

10 September 2010

The mean values for influent and effluent loads as well as influent and effluent concentrations
 (During nominal sequences 2, 4, 6, 8 and 10)

Parameter	BOD ₇	COD _{Cr}	SS	P _{tot}	N _{tot}	NH ₄ -N	pH	Wastewater temperature °C
The mean value of the influent load (g/d)	205	491	269	7,1	40	32	-	-
The range of variation (g/d)	108 - 331	274 - 677	151 - 482	4,2 - 10,1	23 - 56	18 - 48	-	-
The mean value of the influent concentration (mg/l)	284	682	374	9,9	56	44	7,6	11,2
The range of variation (mg/l)	150 - 460	380 - 940	210 - 670	5,8 - 14,0	32 - 78	25 - 66	7,4 - 7,8	8,9 - 14,4
The mean value of the effluent load (g/d)	7,2	34	37	0,7	22	0,7	-	-
The range of variation (g/d)	2,7 - 15,8	23 - 54	16 - 60	0,3 - 1,2	12 - 35	0,1 - 0,7	-	-
The mean value of the effluent concentration (mg/l)	10,0	48	51	1,0	31	1	6,5	12,9
The range of variation (mg/l)	3,7 - 22,0	32 - 75	22 - 84	0,47 - 1,7	17 - 48	0,1 - 1	3,9 - 7,2	10,0 - 17,9

The use and maintenance of the Raita SBR and observations during testing

The operation of the Raita SBR was monitored regularly and it was used and maintained in accordance with the manufacturer's instructions. The normal use and maintenance operations are monthly checks (property owner) and the yearly services (a service contract is recommended). Monthly checks include visual monitoring of the treated water, addition of a precipitating chemical as well as the changing of the sludge basket/bag and/or emptying of excess sludge as required.

The treatment plant includes a 30-litre can for the precipitating chemical, which with the test loading needs to be filled approximately every 5 months. During the testing, the average consumption of the chemical was approximately 0.24 l/m³. According to the manual, alkalisng chemical is added to regulate the pH level, when needed. The alkalisng chemical can be either lime which is added manually or lye (liquid) which is pumped automatically. The lime was added manually (monthly dosage approximately 4 litres) during testing. Sludge removal is done automatically by pumping sludge from the process tank either to the sludge basket (above the process tank) or to the separate sludge tank. The sludge basket was used during testing, and the sludge bag from the basket was exchanged 5 times. In addition, sludge removal by pumping was carried out 11 times.

The electrical equipment of the Raita SBR include the loading, discharging, chemical, and sludge pumps and the air pumps. With the test flow, the treatment plant used 1.7 kWh/day on average, which means that the annual electricity consumption is 634 kWh.

After scheduled power breakdowns (in sequences 4 and 8), the Raita SBR started otherwise normally but some overflow was observed after the second one. No overflows were observed during the weekly peak flow discharges (= 400 l of wastewater during 6 minutes) that were conducted during nominal loading. Operation started normally after a two-week low occupation stress (sequence 5), and no significant weakening was observed in treatment efficiency.

A final inspection was conducted on the plant once the testing was completed, in which the condition of the tanks, connections, and equipment was checked. The treatment plant was found to be in good order, with no deviations or weakening of condition.

Verified:

10 September 2010 Helsinki

Date and time



Responsible manager of the testing, research engineer Riikka Vilpas, SYKE

Collected results
 Raita PA0.6R07 SBR



COLLECTED RESULTS OF EN TESTING

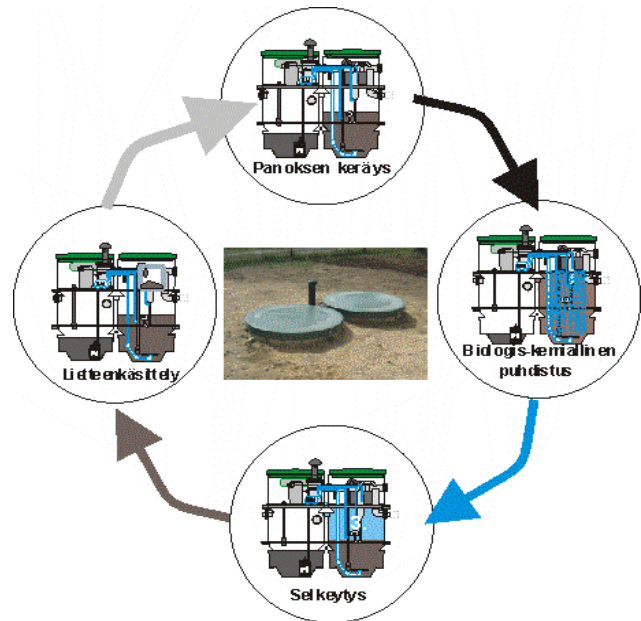
(Based on the test report of 26 November 2008, SYKE-2004-A-3-A4/30)

Raita PA0.6R07 Sequencing Batch Reactor (SBR) Raita Environment Oy

The Finnish Environment Institute (SYKE) has carried out initial type testing of the Raita SBR in accordance with the standard EN 12566-3:2005 (CEN), including tests in accordance with Annexes A (watertightness) and B (treatment efficiency). This report includes the collated results of treatment efficiency testing. Testing was performed at SYKE's Suomenoja Research Station at Hyljeluodontie 5, FI-02270 Espoo, Finland. The watertightness test was performed and approved in June 2007.

SYKE has been found to fulfil the requirements of reliability and independence, as well as other general requirements set by the Act on the Approval of Construction Products (230/2003) for a body involved in assessing the conformity of products for CE marking, including the competence to carry out initial type testing of equipment for the treatment of domestic wastewater.

The Raita SBR is a biological-chemical treatment plant made of polyethylene that is designed for all wastewater generated by one household (max. 6 persons). According to the manufacturer, the nominal hydraulic daily flow of the treatment plant is 0.72 m³/d and the nominal organic load 300 g BOD₇/d.



Test schedules

Sequence	Flow l/d	Duration weeks	Samples
1 Biomass establishment	720	X	X
2 Nominal 100 %	720	6	4
3 Underloading 50 %	360	2	2
4 Nominal 100 % + power breakdown 24h	720	6	5
5 Low occupation stress 0 %	0	2	-
6 Nominal 100 %	720	6	3
7 Overloading 150 % *	1080* / 720	2	2
8 Nominal 100 % + power breakdown 24h	720	6	5
9 Underloading 50 %	360	2	2
10 Nominal 100 %	720	6	3
* 150% overload is organised for a duration of 48 h at the beginning of the sequence		38+X	26

Treatment efficiency during nominal loading, underloading, and overloading

Parameter	Nominal* 720 l/d	Underloading** 360 l/d			Overloading*** 1080 l/d			
Total chemical oxygen demand COD (%)	93	93	89	93	93	86	91	
Total biological oxygen demand BOD (%)	96	97	97	94	97	97	91	98
Suspended solids SS (%)	80	90	85	86	83	77	78	
Total nitrogen N _{tot} (%)	44	44	0	47	16	45	38	
Total phosphorus P _{tot} (%)	90	91	78	93	91	84	93	

* the mean value of 20 samples
** 4 composite samples
*** 2 composite samples