

# Compact Sewage Systems in France

## *A technical and cost comparison*

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### 2010 Sewage System Approvals

#### Introduction

The methods of evaluating systems are fixed by a decree dated 7<sup>th</sup> September 2009. All companies wishing to have a system approved must submit a file to the appropriate organisation. There are two organisations that can evaluate a system: 'CSTB' and 'CERIB'. After evaluating a system the organisation returns a report on its characteristics & performance. The organisation then gives a positive opinion, or not, from the contents of the file.

There are 2 different approval procedures.

- Simple evaluation if the installation already possesses the CE (Conformité Européen) markings
- Complete evaluation (if the installation doesn't have CE approval) which includes:
  - tests carried out on a test bench
  - tests involving the installations receiving hydraulic loads and organic material which represent the pollution that a property would produce, given a known number of inhabitants.
  - tests of the purifying performance, which are characterised principally by the material in suspension (MES) and the daily biological oxygen demand over 5 days (DBO5) : these must be less than 30 and 35mg/l

#### 2010 Approved Systems

- 13 Micro-stations
  - 3 using a free culture
  - 10 using a fixed culture
- 9 Compact filters
- All approved in general for 3, 4 or 5 EH (Equivalent Inhabitants)
- Only Eparco (up to 20 EH), Epurflo (up to 17 EH), Epurfix (up to 7 EH) and EauClin (6 EH) are approved for more

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### Contents

This document is intended to provide an overview and comparison of approved micro and compact sewage systems, and contains:

#### **Section 1: Approved Micro-stations**

1. Presentation of the systems: free culture and fixed culture
2. Comparison of the systems
  - Weight and size
  - Maintenance
  - Cost
3. Conclusion / Summary

#### **Section 2: Approved compact filter systems**

1. Presentation of the systems
2. Comparison of the systems
  - Maintenance
  - Cost
3. Conclusion / Summary

#### **Section 3: Summary of real costs of all the systems contained in this document**

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### Section 1: Approved Micro-stations

#### 1 – Presentation of Systems – Free culture and Fixed culture

##### A : Free culture process

The free culture process is putting waste water in contact with a rich mixture of bacteria and protozoa organic matter in suspension, or dissolved.

Micro Stations generally consist of:

- A reactor positioned after a pre-treatment

- A clarifier placed after the reactor

- A sludge recirculation device

- A device to supply oxygen (compressor)

Process is continuous or SBR (Sequential Batch Reactor)

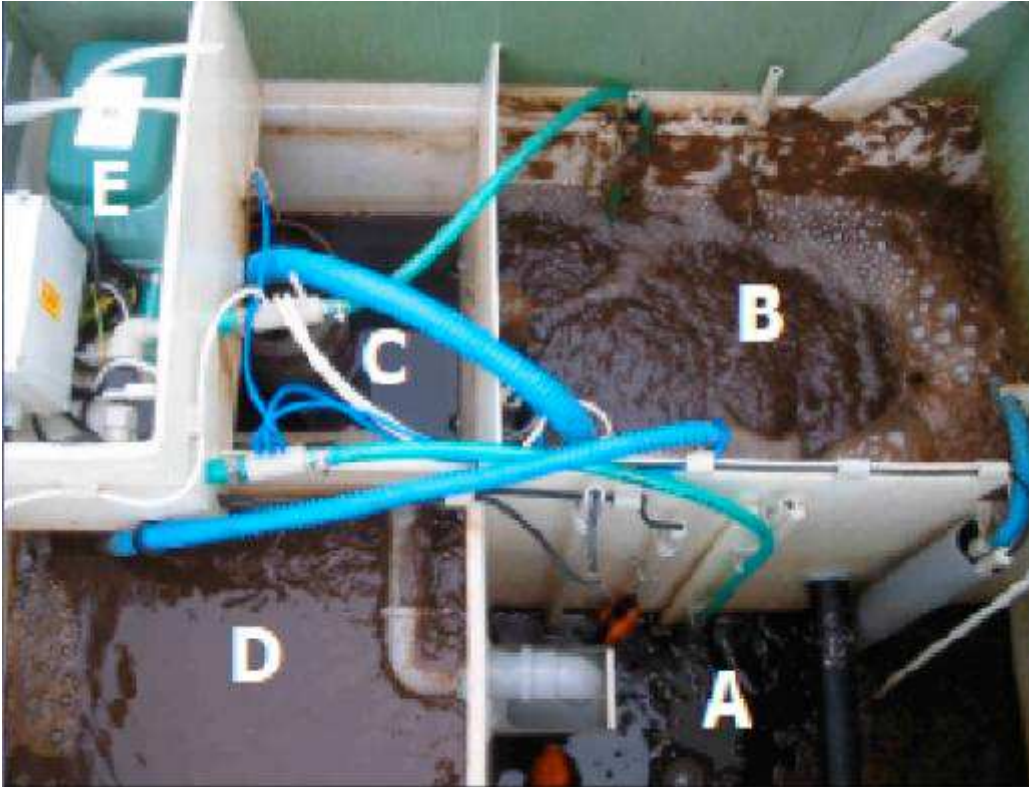
#### Free culture process

N° approval and date of appearance in the official journal	Company	System name	Equivalent inhabitants (EH)
2010 – 003 31/03/2010	Neve Environnement	TOPAZE T5 avec filtre à sable	5
2010 – 004 31/03/2010	Sotralentz ACTIBLOC	2500-2500 SL	4
2010 – 019 07/10/2010	Kessel AG	INNO-CLEAN EW4	4

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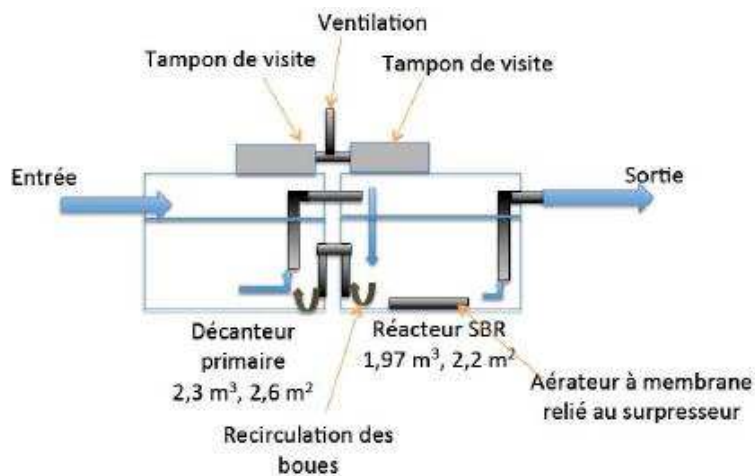
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### Filière Topaze T5 (5 EH) NEVE ENVIRONNEMENT



Single tank system comprising:

- Accumulation tank A
- Aeration Zone (B)
- Settlement Tank (C)
- Sludge stockage (D)
- Sand filter



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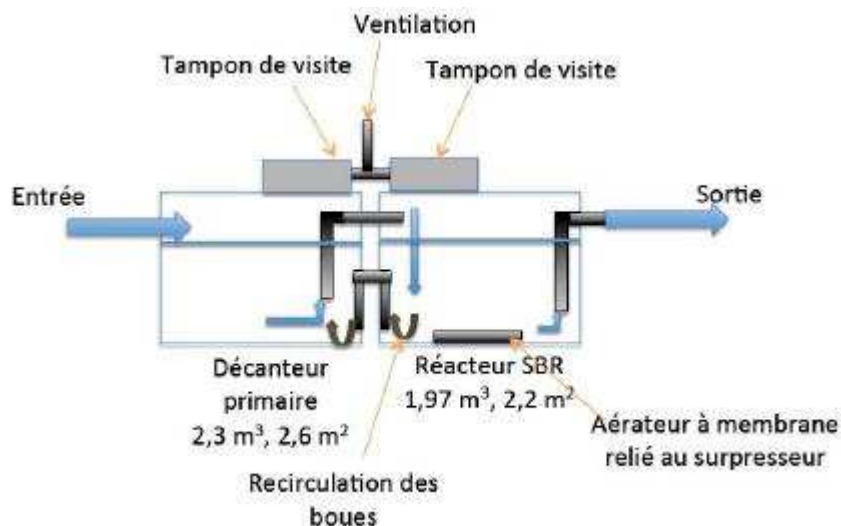
Filiere Actibloc 2500 et 2500SL (4EH - Sotralentz)



A Multi tank system comprising a settlement tank and a reactor tank (SBR)

Principal of the SBR (cycle of 6 hours) divided into 5 stages

- The transfer of used water to the reactor
- Aeration
- Settlement
- Removal of purified water
- Removal of secondary sludge to the settlement tank

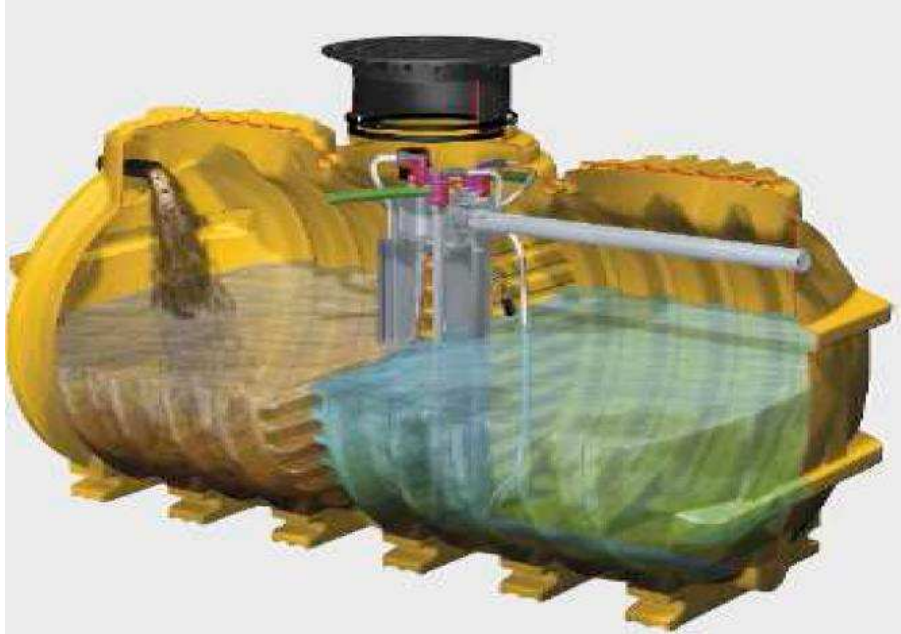


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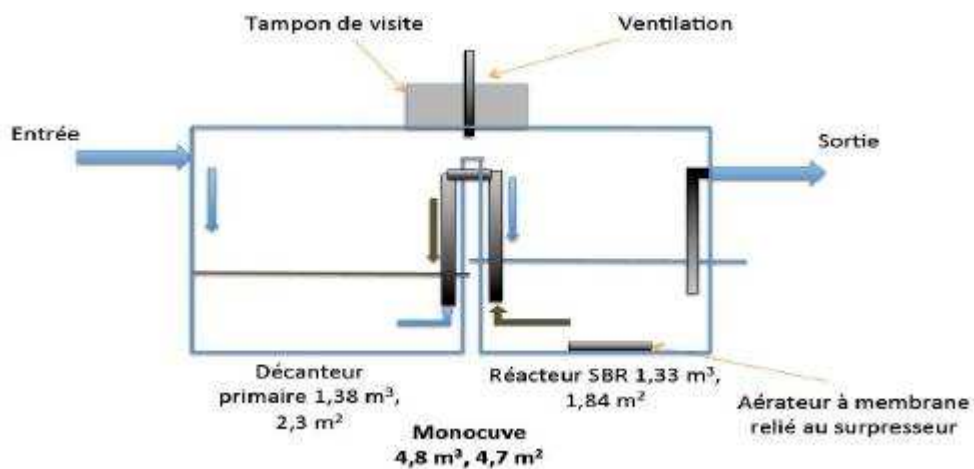
Inno-Clean EW4 (4 EH) Kessel AG



### Single Tank system

Principal of the SBR (Cycle of 8 hours) divided into 6 stages

- Settlement in the primary settlement tank
- Transfer of pre-treated effluents in the reactor
- Sequential aeration of the reactor of six hours
- Second phase of settlement
- Evacuation of water
- Sending back sludge to the primary settlement tank



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### Section 1: Approved Micro-stations continued

#### B : Fixed culture process

The Fixed culture process is based on the creation of a biofilm on a support  
The biofilms are composed of micro-organisms, water, particles in suspension and dissolved materials rejected by the bacteria

N° approval and date of appearance in the official journal	Company	System name	Equivalent inhabitants (EH)
2010 – 005 06/04/2010	Bionest France	BIONEST PE-5	5
2010 – 006 09/07/2010	Epur SA	BIOFRANCE F4	5
2010 – 007 09/07/2010	Epur SA	BIOFRANCE PLAST F4	5
2010 – 010 30/07/2010	Phyto Plus Environnement	BIO REACTION SYSTEM	5
2010 – 011 30/07/2010	EauClin	MONOCUVE TYPE 6	6
2010 – 015 17/09/2010	Eloy Water	OXYFIX C-90 MB 4EH 4500 3	3
2010 – 016 17/09/2010	Eloy Water	OXYFIX C-90 MB 5EH 6000	5
2010 – 020 04/11/2010	Delphin Walter Systems	DELPHIN COMPACT1	4
2010 – 021 07/10/2010	Abas	SIMBIOSE 4 EH	4
2010 – 022 07/10/2010	Kingspan Environnemental	BIODISC BA 5 EH	5

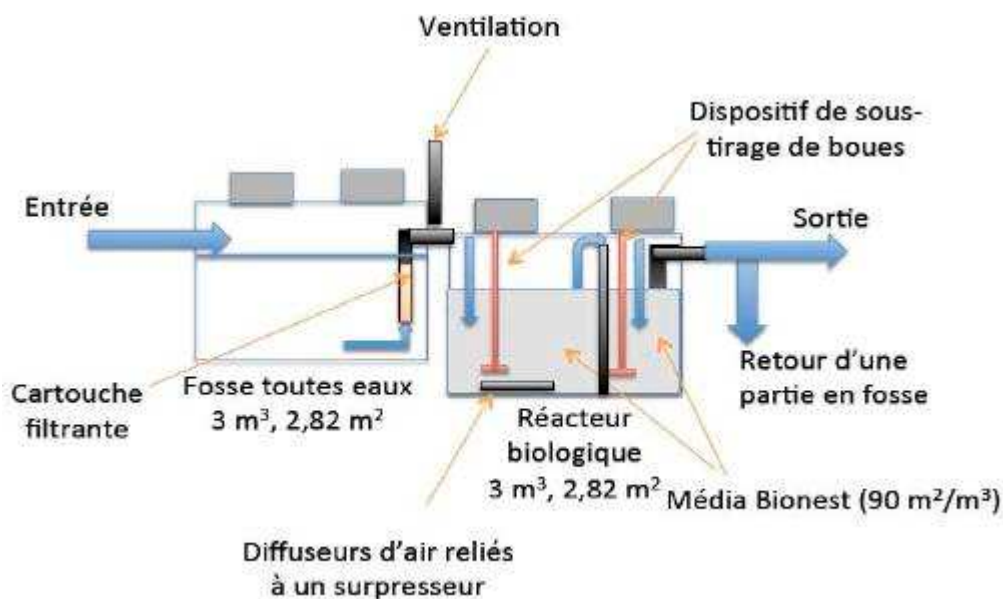
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Bionest PE-5 (5 EH) Bionest



Immersed fixed culture polymer ribbon in a multi tank system  
Composed of a primary settlement tank and a biological reactor divided in 2:  
1/3 and 2/3  
Continuous aeration



# Compact Sewage Systems in France

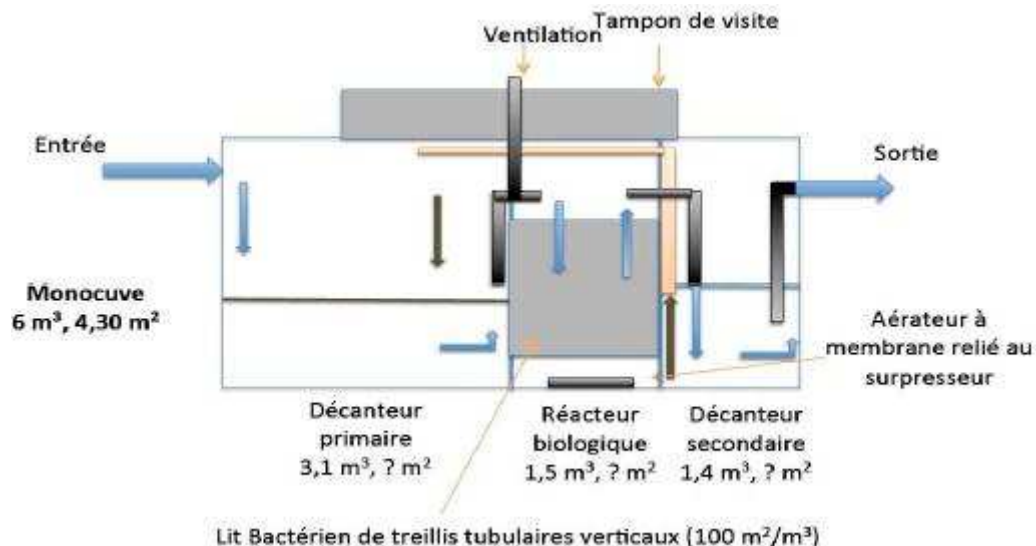
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### Biofrance F4 and Biofrance Plast F4 (5 EH) Epur SA



These 2 systems are differentiated by the different material of the tanks; concrete for the F4 & Polypropylene (plastic) for the Plast F4  
Immersed fixed culture support composed of vertical tubular mesh on blocks in a single tank system  
Three compartments: primary settlement tank, biological reactor and a secondary settlement tank  
Sequential aeration



# Compact Sewage Systems in France

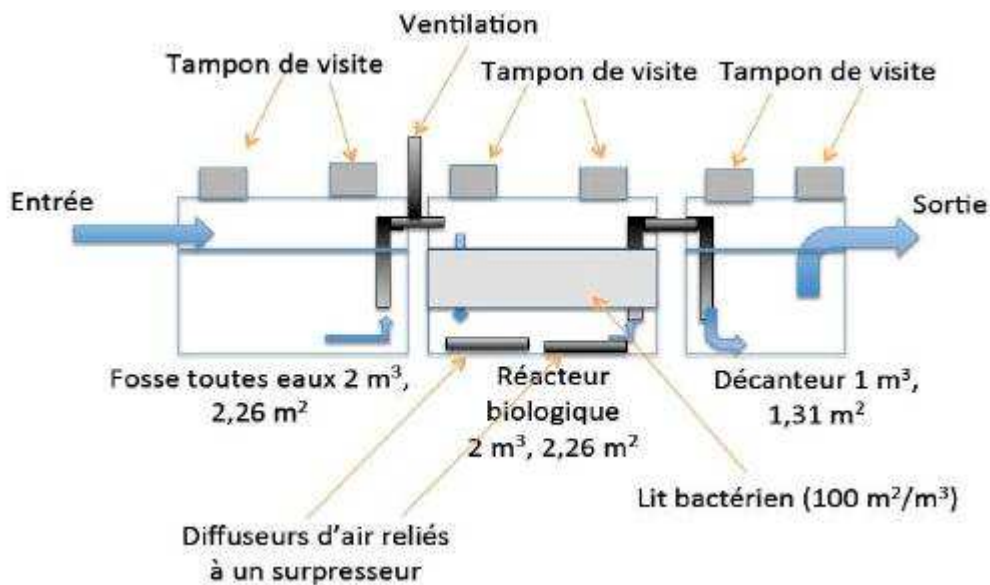
## *A technical and cost comparison*

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### BioReaction System (5 EH) – Phyto Plus Environment



Immersed fixed culture in a system of multiple tanks  
Composed of a primary settlement tank, a bioreactor and a final settlement tank  
Continuous aeration



# Compact Sewage Systems in France

## *A technical and cost comparison*

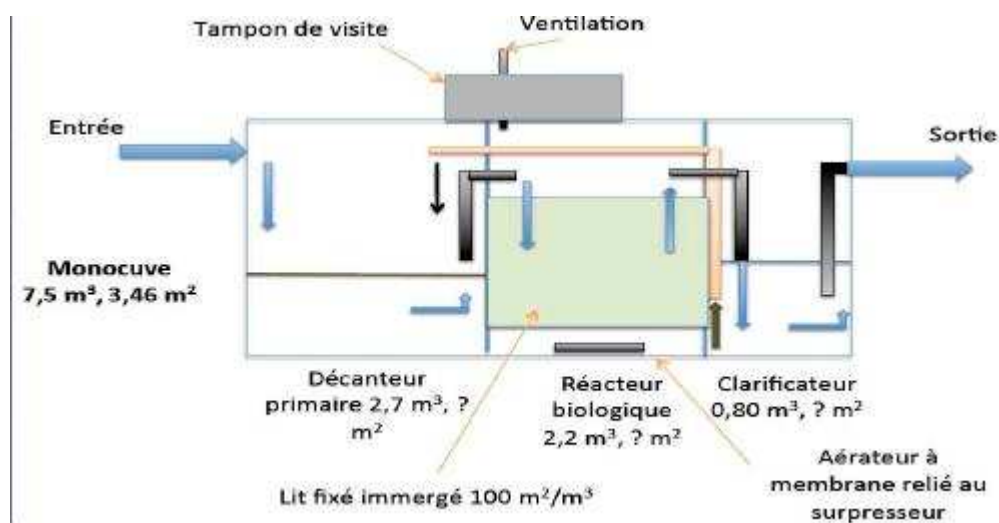
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### Monocuve Type 6 (6 EH) - Eauclin



Immersed fixed biomass in a single tank  
Composed of a primary settlement area, a reactor and a clarifier

Sequential aeration – 45 minutes every 6 hours



# Compact Sewage Systems in France

## *A technical and cost comparison*

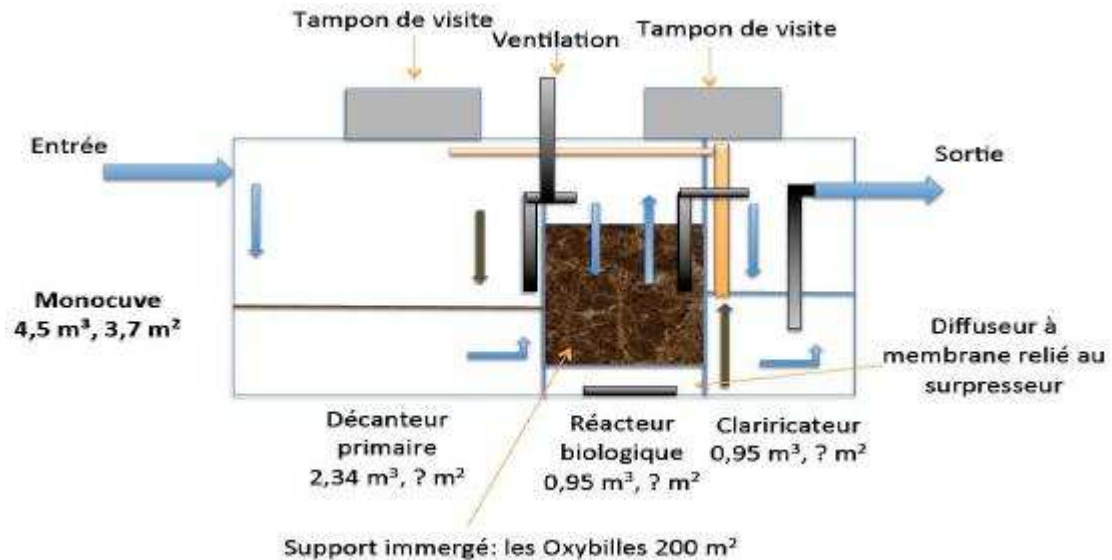
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Oxyfix C-90 MB 4500 & 6000 – Eloy Water



Immersed fixed biomass (Oxybille ©) in a single tank system  
Composed of a primary settlement tank, a biological reactor and a secondary settlement area  
Continuous aeration

The Oxyfix C-90 MB 6000 (5 EH) has the same workings as the smaller version above



# Compact Sewage Systems in France

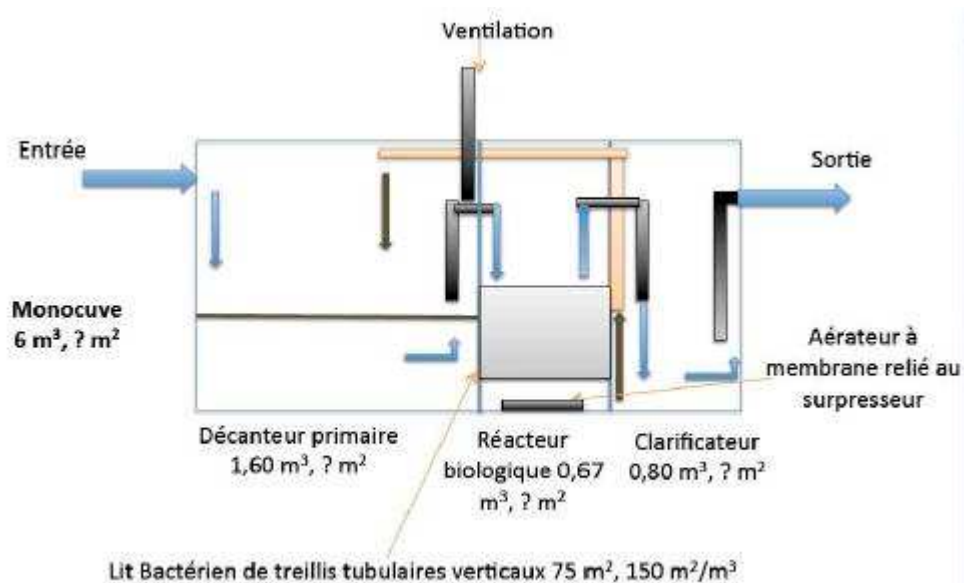
## *A technical and cost comparison*

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Delphin Compact 1 (4 EH) – Delphin Water systems



Fixed immersed culture (tank bed is composed of vertical tubular mesh) in a single tank  
Composed of a primary settlement tank of 2 reservoirs, a biological reactor and a final settlement area.

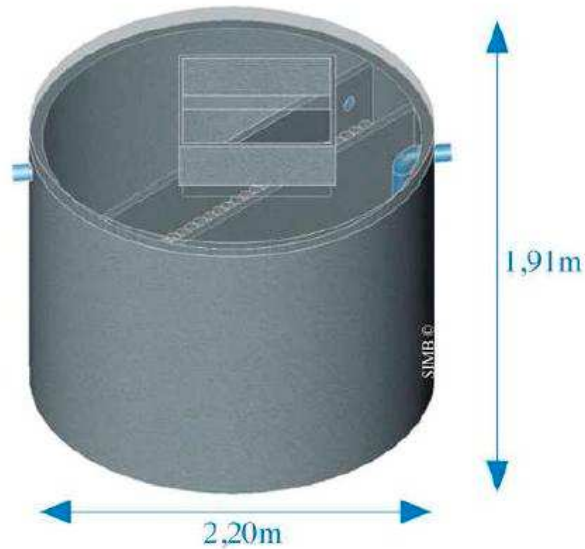


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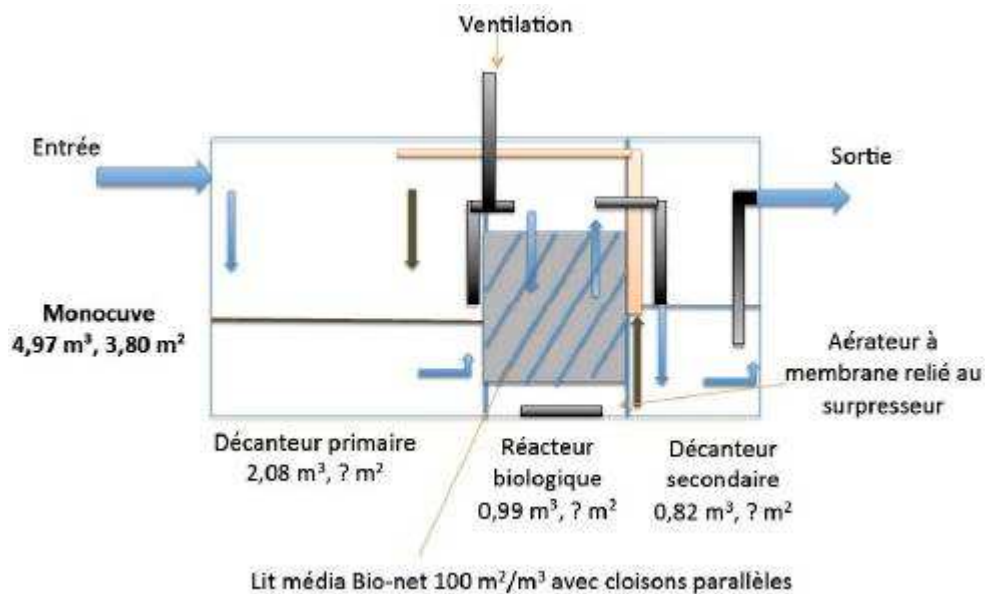
### Simbiose (4 EH) - Abas



Immersed fixed culture (bed Bio-Net ©) in a single tank system

Composed of a primary settlement tank, a biological reactor made of parallel walls and a secondary settlement tank.

Sequential aeration

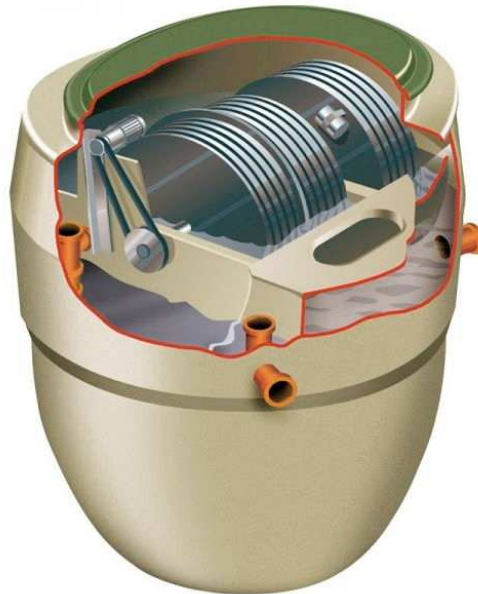


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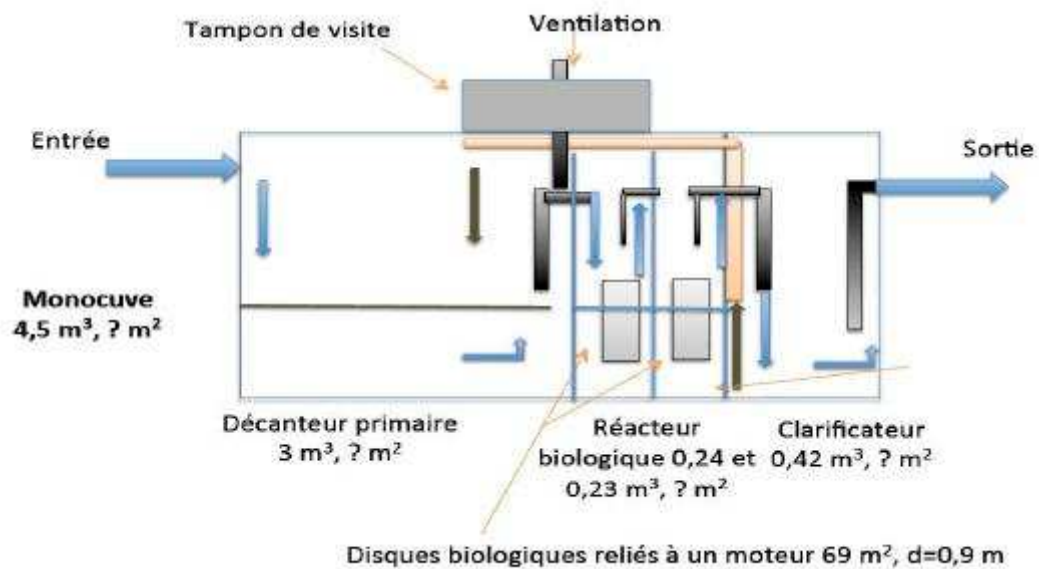
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Biodisc BA (5 EH) – Kingspan Environmental



Culture fixed on biological disc in a single tank

Composed of a primary settlement tank, 2 biological discs and a secondary settlement tank



# Compact Sewage Systems in France

## *A technical and cost comparison*

### Section 1: Approved Micro-stations

#### 2 – Comparison of the Systems

All these systems (except biodisc that uses a motor to make the discs turn) use a compressor of between 50 and 120Watts. Also most use a pump and a control system. All of this will generate considerable energy consumption and maintenance costs.

#### Weight & size

An important parameter not only for the installer but also for the purchaser

- For the installer the weight, the height and the presence or not of a single tank will play an important role in the feasibility of the installation and the plant & machinery needed;
- For the purchaser the volume or the surface of the tanks, representing the footprint of the system is important.

Construction material:

Tanks in concrete are heavy to move (more than 6 tonnes for the Biofrance F4)

Tanks in HDPE (high density polyethylene), PP (polypropylene) & Polyester are much lighter (from 300kg to 700kg) so are much easier to handle.

System	Tank Material	Weight empty (Kg)	Footprint (m2)	Volume Total (m3)	Single tank	Height of the installation (m)	Weight empty (Kg)
TOPAZE T5	PP	300	1.5	3	Yes	2.3	300
ACTIBLOC 2500-2500 SL	HDPE	355	>4	4.3	No	1.9	355
BIONEST PE-5	concrete	3300	>4	6	No	1.5	3300
BIOFRANCE F4	concrete	6200	>4	6	Yes	2.2	6200
BIOFRANCE PLAST F4	PP	540	>4	7.4	Yes	2.5	540
BIO REACTION SYSTEM	HDPE	350	>4	6	Non	1.4	350
MONOCUVE TYPE 6	HDPE	750	>4	7.5	Yes	2.9	750
OXYFIX C-90 MB 4EH 4500	Concrete & fibres	2700	>4	4.5	Yes	1.9	2700
OXYFIX C-90 MB 5EH 6000	Concrete & fibres	2850	>4	6	Yes	2.3	2850
INNO-CLEAN EW4	PE	530	>4	4.8	Yes	1.8	530
DELPHIN COMPACT1	PE	350	>4	3.9	Yes	2.2	350
SIMBIOSE 4 EH	Concrete & fibres	3013	>4	5	Yes	1.6	3013
BIODISC BA 5 EH	Polyester	388	>4	4.5	Yes	2.2	388

- The footprint of all the systems here is about the same except the Topaze that only occupies 1.5m2
- The volumes of the tanks are between 3 and 7.5m3. The fact that a system is created from one tank doesn't automatically imply that it will have a smaller volume
- The height (depth) of the installations is between 1.4 and 3 metres

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### Maintenance

- Frequency of emptying of the “sludge” is between 3 months and 4 years (as stated by manufacturers)
- All (except Kingspan Biodisc) use a compressor and membranes to diffuse the air within the systems, therefore the maintenance regime would need to include:
  - Annual maintenance of air filter of the compressor
  - Maintenance of the compressor membranes every 2 years
  - Changing the compressor every five years
  - Changing aeration membranes every 8 years with maintenance every 1 – 3 years
  - Electric consumption (around 50euro year)
  - For the Biodisc: inspection & maintenance of the disc spindle and motor.

System	Emptying Frequency	Prefilter (annual)	Membranes d'aeration	Compressor or motor
Topaze 2010-003	6 months		X	X
Actibloc 2010-004	3		X	X
Bionest PE-5 2010-005	4	X	X	X
Biofrance 2010-006 & 7	2		X	X
Bio Reaction System 2010-010	4		X	X
Monocuve Type 6 2010-011	4		X	X
Oxyfix 2010-015 & 16	3		X	X
Inno-Clean EW4 2010-019	4		X	X
Delphin Compact 1 2010-020	1		X	X
Simbiose 2010-021	4		X	X
Biodisc BA 2010-022	1			X

### Cost of the Systems

System	Purchase cost (euro)	Installation cost (euro)	Electricity /year (euro)	Cost of yearly contract proposed (euro)	Cost over 25 years (euro)
TOPAZE T5	4600	1500	80	250	25056
ACTIBLOC 2500-2500 SL	7174	2000	17	100	14465
BIONEST PE-5	4546	2000	78	70	12202
BIOFRANCE F4	4750	2000	58	100	13844
BIOFRANCE PLAST F4	7074	2000	58	100	16168
BIO REACTION SYSTEM	7000	2000	60	140	15956
MONOCUVE TYPE 6	7700	2000	50	100	15406
OXYFIX C-90 MB 4EH 4500	3934	1700	51	109	11336
OXYFIX C-90 MB 5EH 6000	4300	1700	51	109	11702
INNO-CLEAN EW4	9000	?	43		13566
DELPHIN COMPACT1	6400	1800	46		12768
SIMBIOSE 4 EH	?				
BIODISC BA 5 EH	4000	1800	43	100	14575

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### Section 1: Approved Micro-stations

#### 3 – Conclusion / Summary

- A high cost over 25 years for the client
- Daily energy consumption
- Continuous maintenance (electric components)
- Cost of spare parts not known
- Frequent emptying of sludge
- The systems must run all the time so they are not suitable for holiday homes (must continue to work when you go on holiday as well)
- Risk of breakdown
- Excluded from an interest free loan
- Service contract costs are likely to rise over time

# Compact Sewage Systems in France

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### Section 2: Approved Compact Filter Systems

#### 1 – Presentation of Systems

##### Process of filtration

Compact filter preceded by a primary treatment - a septic tank that has the role of:

- Retaining decantable particle pollution
- Reducing the total pollution using a process of anaerobic digestion

Role of the filter:

- To treat the residual pollution aerobically by aerobic bacteria grown within the filter as the wastewater percolates.
- The oxygen is carried by diffusion from the surface and / or provided by the ventilation tubes in the filter.
- The compact filters are of sand, zeolite, coconut husks, rock wool

#### Approved systems

N° approval and date of appearance in the official journal	Company	System name	Equivalent inhabitants (EH)
2010 – 002 18/03/2010	Assainissement Autonome	COMPACT'O 4ST2	4
2010 – 008 09/07/2010	Sebico	SEPTODIFUSSEUR SD14, SD22	4
2010 – 009 09/07/2010	Sebico	SEPTODIFFUSEUR SD23	5
2010 – 012 06/10/2010	Premier Tech Environnement	EPURFIX CP 5	5
2010 – 013 06/10/2010	Premier Tech Environnement	EPURFLO MAXI CP	5
2010 – 014 06/10/2010	Premier Tech Environnement	EPURFLO MAXI CP	6
2010 – 017 07/10/2010	Premier Tech Environnement	EPURFLO models MAXI CP	5 to 17
2010 – 018 07/10/2010	Premier Tech Environnement	EPURFIX models CP	5 to 7
2010 – 023 04/12/2010	Eparco	Zeolite filter	5 to 20

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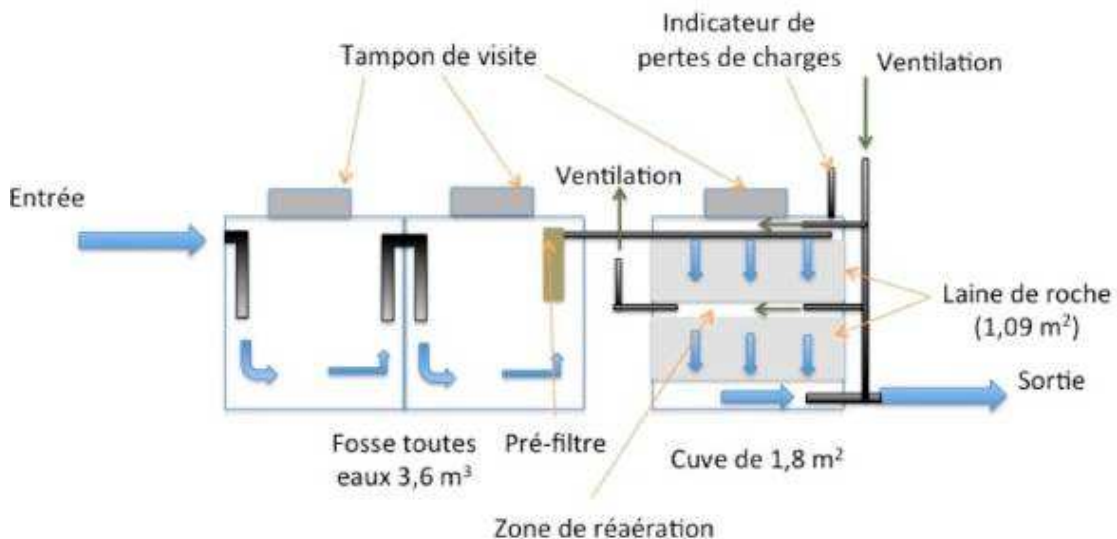
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### Compact'o 4 ST2 (4 EH) - Assainissement Autonome



Composed of a septic tank in 2 compartments (3.6m<sup>3</sup>) with a pre-filter & a separate 2 stage filter of rock wool.



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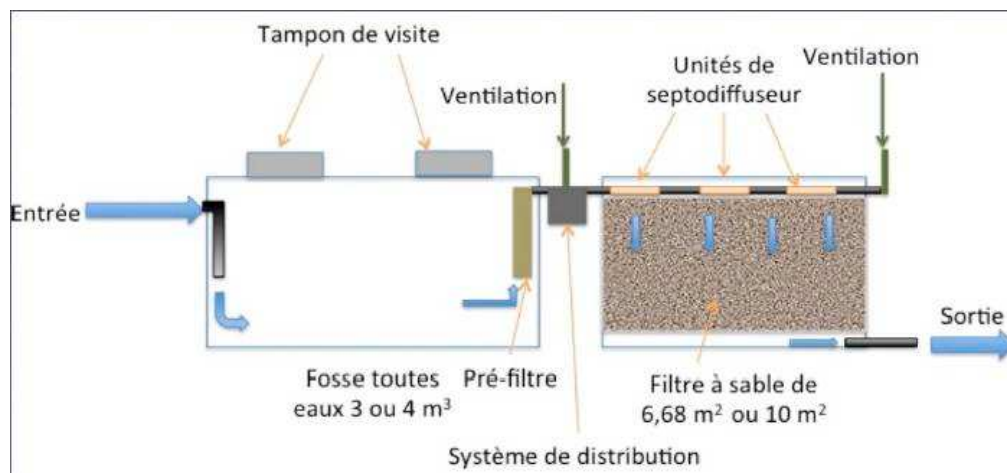
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Septodiffuseur SD14, SD22 (4 EH), SD23 (5 EH) – Sebico



Composed of a septic tank of 3000litres ( for the SD14 & SD22) and 4000litres (for the SD23) attached to a system of distribution, and a sand filter with units of septodiffuseurs placed on top.

The septodiffuseurs are placed in series, or parallel, on the sand filter, and allow a spreading of the pre-treated water and aid the cleaning of the water.



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Epurfix Modeles CP (5 to 7 EH) - Premier Tech

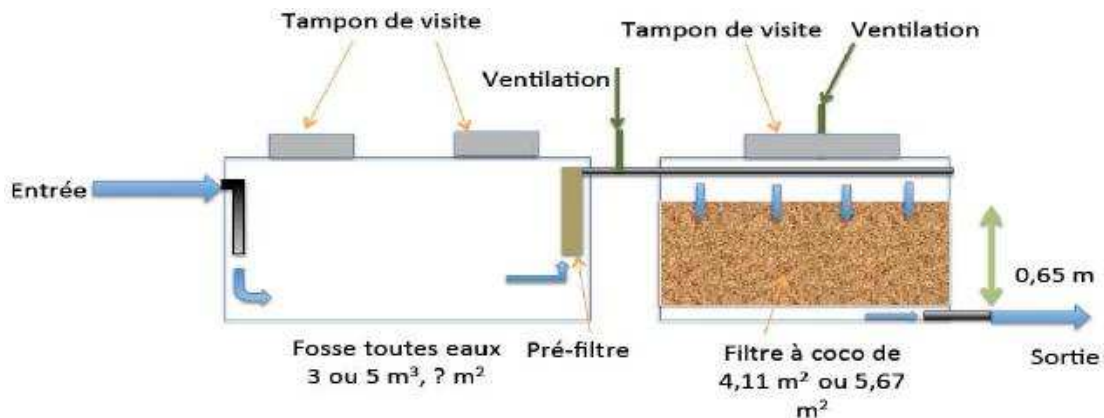


Modèle EPURFIX 5 EH

System composed of 2 tanks, a septic tank of 3000litres (for 5 EH) or 4000litres (for 7 EH), and a filter of coconut husks

Spreading of the pre-treated water by distribution plates

Needs a pre-filter EFT080 when used on suitable pre-existing septic tanks.



# Compact Sewage Systems in France

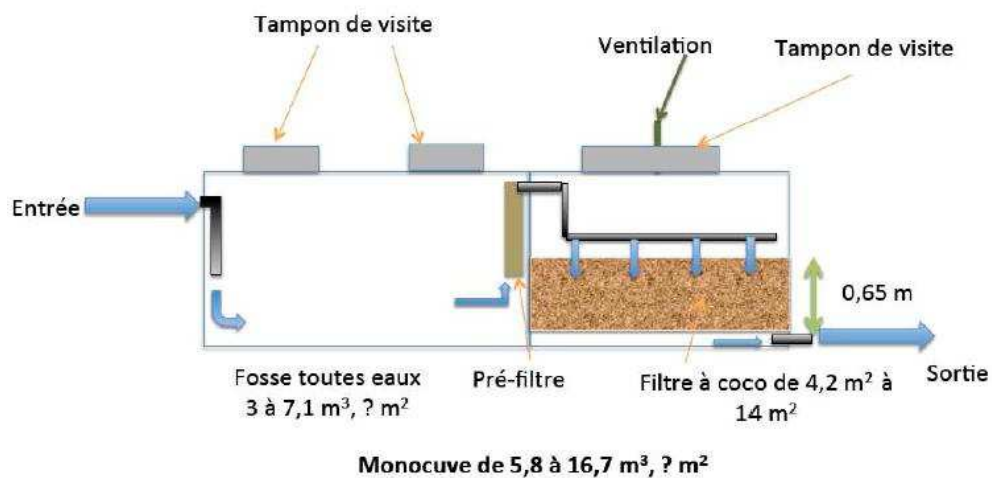
## *A technical and cost comparison*

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Epurflo models maxi CP (5 to 17 EH) – Premier Tech



Single tank system composed of a septic tank and a coconut husk filter  
Spreading of the pre-treated water is done by a flush system & distribution plates

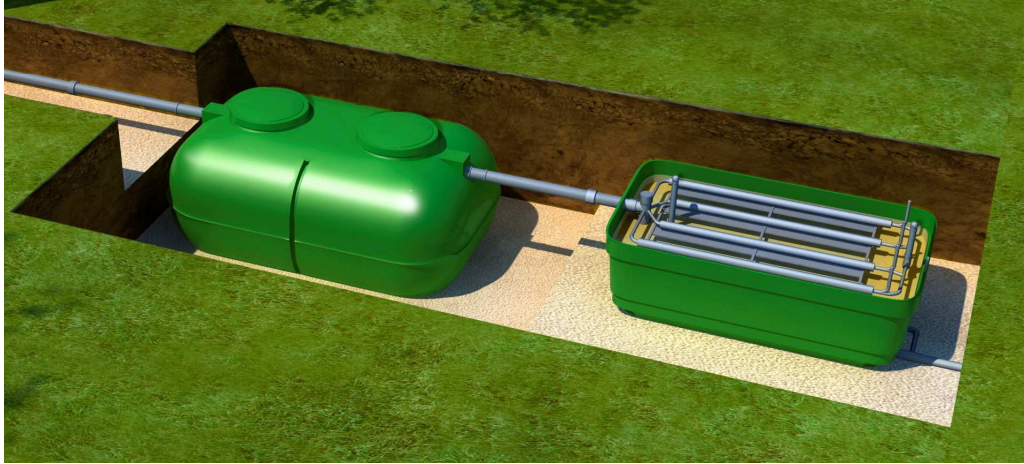


# Compact Sewage Systems in France

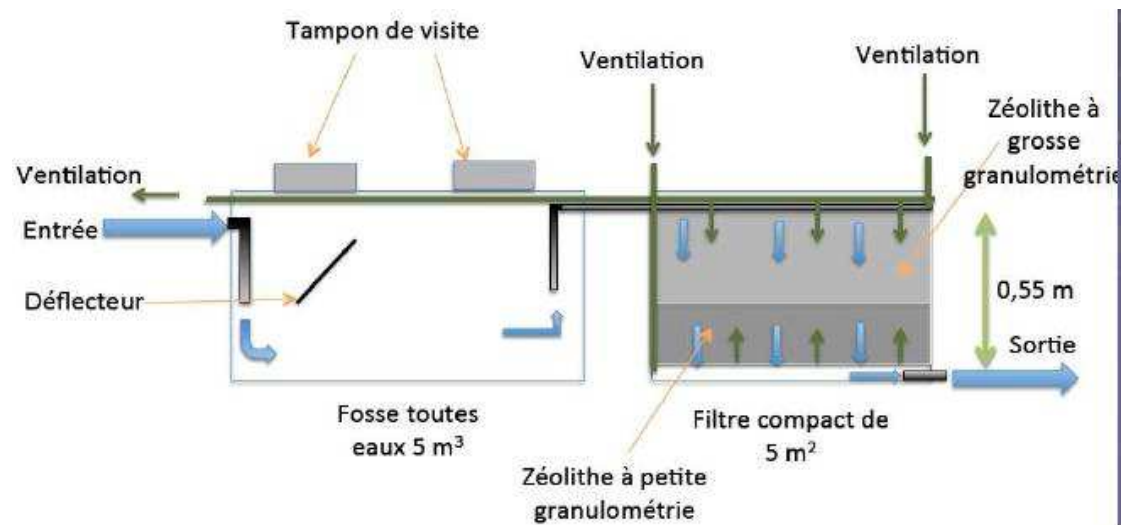
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Zeolite Filter ( 5 to 20 EH ) - Eparco



System composed of a septic tank and a zeolite filter (available in 5 & 7m<sup>2</sup>)  
System is gravity fed  
Aeration at the entrance & exit of the filter



# Compact Sewage Systems in France

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### Section 2: Approved Compact Filter Systems

#### 2 – Comparison of the Systems

##### Maintenance of the systems

Things to take into account when choosing a system

- Frequency of emptying the septic tank
- Changing the filter media is obligatory for certain models
- Maintenance of the pre-filter - six monthly or annual
- Cleaning of the pipes (annual)
- Maintenance of the automatic flush (six monthly)
- Raking the coconut filter (annual)
- Maintenance of the aeration ramp (annual)

##### Indicative system maintenance

System name	Emptying frequency (years)	Changing filter media (years)	Prefilter maintenance	Cleaning of pipes	Others
COMPACT'O 4ST2	3,5*	Yes 4 – 8	yearly		Maintenance of the aeration ramp
SEPTODIFUSSEUR	5*		Six months	annual	Maintainance of the automatic flush (six monthly)
PREMIER TECH ENVIRONNEMENT	4*	Yes (10)	yearly		Raking the coconut filter (annual)
EPARCO	10* / 15**	no	no	no	No

\* from users guide

\*\*source Eparco 3EH

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### Cost of the Systems

System name	Purchase price	Installation cost *	Maintenance per year **	Cost over 15 years	Cost over 25 years
COMPACTO 4ST2	4743	3553	90	10657	14331
SEPTODIFUSS EUR SD14,SD22	6310	3000	100	10310	13310
SEPTODIFFUS EUR SD23	6760	3000	150	10810	15010
EPURFIX CP 5	4695	2500	120	10315	15195
EPURFLO MAXI CP 5	5380	2500	120	11000	15880
EPURFLO MAXI CP 6	5908	2500	120	11528	16408
EPARCO (5 EH)	6375	3195	0	10020	10320

\* cost indicative for a standard installation without constraints & additional work

\*\* cost of maintenance includes the raking of the coconut filter, cleaning of the pipes & cleaning of the aeration ramp or the automatic flush

### 3 – Conclusion / Summary

- The systems work without electricity
- Some systems need more frequent media changes than others
- Can be installed for holiday homes
- If a full time French residence a 10 year interest free loan is available

# Compact Sewage Systems in France

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### Section 3: Summary of real costs of all the systems contained in this document

System	Cost 25 years	Cost 15 years
TOPAZE 5	25056	17463
EPURFLO 6	16408	11528
BIO France 4	16168	10995
BIO REACTION	15956	13163
EPURFLO 5	15880	11000
MONOCUVE 6	15406	13113
EPURFIX CP5	15195	10315
SEPTO 23	15010	10810
BIODISC BA 5 EH	14575	10945
ACTIBLOC 2500	14465	12338
COMPACTO 4	14331	10657
BIOFRANCE F4	13844	10995
INNO CLEAN 4	13566	11697
SEPTO 14	13310	10310
DELPHIN	12768	10899
BIONEST 5	12202	9928
OXYFIX 5	11702	9410
OXYFIX 4	11336	9044
EPARCO 5	10320	10020