FINNISH ENVIRONMENT INSTITUTE (SYKE)
Research Programme for Production and Consumption
Suomenoja Research Station
30 March 2009

COLLECTED RESULTS OF CE TESTING and ESTIMATE OF OPERATION IN RESPECT OF THE REQUIREMENTS OF THE WASTEWATER DECREE (542/2003)

BioKem 6 sequencing batch reactor (SBR)
Wavin-Labko Ltd

The Finnish Environment Institute (SYKE) has carried out initial type testing of the BioKem 6 SBR in accordance with the standard EN 12566-3 (CEN 2005), including tests in accordance with Annexes A and B. Testing was performed at SYKE's Suomenoja Research Station at Hyljeluodontie 5, FI-02270 Espoo, Finland between 2 March 2006 and 28 January 2007.

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

The BioKem 6 SBR is a biological-chemical treatment plant designed for all wastewater generated by one household (2 to 6 persons). The design flow of the treatment plant is 900 l/day and the organic design load 300 g BOD_7/day.

Test schedules

Sequence	Flow l/d	Duration weeks	Samples
1 Biomass establishment	900	X	X
2 Nominal 100 %	900	6	4
3 Underloading 50 %	450	2	2
4 Nominal 100 % + power breakdown 24h	900	6	5
5 Low occupation stress 0 %	0	2	-
6 Nominal 100 %	900	6	3
7 Overloading 150 % *	1350* / 900	2	2
8 Nominal 100 % + power breakdown 24h	900	6	5
9 Underloading 50 %	450	2	2
10 Nominal 100 %	900	6	3
* 150% overload is organised for a duration of 48 h at the beginning of the sequence		**38+X**	**26**

The mean values of the efficiency ratios

Parameter	Nominal* 900 l/vrk	Underloading** 450 l/vrk	Overloading*** 1350 l/vrk
Total chemical oxygen demand COD (%)	92	93	93
Total biological oxygen demand BOD (%)	97	98	98
Suspended solids SS (%)	92	91	94
Total nitrogen N_{kok} (%)	54	46	62
Total phosphorus P_{kok} (%)	90	90	92

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

The average values for influent loads as well as influent and effluent concentrations

Parameter	Unit	BOD_7	Total nitrogen	Total phosphorus
Influent load	g/d	291	63	11,1
Influent concentration	mg/l	300	67	11,8
Effluent concentration	mg/l	9,9	29	1,1

Use and maintenance of the BioKem 6 SBR during testing

The normal use and maintenance operations of the BioKem 6 SBR are the removal of sludge, the addition of a precipitating chemical, and the monthly check of the pumps and the compressor. There is a 30 l tank for the precipitating chemical which needs to be filled approximately every 5 months with the test load. Sludge removal was carried out twice during testing. When the testing was completed, a final inspection was performed on the treatment plant, which was found to be in good order. Equipment failures were not observed during testing.

Model of the CE marking for the BioKem 6 SBR (EN 12566-3:2005/prA1:2008)

CE

Wavin-Labko Ltd,
Labkotie 1, FI-36240 Kangasala, FINLAND
07

EN 12566-3

Packaged domestic wastewater treatment plant
for treatment of domestic wastewater

- Product's reference code "BioKem 6 SBR"
- Material Polyethylene (PE)

Effectiveness of treatment:		
Treatment efficiency ratios at tested organic daily load BOD_7 = 0,29 kg/d	COD_{Cr}:	92%
	BOD_7:	97%
	SS:	92%
	Total phosphorus:	90%
	Total nitrogen:	54%
Treatment capacity (nominal designation)**:**		
- Nominal organic daily load (BOD_7) - Nominal hydraulic daily flow	0,3 kg/d 0,9 m^3/d	
Electrical consumption:	0,9 kWh/d	
Watertightness: (water test)	Pass	
Crushing resistance:	NPD	
Durability:	NPD	

Estimate of the operation of the BioKem 6 SBR in respect of the requirements of the Wastewater Decree (542/2003)

Based on the testing results, it can be stated that the BioKem 6 SBR fulfils the requirements of the Wastewater Decree, if properly used and maintained. The Decree requirements for treatment – BOD_7 90%, total phosphorus 85% and total nitrogen 40% – were met, on average, for all parameters in normal loading, underloading and overloading conditions. Treatment efficiency was also good after a break of 2 weeks.

SYKE

Design parameters for the BioKem 6 -SBR

Parameter	Unit	BioKem 6
Nominal hydraulic flow	l/d	900
BOD_7-load	kg BOD_7 / d	0,3
Volume load	kg BOD_7 / m^3xd	0,1-0,2
Sludge load	kg BOD_7 / kg MLSS d	0,04

30.3.2009 Helsinki

Responsible manager, research engineer Riikka Vilpas, SYKE