

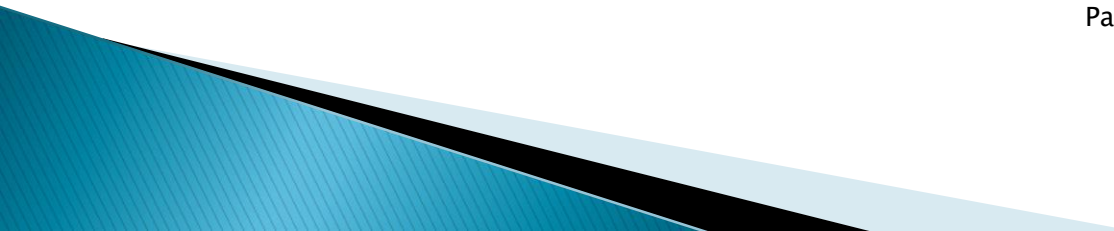
DCD–Bever Decentral WasteWater Treatment

Data Sheet

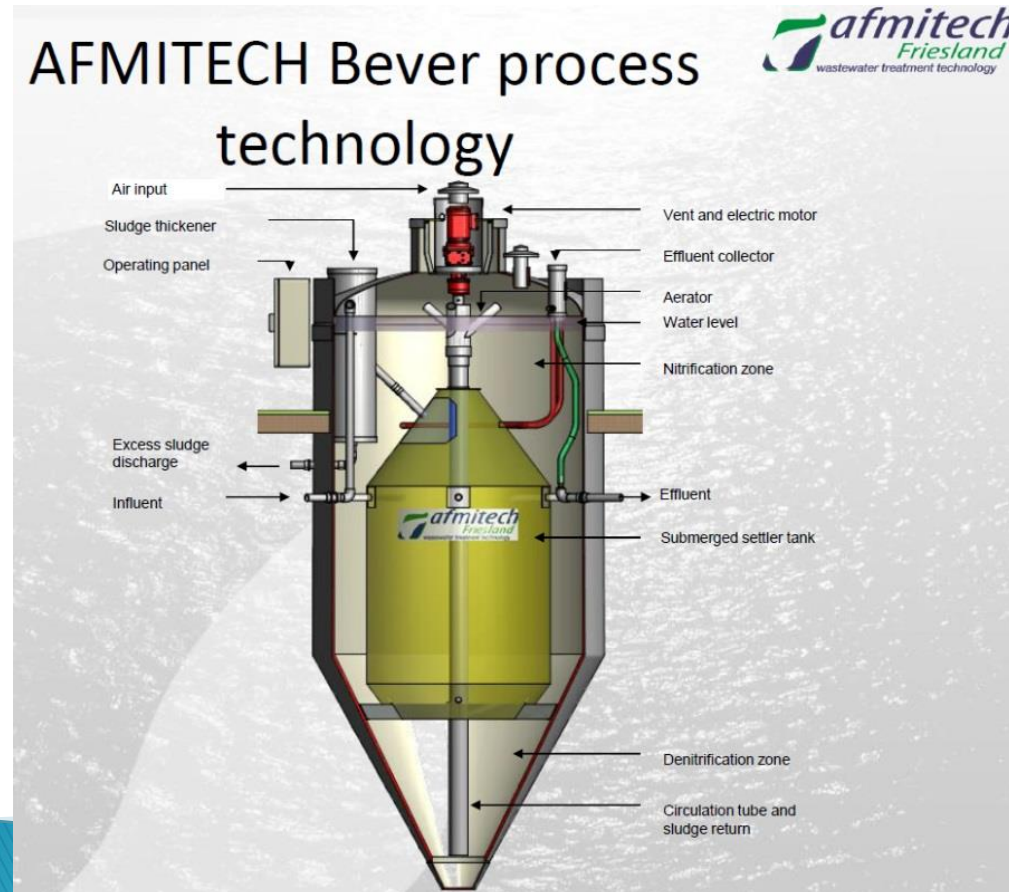
BouwCoach Engineering BV

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DCD Mini Modular Wasterwaterplant



BouwCoach Engineering BV
The Netherlands

DCD Mini Modular Wasterwaterplant

Purifying System

For purifying the wastewater, the DCD-Bever works with the activated sludge process which is used worldwide (patented technology Afmitech Friesland bv). In this process the pollution is degraded biologically by micro organisms floating in the water. These micro organisms form a floc, which is the so-called activated sludge.

Because this activated sludge is heavier than the water in the tank, it will sink down in the settling compartment from where it can be separated from the water flow.

The installation is made vertically with a surface aerator which creates a vertical circulation by intermittent aeration. This vertical circulation makes denitrification possible.

The system itself signalizes the amount of wastewater coming in and automatically adjusts the oxygen input while the purification process continues; this means that the DCD-Bever has a continuous purification process with a discontinuous control. In this way, the wastewater treatment system can perform properly with changing seasonable loads.

The excess growth of sludge is automatically thickened and periodically drained to the excess sludge sump. In this way the system keeps the concentration of excess sludge in the aeration compartment stable and prevents the wastewater treatment tank from becoming overgrown with sludge.

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Cost Comparison

For six communities in the Arad Area businesscases are established.

These communities vary from 4 villages with in total 1500 inhabitants to 10 villages with in total 4000 inhabitants. The calculated average cost of ownership for complete DCD-Bever community systems (excluded village-canalisation) go down to € 25,- per i.e. per year (with EU funding included).

When the investment costs are compared, the absence of inter-village sewers and main sewer to a traditional plant, cause a significant cost-difference in favour of decentralized units.

To be able to compare the investment costs with a traditional (50.000-100.000ie) wastewater treatment plant, some assumptions are made:

- 1) investment costs for traditional plant are € 300,- per i.e.
- 2) investment in meter freefall sewage pipe is € 100,-
- 3) the distance from "lowest" village to a traditional wwtp is 10km.

These assumptions are based on conservative Key-Figures, nevertheless always discussable. But the results of the comparison of average investment costs for DCD-Bever systems and traditional show a **factor 3** in lower costs for decentral systems!

Modular Approach

The Bever-DCD system is a modular system of decentral wastewater-treatment for communities from 50i.e., 100i.e. and 175i.e in steps up to 2500/5000 i.e.

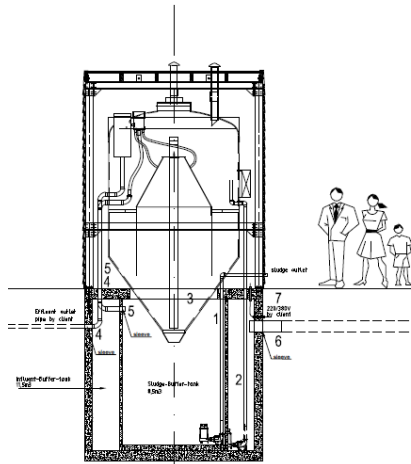
This modularity guarantees flexibility in phasing, providing any needed growth of connected population and/or availability of canalization.

Also innovation in purification technologies develops fast. This modular approach guarantees, (in combination with 15 or 25 years administrative life-time) the flexibility of replacing systems or system-parts at any time.

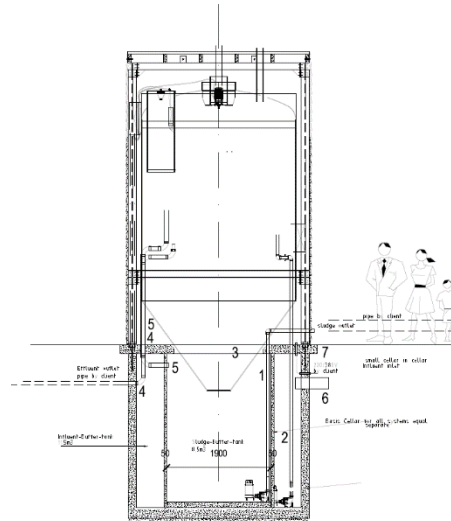
Waste and wastewater become more and more a source of energy and raw materials (as for example phosphorus). Modular units can be added for extraction of specific substances and exploiting the energy sources in near future.

At last but not least, the awareness of health-threatening pollutions, as for example medicine and metals, will demand purification on these substances in near future. Our modular systems can be expanded at any time with the newest technology.

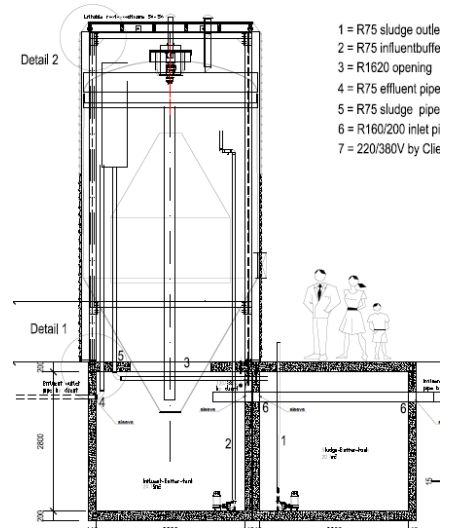
DCD-Bever 50 I.E.



DCD-Bever 100 I.E.

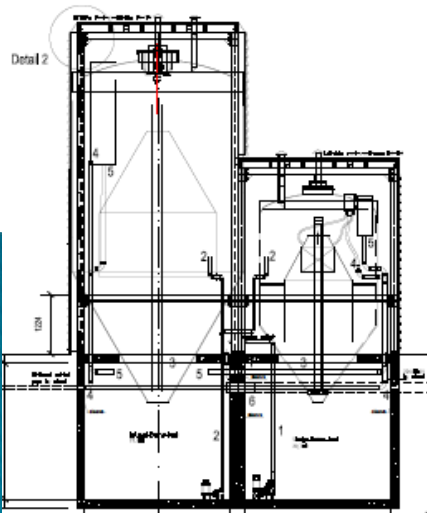


DCD-Bever 175 I.E.

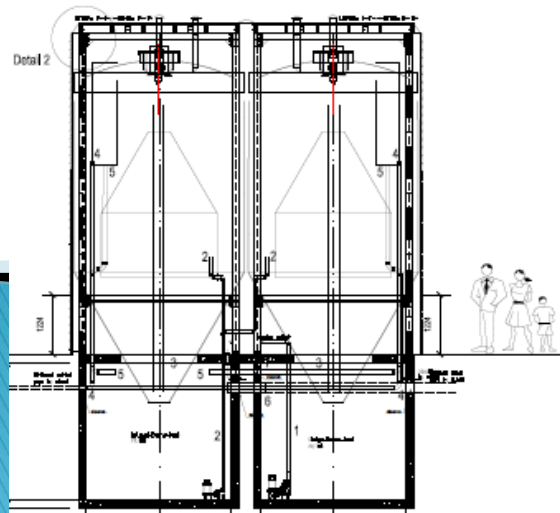


- 1 = R75 sludge outlet
- 2 = R75 influent buffer
- 3 = R1620 opening
- 4 = R75 effluent pipe
- 5 = R75 sludge pipe
- 6 = R160/200 inlet pi
- 7 = 220/380V by Clie

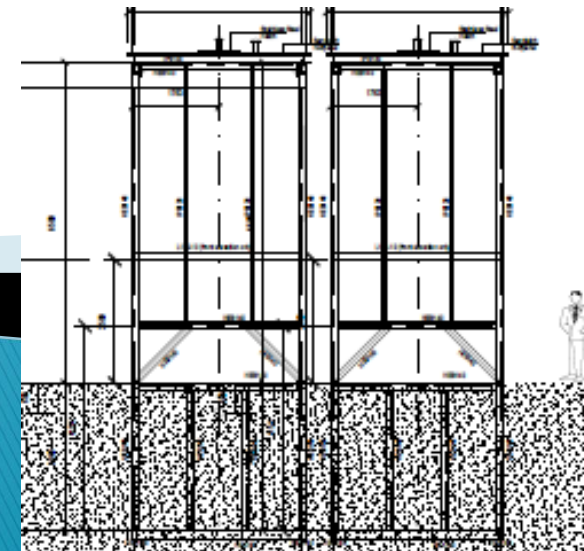
DCD-Bever 225 I.E.

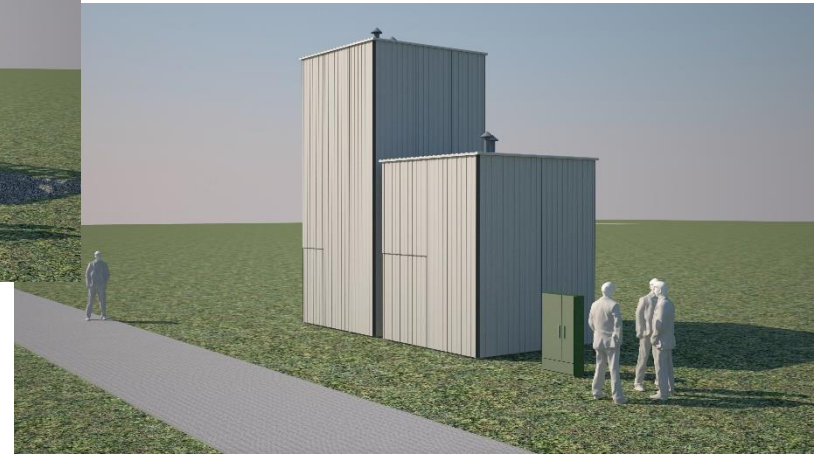


DCD-Bever 350 I.E.



DCD-Bever 525-700 I.E.

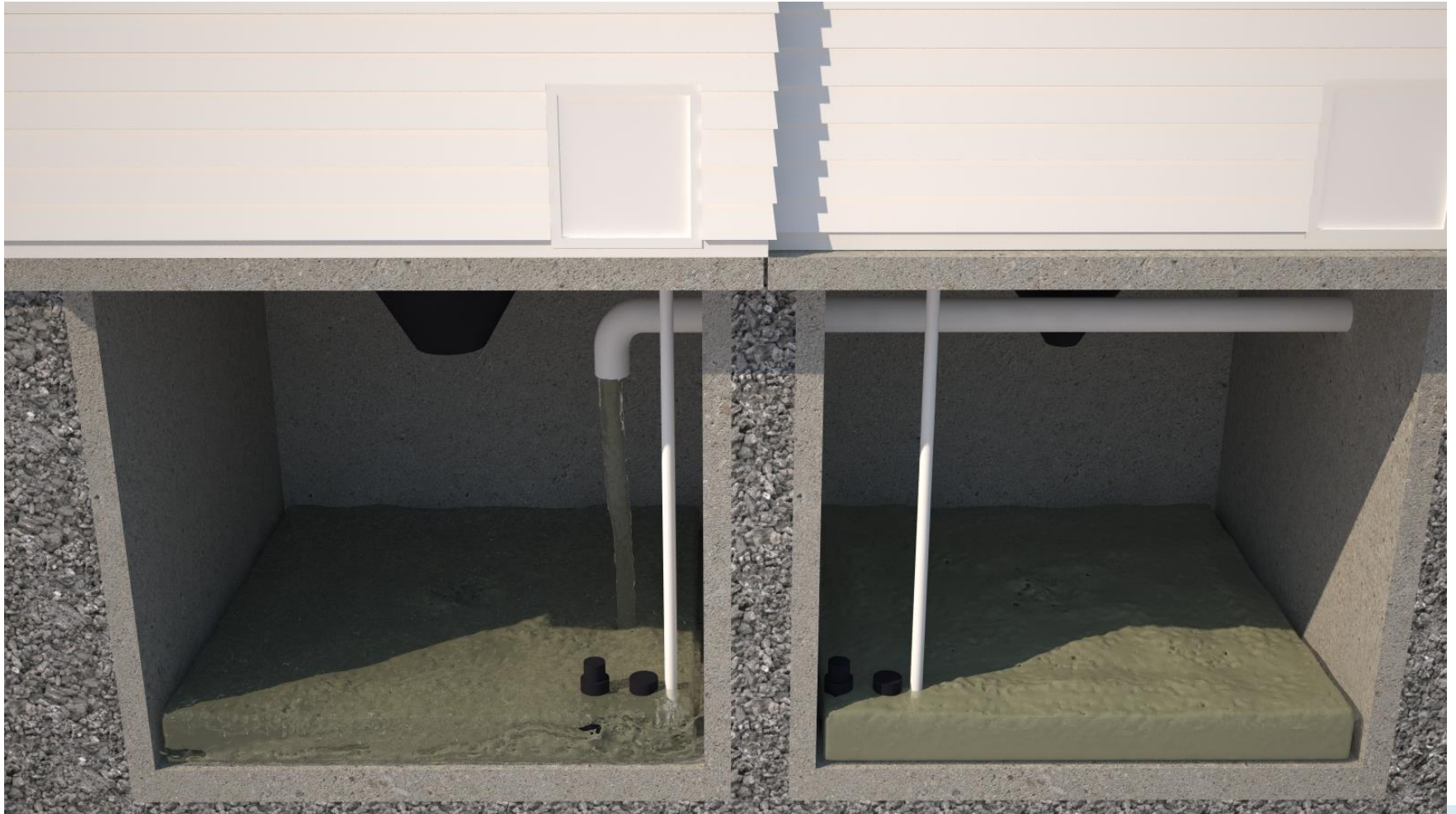




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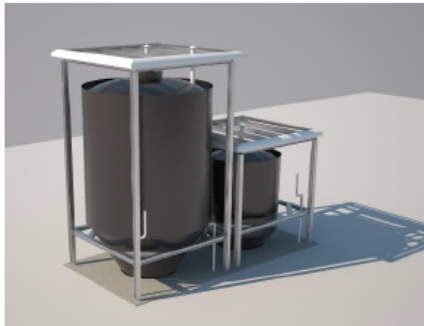
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Overview of DCD-Bever modular Systems

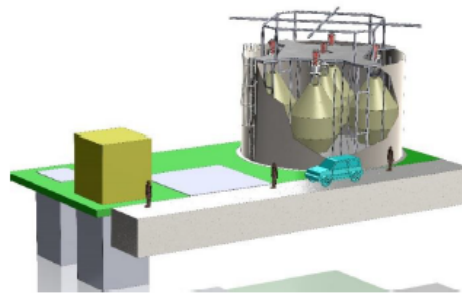
Summary

			Estimated daily energy consumption(kWh)	Estimated annual energycosts	Needed construction Area (m2)	Remaining building Area (m2)	flux min. m3/day	flux medium m3/day	flux max. m3/day	<i>included</i> influent tank m3	<i>included</i> Sludge tank m3	To be emptied in days	Sludge m3/day
25-75	IE	50 DCD-Bever 50	5,5	€ 161	58	16	3,0	6,0	12	23	7	200	0,035
50-150	IE	100 DCD-Bever 100	8,0	€ 234	58	16	6,0	13,0	24	23	7	100	0,07
90-250	IE	175 DCD-Bever 175	19,0	€ 555	85	32	11,0	27,0	41	30	30	250	0,12
115-330	IE	225 DCD-Bever 225	24,0	€ 701	85	32	14,0	40,0	53	30	30	188	0,16
175-525	IE	350 DCD-Bever 350	32,0	€ 934	85	32	22,0	64,0	82	30	30	120	0,25
263-785	IE	525 DCD-Bever 525	48,0	€ 1.402	125	64	33,0	91,0	123	60	30	79	0,38
350-1050	IE	700 DCD-Bever 700	64,0	€ 1.869	125	64	44,0	128,0	164	90	30	60	0,5
750-2250	p.e.	1750 DCD 1750	200,0	€ 5.840	300	275	97,0	194,0	365	100	68	68,0	1
1250-3750	p.e.	2500 DCD 2500	226,0	€ 6.599	600	525	140,0	281,0	527	150	90	53,0	1,7

DCD 50-100-175-225-350-525-700

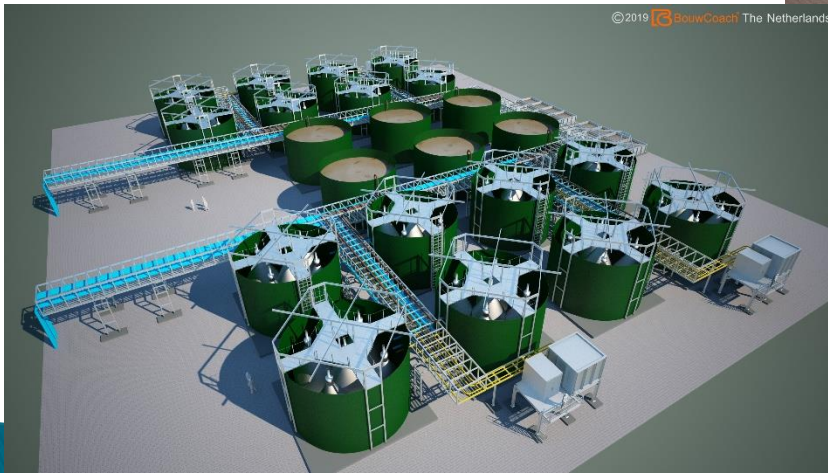


DCD 1750-2500



Electricity and Sludge per M3 influent

	Electricity kWh/m3 infl	Sludge M3/M3 infl
DCD-Bever 50	0,917	0,0058
DCD-Bever 100	0,615	0,0054
DCD-Bever 175	0,704	0,0044
DCD-Bever 225	0,600	0,0040
DCD-Bever 350	0,500	0,0039
DCD-Bever 525	0,527	0,0042
DCD-Bever 700	0,500	0,0039
DCD 1750	1,031	0,0052
DCD 2500	0,804	0,0060



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Test Results:

Our Bever wastewater treatment system (patented technology Afmitech Friesland bv) is extensively tested for 26 weeks in 2002 by the Van Hall Larenstein Institute, Leeuwarden. During the attestation, only flux-proportional collect samples of the effluent were taken and analyzed by an accredited research laboratory.

The requirements at the effluent of an IBA-class IIIA were:

Parameters	Concentrations in any 24-hour aggregate sample (mg/l)	Concentrations in any stitch sample (mg/l)
BOD ₅	< 20	< 40
COD	< 100	< 200
N-total	< 30	< 60
NH ₄ ⁺	< 2	< 4
SS	< 30	< 60

Influent parameters for testing

Parameters	Average Value	Maximal Value	Minimal Value
BZV ₅	308,8	380,0	259,8
CZV	783,3	1028,3	669,3
N-totaal	68,8	79,1	54,8
SS	390,9	615,0	307,5
CZV : BZV	2,6	3,0	2,0

Test results Effluent

Parameters	Average Value	Maximal Value	Minimal Value
BZV ₅	< 3,0	< 3,0	< 3,0
CZV	40	50	30
N-totaal	10,0	26,8	2,2
NH ₄ ⁺	0,9	1,9	< 0,2
SS	2,7	7,7	< 2,0

Capacity Calculations: DCD-Bever 50

SOC-50PE-JB150305



Total wastewater		8,1 m ³ /day	See the remarks above
COD	750 mg/l		6,08 kg COD/day
BOD ₅	340 mg/l		2,75 kg BOD/day
N-kjh (N _{total})	70 mg/l		0,57 kg N-kjh/day
Phosphorus (P-total)	9 mg/l		0,07 kg P/day
TSS	185 mg/l		1,50 kg SS/day
Fats	100 mg/l		0,81 kg F/day
pH	6,5 - 7,5		
Temperature	15 - 20 Celcius		

BOD₅ = 4,9 ideal = 4,6*

NOTE : has to be reduced before WWTP to < 200 mg/l with a fat or oil benzene separator. A too high concentration will effect the PE load and give a negative effect on the setting process (the sludge ...)

requirements (assumed)	Value :	Minimal required efficiency (assumed):
COD	125 mg/l	83%
BOD ₅	25 mg/l	93%
N-kjh (N _{total})	15 mg/l	79%
Phosphorus (P-total)	6 mg/l	33%
TSS	30 mg/l	84%
Fats	50 mg/l	50%
pH	6,5 - 7,5	
Temperature	15 - 20 Celcius	

Load based on COD :	58	PE	1 PE = 150 gram TOD a day.
Load based on BOD ₅ :	46	PE	1 PE = 60 gram BOD a day.
RECOMANDED DCD BEVER STP TYPE :	50	PE BEVER IIIA MODEL	
Peak load continuous:	125%	10 m ³ /day	72 PE (based on 1 PE = 150 gram TOD a day)
Peak load incidental:	150%	12 m ³ /day	87 or continuous (depends on the influent buffer volume)
Average load continuous:	80%	6 m ³ /day	46
Min. load continuous:	40%	3 m ³ /day	23

Power consumption at nominal load:			
Average assumed for the aeration process :	4,7	kWhour	Aerators 1x 1,1 kW, 3 phase 400 VAC
Influent pump(s) for the calculated flow :	0,6	kWhour	Type pump : 1,1 kW (P1) Zenit GR Blue 150T, 3 phase 400 VAC
Controlbox and small airpump :	0,7	kWhour	100 watt controller and 16 hours one blower 27 watt 230 VAC 1 phase
Total assumed power consumption	<u>6,0</u>	<u>kWhour</u>	

SOC-50PE-JB150305



Dimensions / volume DCD Bever IIIA STP (decentralized medium scaled)			
Main dimensions tank :	Ø 2,5	meter	
Height tank :	4,8	meter	
Volume, total :	12,2	m ³	Nett
Recommended nett volume excess sludge sump :	8	m ³	Empty frequency : 1 time/year
Recommended nett volume influent buffer pump sump (equalize sump) :	8	m ³	12 hours buffervolume by total flow in 12 hours. nett, under the influent incoming pipe.

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Capaciteitsberekening tbv verticaal actiefslibstelsysteem de BIIIA

Onderwerp:

Bedrijf Afmitech Friesland
 Naam Jan Boele de Jong
 Plaats Joure (NL)
 Referentie
 Datum
 Wijziging

In opdracht van:

Bedrijf
 Contactpers.
 Uw Ref.
 Plaats

Benodigde capaciteit bij een gemiddelde belasting in het hoogseizoen op één dag (geprognosticeerd)

uitgangspunten:	COD:	ca.	750 mg/l	flow	8,10 m ³ /day	aeration	1,50 kg O ₂ /kwh
	BOD	ca.	340 mg/l	flowtime	16 hours	VBT-bio-space	1,25 day
	COD:BOD		2,2	flow-hour	506,25 /uur	slibbelasting	kg BOD/kg ss.day
	N-kjh		70 mg/l	CZV:N:P		ss (drogestof)	4 kg/m ³
	P		20 mg/l	BZVS :N:P		kg BOD/dag	2,754
	dentrificatie		95 %	runningtime		kg COD/dag	6,075
	vbt-			aeration	12 hours	b (spec. ademh.)	0,07
	sedimentation		3,5 hours	aeration		b	0,06 slibbelasting=0,05
				powerunit	3 kw		0,08 slibbelasting=0,1
							0,09 slibbelasting=0,15
							0,1 slibbelasting=0,2
	IE belasting		68 IE	(2,2;3;4;5,5)			

engineering:

Bio-ruimte tbv COD-reductie (m ³)	V-totaal, incl. sedimentation (m ³)	slibbelasting kg BOD/kgds.d	endogene ademhaling (kg O ₂ /d)	substrademh (kg O ₂ /d)	Nitr.ademh (kg O ₂ /d)	aeration power kwh-total	aeration units	Diameter processtank	Heigh processtank
10,13	11,9	0,068	2,84	1,38	1,05	3,29	0,1	nvt	nvt
Alpha factor (zuurstof overdracht rendement)			0,7	Geschat stroomverbruik (kwh/dag).		4,70	0,1		

Minimaal benodigde ontwerpcapaciteit Bever IIIA 61 IE

0,70481933

Conclusie / aanbeveling

Om de gemiddelde belasting goed aan te kunnen worden een 51 IE Bever IIIA aanbevolen. Deze heeft nog overcapaciteit.
 Het is van groot belang dat bij elke afvoer vanuit een professionele keuken/kantine een goed berekende vetafscheider aanwezig is en dat deze tijdig geleegd wordt.
 Voor het bufferen van het afvalwater en dit gedoseerd naar de afvalwaterzuivering te verpompen wordt een een pompput met een inhoud van 7,5 m³ aanbevolen.
 Het slib kan in een gelijke put gebufferd worden.

Capacity Calculations: DCD-Bever 100

SOC-100PE-JB 150305



Total wastewater		16,2 m ³ /day	See the remarks above	
	COD	750 mg/l	12,15 kg COD/day	
	BOD ₅	340 mg/l	5,51 kg BOD/day	
	N-kj (N _{total})	70 mg/l	1,13 kg N-kj/day	BOD:N = 4,9 ideal = 4,6*
	Phosphorus (P-total)	9 mg/l	0,15 kg P/day	
	TSS	185 mg/l	3,00 kg SS/day	
	Fats	100 mg/l	1,62 kg F/day	
	pH	6,5 - 7,5		
	Temperature	15 - 20 Celcius		

NOTE : has to be reduced before WWTP to < 200 mg/l with a fat or oil benzene separator. A too high concentration will effect the PE load and give a negative effect on the setting process (the sludge

requirements (assumed)	Value :	Minimal required efficiency (assumed):	
	COD	125 mg/l	83%
	BOD ₅	25 mg/l	93%
	N-kj (N _{total})	15 mg/l	79%
	Phosphorus (P-total)	6 mg/l	33%
	TSS	30 mg/l	84%
	Fats	50 mg/l	50%
	pH	6,5 - 7,5	
	Temperature	15 - 20 Celcius	

Load based on COD :	116	PE	1 PE = 150 gram TOD a day.	
Load based on BOD ₅ :	92	PE	1 PE = 60 gram BOD a day.	
RECOMANDED DCD BEVER STP TYPE :	100	PE BEVER IIIA MODEL		
Peak load continuous:	125%	20	m ³ /day	144 PE (based on 1 PE = 150 gram TOD a day)
Peak load incidental:	150%	24	m ³ /day	173 or continuous (depends on the influent buffer volume)
Average load continuous:	80%	13	m ³ /day	92
Min. load continuous:	40%	6	m ³ /day	46

Power consumption at nominal load:

Average assumed for the aeration process :	9,4	kWhour	Aerators 1x 2.2 kW, 3 phase 400 VAC	
Influent pump(s) for the calculated flow :	1,3	kWhour	Type pump : 1,7 kW (P1) GRF 200, 3 phase 400 VAC	
Controlbox and small airpump :	0,7	kWhour	100 watt controller and 16 hours one blower 27 watt 230 VAC 1 phase	
Total assumed power consumption	11,3	kWhour		

SOC-100PE-JB 150305



Dimensions / volume DCD Bever IIIA STP (decentralized medium scaled)				
Main dimensions tank :	Ø 2,9	meter		
Height tank :	6,2	meter		
Volume, total :	25	m ³		
Recommended nett volume excess sludge sump :	15	m ³	Nett	
Recommended nett volume influent buffer pump sump (equalize sump) :	15 - 20	m ³	Empty frequency :	1 - 2 time/year

7,5 hours buffervolume by total flow in 16 hours. nett, under the influent incoming pipe.

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Benodigde capaciteit bij een gemiddelde belasting in het hoogseizoen op één dag (geprognosticeerd)

uitgangspunten:	COD:	ca.	750 mg/l	flow	18,20 m ³ /day	aeration	1,60 kg O ₂ /kwh
	BOD	ca.	340 mg/l	flowtime	16 hours	VBT-blo-space	1,25 day
	COD:BOD		2,2	flow-hour	1012,50 l/uur	slibbelasting	kg BOD/kg ss.day
	N-kjh		70 mg/l	CZV:N:P		ss (drogestof)	4 kg/m ³
	P		20 mg/l	BZV5 :N:P		kg BOD/dag	5,508
	dentrificatie		95 %	runningtime		kg COD/dag	12,15
	vbt-sedimentation		3,5 hours	aeration	12 hours	b (spec. ademh.)	0,07
				aeration		b	0,06 slibbelasting=0,05
				powerunit	8 kw		0,08 slibbelasting=0,1
					(2,2;3;4;5,5)		0,09 slibbelasting=0,15
							0,1 slibbelasting=0,2
	IE belasting		118 IE				

engineering:

Bio-ruimte tbv COD-reductie (m ³)	V-totaal, incl. sedimentation (m ³)	slibbelasting kg BOD/kgds.d	endogene ademhaling (kg O ₂ /d)	substr.ademh (kg O ₂ /d)	Nitr.ademh (kg O ₂ /d)	aeration power kwh-totaal	aeration units	Diameter processtank mvt	Heigh processtank mvt
20,25	23,8	0,068	5,67	2,75	2,10	6,58	0,2		
Alpha factor (zuurstof overdracht rendement)			0,7		Geschat stroomverbruik (kwh/dag)		9,40	0,3	

Minimaal benodigde ontwerpcapaciteit Bever IIIA 101 IE

1,409638661

Conclusie / aanbeveling

Om de gemiddelde belasting goed aan te kunnen worden een 101 IE Bever IIIA aanbevolen. Deze heeft nog overcapaciteit.
 Het is van groot belang dat bij elke afvoer vanuit een professionele keuken/kantine een goed berekende vetafscheider aanwezig is en dat deze tijdig geleegd wordt.
 Voor het bufferen van het afvalwater en dit gedosseerd naar de afvalwaterzuivering te verpompen wordt een een pompput met een inhoud van 7,5 m³ aanbevolen.
 Het slib kan in een gelijke put gebufferd worden.

Capacity Calculations

DCD-Bever 175

Total wastewater		27,0 m ³ /day	See the remarks above	
COD	750 mg/l		20,25 kg COD/day	
BOD ₅	340 mg/l		9,18 kg BOD/day	
N-kjh (N _{total})	70 mg/l		1,89 kg N-kjh/day	BOD:N = 4,9 ideal = 4,6*
Phosphorus (P-total)	9 mg/l		0,24 kg P/day	
TSS	185 mg/l		5,00 kg SS/day	
Fats	100 mg/l		2,70 kg F/day	
pH	6,5 - 7,5			
Temperature	15 - 20 Celcius			

NOTE : has to be reduced before WWTP to < 200 mg/l with a fat or oil benzene separator. A too high concentration will effect the PE load and give a negative effect on the setting process (the sludge

requirements (assumed)	Value :	Minimal required efficiency (assumed):	
COD	125 mg/l	83%	
BOD ₅	25 mg/l	93%	
N-kjh (N _{total})	15 mg/l	79%	
Phosphorus (P-total)	6 mg/l	33%	
TSS	30 mg/l	84%	
Fats	50 mg/l	50%	
pH	6,5 - 7,5		
Temperature	15 - 20 Celcius		

Load based on COD :	193	PE	1 PE = 150 gram TOD a day.
Load based on BOD ₅ :	153	PE	1 PE = 60 gram BOD a day.
RECOMANDED DCD BEVER STP TYPE :	175	PE BEVER IIIA MODEL	
Peak load continuous:	125%	34 m ³ /day	241 PE (based on 1 PE = 150 gram TOD a day)
Peak load incidental:	150%	41 m ³ /day	289 or continuous (depends on the influent buffer volume)
Average load continuous:	80%	22 m ³ /day	154
Min. load continuous:	40%	11 m ³ /day	77

Power consumption at nominal load:			
Average assumed for the aeration process :	16,0	kWhour	Aerators 1x 2.2 kW, 3 phase 400 VAC
Influent pump(s) for the calculated flow :	2,1	kWhour	Type pump : 1,7 kW (P1) GRF 200, 3 phase 400 VAC
Controlbox and small airpump :	0,7	kWhour	100 watt controlier and 16 hours one blower 27 watt 230 VAC 1 phase
Total assumed power consupion	18,8	kWhour	

Dimensions / volume DCD Bever IIIA STP (decentralized medium scaled)			
Main dimensions tank :	Ø 3,55	meter	
Height tank :	7,3	meter	
Volume, total :	43	m ³	
Recommended nett volume excess sludge sump :	20	m ³	Nett
Recommended nett volume Influent buffer pump sump (equalize sump) :	20	m ³	Empty frequency : 1 - 2 time/year
			7,5 hours buffervolume by total flow in 16 hours nett, under the influent incoming pipe.

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Benodigde capaciteit bij een gemiddelde belasting in het hoogseizoen op één dag (geprognosticeerd)

uitgangspunten:	COD:	ca.	750 mg/l	flow	27,00 m ³ /day	aeration	1,60 kg O ₂ /kwh
	BOD	ca.	340 mg/l	flowtime	16 hours	VBT-bio-space	1,30 day
	COD:BOD		2,2	flow-hour	1687,50 l/uur	slibbelasting	kg BOD/kg ss.day
	N-kjh		70 mg/l	CZV:N:P		ss (drogestof)	4 kg/m ³
	P		20 mg/l	BZVS :N:P		kg BOD/dag	9,18
	dentrificatie		95 %	runningtime		kg COD/dag	20,25
	vbt-			aeration	12 hours	b (spec. ademh.)	0,07
	sedimentation		3,5 hours	aeration		b	0,06 slibbelasting=0,05
				powerunit	8 kw		0,08 slibbelasting=0,1
					(2,2;3;4;5;5)		0,09 slibbelasting=0,15
							0,1 slibbelasting=0,2
	IE belasting		193 IE				

engineering:

Bio-ruimte tbv COD-reductie (m ³)	V-totaal, incl. sedimentation (m ³)	slibbelasting kg BOD/kgds.d	endogene ademhaling (kg O ₂ /d)	substr.ademh (kg O ₂ /d)	Nitr.ademh (kg O ₂ /d)	aeration power kwh-total	aeration units	Diameter processtank nvt	Heigh processtank nvt
35,10	41,0	0,065	9,83	4,89	3,50	11,20	0,3		
Alpha factor (zuurstof overdracht rendement)			0,7		Geschat stroomverbruik (kwh/dag)		16,00	0,4	

Minimaal benodigde ontwerpcapaciteit Bever IIIA 178 IE

2,40002768

Conclusie / aanbeveling

Om de gemiddelde belasting goed aan te kunnen worden een 176 IE Bever IIIA aanbevolen. Deze heeft nog overcapaciteit. Het is van groot belang dat bij elke afvoer vanuit een professionele keuken/kantine een goed berekende vetafscheider aanwezig is en dat deze tijdig geleegd wordt. Voor het bufferen van het afvalwater en dit gedoseerd naar de afvalwaterzuivering te verpompen wordt een pompput met een inhoud van 7,5 m³ aanbevolen. Het slib kan in een gelijke put gebufferd worden.

Capacity Calculations: DCD-Bever 1750

0CC-1750PE V1.0-JB160213 (offerter ref 15015.2-D1)



1750 Pollution Equivalent Capacity - calculation wastewater flows DCD Bever STP

Subject		Ordering customer	
Company	Afmitech Friesland	Company	-
Name	Jan Boele de Jong	Contact person	-
Location	Joure (NL)	Your reference	1750 PE nominal load (1 PE = 150 gram TOD a person a day)
Offer	0CC-1750PE-JB160202	Location	
Date	2-2-2015	Concerning	Domestic wastewater
Adjustment	25-1-2016		

Standards parameters 24 hour sampling or average 5 samples

Parameter	units	EU standard 10.000 up to 100.000 P.E.	Customer requirements :
BOD ⁵	mg O ₂ /l	< 25	<25
COD	mg O ₂ /l	< 125	<125
N-total	mg/l	< 15	<30
NH ₄ -N	mg/l	-	<4
PO ₄ -P	mg/l	-	<10
TSS	mg/l	< 10	<30

Remarks (example):

- 1) Number of households : 450
- 2) Number of persons a family : 4
- 3) Average use of water : 135 ltr a person/day
- 4) Total persons : 1800

As proven during independent tests in 2002 for a period of 26 weeks by Van Hall Larenstein Institute (Leeuwarden, the Netherlands):
Shown are the 24h average values for practice operation and the 24h average value reached by the Bever IIIA system during the whole period of 26 weeks (several kind of tests).

Parameter	units	Average Value effluent practice	Average Value 'Bever' during the 26 weeks testing.
BOD ⁵	mg O ₂ /l	< 10	< 3
COD	mg O ₂ /l	< 100	40
N-total	mg/l	< 15	10
NH ₄ -N	mg/l	< 4	0,9
PO ₄ -P	mg/l	-	Not measured
TSS	mg/l	< 10	2,7

Parameter declaration :

BOD⁵ - Biological Oxigen Demand
 COD - Chemical Oxigen Demand
 N-total - Total nitrogen
 NH₄-N - Ammonium - nitrogen
 PO₄-P - phosphorus in the form of phosphates
 TSS - Total Suspended Solids

BouwCoach Engineering BV
The Netherlands

Total wastewater		243,0 m ³ /day	See the remarks above
	COD	750 mg/l	182,25 kg COD/day
	BOD ₅	340 mg/l	82,62 kg BOD/day
	N-t/h (N _{total})	70 mg/l	17,01 kg N-kjh/day
	Phosphorus (P-total)	9 mg/l	2,19 kg P/day
	TSS	185 mg/l	44,96 kg SS/day
	Fats	100 mg/l	24,30 kg F/day
	pH	6,5 - 7,5	
	Temperature	20 - 40 Celcius	

BOD:N = 4,9 ideal = 4,6*

NOTE : has to be reduced before WWTP to < 200 mg/l with a fat or oil benzene separator. A too high concentration will effect the PE load and give a negative effect on the settling process (the sludge

requirements (assumed)	Value :	Minimal required efficiency (assumed):
	COD	125 mg/l 83%
	BOD ₅	25 mg/l 93%
	N-t/h (N _{total})	15 mg/l 79%
	Phosphorus (P-total)	6 mg/l 33%
	TSS	30 mg/l 84%
	Fats	50 mg/l 50%
	pH	6,5 - 7,5
	Temperature	15 - 20 Celcius

Load based on COD :	1733	PE	1 PE = 150 gram TOD a day.
Load based on BOD ₅ :	1377	PE	1 PE = 60 gram BOD a day.
RECOMANDED DCD BEVER STP TYPE :		1750	PE BEVER IIIA MODEL
Peak load continuous:	125%	304	m³/day 2167 PE (based on 1 PE = 150 gram TOD a day)
Peak load incidental:	150%	365	m³/day 2600 or continuous (depends on the Influent buffer volume)
Average load continuous:	80%	194	m³/day 1387
Min. load continuous:	40%	97	m³/day 693

Power consumption at nominal load:

Average assumed for the aeration process :	151,3	kWhour	Aerators 5x 2.2 kW, 3 phase 400 VAC
Influent pump(s) for the calculated flow :	25,4	kWhour	Type pump : 2.3 kW (P1) GRN 250, 3 phase 400 VAC
Controlbox and small airpump :	22,4	kWhour	200 watt controller and 16 hours one blower 1100 watt 230 VAC 1 phase
Total assumed power consumption	199,1	kWhour	

Dimensions / volume DCD Bever STP (decentralized medium scaled)

Main dimensions tank :	Ø 9,8	meter	
Height tank :	6,0	meter	
Volume, total :	419	m ³	Nett
Recommended nett volume excess sludge sump :	100	m ³	Empty frequency : 2 - 3 time/year
Recommended nett volume influent buffer pump sump (equalize sump) :	100	m ³	7,5 hours buffervolume by total flow in 12 hours. nett, under the influent incoming pipe.

Capacity Calculations: DCD-Bever 2500

0CC-2500PE-JB150202 (offerte ref 15016.1-DI)



Total wastewater		351,0 m ³ /day	See the remarks above	
	COD	750 mg/l	263,25 kg COD/day	
	BOD ₅	340 mg/l	119,34 kg BOD/day	
	N-kjh (N _{tot})	70 mg/l	24,57 kg N-kjh/day	BOD:N = 4,9 ideal = 4,6*
	Phosphorus (P-total)	9 mg/l	3,16 kg P/day	
	TSS	185 mg/l	64,94 kg SS/day	
	Fats	100 mg/l	35,10 kg F/day	
	pH	6,5 - 7,5		
	Temperature	15 - 20 Celcius		

NOTE : has to be reduced before WWTP to < 200 mg/l with a fat or oil benzene separator. A too high concentration will effect the PE load and give a negative effect on the setting process (the sludge

requirements (assumed)	Value :	Minimal required efficiency (assumed):	
	COD	125 mg/l	83%
	BOD ₅	25 mg/l	93%
	N-kjh (N _{tot})	15 mg/l	79%
	Phosphorus (P-total)	6 mg/l	33%
	TSS	30 mg/l	84%
	Fats	50 mg/l	50%
	pH	6,5 - 7,5	
	Temperature	15 - 20 Celcius	

Load based on COD :	2504	PE	1 PE = 150 gram TOD a day.
Load based on BOD ₅ :	1989	PE	1 PE = 60 gram BOD a day,

RECOMANDED DCD BEVER STP TYPE :	2500	PE BEVER IIIA MODEL	
Peak load continuous:	125%	439 m ³ /day	3129 PE (based on 1 PE = 150 gram TOD a day)
Peak load incidental:	150%	527 m ³ /day	3755 or continuous (depends on the Influent buffer volume)
Average load continuous:	80%	281 m ³ /day	2003
Min. load continuous:	40%	140 m ³ /day	1001

Power consumption at nominal load:

Average assumed for the aeration process :	225,6	KWhour	Aerators 5x 4 kW, 3 phase 400 VAC
Influent pump(s) for the calculated flow :	36,7	KWhour	Type pump : 2.3 KW (P1) GRN 250, 3 phase 400 VAC
Controlbox and small airpump :	22,4	KWhour	200 watt controller and 16 hours one blower 1100 watt 230 VAC 1 phase
Total assumed power consumption	284,6	KWhour	

0CC-2500PE-JB150202 (offerte ref 15016.1-DI)



Dimensions / volume DCD Bever STP (decentralized medium scaled) 2500 PE

Main dimensions tank :	Ø 10,67	meter	
Height tank :	7,0	meter	
Volume, total :	609	m ³	Nett
Recommended nett volume excess sludge sump :	150	m ³	Empty frequency : 3 - 4 time/year
Recommended nett volume Influent buffer pump sump (equalize sump) :	150 - 175	m ³	7 hours buffervolume by total flow in 16 hours. nett, under the Influent incoming pipe.

Capaciteitsberekening tbv verticaal actiefslibstelsysteem de BIIA

Onderwerp:

Bedrijf Afmitech Friesland
 Naam Jan Boele de Jong
 Plaats Joure (NL)
 Referentie
 Datum
 Wijziging

In opdracht van:

Bedrijf
 Contactpers.
 Uw Ref.
 Plaats

Benodigde capaciteit bij een gemiddelde belasting in het hoogseizoen op één dag (geprognosticeerd)

uitgangspunten:	COD:	ca.	750 mg/l	flow	361,00 m3/day	aeration	1,60 kg O2/kwh
	BOD	ca.	340 mg/l	flowtime	16 hours	VBT-blo-space	1,50 day
	COD:BOD		2,2	flow-hour	21937,50 /uur	slibbelasting	kg BOD/kg ss.day
	N-kjh		70 mg/l	CZV:N:P		ss (drogestof)	4 kg/m3
	P		20 mg/l	BZVS :N:P		kg BOD/dag	119,34
						kg COD/dag	263,25
	denitrificatie		95 %	runningtime		b (spec. ademh.)	0,07
	vbt-sedimentation		3,5 hours	aeration	12 hours	b	0,06 silbelasting=0,05
				aeration			0,08 silbelasting=0,1
				powerunit	4 kw		0,09 silbelasting=0,15
							0,1 silbelasting=0,2
	IE belasting		2604 IE	(2,2;3;4;5,5)			

engineering:

Bio-ruimte tbv COD-reductie (m3)	V-totaal, incl. sedimentation (m3)	slibbelasting kg BOD/kgds.d	endogene ademhaling (kg O2/d)	substrademh (kg O2/d)	Nitr. ademh (kg O2/d)	aeration power kwh-total	aeration units	Diameter processtank	Hoigh processtank
526,50	603,3	0,057	147,42	59,67	45,53	157,89	3,3	nvt	nvt
Alpha factor (zuurstof overdracht rendement)			0,7	Geschat stroomverbruik (kwh/dag).		225,55	4,7		

Minimaal benodigde ontwerpcapaciteit Bever IIIA 2633 IE

33,83279598

Conclusie / aanbeveling

Om de gemiddelde belasting goed aan te kunnen worden een 2633 IE Bever IIIA aanbevolen. Deze heeft nog overcapaciteit. Het is van groot belang dat bij elke afvoer vanuit een professionele keuken/kantine een goed berekende vetafscheider aanwezig is en dat deze tijdig geleegd wordt. Voor het bufferen van het afvalwater en dit gedoseerd naar de afvalwaterzuivering te verpompen met een pompput met een inhoud van 7,5 m³ aanbevolen. Het silb kan in een gelijke put gebufferd worden.

Analysis in practice:

Example: DCD-Bever 201E at a Restaurant in Holland

Kenmerk rapport	DEEL8761520-0
Vervangt	-
Rapportdatum	10-09-2015
Contactpersoon	Annet Peeters
Pagina 1 van 1	
Afmitech B.V. - Sneekermeer 4 . 8502 TP Joure NETHERLANDS	



Ontvangen van Hajé Nieuwegein bv Rijksweg A27, afrit 28, Waterliniedok 1 3433 NV Nieuwegein NETHERLANDS	
Ontvangstdatum	04-09-2015
Projectnummer	HAJE-A-EDE-150020

Monstergegevens

Nr. 11690813

Product	: Afvalwater
Monsternamedatum	: 03-09-2015 15:15
Datum start analyse	: 04-09-2015
Monstername door	: Mérieux NutriSciences
Conditie ontvangst	: Gekoeld
Type monster	: Steekmonster
Monsternameplaats	: A27 afrit Nieuwegein
Conditie van verpakking	: Ongeopend

Analyseresultaten

Q	Analyse Methode	Resultaat	Dimensie	Richtwaarde	Datum Afgerond
Q	CZV in accordance with NEN 6633:2006/A1:2007	27	mg/l	-	10-09-2015
	Onopgeloste bestanddelen according to NEN 6621	< 20	mg/l	-	07-09-2015
Q	Stikstof-Kjeldahl equivalent to ISO 5663	2,3	mg/l	-	10-09-2015
Q	Fosfor in-house method-GK409	0,75	mg/l	-	09-09-2015
Q	Ammonium (als N) in-house method-GN367	1,3	mg/l	-	10-09-2015
	Ontsluiting metalen in-house method-FK547	+	-	-	08-09-2015
	Monsterbehandelingskosten	+	-	-	04-09-2015

BouwCoach Engineering BV
The Netherlands

Monstergegevens

Nr. 11725746

Product : Afvalwater
 Monsternamedatum : 10-09-2015 13:20
 Datum start analyse : 10-09-2015
 Monstername door : Mérieux NutriSciences
 Conditie ontvangst : Gekoeld
 Type monster : Steekmonster
 Monsternameplaats : A27 afrit Nieuwegein
 Conditie van verpakking : Ongeopend

Analyseresultaten

Q Analyse Methode	Resultaat	Dimensie	Richtwaarde	Datum Afgerond
Q CZV in accordance with NEN 6633:2006/A1:2007	31	mg/l	-	14-09-2015
Onopgeloste bestanddelen according to NEN 6621	41	mg/l	-	14-09-2015
Q Stikstof-Kjeldahl equivalent to ISO 5663			-	15-09-2015
Stikstof Enkelvoudresultaat	4,2	mg/l	-	
Stikstof gemiddelde	4,2	mg/l	-	
Q Fosfor in-house method-GK409	2,4	mg/l	-	16-09-2015
Q Ammonium (als N) in-house method-GN367	3,1	mg/l	-	17-09-2015
Q Nitraat (als N) in-house method-GN063	< 1	mg/l	-	16-09-2015
Q Nitriet (als N) in-house method-GN063	< 0,5	mg/l	-	16-09-2015
Ontsluiting metalen in-house method-FK547	+	-	-	14-09-2015
Monsterbehandelingskosten	+	-	-	10-09-2015

Monstergegevens

Nr. 11752609

Product : Afvalwater
 Monsternamedatum : 15-09-2015 10:00
 Datum start analyse : 15-09-2015
 Monstername door : Mérieux NutriSciences
 Conditie ontvangst : Gekoeld
 Type monster : Steekmonster
 Monsternameplaats : A27 afrit Nieuwegein
 Conditie van verpakking : Ongeopend

Analyseresultaten

Q Analyse Methode	Resultaat	Dimensie	Richtwaarde	Datum Afgerond
Q CZV in accordance with NEN 6633:2006/A1:2007	31	mg/l	-	23-09-2015
Onopgeloste bestanddelen according to NEN 6621	21	mg/l	-	21-09-2015
Q Stikstof-Kjeldahl equivalent to ISO 5663			-	17-09-2015
Stikstof Enkelvoudresultaat	5,2	mg/l	-	
Stikstof gemiddelde	5,2	mg/l	-	
Q Fosfor in-house method-GK409	1,73	mg/l	-	21-09-2015
Q Nitraat (als N) in-house method-GN063	< 1	mg/l	-	21-09-2015
Q Nitriet (als N) in-house method-GN063	< 0,5	mg/l	-	21-09-2015
Ontsluiting metalen in-house method-FK547	+	-	-	17-09-2015
Monsterbehandelingskosten	+	-	-	15-09-2015

Monstergegevens

Nr. 11796929

Product : Afvalwater
 Monsternamedatum : 22-09-2015 13:50
 Datum start analyse : 22-09-2015
 Monstername door : Mérieux NutriSciences
 Conditie ontvangst : Gekoeld
 Type monster : Steekmonster
 Monsternameplaats : A27 afrit Nieuwegein
 Conditie van verpakking : Ongeopend

Analyseresultaten

Q Analyse Methode	Resultaat	Dimensie	Richtwaarde	Datum Afgerond
Q CZV in accordance with NEN 6633:2006/A1:2007	49	mg/l	-	29-09-2015
Onopgeloste bestanddelen according to NEN 6621	40	mg/l	-	28-09-2015
Q Stikstof-Kjeldahl equivalent to ISO 5663			-	24-09-2015
Stikstof Enkelvoudresultaat	2,7	mg/l	-	
Stikstof gemiddelde	2,7	mg/l	-	
Q Fosfor in-house method-GK409	0,83	mg/l	-	30-09-2015
Q Nitraat (als N) in-house method-GN063	< 1	mg/l	-	01-10-2015
Q Nitriet (als N) in-house method-GN063	< 0,5	mg/l	-	01-10-2015
Ontsluiting metalen in-house method-FK547	+	-	-	24-09-2015
Monsterbehandelingskosten	+	-	-	22-09-2015

Monstergegevens

Nr. 11851069

Product : Afvalwater
 Monsternamedatum : 30-09-2015 13:55
 Datum start analyse : 30-09-2015
 Monstername door : Mérieux NutriSciences
 Conditie ontvangst : Gekoeld
 Type monster : Steekmonster
 Monsternameplaats : A27 afrit Nieuwegein
 Conditie van verpakking : Ongeopend

Analyseresultaten

Q Analyse Methode	Resultaat	Dimensie	Richtwaarde	Datum Afgerond
Q CZV in accordance with NEN 6633:2006/A1:2007	32	mg/l	-	01-10-2015
Onopgeloste bestanddelen according to NEN 6621	< 20	mg/l	-	02-10-2015
Q Stikstof-Kjeldahl equivalent to ISO 5663			-	02-10-2015
Stikstof Enkelvoudresultaat	1,5	mg/l	-	
Stikstof gemiddelde	1,5	mg/l	-	
Q Fosfor in-house method-GK409	0,37	mg/l	-	05-10-2015
Q Nitraat (als N) in-house method-GN063	4,9	mg/l	-	06-10-2015
Q Nitriet (als N) in-house method-GN063	< 0,5	mg/l	-	06-10-2015
Ontsluiting metalen in-house method-FK547	+	-	-	02-10-2015
Monsterbehandelingskosten	+	-	-	30-09-2015

Certification:



DECLARATION IIA

EC DECLARATION OF CONFORMITY FOR MACHINERY
(Directive 89/37 EG, appendix II, under A),

Afmitech Friesland

Sneekermeer 6
8502 TP Joure
The Netherlands
Tel. +31(0)513 54 1022
i. www.afmitech.com

The products, to which this declaration relates, are in conformity with the Council Directives on the approximation of the laws of the EEC Member States relating to

Hereby declares under their own responsibility that the product, Decentralized Wastewater treatment Bever IIIA and added equipment conform the project proposals to DCD (Dutch Civil Design srl), to which this directive pertains, complies with the conditions of the Machinery directive (Directive 89/37 EEC).

The products, to which this declaration relates, are in conformity with the Council Directives on the approximation of the laws of the EEC Member States relating to

- Machinery (98/37/EEC)
Standard used: SFS-EN ISO 12100-1:2003 and SFS-EN ISO 12100-2:2003

- Electromagnetic compatibility (2004/108/EC)
Standard used: EN 618:2002 and EN 60034-1.

- Electrical equipment designed for use within certain voltage limits (2006/95/EC)
Standard used: EN 60204-1 and EN 60335-1.

Date of declaration: 02-09-2014
Location of declaration: Joure

Signature:



Certificate

Nr.: VHL-001-IBA

The undersigned declares that:

Bever Combi Compact (5 PT)

Manufactured by:

Afmitech Friesland

Has successfully passed the Initial Type Testing according to:

NEN - EN 12566-3 (2005)
Small waste water treatment systems for up to 50 PT-part 3:
Packaged and/or site assembled domestic wastewater treatment plants

Parts:

- Water tightness (water test)
- Treatment efficiency
- Structural behaviour (by calculation)

The testing was done by the Van Hall Institute, University for Professional Education in Agriculture, Food Technology, Environmental and Animal Sciences in Leeuwarden, the Netherlands.

Notification number 1554

Leeuwarden, 11 October 2007



Nummer	KZ3024/01	versie	--
Uitgegeven	2003-03-11	d.d.	--

Attest-met-productcertificaat
IBA-compactsystemen klasse III A

Op grond van onderzoek, alsreeds regelmatig door Kiwa uitgevoerde controles, worden de door

Afmitech Friesland v.o.f.

vervaardigde producten, die gespecificeerd zijn in dit certificaat, en die voorzien zijn van het onder "Merken" aangegeven Kiwa-keur, bij aflevering geschikt te voldoen aan Kiwa-beoordelingsrichtlijn K10004, "IBA-compactsystemen", d.d. 2000-09-01.

Kiwa N.V.

ing. B. Meekma
Directeur
Certificatie en Keuringen

Dit certificaat is afgegeven conform het Kiwa-Reglement voor productcertificatie.
Dit certificaat bestaat uit 4 pagina's.
Openbaarmaking van het certificaat is toegestaan

Evenwiel (ontwikkelaar)
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8423 PS Vathijk
Nederland
Telefoon: 0513 - 54 10 22
Telefax: 0513 - 54 10 33
Internet: www.afmitech.nl
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