,9	6,8	6,7
BOD ₅	mg/l	236	294	256	267	349	314	346
COD	mg/l	397	541	469	735	887	552	707
SS	mg/l	204	264	184	216	356	300	320
N _{ki}	mg/l	53,8	49,3	76,2	66,6	101	74,5	73,9
P	mg/l	4,85	5	6,34	6,89	7,47	7,48	7,4
NH ₄ -N	mg/l	44,9	48	55,1	62,2	53,6	63,8	66,7
pH	-	7,21	7,2	7,88	7,87	7,87	7,91	7,94
Temperature	°C	5	4,8	4	2,6	3,3	3,7	4,1
BOD ₅	mg/l	6,1	5,1	5,1	5,7	3,3	9,1	9
COD	mg/l	24	46	42	13	19	46	55
SS	mg/l	7,2	4,5	5,5	3,2	1,8	13	20
N _{ki}	mg/l	2,24	1,2	4,76	1,2	1,2	1,96	3,36
NO ₂ -N	mg/l	0,75	0,485	0,782	0,981	0,213	0,883	1,26
NO ₃ -N	mg/l	45,3	42,4	51,3	56,5	55,1	55,8	51,7
N _{tot}	mg/l	48,29	44,09	56,84	58,68	55,3	58,64	56,32
P	mg/l	2,9	2,89	3,13	3,87	4,24	5,06	4,76
NH ₄ -N	mg/l	0,216	0,155	0,366	0,782	0,203	0,83	0,063
pH	-	7,26	7,43	7,6	7,49	7,69	7,56	7,46

Table 7 continuation. Measured values

Sequence No.	4	6	6	6	6	7	7	7	8	8
Flow rate	100%	100%	100%	100%	100%	100%	150%	150%	100%	100%
Date	2013-03-20	2013-03-27	2013-04-24	2013-04-30	2013-05-22	2013-05-29	2013-06-05	2013-06-19	2013-06-19	2013-06-26
Inlet										
Outdoor temp.	°C	10	13	22	22	22	24	24	23	24
Temperature	°C	7	7,5	10,6	11	11	11,8	11,8	12,8	13,5
BOD ₅	mg/l	302	306	406	342	342	291	291	453	360
COD	mg/l	582	394	616	597	597	782	782	934	876
SS	mg/l	276	208	328	324	324	348	348	456	432
N _{ki}	mg/l	82,9	43,1	54,3	70,6	70,6	91,3	91,3	91,8	97,4
P	mg/l	7,78	4,81	6,88	6,15	6,15	8,25	8,25	9,55	11
NH ₄ -N	mg/l	73,4	38,9	46,8	54	54	64,1	64,1	69,6	69,7
pH	-	7,95	7,85	7,87	7,86	7,86	7,82	7,82	7,71	7,58
Outlet										
Temperature	°C	7,2	8,2	15,6	14,7	14,7	16,5	16,5	16,9	20
BOD ₅	mg/l	5,1	5,6	5,1	3,8	3,8	3	3	3,5	3,1
COD	mg/l	9	48	30	45	45	42	42	48	39
SS	mg/l	5,4	4,3	5,5	4	3,9	6,2	6,2	3,3	3,4
N _{ki}	mg/l	2,24	4,2	1,2	6,44	3,36	2,24	2,24	3,08	4,2
NO ₂ -N	mg/l	0,993	0,683	0,492	0,585	0,381	0,489	0,489	0,418	0,616
NO ₃ -N	mg/l	66,6	37,1	41,2	49,4	55,9	58,6	58,6	59,7	56,7
N _{tot}	mg/l	69,83	41,98	42,89	56,43	59,641	61,329	61,329	63,20	61,52
P	mg/l	4,85	2,1	4,19	2,6	3,59	5,2	5,2	4,02	5,55
NH ₄ -N	mg/l	1,99	0,233	0,26	0,285	0,158	0,423	0,423	0,394	0,689
pH	-	7,46	7,73	7,69	7,64	7,63	7,53	7,53	7,62	7,54

Table 7 continuation. Measured values

Sequence No.	8	8	8	8	8	9	9	9	10	10	10
Flow rate	100%	100%	100%	100%	100%	50%	50%	50%	100%	100%	100%
Date	2013-07-03	2013-07-17	2013-07-24	2013-07-31	2013-08-07	2013-10-24	2013-10-31	2013-11-06			
Inlet											
Outdoor temp.	26	22	18	18	28	12	9	6			
Temperature	13,2	13,3	12,9	15	15,6	11,2	11,3	10,8			
BOD ₅	420	382	641	464	741	523	507	436			
COD	826	810	1109	1266	1398	1281	920	1354			
SS	412	428	476	600	788	640	432	388			
N _{kl}	103	88,5	88,5	80,7	79,5	104	91,3	107			
P	10,4	8,92	9,99	9,06	12,5	10,3	8,1	9,18			
NH ₄ -N	86,5	69,7	83,8	80,5	71,9	77,6	77,7	80,7			
pH	7,86	7,48	7,48	7,42	7,36	7,92	7,6	7,57			
Outlet											
Temperature	18,2	19,4	17,2	21	21,1	11,4	11,8	10,6			
BOD ₅	3,2	11	6	6,5	4,8	6,6	6,3	6,8			
COD	27	80	61	61	61	54	61	46			
SS	3,8	57	27	32	29	7,3	11	12			
N _{kl}	3,64	9,81	5,32	3,92	5,6	8,96	5,88	6,44			
NO ₂ -N	0,766	0,491	0,437	0,28	0,302	0,395	0,294	0,487			
NO ₃ -N	62,5	47,5	59,9	65,6	79,9	58,4	52,5	57,6			
N _{tot}	66,91	57,80	65,66	69,8	85,802	67,76	58,67	64,53			
P	4,75	7,88	4,87	8,01	8,05	4,84	5,34	4,56			
NH ₄ -N	1,22	0,178	0,241	0,153	0,134	1,25	1,38	1,46			
pH	7,46	7,5	7,49	18	28	7,6	7,6	7,6			



VĮ STATYBOS PRODUKCIJOS SERTIFIKAVIMO CENTRAS
Linkmenų str. 28, LT-08217 Vilnius, Lithuania
Notified body No. 1397



LIETUVOS
NACIONALINIS
AKREDITACIJOS
BIŪRAS

Waste water treatment plant laboratory

BANDYMAI
ISO/IEC 17025

Nr. LA. 01.103

10. MAINTENANCE AND REPAIRS MADE DURING THE TEST PERIOD.

Maintenance cared out by client under supervision of laboratory.
Maintenance work made during test period in the Table 8.

Table 8. Maintenance work made during test period.

	Period	Maintenance description
1	2012.12.20	Start after biomass establishment
2	2012-03-05	60,5 litres of floating sludge removed from settling chamber.
3	2013-05-14	34 litres of floating sludge removed from settling chamber. Blower JDK-S-80, 80l/min, 14,7kPa, 45-50W replaced by blower EL 80-15, 14,7kPa, 90W due to failure. Checking-regulating of aeration system.
4	2013-05-23	22 litres of floating sludge removed from settling chamber. Blower JDK-S-80, 80l/min, 14,7kPa, 45-50W placed back after repairing instead of blower EL 80-15, 14,7kPa, 90W. Checking-regulating of aeration system.
5	2013-06-12	Blower JDK-S-80, 80l/min, 14,7kPa, 45-50W due to failure replaced by blower EL 80-15, 14,7kPa, 90W.
6	2013-08-07	38 litres of floating sludge removed from settling chamber. Checking-regulating of aeration system.
7	2013-10-30	53 litres of floating sludge removed from settling chamber.
8	2013-11-05	32 litres of floating sludge removed from settling chamber.
	2013.11.28	End of the test

Electrical energy consumption: 1,52 kWh/d is average rate during nominal sequences of the test.
Electrical energy consumption: 1,47 kWh/d is average rate during the all test period.
There were installed air blower model JDK-S-80, 80l/min, 14,7kPa, 45-50W and later model EL 80-15, 14,7kPa, 90W (see Table 8 for details) controlled by timer for periodical (non-continued) operation.

11. ASSESSMENT. No requirements for the efficiency performance in the standard.

12. INFORMATION ON THE CONFORMITY OF THE PLANT TESTED WITH INFORMATION PROVIDED PRIOR TO TESTING.

There are no contradictions with information provided before tests.

13. ANNEXES. Annex 1: Vortex Operation Manual, 10 pages.

This test report only certifies the characteristics of the sample submitted for testing.

Head of laboratory

Arnas Danila

Director

Robertas Encius

