

ECO

Integrated waste water Treatment systems

we are wienerberger

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1 INTRODUCTION

1.1 Why is it necessary to treat waste waters?

The necessity of preserving the ecological balance in nature requires reduction of pollutants in the surface and subterranean waters. Such pollutants can be:

- High concentration of petroleum products and oils.
- High concentration of plant and animal fats.
- High concentration of organic and non-organic substances.

1.2 What are Pipelife's solutions for treating waste waters?

- Wastewater treatment plants for household-fecal waters - ECOBOX.
- Treatment of waters with high concentration of animal and plant fats - grease separators FATBOX.
- Treatment of waters with high concentration of oils and petroleum products - oil separators OILBOX.
- Treatment of waters with high concentration of big mechanical admixtures - SANDBOX grit separator.

2 APPLICATIONS

ECOBX - modular wastewater treatment plants for household fecal waters.

Where there is no built sewage system of the place or out of the towns and villages (houses, residential and hotel complexes, small plants and workshops, public and administrative buildings).

FATBOX - separator of animal and plant fats

Where the high concentration of fats does not allow their direct discharge in the sewage system of the place or in case of treatment of waste waters through local wastewater treatment plants (meat-processing plants, dairy farms, kitchens, restaurants, confectionery workshops and other plants)

OILBOX - separator of oils and petroleum products

Where the high concentration of oils and petroleum products does not allow their direct discharge in the settlement sewage system or in an existing water receiver (garages, auto shops, car washes, gas stations, production workshops, roads and parking lots).

SANDBOX - separator of big sludge mechanical admixtures (sand and others inert materials)

Where the high concentration of big admixtures would lead to sludge deposits in the sewage system or in the next treatment facilities (in productions which separate heavier admixtures or insoluble sludge substances, roads, parking lots and others).

3 ADVANTAGES OF THE PIPELIFE ECOSYSTEMS

- Guaranteed effect of treatment - above 92%.
- Guaranteed leak-tightness of all the facilities.
- Quick and easy assembly due to the low weight of the facilities.
- Chemical resistance - pH2 - pH12.
- Easy increase the capacity of the wastewater treatment plants by adding of additional modules.
- Long exploitation life.
- An integrated part of the whole system for leading and treating of waters.
- Permanent production control of the raw material and the ready to use product.
- High quality of all facilities. They meet all the requirements of the European standards and the Bulgarian normative organization.

4 STANDARDS

4.1 Why are standards necessary?

The standards are a combination of rules and norms of practical and theoretical observations and research of the technical parameters which the products should meet. They define minimal requirements for the quality of the specific product. At the same time they guarantee compatibility of products manufactured by different manufacturers.

All this makes the standard extremely important because it guarantees all parties:

Designers, engineers, architects, builders, clients, control authorities and others that the product which they use meets the specific application and possesses all the necessary requirements in order to allow unhindered, flawless and long exploitation.

4.2 Which standards Pipelife's ecosystems meet:

4.2.1 Modular wastewater treatment plants - ECOBOX:

EN 12566-3 from 4 to 52 P.E.¹, which requires:

- The allowed materials for building the tanks to be concrete, steel, PVC, PE, PP and glass-reinforced plastic.
- Facility leak-tightness tested by vacuum, water and air.
- Resistance to load from soil, hydrostatic load and pedestrian/traffic load.
- Durability of all facility components which are in exploitation.
- Permanent control of: used raw materials and components, manufacture process, ready to use product and its storage.
- Sizing is made on the basis of degree of treatment according to the allowed values of inlet pollution of the treatment facility which are shown in table 1:

BOD ₅	150-500	mgO ₂ /l
COD	300-1000	mgO ₂ /l
SS	200-700	mg/l
Total nitrogen	22-80	mg/l
Total phosphorus	5-20	mg/l

Table 1

EN 12566-3 does not state specific requirements with regard to the outgoing values of the pollutants (BOD, COD, SS, nitrogen and phosphorus and others). They are determined according to:

- Regulation № 6 from 9.11.2000 "About emission norms for the allowed contents of harmful and dangerous substances in the waste waters, discharged in water sites" and
- Regulation № 7 from 14.11.2000 "About the conditions and order for discharge of production waste waters in the sewage systems of the populated areas" and are coordinated with the European Directive 91/271 EEC.

Regulation № 7 from 14.11.2000 defines the following categories of water receiver:

- **Category I** – waters for drinking needs, bathing, swimming pools and for the food industry
- **Category II** – waters for water sports, fish-breeding, watering-place and bathing of animals
- **Category III** – waters for irrigation and industrial needs

Discharge of waste waters after their treatment is possible only in the second or the third category water receiver or in soil which meets the requirements for the second category, (see Table 2)

¹ Person Equivalent – reflects the pollution with industrial (waste) waters. This is the number of fictitious residents who would pollute with the same mass which the production would make.

Norms/Parameters	91/271EEC mg/l I k.	91/271EEC mg/l II k.	91/271EEC mg/l III k.	Pipelife mg/l
BOD ₅	≤5	≤15	≤25	≤10
COD	25	70	100	≤60
SS	≤30	≤50	≤100	≤50
N	6	17	36	17
O ₂	≥6	≥4	≥2	≥4
P	1	2	4	Additional treatment facility

Table 2

The German standard ATV-122 from 50 to 500 P.E., which requires:

- The allowed materials for building of the tanks must be concrete, steel, PVC, PE, PP and glass-reinforced plastic.
- Facility leak-tightness tested by vacuum, water and air.
- Resistance to static and dynamic loads from the soil and the traffic.
- The elements which are sensitive to pollution must be protected.
- Durability of all facility components which are in exploitation conditions.
- Permanent control of: used raw materials and components, manufacture process, ready to use product and its storage.
- Sizing is based on the following values:
 - drain capacity = 150 l/ r.d.
 - BOD₅ 60 g/resident/day
 - SS 40 g/resident/day
- To be capable of extending and adding to the facility.
- To be easy-accessed for inspection, maintenance and cleaning.
- To be fitted with a device for measuring the working hours.
- To have signals in case of crash.

According to Table 3 can be calculated the capacity of the treatment facility as equivalent of residents.

Calculation of modular WWTP in relation to P.E. capacity, according to ATV A 122		
Types of buildings and activities	Unit of measurement for users	Equivalent of (P.E.):
Hotels and boarding houses	1 bed	1-3 P.E.
Camping site (tent or large flat vessel)	2 visitors	1 P.E.
A place of eating (without cooking, packed food)	3 places	1 P.E.
restaurants (with a kitchen and using of one place max. three times per twenty-four-hour period).	1 place	1 P.E.
- any additional usage of place is three times per twenty-four-hour period	extra	1 P.E.
A drinking place (beer-house, discotheque, bar) without kitchen	10 places	1 P.E.
Café without kitchen	30 places	1 P.E.
Sports grounds without restaurant and café	5 visitors	1 P.E.
Plants and workshops without kitchen	2 employees	1 P.E.
Study-hall without kitchen	3 children or educator	1 P.E.
Study-hall and schools with kitchen	2 children or educator	1 P.E.
Kindergartens and nursery during the weekend	2 children or educator	1 P.E.
Everyday manger and kindergartens	1 child or educator	1 P.E.
One-family houses and apartments according to their area	< 50 m ²	min. 2 P.E. per apartment
	from 50 m ² to 75 m ²	min. 3 P.E. per apartment
	> 75 m ²	min. 4 P.E. per apartment
In case that the apartment or the house has a bigger number of residents, the users are taken into account (8 residing-8 P.E.)		

Table 3

4.2.2 Grease separator - FATBOX:

EN 1825-1,2, which requires:

- Nominal size of the grease separators - NS: 1, 2, 4, 7, 10, 15, 20 and 25.
- Construction resistance to tension above 15 MPa, not to be deformed more than 25% and to preserve its integrity (against cracks or breaking)
- To be made of homogeneous materials without visible defects on the body or inside.
- The inlets and outlets of the inspection holes must be fitted with sealings which lead to full leak-tightness of the facility.
- Facility leak-tightness.
 - for the tanks there must be no leak for 20 minutes when filling the facility with water of 100 mm above the exploitation level
 - for the assembled manholes there must be no leak for 2 hours, at water pressure of 0,5 ba
- Minimal inlets and outlets diameters according to Table 4:

Nominal size (NS)	Minimal diameter (DNmin)
≤ NS 4	100
>NS4 до NS7	125
>NS7 до NS10	150
>NS10 до NS25	200

Table 4

- Minimal facility covering 650 mm and maximum 2000 mm.
- Defining the facility construction according to:
hydrocarbon concentration must not be more than 25 mg/l
the facility construction must be in accordance with the parameters in Table 5

Nominal size NS	Grease separator minimal surface of the (m ²)	Grease separator minimal volume (m ³)	Minimal volume of the layer for grease separation (m ³)
NS	0,25 x NS	0,24 x NS	0,04 x NS

Table 5

- The minimal difference in the elevations between the bottom of the inlet pipe and the maximal fluid level in the separator must be 70 mm.
- The volume in the facility for separation of mechanical admixtures and insoluble substances must be at least 100 x NS in liters.
- Defining the nominal size according to the formulas and tables in EN 1825-2. The calculations are equalized to grease separator with a bigger nominal size of the received one.
- Easy facility access, for cleaning, maintenance and wreck repair.
- The covers must meet the corresponding class, according to EN 124.

4.2.3 Oil separator - OILBOX:

EN 858-1,2, which requires:

- Two classes of the facility, according to the separation technology and the quantity of the remaining oil at the facility outlet (see Table 6):

class	Maximal remaining oil at the facility outlet, mg/l	Separation technology
I	5	By a coalescent filter
II	100	By gravity

Table 6

- Nominal size of the grease separators NS: 1.5, 3, 6, 10, 15, 20, 30, 40, 50, 65, 80, 100, 125, 150, 200, 300, 400 and 500.
- Construction resistance to tension above 15 MPa, it must not be deformed more than 25% and to preserve its integrity (against cracks or breaking).

- To be made of a homogeneous material without visible defects on the body or on the inside.
- The inlets and the outlet of the manholes must be equipped with sealings which lead to full leak-tightness of the facility.
- Facility leak-tightness:
 - for tanks there must be no leak for 20 minutes when filling the facility with water of 40 mm above the exploitation level
 - for the assembled manholes there must be no leak for 2 hours, at water pressure of 0,5 ba
- Minimal diameters of the inlets and the outlets according to Table 7:

Nominal size (NS)	Minimal diameter DNmin
≤ NS 3	100
>NS3 до NS6	125
>NS6 до NS10	150
>NS10 до NS20	200
>NS20 до NS30	250
>NS30 до NS100	300
>NS100	400

Table 7

- The use of mechanism for automatic facility inlet closing (according to the norms at our country it is not necessary and can not be applied)
- Defining the facility construction according to its functionality e.g. to be possible during the stay of the fluid to be achieved the necessary outlet values for the corresponding class.
- The facility volume for separation of oils and petroleum products must be at least 15 x NS in liters.
- Possibility for taking out the coalescent filters for cleaning.
- Defining the nominal size, according to the formulas and tables in EN 858-2. The calculations are equalized to the grease separator with a bigger nominal size from the received one.
- Easy facility access, for cleaning, maintenance and wreck repair.
- The covers must meet the corresponding class, according to EN 124.

The standard allows the usage of by-pass connection which is in accordance with the corresponding nominal size of the facility for treatment of waters from parking lots, roads, storage grounds and others.

4.2.4 Sedimentation tank - SANDBOX:

DIN 4040 and DIN4041, which require:

- Construction resistance to tension above 15 MPa, not to be deformed more than 25% and to preserve its integrity (against cracks or breaking)
- To be made of homogeneous materials without visible defects on the body or inside.
- The inlets and outlets of the manholes must be fitted with sealings which lead to full leak-tightness of the facility.
- Facility leak-tightness.
 - for the tanks there must be no leak for 20 minutes when filling the facility with water of 100 mm above the exploitation level
 - for the assembled manholes there must be no leak for 2 hours, at water pressure of 0,5 ba
- Defining the facility construction according to Table 8:

Incoming water quantity l/s	Minimal sludge surface 0,25 m ² per liter/ second, m ²	Minimal stay 3 min, defining the useful volume in liters	Sludge effectiveness
Q	0,25 x Q	3 x Q x 60	92%

Table 8

5 Modular wastewater treatment plants - ECOBOX

5.1 What is the treatment technology?

- Mechanical stage – sludge part.
- Biological stage – bio-pool with a cyclic action –SBR (cyclic, non-protracted, reactor).
- The technology cycle for WWTPs with a capacity of 4 PE to 500 PE has a duration of 8 hours and is repeated three times a day. It consists of the following phases:
 - **Filling with waste water** - 25 minutes
 - **Aeration** - 6 hours
 - **Sedimentation (clarification) and** - 1 hour and 15 minutes
 - **Removing SAS²** - within 1 minute before removing treated water
 - **Treated water output** - 20 minutes
- Going back to the mechanical stage for additional purification of SAS².
- Purification effect 98%.

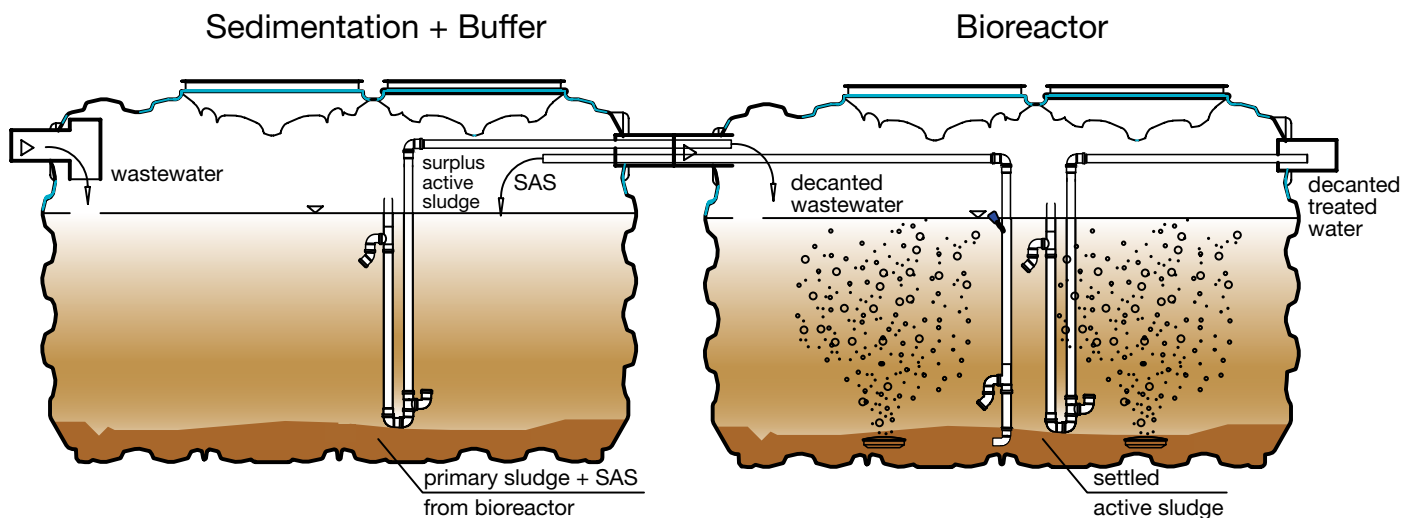
Waste water treatment starts two weeks after the start of the process and initial replenishment with active biomass. The treatment effect is achieved after the fourth week of the start of the process. This is the time necessary for the development of active biomass of bacteria and micro-organisms known as activated sludge, by means of which biochemical treatment of wastewater is done. The most appropriate time to test the treated water is after four weeks of continuous operation of the treatment module.

For seasonal use of the system the maximum time for which the sludge can not be fed with wastewater is no longer than two months. In this period the aeration of the activated sludge must not stop. After that time a part of the bacteria die and another part turns into spores. In this condition the device may not be in use (be in "standby mode") for 3 to 6 months. With a new start of the system and waste water supply spores are again turned into active biomass, and this does not exclude the need for external replenishment with active biomass.

ECOBX works with an air lift system which transports the wastewater and the sludge between the tanks and discharges the treated water. This air lift system eliminates the need to use mechanical elements mounted inside the tanks. Aeration in the bioreactor tank is carried out by membrane diffusers installed on the bottom of the tank.

The air is supplied to the air lift system and membrane diffusers by compressors and is controlled by magnetic valves. Control panel, compressors and magnetic valves are installed in the cabinet outside of the facility.

ECOBX wastewater treatment plants consist of one, two or three reservoirs, irrespective of the configuration of the reservoirs, the sediment-buffer volume is separated from the reactor volume.



² SAS - Surplus Active Sludge



control cabinet



control panel

compressor for
airlift system and
membrane diffusersmagnet valves for
control of the air
supplied to the airlift
system and the
membrane diffusers

5.2 Why should we choose ECOBOX, instead of “leak-tight” (septic) concrete tank?

The leak-tight tank requires low initial investment but depending on the site situation and its proximity to urbanized places, the costs for periodical (between 20 and 30 times a year) cleaning of the pits vary greatly.

The ECOBOX systems require one initial investment but the costs for cleaning are many times lower due to the fact that smaller volume is cleaned and at intervals from 1 to maximum 3 times a year.

Example, see. Table 9 :

One-family house 4 PE = 600L/day	Watertight reinforced concrete wastewater store tank 8 m ³	ECOBX 4 PE	DIFFERENCE
Initial investment in BGN (VAT incl.)	1850	6135	-4285
Cleaning intensity per year	26	2	
Cleaning costse in BGN (VAT incl.)	240	240	
Cleaning costs per year in BGN (VAT incl.)	6240	480	5760
Period of time for covering the initial investment in months			9

Table 9

The example shows that after 9 months you would get back the bigger initial investment

5.3 ECOBOX Product range and technical data for design

5.3.1 Product range and technical data

Product code	PE	Common Sedimentation + Buffer	Separate sedimentation	Separate buffer	Bioreactor	Common sedimentation + buffer	Sedimentation	Buffer	Bioreactor	Total length	Total width	Re-quired area	Standard depth of the facility from ground level to tank bottom level (with one riser)	Number of man-holes	Number of polyester belts	Volt-age	Power	Weight
-	-		tank	tank	tank	m ³	m ³	m ³	m ³	m	m	m ²	m	pcs.	pcs.	V	W	kg
ECOBX/AIR-EW4	4	ECO-TPV_1000-1210	0	0	ECO-TPV_800-580	1,21	0	0	0,58	3,57	2,14	7,64	2,58	2	0	230 V	55 W	291
ECOBX/AIR-EW4/2Y	4	ECO-TPV_800-745	0	0	ECO-TPV_800-580	0,745	0	0	0,58	3,36	1,93	6,48	2,32	2	0	230 V	55 W	250
ECOBX/AIR-EW4/3Y	4	ECO-TPV_800-580	0	0	ECO-TPV_800-580	0,58	0	0	0,58	3,36	1,93	6,48	2	2	0	230 V	55 W	240
ECOBX/AIR-EW6	6	0	ECO-TPV_1000-1400	ECO-TPV_800-580	ECO-TPV_800-620	0	1,4	0,58	0,62	5	2,14	10,7	2,83	3	0	230 V	75 W	427
ECOBX/AIR-EW6/2Y	6	ECO-TPV_1000-1110	0	0	ECO-TPV_800-620	1,11	0	0	0,62	3,57	2,14	7,64	2,46	2	0	230 V	75 W	289
ECOBX/AIR-EW6/3Y	6	ECO-TPV_800-865	0	0	ECO-TPV_800-620	0,865	0	0	0,62	3,36	1,93	6,48	2,56	2	0	230 V	75 W	261
ECOBX/AIR-EW8	8	ECO-T3000	0	0	ECO-TPV_800-825	3	0	0	0,825	4,59	2,36	10,83	2,48	3	1	230 V	75 W	334
ECOBX/AIR-EW8/2Y	8	ECO-TPV_1000-1495	0	0	ECO-TPV_800-825	1,495	0	0	0,825	3,57	2,14	7,64	2,95	2	0	230 V	75 W	324
ECOBX/AIR-EW8/3Y	8	ECO-TPV_1000-1210	0	0	ECO-TPV_800-825	1,21	0	0	0,825	3,57	2,14	7,64	2,58	2	0	230 V	75 W	306
ECOBX/AIR-EW10	10	ECO-TR3500	0	0	ECO-TPV_1000-1015	3,5	0	0	1,015	4,72	2,8	13,22	2,55	2	1	230 V	80 W	310
ECOBX/AIR-EW10/2Y	10	0	ECO-TPV_1000-1210	ECO-TPV_800-705	ECO-TPV_1000-1015	0	1,21	0,705	1,015	5,21	2,14	11,15	2,58	3	0	230 V	80 W	459
ECOBX/AIR-EW10/3Y	10	ECO-TPV_1000-1495	0	0	ECO-TPV_1000-1015	1,495	0	0	1,015	3,78	2,14	8,09	2,95	2	0	230 V	80 W	349

Product code	PE	Common Sedimentation + Buffer	Separate sedimentation	Separate buffer	Bioreactor	Common sedimentation + buffer	Sedimentation	Buffer	Bioreactor	Total length	Total width	Required area	Standard depth of the facility from ground level to tank bottom level (with one riser)	Number of man-holes	Number of polyester belts	Voltage	Power	Weight
-	-		tank	tank	tank	m³	m³	m³	m³	m	m	m²	m	pcs.	pcs.	V	W	kg
ECOBX/AIR-EW12	12	ECO-TR3500	0	0	ECO-TPV_1000-1210	3,5	0	0	1,21	4,72	2,8	13,22	2,58	2	1	230 V	90 W	321
ECOBX/AIR-EW12/2Y	12	0	ECO-TPV_1000-1400	ECO-TPV_800-825	ECO-TPV_1000-1210	0	1,4	0,825	1,21	5,21	2,14	11,15	2,83	3	0	230 V	90 W	490
ECOBX/AIR-EW12/3Y	12	0	ECO-TPV_800-910	ECO-TPV_800-825	ECO-TPV_1000-1210	0	0,91	0,825	1,21	5	2,14	10,7	2,65	3	0	230 V	90 W	447
ECOBX/AIR-EW16	16	ECO-T5000	0	0	ECO-TPV_1000-1685	5	0	0	1,685	5,46	2,66	14,52	3,19	3	2	230 V	90 W	500
ECOBX/AIR-EW16/2Y	16	ECO-TR3500	0	0	ECO-TPV_1000-1685	3,5	0	0	1,685	4,72	2,8	13,22	3,19	2	1	230 V	90 W	351
ECOBX/AIR-EW16/3Y	16	0	ECO-TPV_1000-1210	ECO-TPV_1000-1110	ECO-TPV_1000-1685	0	1,21	1,11	1,685	5,42	2,14	11,6	3,19	3	0	230 V	90 W	538
ECOBX/AIR-EW20	20	0	ECO-T5000	ECO-TPV_1000-1110	ECO-TR2350-V	0	5	1,11	2,35	7,46	2,66	19,84	2,46	4	3	230 V	215 W	566
ECOBX/AIR-EW20/2Y	20	ECO-TR3500	0	0	ECO-TR2350-V	3,5	0	0	2,35	5,08	2,8	14,22	2,55	2	2	230 V	215 W	251
ECOBX/AIR-EW20/3Y	20	0	ECO-TPV_1000-1590	ECO-TPV_1000-1110	ECO-TR2350-V	0	1,59	1,11	2,35	5,78	2,5	14,45	3,07	3	1	230 V	215 W	462
ECOBX/AIR-EW24	24	ECO-TJ8000	0	0	ECO-TR2700-V	8	0	0	2,7	5,7	3,3	18,81	2,9	3	3	230 V	215 W	341
ECOBX/AIR-EW24/2Y	24	ECO-TR5000	0	0	ECO-TR2700-V	5	0	0	2,7	5,45	2,8	15,26	2,55	2	3	230 V	215 W	281
ECOBX/AIR-EW24/3Y	24	ECO-TR3500	0	0	ECO-TR2700-V	3,5	0	0	2,7	5,08	2,8	14,22	2,55	2	2	230 V	215 W	251
ECOBX/AIR-EW28	28	ECO-TJ10000	0	0	ECO-TR3500	10	0	0	3,5	6,88	3,3	22,7	2,9	3	3	230 V	215 W	430
ECOBX/AIR-EW28/2Y	28	ECO-T5000	0	0	ECO-TR3500	5	0	0	3,5	6,4	2,8	17,92	2,55	3	3	230 V	215 W	449
ECOBX/AIR-EW28/3Y	28	ECO-TR5000	0	0	ECO-TR3500	5	0	0	3,5	6,03	2,8	16,88	2,55	2	3	230 V	215 W	330
ECOBX/AIR-EW32	32	ECO-TJ10000	0	0	ECO-TR3500	10	0	0	3,5	6,88	3,3	22,7	2,9	3	3	230 V	215 W	430
ECOBX/AIR-EW32/2Y	32	ECO-TJ8000	0	0	ECO-TR3500	8	0	0	3,5	6,28	3,3	20,72	2,9	3	3	230 V	215 W	390
ECOBX/AIR-EW32/3Y	32	ECO-TR5000	0	0	ECO-TR3500	5	0	0	3,5	6,03	2,8	16,88	2,55	2	3	230 V	215 W	330
ECOBX/AIR-EW36	36	ECO-TJ12000	0	0	ECO-TR3500	12	0	0	3,5	7,48	3,3	24,68	2,9	3	4	230 V	215 W	470
ECOBX/AIR-EW36/2Y	36	ECO-TJ8000	0	0	ECO-TR3500	8	0	0	3,5	6,28	3,3	20,72	2,9	3	3	230 V	215 W	390
ECOBX/AIR-EW36/3Y	36	ECO-T5000	0	0	ECO-TR3500	5	0	0	3,5	6,4	2,8	17,92	2,55	3	3	230 V	215 W	449
ECOBX/AIR-EW40	40	ECO-TJ12000	0	0	ECO-TR5000	12	0	0	5	7,85	3,3	25,91	2,9	3	5	230 V	430 W	500
ECOBX/AIR-EW40/2Y	40	ECO-TJ8000	0	0	ECO-TR5000	8	0	0	5	6,65	3,3	21,95	2,9	3	4	230 V	430 W	420
ECOBX/AIR-EW40/3Y	40	ECO-TR6000	0	0	ECO-TR5000	6	0	0	5	6,77	2,8	18,96	2,55	2	4	230 V	430 W	400
ECOBX/AIR-EW44	44	ECO-TJ15000	0	0	ECO-TR5000	15	0	0	5	8,65	3,3	28,55	2,9	3	6	230 V	430 W	580
ECOBX/AIR-EW44/2Y	44	ECO-TJ8000	0	0	ECO-TR5000	8	0	0	5	6,65	3,3	21,95	2,9	3	4	230 V	430 W	420
ECOBX/AIR-EW44/3Y	44	ECO-TJ8000	0	0	ECO-TR5000	8	0	0	5	6,65	3,3	21,95	2,9	3	4	230 V	430 W	420
ECOBX/AIR-EW48	48	ECO-TJ15000	0	0	ECO-T5000	15	0	0	5	9,02	3,3	29,77	2,9	4	6	230 V	430 W	699
ECOBX/AIR-EW48/2Y	48	ECO-TJ10000	0	0	ECO-T5000	10	0	0	5	7,62	3,3	25,15	2,9	4	4	230 V	430 W	579
ECOBX/AIR-EW48/3Y	48	ECO-TJ8000	0	0	ECO-T5000	8	0	0	5	7,02	3,3	23,17	2,9	4	4	230 V	430 W	539
ECOBX/AIR-EW50	50	ECO-TJ15000	0	0	ECO-T5000	15	0	0	5	9,02	3,3	29,77	2,9	4	6	230 V	430 W	699
ECOBX/AIR-EW50/2Y	50	ECO-TJ10000	0	0	ECO-T5000	10	0	0	5	7,62	3,3	25,15	2,9	4	4	230 V	430 W	579
ECOBX/AIR-EW50/3Y	50	ECO-TJ8000	0	0	ECO-T5000	8	0	0	5	7,02	3,3	23,17	2,9	4	4	230 V	430 W	539
ECOBX/AIR-EW60	60	ECO-TJ10000	0	0	ECO-TJ8000	10	0	0	8	7,5	3,3	24,75	2,9	4	4	230 V	940 W	520
ECOBX/AIR-EW60/2Y	60	ECO-TJ8000	0	0	ECO-TJ8000	8	0	0	8	6,9	3,3	22,77	2,9	4	4	230 V	940 W	480
ECOBX/AIR-EW60/3Y	60	ECO-TJ8000	0	0	ECO-TJ8000	8	0	0	8	6,9	3,3	22,77	2,9	4	4	230 V	940 W	480
ECOBX/AIR-EW75	75	ECO-TJ15000	0	0	ECO-TJ10000	15	0	0	10	9,5	3,3	31,35	2,9	4	6	230 V	940 W	680
ECOBX/AIR-EW75/2Y	75	ECO-TJ10000	0	0	ECO-TJ10000	10	0	0	10	8,1	3,3	26,73	2,9	4	4	230 V	940 W	560
ECOBX/AIR-EW75/3Y	75	ECO-TJ8000	0	0	ECO-TJ10000	8	0	0	10	7,5	3,3	24,75	2,9	4	4	230 V	940 W	520
ECOBX/AIR-EW100	100	ECO-TJ17000	0	0	ECO-TJ10000	17	0	0	10	10,1	3,3	33,33	2,9	4	6	230 V	940 W	720
ECOBX/AIR-EW100/2Y	100	ECO-TJ12000	0	0	ECO-TJ10000	12	0	0	10	8,7	3,3	28,71	2,9	4	5	230 V	940 W	600
ECOBX/AIR-EW100/3Y	100	ECO-TJ12000	0	0	ECO-TJ10000	12	0	0	10	8,7	3,3	28,71	2,9	4	5	230 V	940 W	600
ECOBX/AIR-EW125	125	ECO-TJ22000	0	0	ECO-TJ12000	22	0	0	12	12	3,3	39,6	2,9	4	9	230 V	1300 W	880
ECOBX/AIR-EW125/2Y	125	ECO-TJ15000	0	0	ECO-TJ12000	15	0	0	12	10,1	3,3	33,33	2,9	4	7	230 V	1300 W	720
ECOBX/AIR-EW125/3Y	125	ECO-TJ15000	0	0	ECO-TJ12000	15	0	0	12	10,1	3,3	33,33	2,9	4	7	230 V	1300 W	720
ECOBX/AIR-EW150	150	ECO-TJ27000	0	0	ECO-TJ15000	27	0	0	15	14	3,3	46,2	2,9	4	11	230 V	1300 W	1040
ECOBX/AIR-EW150/2Y	150	ECO-TJ20000	0	0	ECO-TJ15000	20	0	0	15	12,1	3,3	39,93	2,9	4	10	230 V	1300 W	880

Product code	PE	Common Sedimentation + Buffer	Separate sedimentation	Separate buffer	Bioreactor	Common sedimentation + buffer	Sedimentation	Buffer	Bioreactor	Total length	Total width	Required area	Standard depth of the facility from ground level to tank bottom level (with one riser)	Number of manholes	Number of polyester belts	Voltage	Power	Weight
-	-		tank	tank	tank	m³	m³	m³	m³	m	m	m²	m	pcs.	pcs.	V	W	kg
ECOBX/AIR-EW150/3Y	150	ECO-TJ17000	0	0	ECO-TJ15000	17	0	0	15	11,5	3,3	37,95	2,9	4	8	230 V	1300 W	840
ECOBX/AIR-EW175	175	ECO-TJ30000	0	0	ECO-TJ17000	30	0	0	17	15,3	3,3	50,49	2,9	4	14	230 V	1300 W	1160
ECOBX/AIR-EW175/2Y	175	ECO-TJ22000	0	0	ECO-TJ17000	22	0	0	17	13,4	3,3	44,22	2,9	4	10	230 V	1300 W	1000
ECOBX/AIR-EW175/3Y	175	ECO-TJ20000	0	0	ECO-TJ17000	20	0	0	17	12,7	3,3	41,91	2,9	4	10	230 V	1300 W	920
ECOBX/AIR-EW200	200	0	ECO-TJ20000	ECO-TJ15000	ECO-TJ20000	0	20	15	20	18,5	3,3	61,05	2,9	6	16	400 V	2550 W	1360
ECOBX/AIR-EW200/2Y	200	ECO-TJ25000	0	0	ECO-TJ20000	25	0	0	20	14,6	3,3	48,18	2,9	4	13	400 V	2550 W	1080
ECOBX/AIR-EW200/3Y	200	ECO-TJ22000	0	0	ECO-TJ20000	22	0	0	20	14	3,3	46,2	2,9	4	12	400 V	2550 W	1040
ECOBX/AIR-EW225	225	0	ECO-TJ22000	ECO-TJ17000	ECO-TJ22000	0	22	17	22	20,5	3,3	67,65	2,9	6	16	400 V	2550 W	1560
ECOBX/AIR-EW225/2Y	225	0	ECO-TJ12000	ECO-TJ17000	ECO-TJ22000	0	12	17	22	17,8	3,3	58,74	2,9	6	13	400 V	2550 W	1320
ECOBX/AIR-EW225/3Y	225	ECO-TJ25000	0	0	ECO-TJ22000	25	0	0	22	15,3	3,3	50,49	2,9	4	13	400 V	2550 W	1160
ECOBX/AIR-EW250	250	0	ECO-TJ25000	ECO-TJ20000	ECO-TJ25000	0	25	20	25	22,3	3,3	73,59	2,9	6	20	400 V	2550 W	1680
ECOBX/AIR-EW250/2Y	250	ECO-TJ30000	0	0	ECO-TJ25000	30	0	0	25	17,2	3,3	56,76	2,9	4	17	400 V	2550 W	1320
ECOBX/AIR-EW250/3Y	250	ECO-TJ27000	0	0	ECO-TJ25000	27	0	0	25	16,5	3,3	54,45	2,9	4	14	400 V	2550 W	1240
ECOBX/AIR-EW300	300	0	ECO-TJ30000	ECO-TJ22000	ECO-TJ30000	0	30	22	30	25,6	3,3	84,48	2,9	6	26	400 V	2550 W	2000
ECOBX/AIR-EW300/2Y	300	ECO-TJ35000	0	0	ECO-TJ30000	35	0	0	30	19,7	3,3	65,01	2,9	4	20	400 V	2550 W	1520
ECOBX/AIR-EW300/3Y	300	0	ECO-TJ10000	ECO-TJ22000	ECO-TJ30000	0	10	22	30	20,4	3,3	67,32	2,9	6	18	400 V	2550 W	1560
ECOBX/AIR-EW350	350	0	ECO-TJ35000	ECO-TJ27000	ECO-TJ35000	0	35	27	35	29,2	3,3	96,36	2,9	6	27	400 V	2550 W	2240
ECOBX/AIR-EW350/2Y	350	0	ECO-TJ17000	ECO-TJ27000	ECO-TJ35000	0	17	27	35	24,8	3,3	81,84	2,9	6	21	400 V	2550 W	1880
ECOBX/AIR-EW350/3Y	350	ECO-TJ35000	0	0	ECO-TJ35000	35	0	0	35	20,9	3,3	68,97	2,9	4	20	400 V	2550 W	1600
ECOBX/AIR-EW400	400	0	ECO-TJ40000	ECO-TJ30000	ECO-TJ35000	0	40	30	35	31,8	3,3	104,94	2,9	6	31	400 V	2550 W	2480
ECOBX/AIR-EW400/2Y	400	ECO-TJ50000	0	0	ECO-TJ35000	50	0	0	35	24,7	3,3	81,51	2,9	4	23	400 V	2550 W	1920
ECOBX/AIR-EW400/3Y	400	ECO-TJ45000	0	0	ECO-TJ35000	45	0	0	35	24	3,3	79,2	2,9	4	22	400 V	2550 W	1840
ECOBX/AIR-EW450	450	0	ECO-TJ45000	ECO-TJ35000	ECO-TJ45000	0	45	35	45	37,3	3,3	123,09	2,9	6	34	400 V	2550 W	2880
ECOBX/AIR-EW450/2Y	450	0	ECO-TJ22000	ECO-TJ35000	ECO-TJ45000	0	22	35	45	31,1	3,3	102,63	2,9	6	28	400 V	2550 W	2400
ECOBX/AIR-EW450/3Y	450	ECO-TJ50000	0	0	ECO-TJ45000	50	0	0	45	27,8	3,3	91,74	2,9	4	25	400 V	2550 W	2160
ECOBX/AIR-EW500	500	0	ECO-TJ50000	ECO-TJ35000	ECO-TJ50000	0	50	35	50	38,7	3,3	127,71	2,9	6	36	400 V	3800 W	3040
ECOBX/AIR-EW500/2Y	500	0	ECO-TJ25000	ECO-TJ35000	ECO-TJ50000	0	25	35	50	32,4	3,3	106,92	2,9	6	30	400 V	3800 W	2520
ECOBX/AIR-EW500/3Y	500	0	ECO-TJ17000	ECO-TJ35000	ECO-TJ50000	0	17	35	50	30,5	3,3	100,65	2,9	6	27	400 V	3800 W	2360

Table 10

On inquiry can be offered bigger wastewater treatment plants above 500 P.E., designed according to ATV-122

5.3.2 Type of tanks used for ECOBOX

ECO-T, ECO-TR и ECO-TJ: are produced from polyethylene (PE) with a rotation technology e.g. seamless corrugated and with a wall thickness ≥ 12 mm.

ECO-TPV: produced by assembled and welded elements from polypropylene (PP)

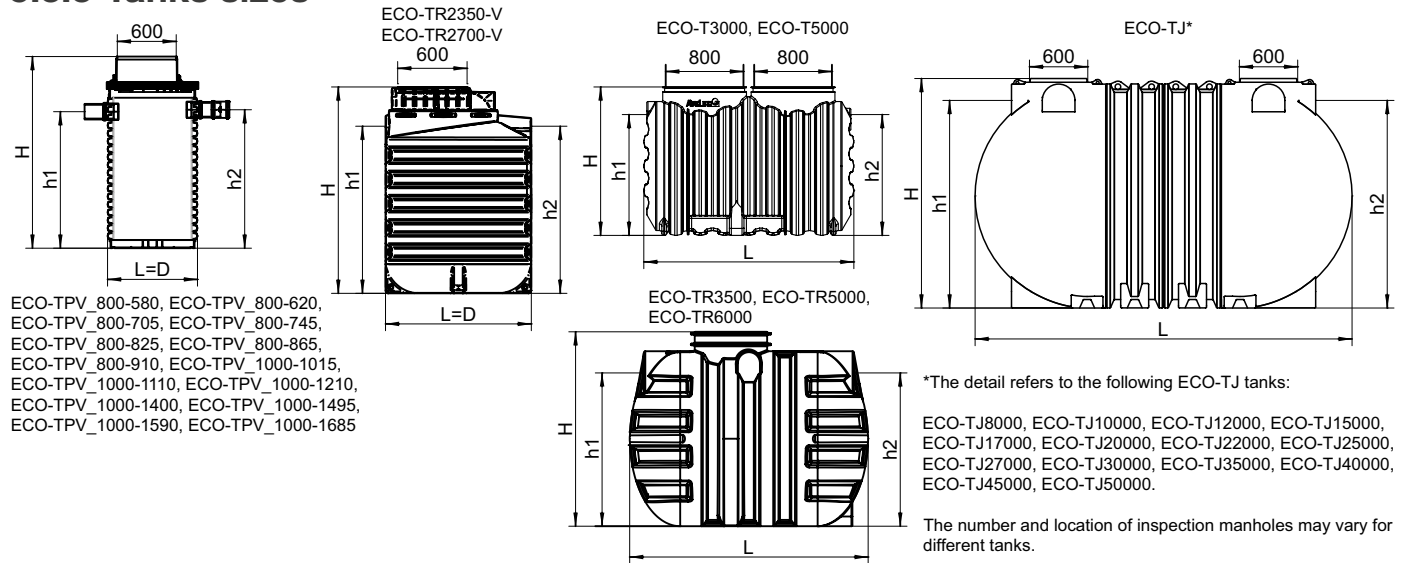
All tanks are equipped with manholes with a diameter DN600. According to the design conditions and the client's wishes they can be made with a diameter DN800. The number of the manholes can be found in Table 10.

If necessary are possible additional manholes with a diameter DN600 or DN800.

ECO-T, ECO-TR и ECO-TJ tanks are designed for pedestrian and green areas but depending on the conditions they can be reinforced with an armoured concrete frames or plate and thus assemblies in traffic zones. The covers which are assembled in this case meet the design load.

ECOBX are equipped with covers, which can be from polyethylene, cast iron or from polymer concrete and do not allow the occurrence of smells out of the facility.

5.3.3 Tanks sizes



Tank Type	Tank Code	Nominal Volume [L]	L (m)	D (m)	H (m)	h1 (m)	h2 (m)	Net Volume [L] (at water level up to 0.1 m under the inlet pipe, when it is used as a sedimentation or a buffer)	Net Volume [L] (at water level up to the inlet pipe, when it is used as a bioreactor)	Weight (kg)
ECO-TPV	ECO-TPV_800-580	580	0,93	0,93	2	1,33	1,33	582	582 *	120
	ECO-TPV_800-620	620	0,93	0,93	2,08	1,41	1,41	623	623 *	123
	ECO-TPV_800-705	705	0,93	0,93	2,24	1,57	1,57	705	705 *	128
	ECO-TPV_800-745	745	0,93	0,93	2,32	1,65	1,65	746	746 *	130
	ECO-TPV_800-825	825	0,93	0,93	2,48	1,82	1,82	828	828 *	135
	ECO-TPV_800-865	865	0,93	0,93	2,56	1,90	1,90	869	869 *	138
	ECO-TPV_800-910	910	0,93	0,93	2,65	1,98	1,98	910	910 *	141
	ECO-TPV_1000-1015	1015	1,14	1,14	2,34	1,48	1,48	1019	1019 *	160
	ECO-TPV_1000-1110	1110	1,14	1,14	2,46	1,60	1,60	1114	1114 *	166
	ECO-TPV_1000-1210	1210	1,14	1,14	2,58	1,72	1,72	1210	1210 *	171
	ECO-TPV_1000-1400	1400	1,14	1,14	2,83	1,97	1,97	1402	1402 *	184
	ECO-TPV_1000-1495	1495	1,14	1,14	2,95	2,09	2,09	1498	1498 *	189
	ECO-TPV_1000-1590	1590	1,14	1,14	3,07	2,21	2,21	1594	1594 *	195
	ECO-TPV_1000-1685	1685	1,14	1,14	3,19	2,33	2,33	1689	1689 *	201
ECO-T	ECO-T3000	3000	2,16	1,36	1,53	1,26	1,26	2380	2578	199
	ECO-T5000	5000	2,82	1,66	1,81	1,50	1,50	4801	5109	299
ECO-TR	ECO-TR2350-V	2350	1,5	1,5	1,87	1,44	1,44	1886	2055	101
	ECO-TR2700-V	2700	1,5	1,5	2,12	1,70	1,70	2327	2489	101
	ECO-TR3500	3500	2,08	1,8	2,05	1,69	1,69	3598	3767	150
	ECO-TR5000	5000	2,45	1,8	2,05	1,69	1,69	4380	4588	180
	ECO-TR6000	6000	2,82	1,8	2,05	1,69	1,69	5163	5410	220
ECO-TJ	ECO-TJ8000	8000	2,7	2,3	2,40	2,17	2,17	7543	7543 *	240
	ECO-TJ10000	10000	3,3	2,3	2,40	2,17	2,17	9661	9661 *	280
	ECO-TJ12000	12000	3,9	2,3	2,40	2,17	2,17	11779	11779 *	320
	ECO-TJ15000	15000	4,7	2,3	2,40	2,17	2,17	14139	14139 *	400
	ECO-TJ17000	17000	5,3	2,3	2,40	2,17	2,17	16256	16256 *	440
	ECO-TJ20000	20000	5,9	2,3	2,40	2,17	2,17	18374	18374 *	480
	ECO-TJ22000	22000	6,6	2,3	2,40	2,17	2,17	20493	20493 *	560
	ECO-TJ25000	25000	7,2	2,3	2,40	2,17	2,17	22852	22852 *	600
	ECO-TJ27000	27000	7,8	2,3	2,40	2,17	2,17	24970	24970 *	640
	ECO-TJ30000	30000	8,5	2,3	2,40	2,17	2,17	29206	29206 *	720
	ECO-TJ35000	35000	9,7	2,3	2,40	2,17	2,17	34189	34189 *	800
	ECO-TJ40000	40000	11,6	2,3	2,40	2,17	2,17	37920	37920 *	960
	ECO-TJ45000	45000	12,8	2,3	2,40	2,17	2,17	42398	42398 *	1040
	ECO-TJ50000	50000	13,5	2,3	2,40	2,17	2,17	46634	46634 *	1120

Table 11

All tanks from the product range described in Table 11 can be applied as tanks for retaining of conditionally clean waters.

5.3.4 Tanks configuration.

The tanks can be placed in different configurations for the purpose of most effective area usage. It is important to obey the requirement for minimal distance (D) between the tanks and the trench walls.

Figure 1: Tanks configuration.

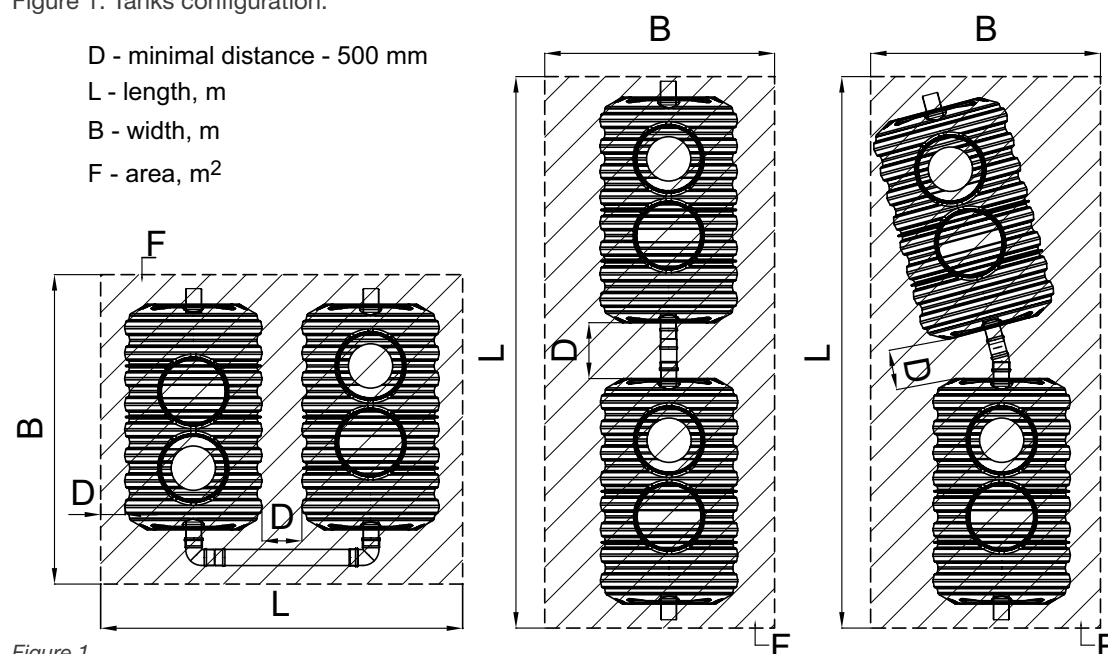


Figure 1

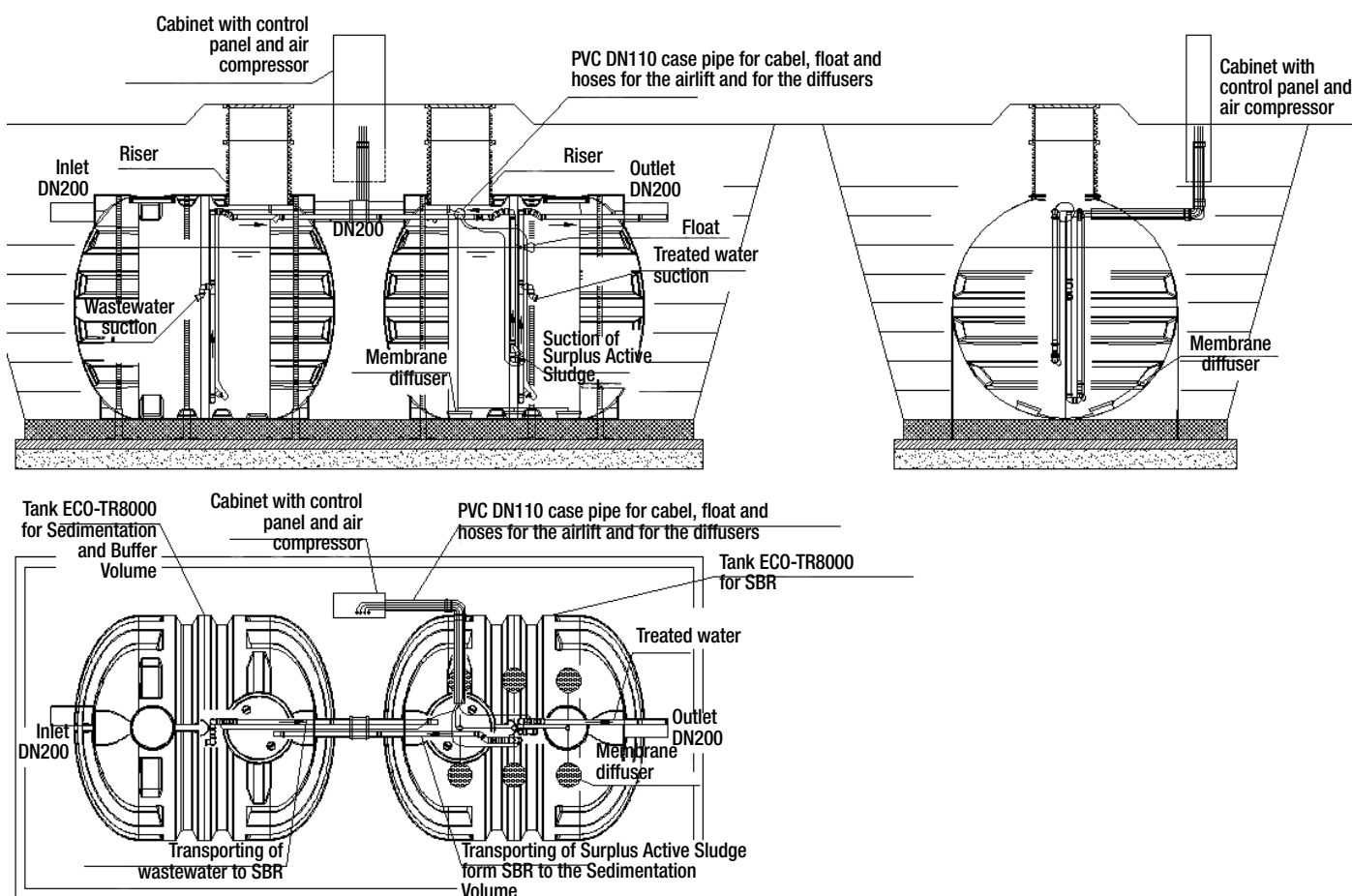


Figure 2

When the depth of the sewage system is big or when the terrain conditions are unfavorable, it is recommended to use modular sewage pump station Pipelife's PROFOS type for pumping the waters, (see Figure 3).

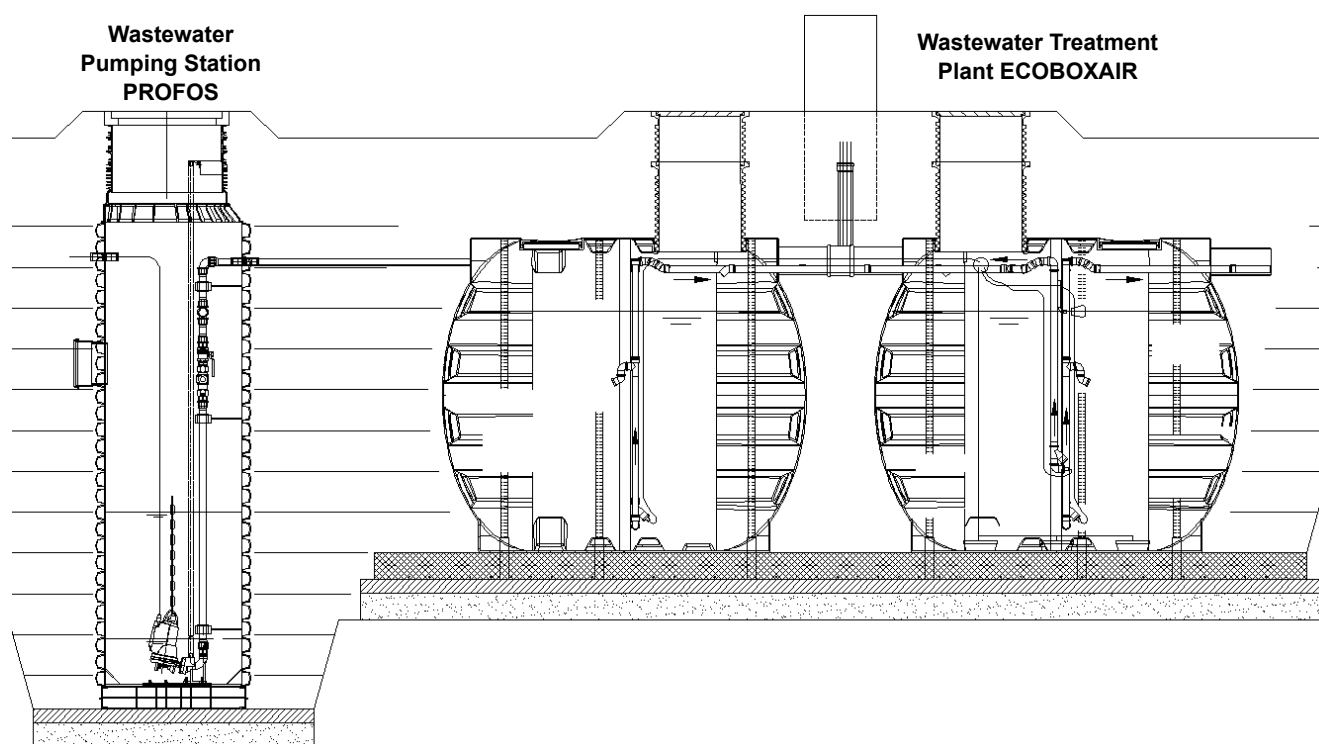


Figure 3

In case that the discharge level is higher than the level of the outlet pipe of the wastewater treatment plant, a sewer pumping station type PROFOS is recommended to be installed after the outlet pipe (see Figure 3 a).

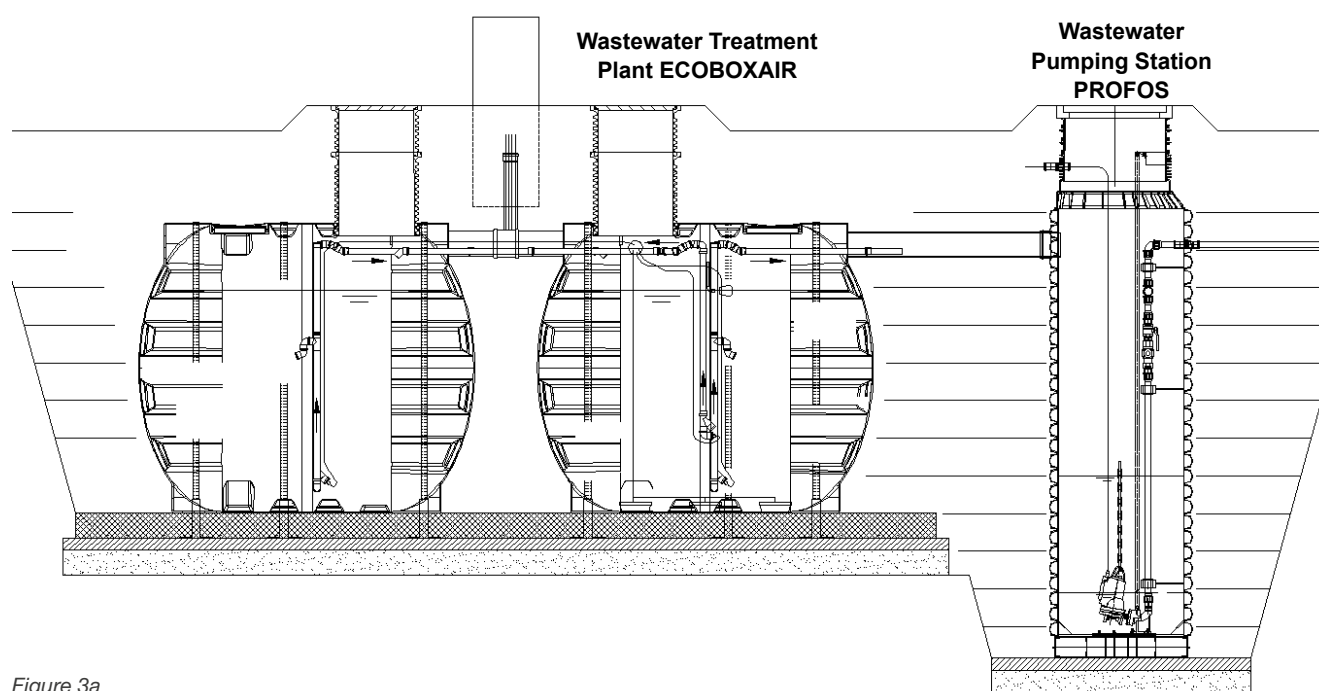


Figure 3a

5.3.5 Initial data for design

The assembly plan of the specific ECOBOX model is prepared by Pipelife in accordance with the concrete design conditions. For the preparation of the assembly plan the following data is necessary (see Table 12).

Input Data	Parameter	Data	Comment
Wastewater Flow m ³ /d	Q		
Infiltration Water (%)	Q%		
Installation Area, Length (L) and Width (B), m	L x B		
Distance from Control Panel, m	L1		
Traffic Load A15, B125, C250 or D400 (BDS EN 124)			
Inlet Pipe Depth, m	H1		
Inlet Pipe Diameter, m	D1		
Discharge Level, m	H2		
Pump Shaft after WWTP, when the treated water could not reach the discharge point by gravity	yes/no		
Underground Water Level, m	Z		

Table 12

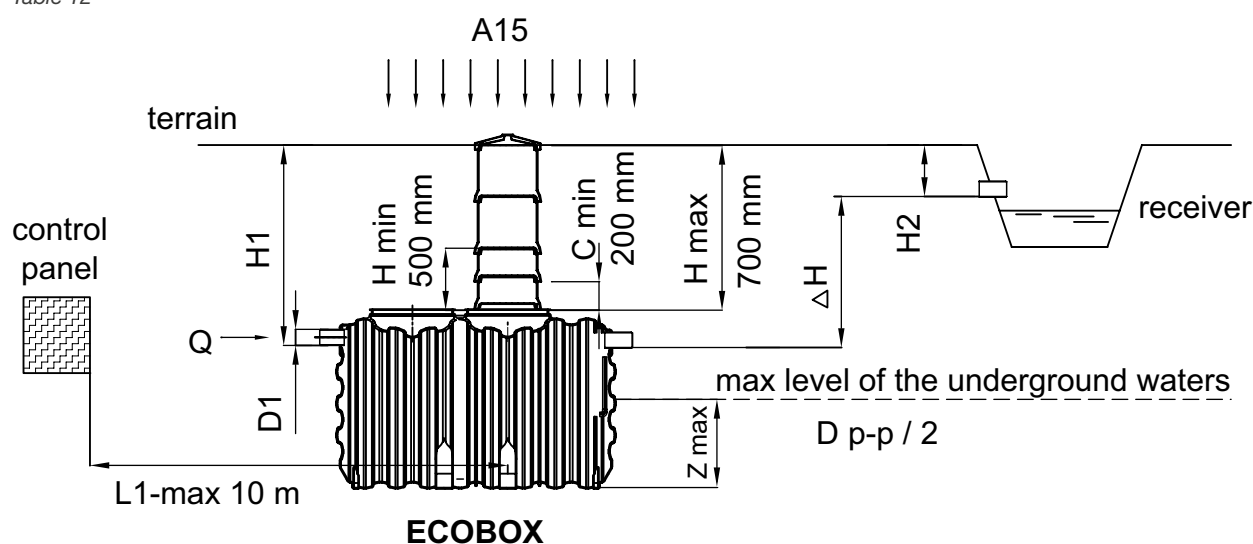


Figure 4: Initial data

The maximum level of the underground waters must not surpass Z_{max} . When the underground waters are high it is necessary a reinforcement with wet concrete with a protective layer thickness of 10 cm around the tank. The maximal and minimal covering of the tanks from crown tank to elevation terrain must be in accordance with H_{min} and H_{max} . C_{min} can be 200 mm when the tanks' load is up to 250 kg (see Figure 5).

When the underground waters are high or the concrete terrain conditions (rocks), the tanks can be semi-dug or in an embankment provided that they have minimal covering of 200 mm and are not subjected to direct sunlight (see Figure 6).

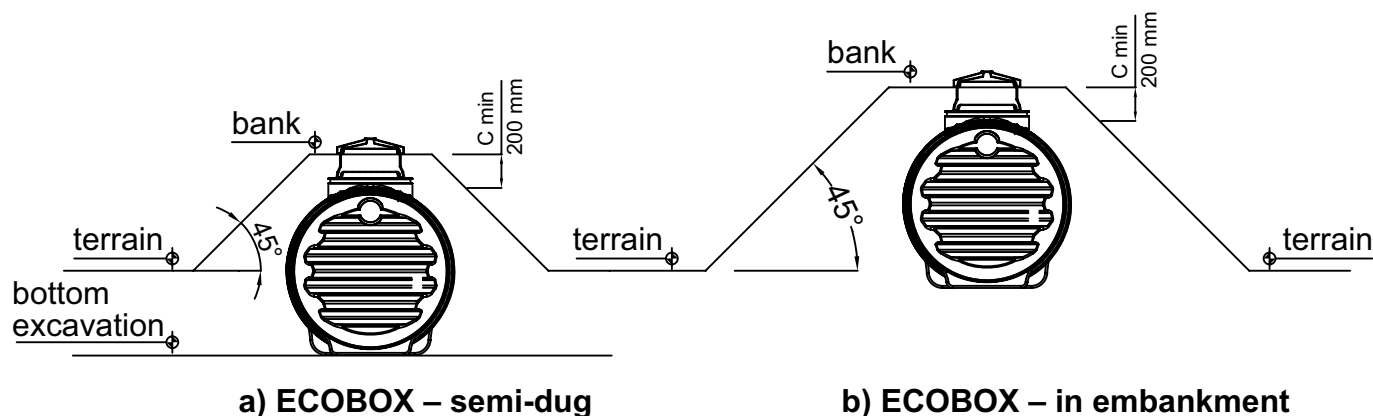


Figure 5: ECOBOX assembly semi-dug and embankment

Discharge of the atmospheric waters in ECOBOX is inadmissible due to fact that this would burden the facility.

If infiltration of underground water is expected in existing or newly sewerage system, this has to be indicated in Table 12 as a percentage of dry flow.

The biological treatment is an exothermic process during which big amount of heat is separated. Due to this reason the low temperatures of the environment do not have a negative effect on the purification. This make the ECOBOX assembly allowed in embankment as well as shallow settled.

5.3.6 Exploitation costs

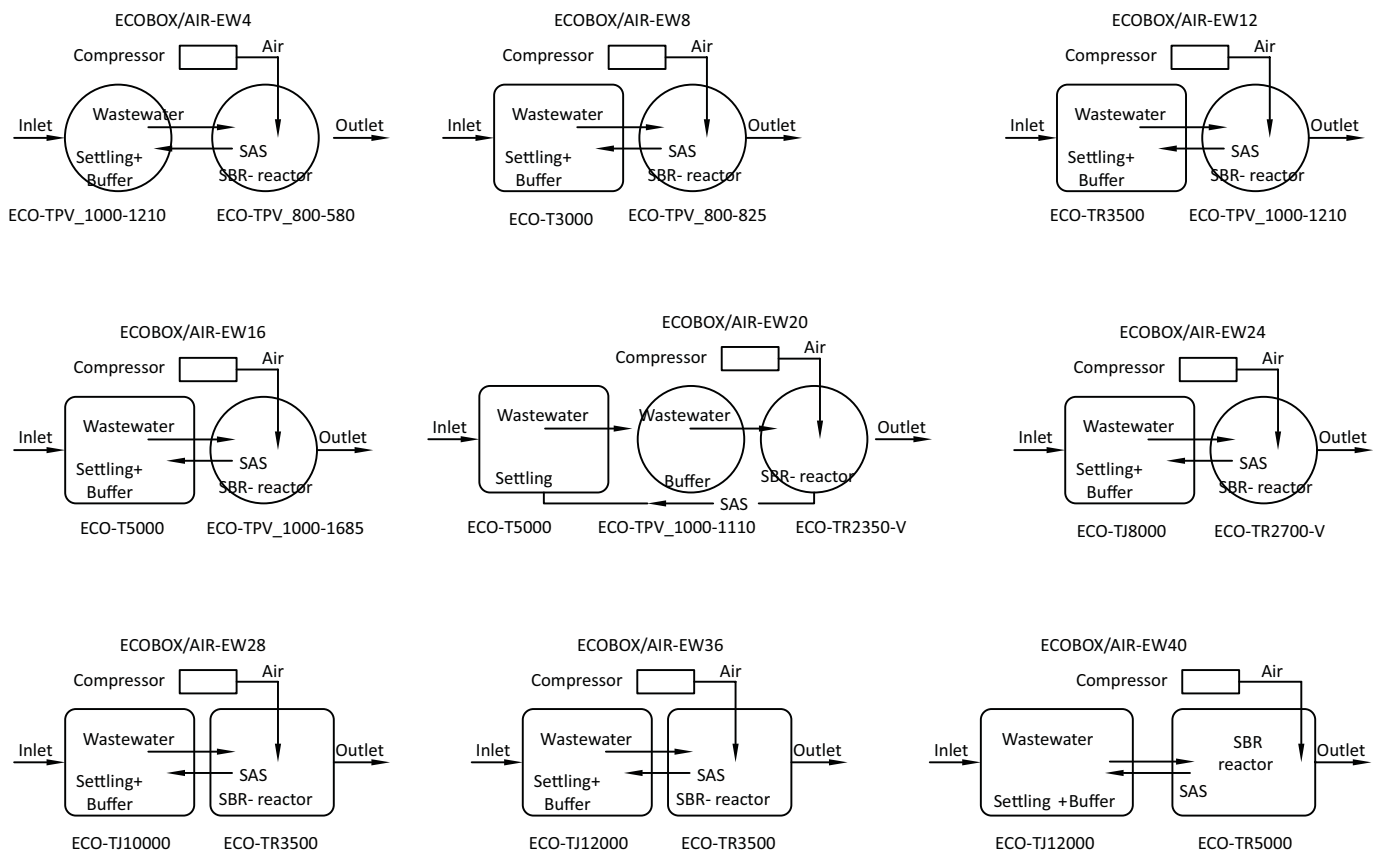
The exploitation costs of ECOBOX wastewater treatment plants are cut to minimum:

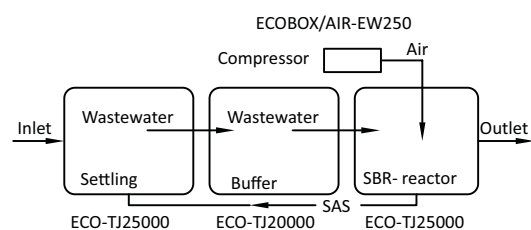
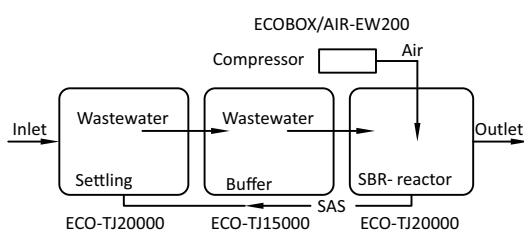
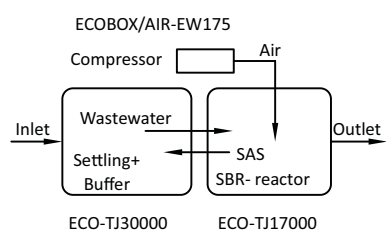
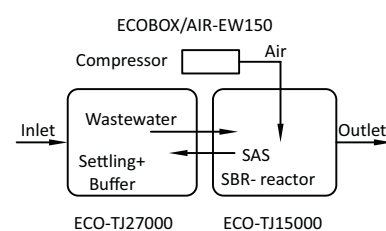
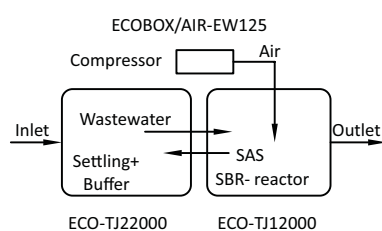
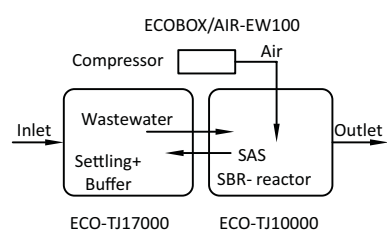
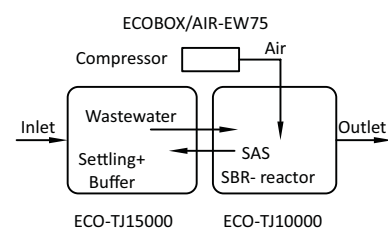
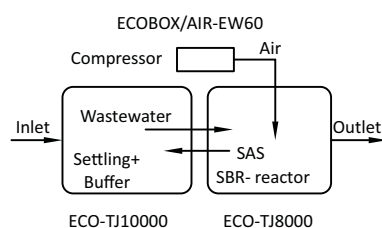
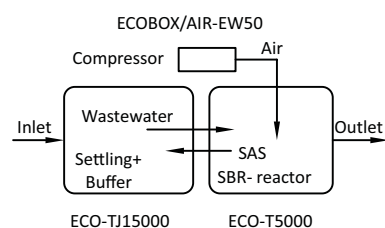
- The necessary supply of the station control panel is single phase 230 V or three phase 400 V, 50 Hz.
- The maximal power of the ECOBOX/AIR system compressors is 3000 W.
- Without additional supplies it is not necessary to put biomass in advance.
- Service is brought to minimum – a few types of periodical “checks” of the facility condition:
 - taking of water samples after ECOBOX for the period 3 to 6 months after the start of the facility.
 - cleaning of the sludge tanks, one to three times per year.
 - facility prevention twice a year.

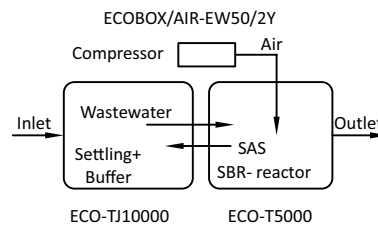
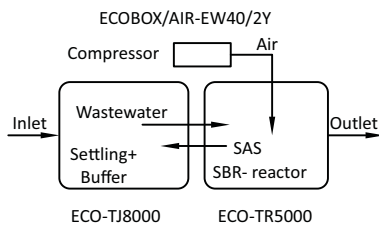
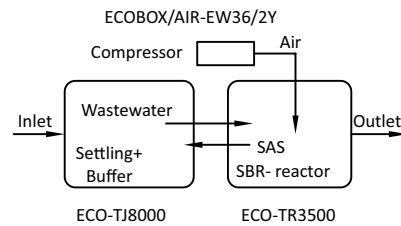
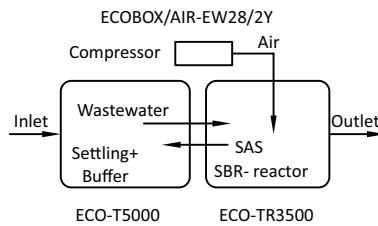
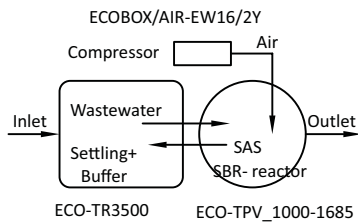
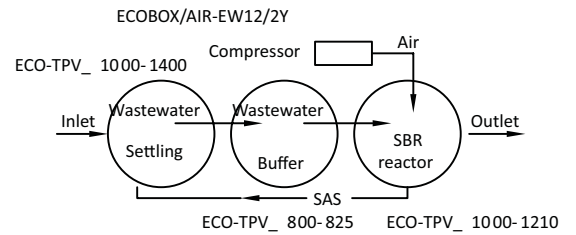
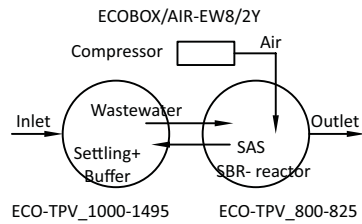
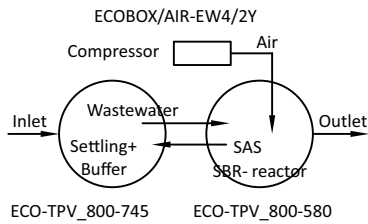
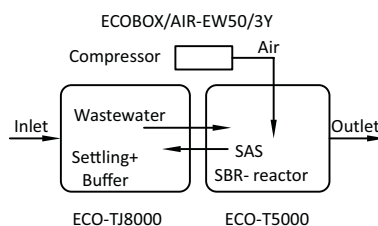
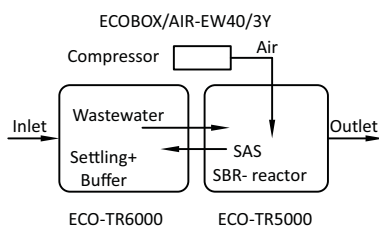
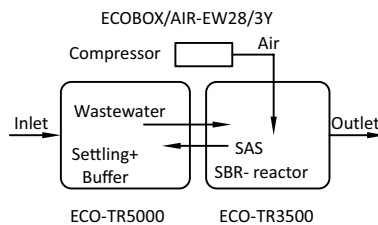
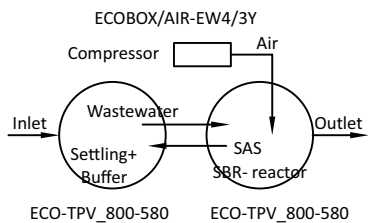
5.3.7 Technological diagrams for connection

The sample diagrams below show the technology for connection the ECOBOX. These configurations can be changed, keeping the sequence and the necessary volumes of the different treatment stages.

ECOBOX for cleaning once an year





ECOBIX for cleaning twice a yearECOBIX for cleaning three times a year

6 Grease separator - FATBOX

6.1 What is the treatment technology?

- The fats surface because their density is lower than the water one.
- They separate with the speed of 4 mm/s.
- Time for stay in the facility from 3 to 5 min.

The waters polluted with fats, without the big particles, enter the first phase of the grease separator, where settlement of the insoluble substances take place and gravity separation of fats, after which water is drained into the sewage system. The separated fats surface where they are kept until the moment of their removal from the grease separator.

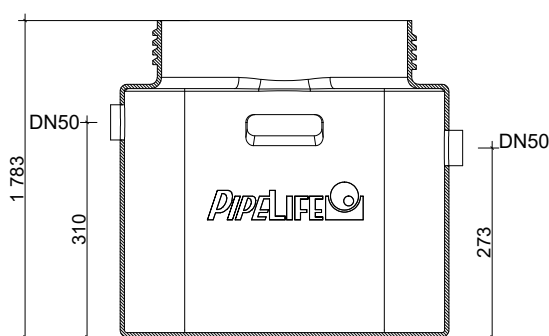
6.2 Why is FATBOX necessary?

- waste waters, for example:
 - restaurants, kitchens
 - shops with processing of dairy, meat or fish products
 - meat-processing workshops, food industry plants and others
- The grease separators protect the sewage pipes from:
 - choking, blocking with fats
 - formation of corrosive fat acids
 - unpleasant smells.
- During the dissolving of the fats which have fallen in the biological wastewater treatment plant the water acidity would increase and the treatment effect would be decreased or entirely eliminated.

6.3 FATBOX Product range and technical data for design

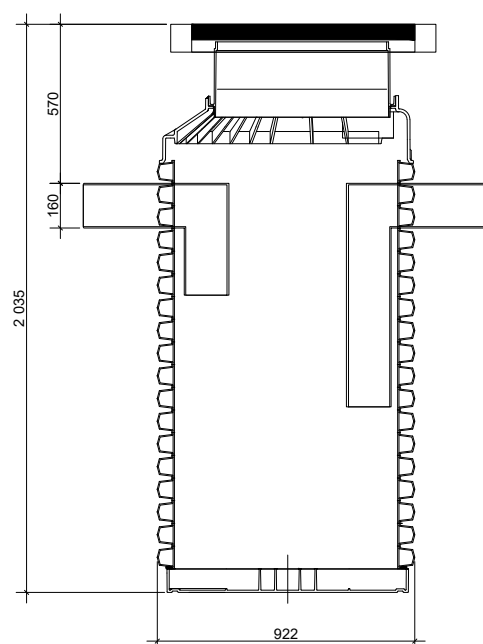
FATBOX-GNS0,5-NEO

Grease separator - FATBOX 0.5 l/s -
gravitational fat separation with extra sludge volume.



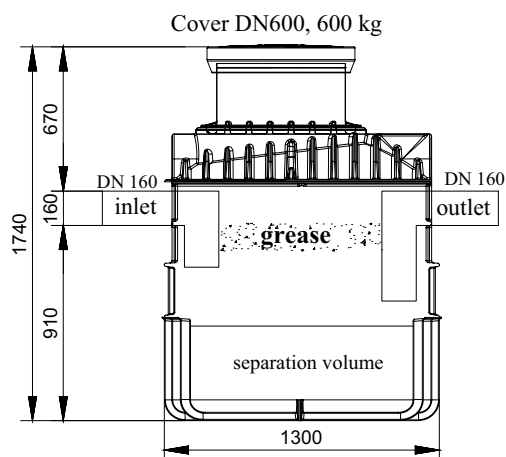
FATBOX-GNS2-TPV

Grease separator - FATBOX 2 l/s -
gravitational fat separation with extra sludge volume.



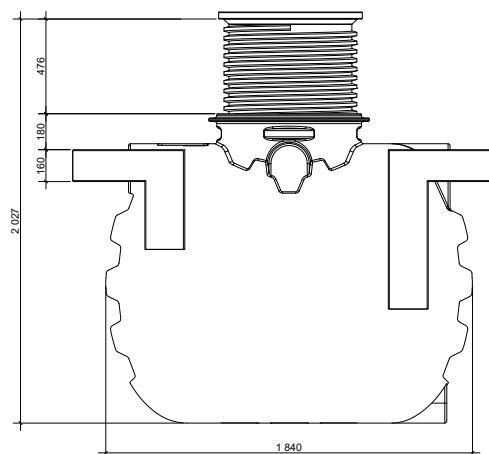
FATBOX-GNS4-TR

Grease separator - FATBOX 4 l/s -
gravitational fat separation with extra sludge volume.



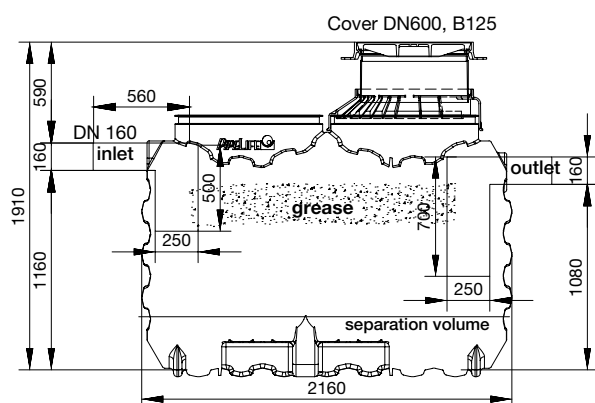
FATBOX-GNS7-TR

Grease separator - FATBOX 7 l/s -
gravitational fat separation with extra sludge volume.



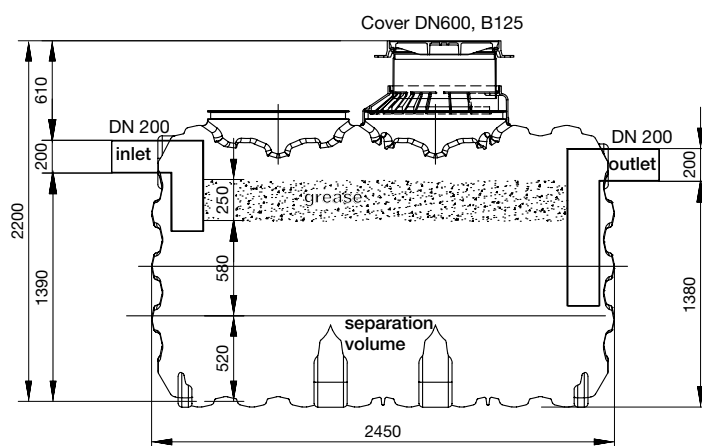
FATBOX-GNS10-T

Grease separator - FATBOX 10 l/s -
gravitational fat separation with extra sludge volume.



FATBOX-GNS15-T

Grease separator - FATBOX 15 l/s -
gravitational fat separation with extra sludge volume.



Product code	Flow (l/s)	Nominal volume (l)	Working volume (l)	Maximum volume of fats (l)	Sludge volume (l)	Inlet / outlet DN
FATBOX-GNS0,5-NEO	0.5	65	39	11	28	DN50
FATBOX-GNS2-TPV	2	800	620	120	155	DN160
FATBOX-GNS4-TR	4	1500	960	160	240	DN160
FATBOX-GNS7-TR	7	2200	2200	280	550	DN160
FATBOX-GNS10-T	10	3000	2600	400	1000	DN160
FATBOX-GNS15-T	15	5000	4600	600	1500	DN200

6.4. Type of the used tanks

The tanks, used for grease separators of the FATBOX system are the following type:

ECO-PRO: PRO Pipelife shafts are used for vertical assembly. They allow free-standing assembly as well as underground assembly. Reinforced construction of the coating – load-carrying capacity up to 40 tons. In case of assembly above the surface (basements, storehouses) they can be fitted with devices for measuring the quantity of fats and with a discharge device for periodical measurement of the fats.

ECO-T и ECO-TR: used for horizontal assembly, in case of high underground waters. They allow free standing assembly as well as underground assembly. Reinforced construction of the coating – load carrying capacity up to 40 tons.

ECO-T and ECO-TR: used for horizontal and underground assembly. The tanks are designed for A15 class of load but depending on the conditions they can reinforced with an armoured concrete frame and thus assembled in traffic zones. The covers which are mounted in these cases meet the designed load (see Figure 24).

All tanks are equipped with manholes with a diameter DN600. According to the design conditions and the client's wishes they can be made with a diameter DN800 (with the exception of ECO-TP). If necessary additional manholes are possible with a diameter DN600 or DN800 (with the exception of ECO-TP and ECO-PRO).

6.5 Initial data for design

Initial data	index	data	comment
Waste waters capacity l/s	Q		
Assembly type – free standing/buried			
Waste water max. temperature, °C	ft		
Fats density gr/cm ²	fd		
Used preparation for cleaning and what are they	fr		
Elevation of the leading canal in relation to the terrain, m	H1		
Leading canal diameter, m	D1		
Traffic load A15, B125, C250 or D400 (EN 124)			
Underground waters height, m	Z		

Table 13: Initial data

To the grease separators are brought only waters polluted with oils and fats of plant or animal origin. It is unacceptable to be brought fecal or atmospheric waters. This determines the design of separation sewage network for technological and production waste waters separated by the fecal and the rain network.

In front of the grease separator must not be installed a device for grinding the kitchen waste. Its usage is not allowed in order not to receive grease separator overloading with organic substances.

The grease separators installing is most appropriate when they are as close as possible to the waste water source and when there is and easy access for cleaning. The treated water can be discharged in the sewage system or in the next step of treatment, for example biological wastewater treatment plant.

6.6 Exploitation costs

FATBOX exploitation costs are brought to minimum:

- Without additional supplies.
- Service is brought to minimum – a few regular “checks” of the facility condition are necessary:
 - taking of samples of water after the FATBOX for the period of 3 to 6 months after the facility is started
 - tanks cleaning
 - facility prevention

7 Oil separator - OILBOX

7.1 What is the treatment technology?

- The oils surface because their density is lower than water. They separate with the speed of 4 mm/s.
- Calculated time for water stay is accepted 3 min.
- Two types of petroleum products separation:
 - **Gravity type** – under the force of gravity the admixtures lighter than the water (oils, fats and petroleum products) under the lifting force separate on the surface.
 - **Coalescent type** – small drops of the petroleum products aggregate which facilitates their separation. Besides that, petroleum products precipitation is achieved on the filter material (adsorption).
- Petroleum products retaining depends on the speed of their surfacing which in turn is defined by the drops size, their density, viscosity and the temperature of the environment where they have fallen – waste water. According to the requirements of EN 858 these separators must provide 97% treatment of the waste water from those products.

The lower the speed of passing, the less oil quantity will remain in the water.

7.2 Why is OILBOX necessary?

- The separation of the petroleum products (petrol, naphtha, oils, kerosene and others), contained in the waste waters is made in separators for separation of liquids with density lower than the water or dissolved in it, called grease separators. They find application in:
 - garages, car-repair shops, car-washes
 - gas stations
 - production warehouses
 - roads and parking lots
- The oil separators prevent:
 - waste water pollution
 - blockage of soil pores and improper air exchange
 - harming the self-cleaning processes in the water receiver
- They allow secondary usage of waters-recirculation (car-washes)

ProPass (ByPass)

ProPass -manhole and pipe system that allows 10% of the maximum water quantity to pass through the oil trap. The first 5 min are the most important to capture the dirtiest waters and then assume that the waters are conditionally clean and do not have to go through the oil saver. **The advantages of the Pipelife ProPass system compared to other bypass systems is that the ProPass system can be revised at the inlet and outlet. In addition, the shaft which is at the outlet of the separator serves as a sampling shaft, which is mandatory for subsequent monitoring by the relevant institutions.**

7.3 OILBOX product range and technical data for design

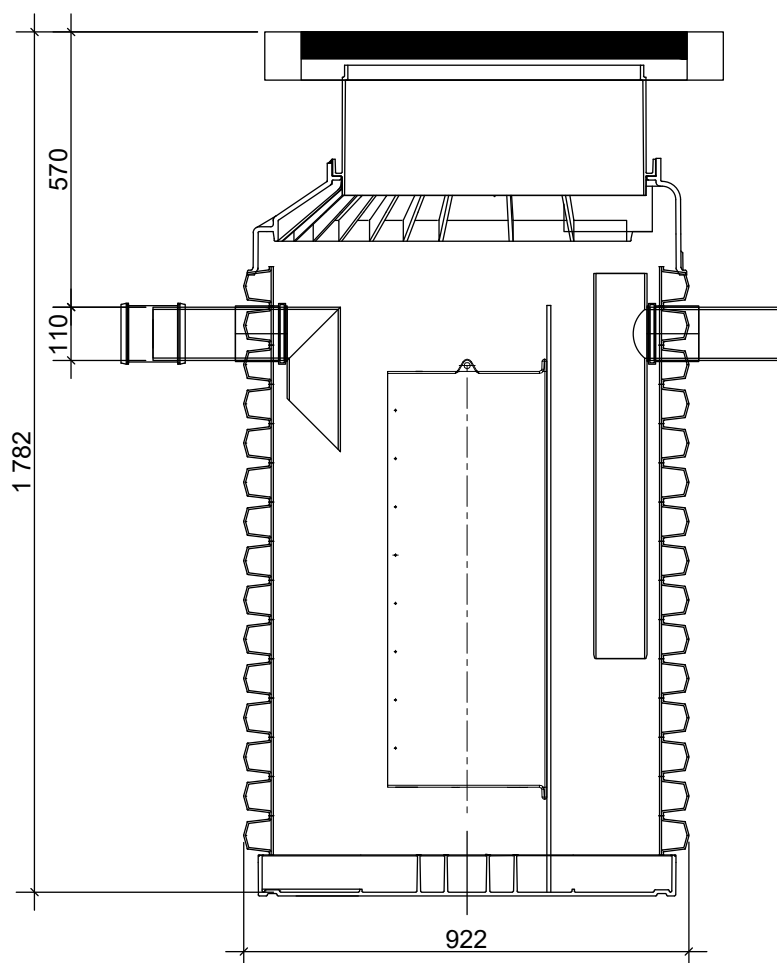
7.3.1.OILBOX with a coalescent filter without a by-pass

What is a coalesced filter?

The coalescence filter is made of polypropylene slabs built one on top of another in a box. The coalescence filter works on the principle of oil particle aggregation and thus to expedite the surface quickly. The most important advantage of Coalition Filters is their long service life - **50 years**. Coal filters are cleaned with a steam-jet and this does not cause their integrity to break. The initial investment is paid with time and seamless operation!

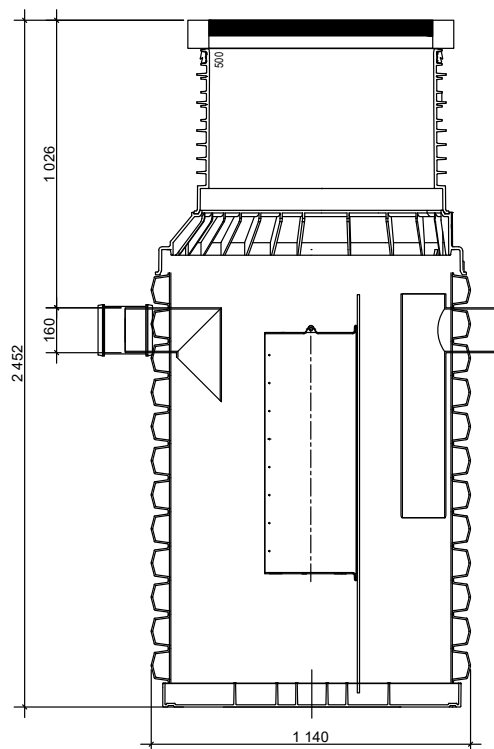
ECO-OILBOX-CNS1,5

OILBOX Class I, 1 l / sec - Oil separator with coalesced filters and additional sludge volume (150 l).



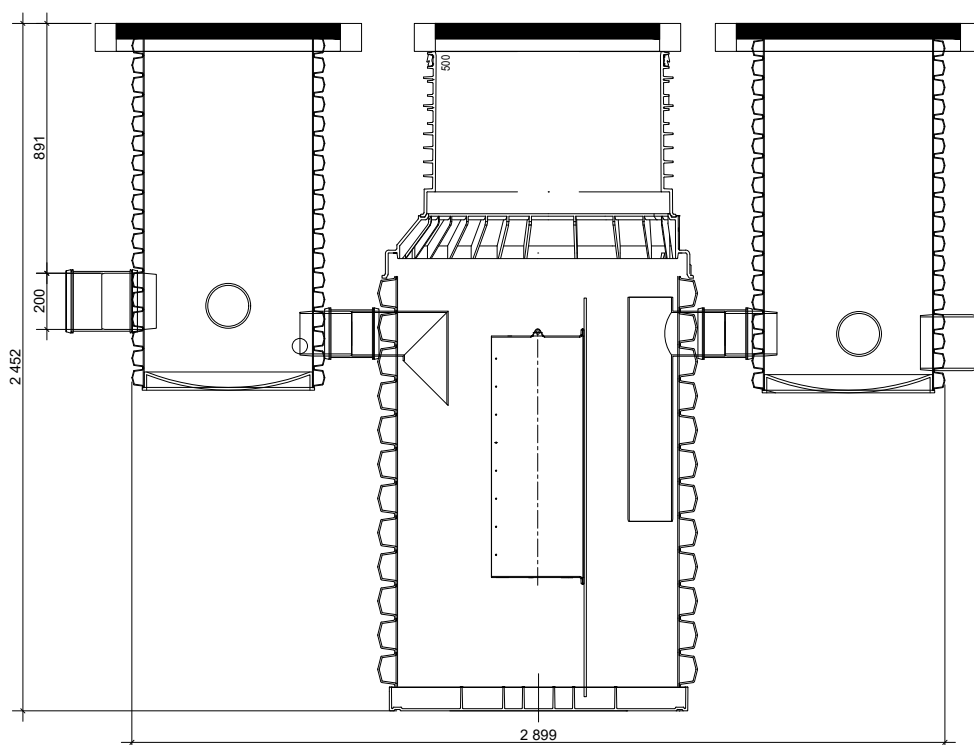
ECO-OILBOX-CNS3

OILBOX Class I, 3 l / sec - Oil separator with coalesced filters and additional sludge volume (300 l).



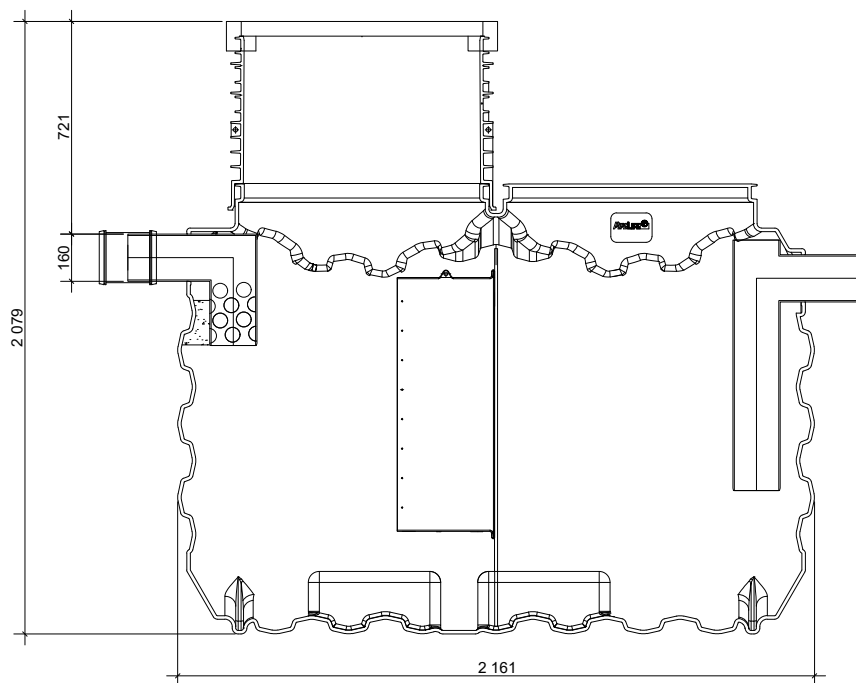
ECO-OILBOX-CNS3/30

OILBOX Class I, 3-30 l / with oil separator using coalesced filters and additional sludge volume (200 liters) and ProPass system with revision capability to conduct incoming water over 3 l / s to 30 l / sec



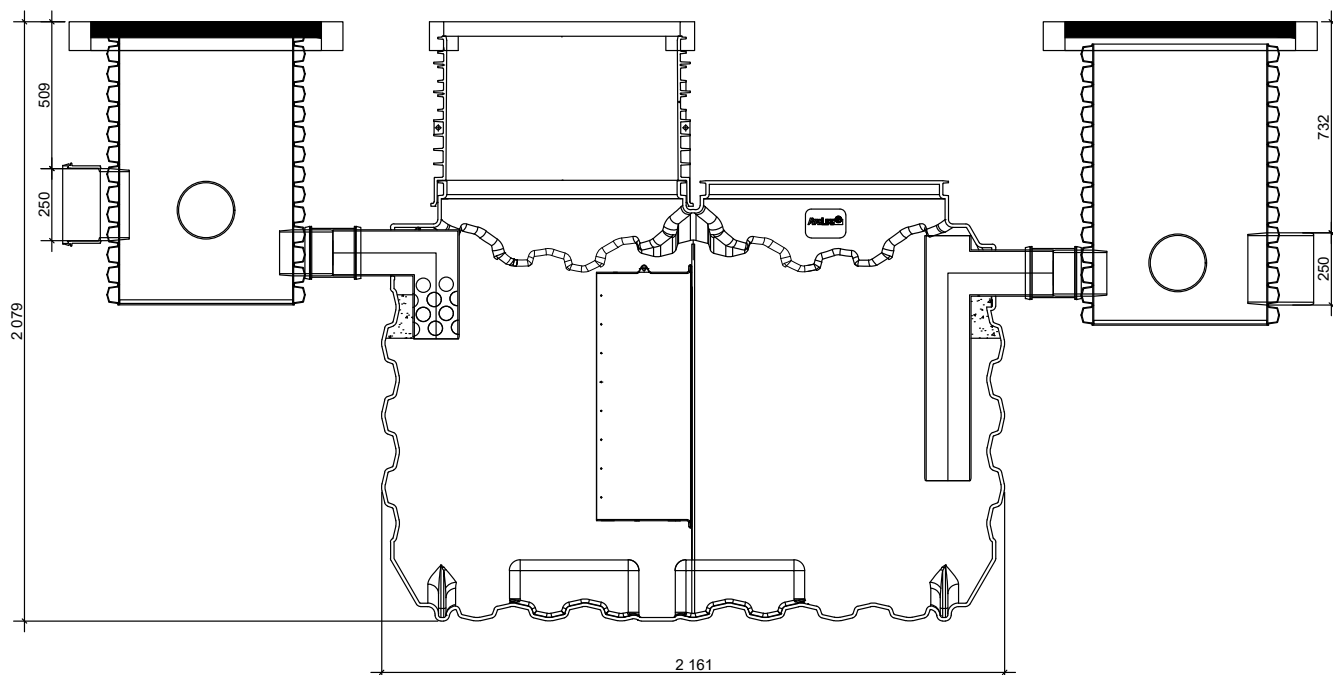
ECO-OILBOX-CNS6

OILBOX Class I, 6 l / sec - Oil separator with coalesced filters and additional sludge volume (300 l).



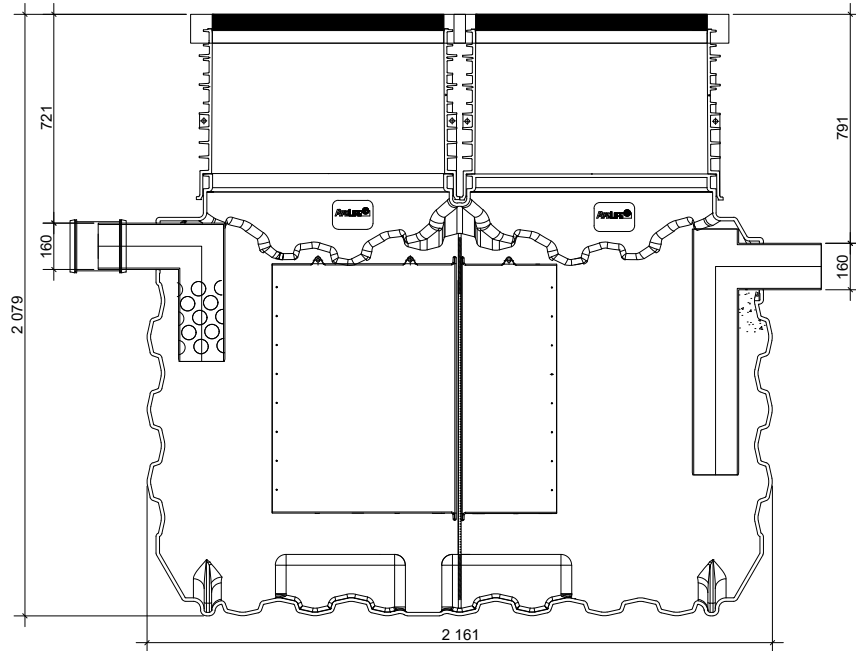
ECO-OILBOX-CNS6/60

OILBOX Class I, 6-60 l / with oil separator using coalesced filters and additional sludge volume (300 liters) and ProPass system with revision capability to conduct incoming water over 6 l / s to 60 l / sec



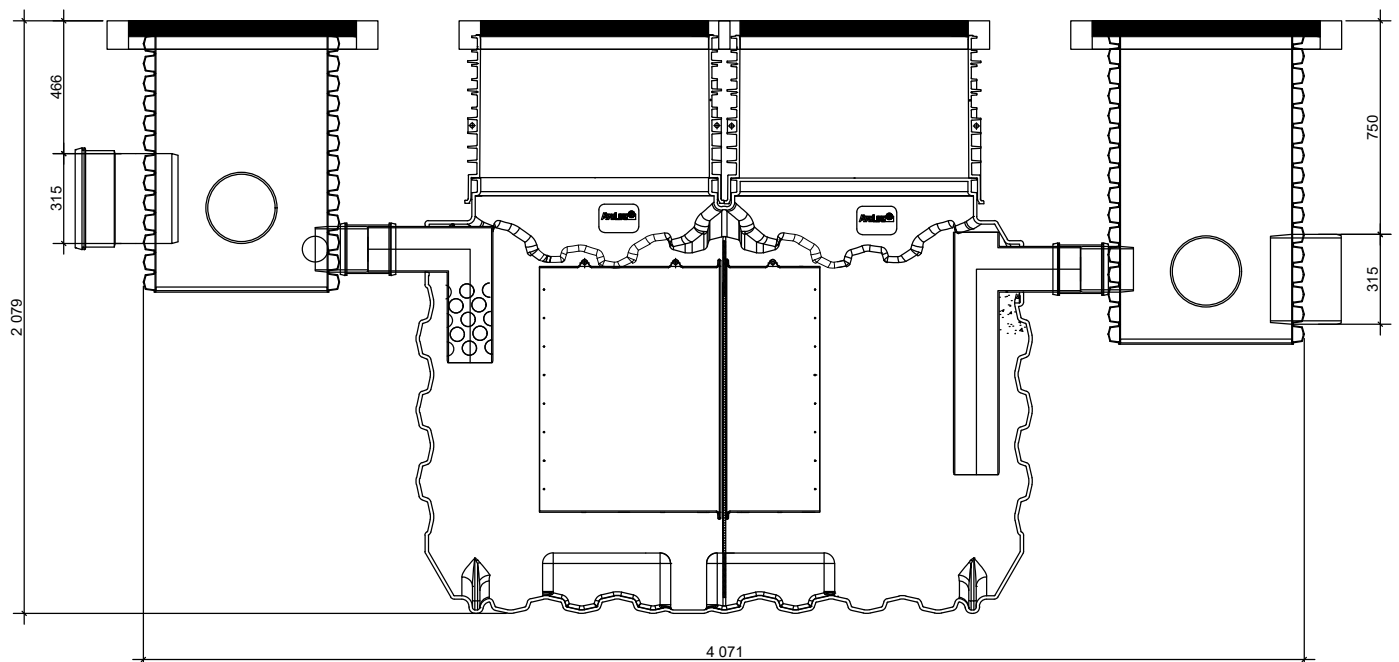
ECO-OILBOX-CNS10

OILBOX Class I, 10 l / sec - Oil separator with coalesced filters and additional sludge volume (400 l).



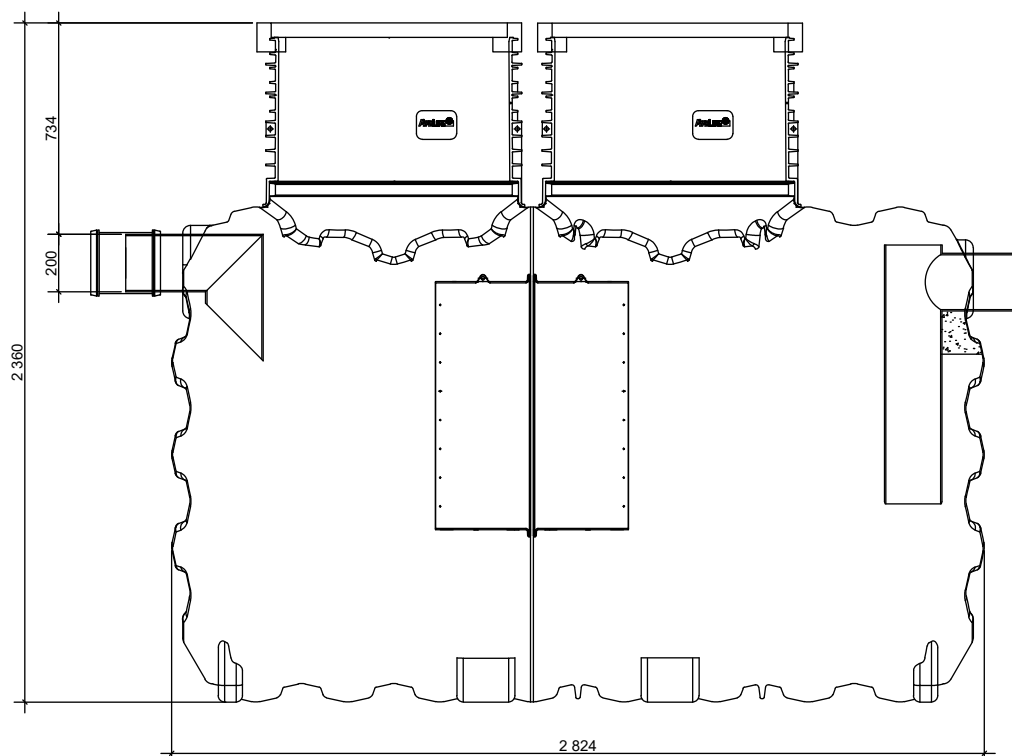
ECO-OILBOX-CNS10/100

OILBOX Class I, 10-100 l / with oil separator using coalesced filters and additional sludge volume (400 liters) and ProPass system with revision capability to conduct incoming water over 10 l / s to 100 l / sec



ECO-OILBOX-CNS15

OILBOX Class I, 15 l / sec - Oil separator with coalesced filters and additional sludge volume (600 l).



Product code	Flow (l/s)	Nominal volume (l)	Working volume (l)	Maximum volume of oil (l)	Sludge volume (l)	Inlet / outlet DN
OILBOX-CNS1.5-TPV	1,5	470	270	50	150	DN110
OILBOX-CNS3-TPV	3	1200	540	100	200	DN110
OILBOX-CNS3/30-TPV-ProPass	3/30	3000	540	100	200	DN110
OILBOX-CNS6-T	6	3000	1080	200	300	DN160
OILBOX-CNS6/60-T-ProPass	6/60	3000	1080	200	300	DN160
OILBOX-CNS10-T	10	3000	1800	300	400	DN160
OILBOX-CNS10/100-T-ProPass	10/100	3000	1800	300	400	DN160
OILBOX-CNS15-T	15	5000	2700	400	600	DN200
OILBOX-CNS15/150-TR	15/150	5000	3600	400	1000	DN400
OILBOX-CNS20-TR	20	6000	4500	400	1000	DN200
OILBOX-CNS20/200-TR	20/200	6000	9	400	1000	DN400
OILBOX-CNS30-TR	30	8000	7000	500	2000	DN315
OILBOX-CNS30/300-TR	30/300	10000	9000	500	2000	DN500
OILBOX-CNS40-TR	40	10000	9000	1200	3000	DN315
OILBOX-CNS40/400-TR	40/400	12000	11000	1200	3000	DN500
OILBOX-CNS50-TR	50	12000	11000	2000	4000	DN315
OILBOX-CNS50/500-TR	50/500	16000	15000	2000	4000	DN600
OILBOX-CNS80-TR	80	22000	20000	2400	6000	DN315
OILBOX-CNC80/800-TR	50/500	25000	23000	2400	6000	DN600
OILBOX-CNS100-TR	100	25000	23000	3000	7000	DN315
OILBOX-CNC100/1000-TR	50/500	30000	28000	3000	7000	DN800
OILBOX-CNS150-TR	150	35000	33000	3500	8000	DN400
OILBOX-CNC150/1500-TR	50/500	40000	37000	3500	8000	DN800
OILBOX-CNS200-TR	200	40000	37000	4000	9000	DN400
OILBOX-CNC200/2000-TR	50/500	45000	42000	4000	9000	DN1000
OILBOX-CNS250-TR	250	45000	42000	4000	10000	DN400
OILBOX-CNC250/2500-TR	50/500	50000	45000	4000	10000	DN1000

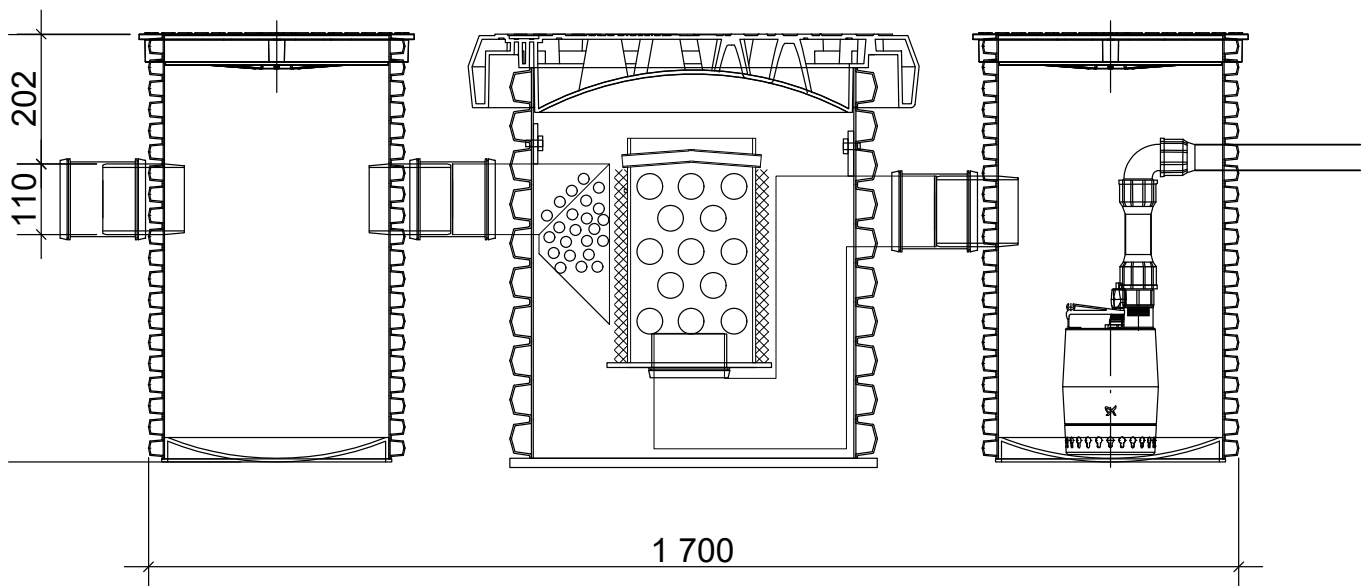
7.3.2.OILBOX - with a foam filter with and without PRO-Pass

The oil separators with a foam filter are compact and easy to operate. The foam filter has a certain pore size and serves to retain the oils. The foam filter is designed for easy disassembly and replacement with a new one. The filter is replaced together with the cleaning of the separator (once every 1-2 years depending on operating conditions).

OILBOX-FNS1.5-SL62-pump-TPV

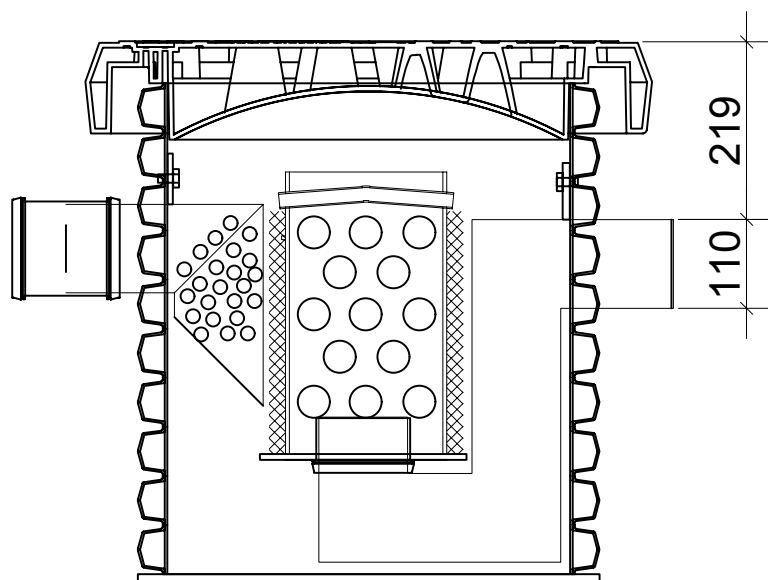
MINIBOX

The FNS1.5 separators with a 60 liter solids separator and a separator pump are specially designed for garages to drain water from ramps. Their dimensions are extremely advantageous - they can be mounted further after providing a hole in the slab.



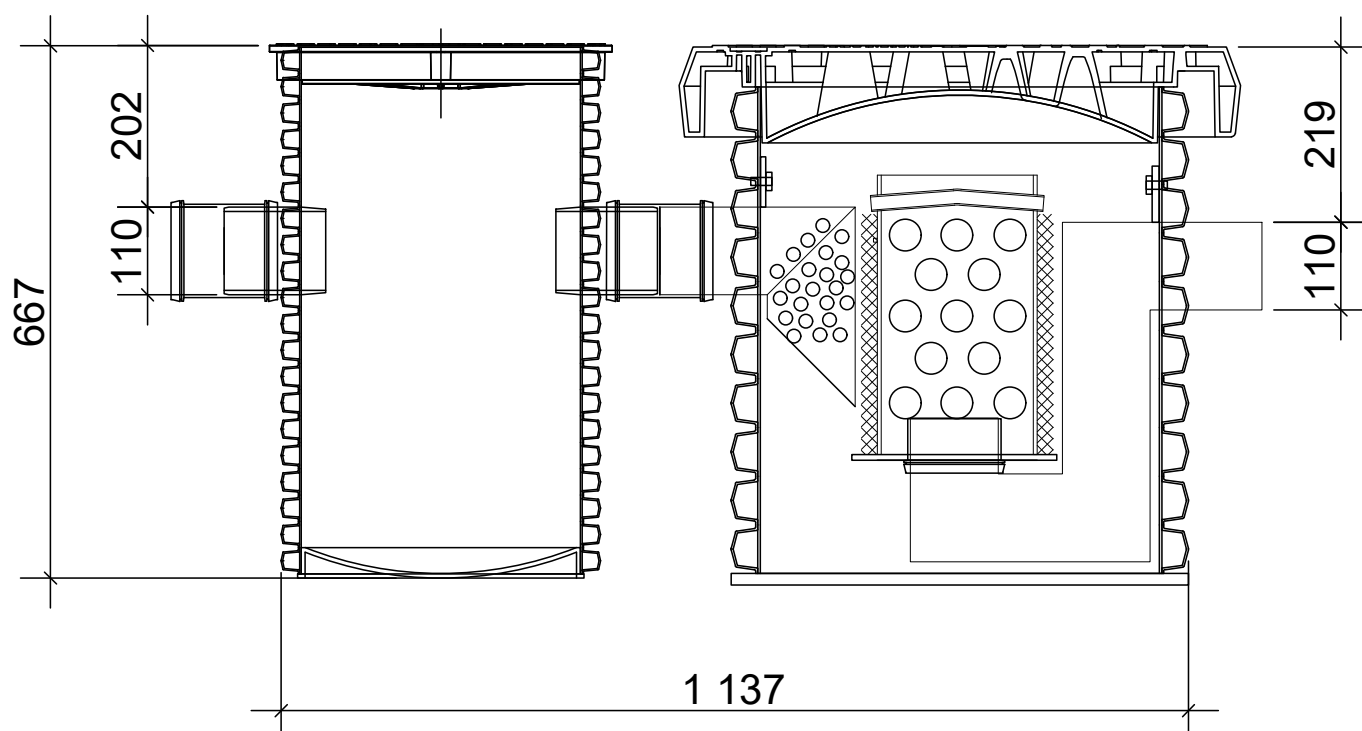
MINI-OILBOX-1.5ls-3ls-1.5ls_sl0

OILBOX Class I, 1.5 l / s - oil separator with a porous filter without sludge volume.



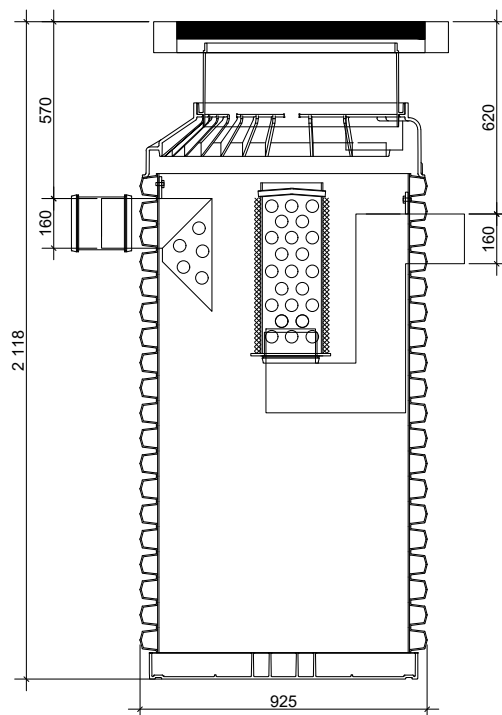
OILBOX-FNS1.5-SL62-TPV

OILBOX Class I, 1.5 l / sec - oil separator with a porous filter and sludge separator (60 liters).



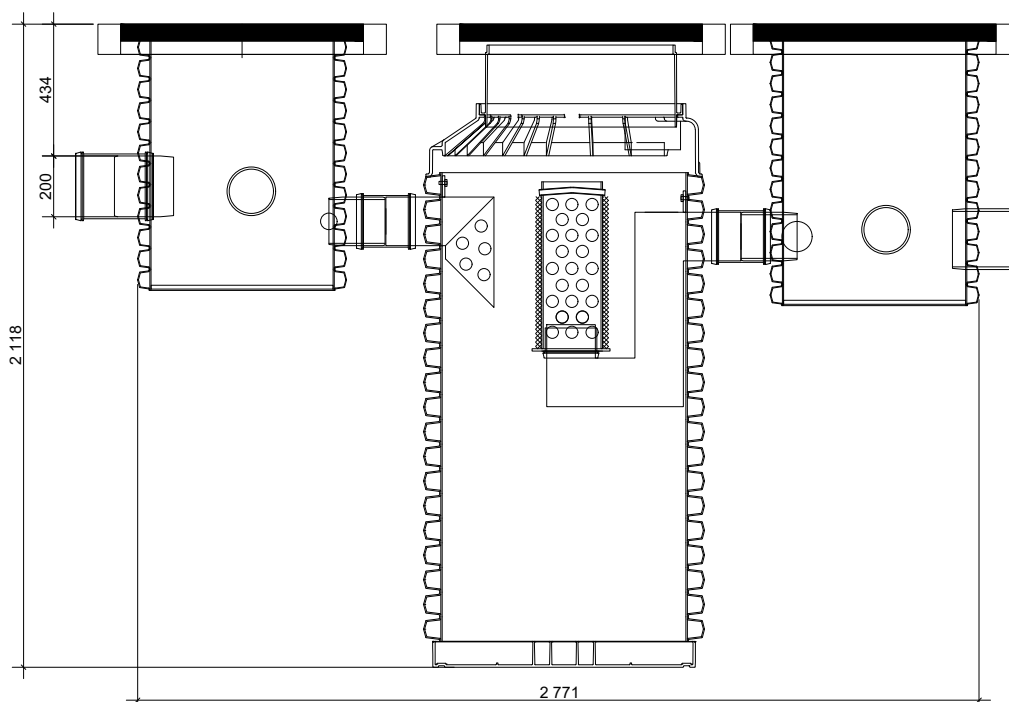
OILBOX-FNS3-110-SL450-TPV

OILBOX Class I, 3 l / s - oil separator with a porous filter and sludge volume (450 l).



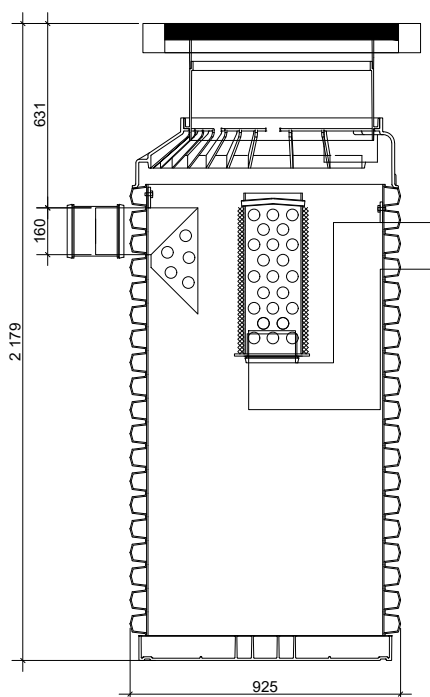
OILBOX-FNS_3/30-160-450-ProPass

OILBOX Class I, 3-30 l / sec - separator for separating oils with a porous filter. Sludge volume (450 l) and ProPass system with revision capability. Water quantity over 3 l / s to 30 l / s



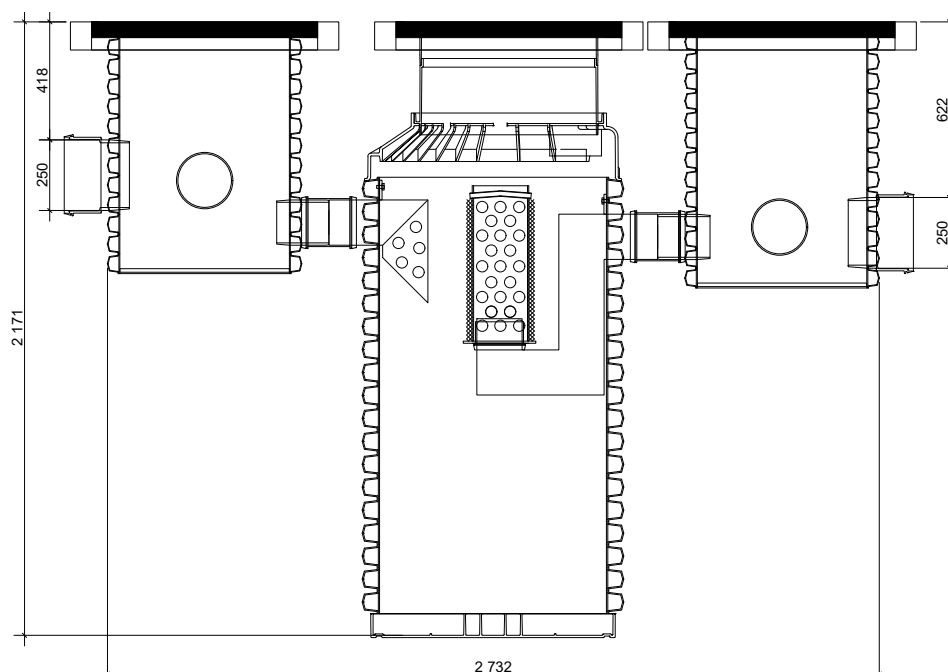
OILBOX-FNS6-160-SL450-TPV

OILBOX Class I, 6 l / sec - separator for separating oils with a porous filter and sludge volume (450 l).



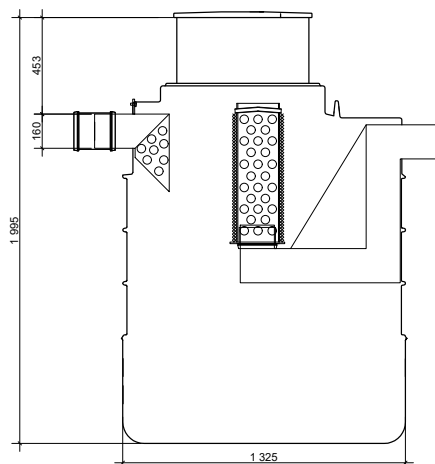
OILBOX-FNS_6/60-160-450-ProPass

OILBOX Class I, 6-60 l / sec - separator for separating oils with a porous filter. Sludge volume (450 l) and ProPass system with revision capability. Water quantity over 6 l / s to 60 l / s



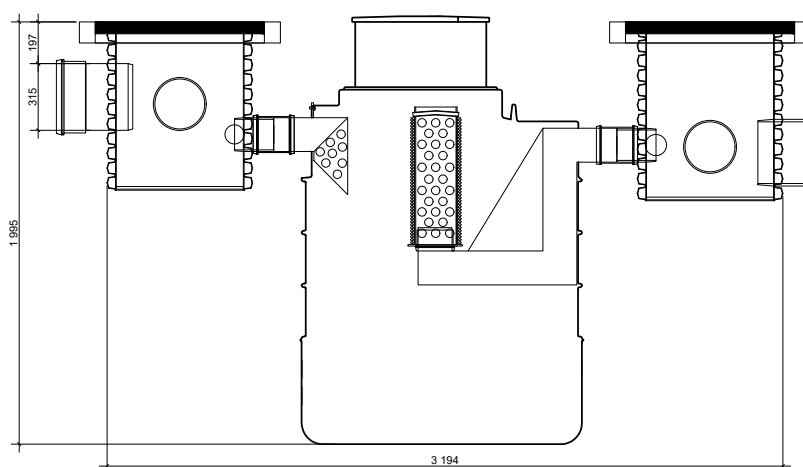
OILBOX-FNS10-160-SL1100-TR

OILBOX Class I, 10 l / sec - separator for separating oils with a porous filter and sludge volume (1100 l).



OILBOX-FNS_10/100-DN160-S1100-ProPass

OILBOX Class I, 10-100 l / sec - separator for separating oils with a porous filter. Sludge volume (1100 l) and ProPass system with revision capability. Water quantity over 10 l / s to 100 l / s

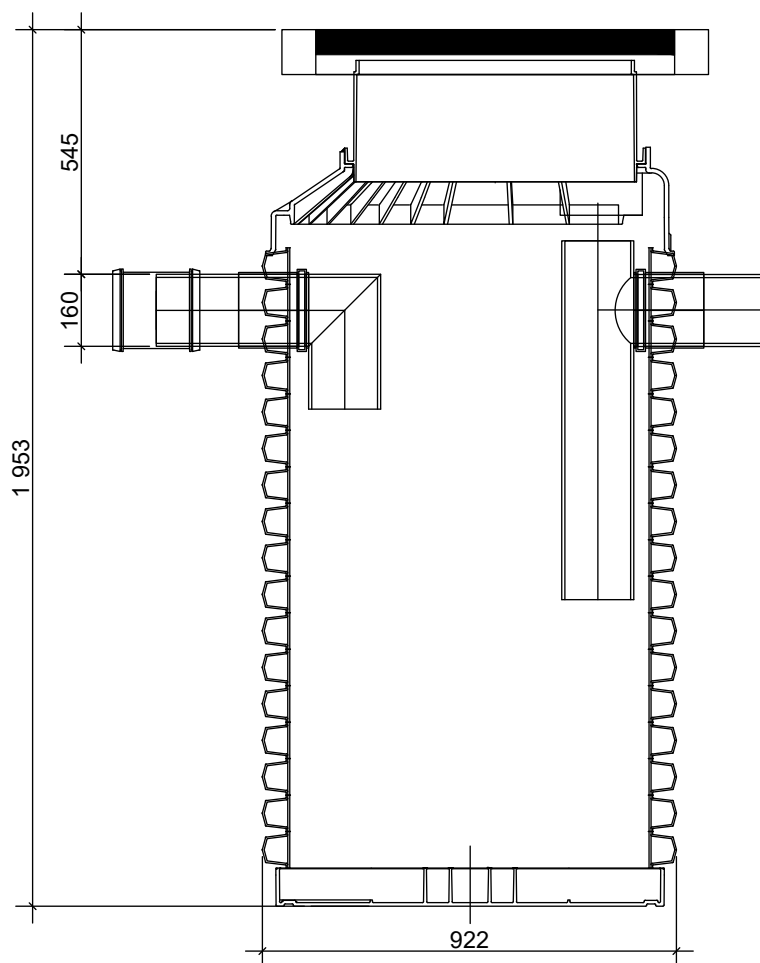


Product code	Flow (l/s)	Nominal volume (l)	Working volume (l)	Maximum volume of oil (l)	Sludge volume (l)	Inlet / outlet DN
OILBOX-FNS1.5-SL0-TPV	1.5	150	150	50	0	DN110
OILBOX-FNS1.5-SL62-TPV	1.5	150	150	50	60	DN110
OILBOX-FNS1.5-SL62-pump-TPV	1.5	150	150	50	60	DN110
OILBOX-FNS3-110-SL0-TPV	3	750	750	50	0	DN110
OILBOX-FNS3-110-SL450-TPV	3	750	750	240	450	DN110
OILBOX-FNS3-160-SL450-TPV	3	750	750	240	450	DN160
OILBOX-FNS_3/30-160-450-ProPass	3	750	750	240	450	DN160
OILBOX-FNS3-110-SL670-TPV	3	990	990	240	670	DN110
OILBOX-FNS3-160-SL670-TPV	3	990	990	240	670	DN160
OILBOX-FNS6-160-SL450-TPV	6	990	990	240	450	DN160
OILBOX-FNS_6/60-160-450-ProPass	6	990	990	240	450	DN160
OILBOX-FNS6-160-SL660-TPV	6	990	990	240	660	DN160
OILBOX-FNS10-160-SL1100-TR	10	2000	1080	270	1100	DN160
OILBOX-FNS_10/100-DN160-S1100-ProPass	10	2000	1080	270	1100	DN160

7.3.3.OILBOX without coalescent filter, with and without ByPass

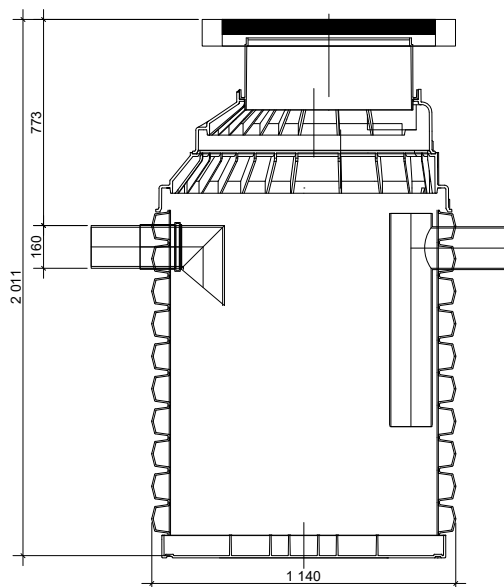
ECO-OILBOX-NS1,5

OILBOX Class II, 1.5 l / s - gravity separator separator with extra volume for sludge (50 l).



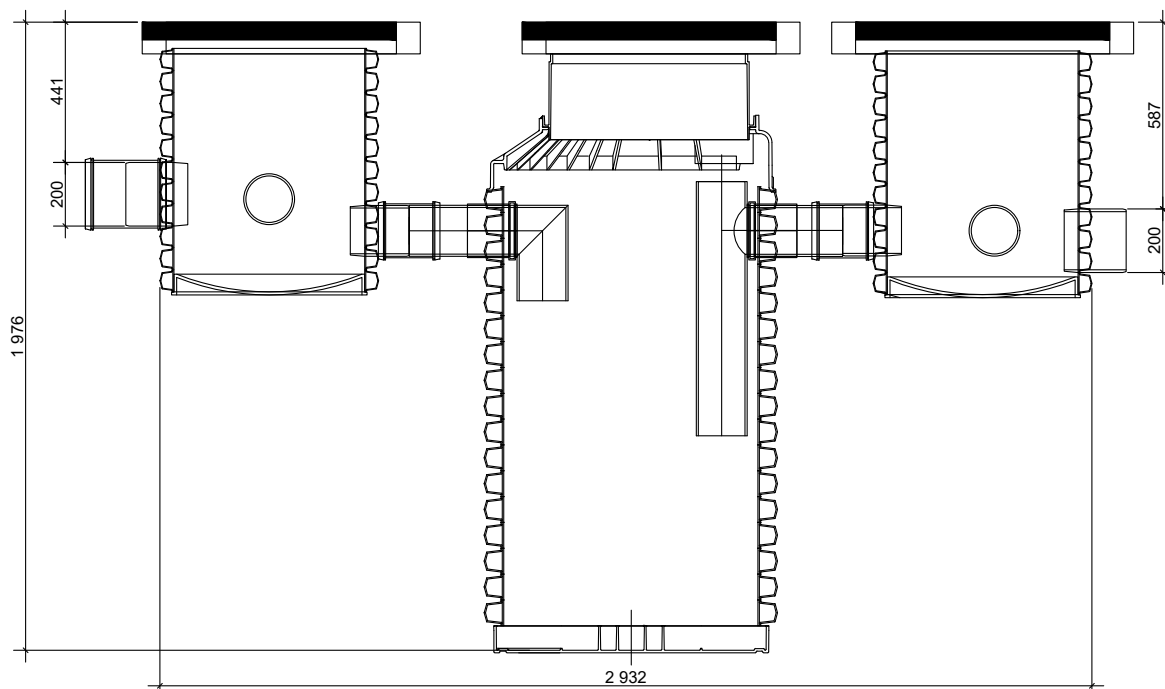
ECO-OILBOX-NS3

OILBOX Class II, 3 l / s - gravity separator separator with extra volume for sludge (200 l).



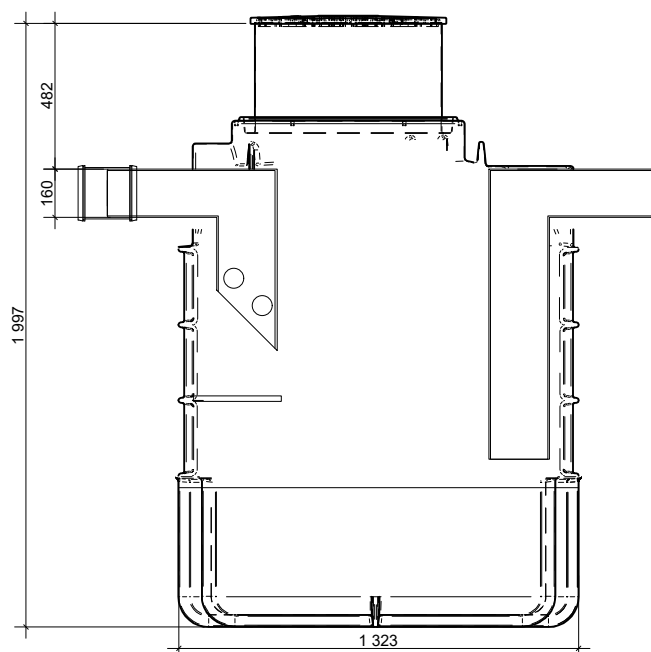
ECO-OILBOX-NS3/30

OILBOX Class II, 3-30 l / sec - oil gravity separator with sludge volume (200 liters) and ProPass system with revision capability to carry incoming water quantity over 3 l / s to 30 l / s



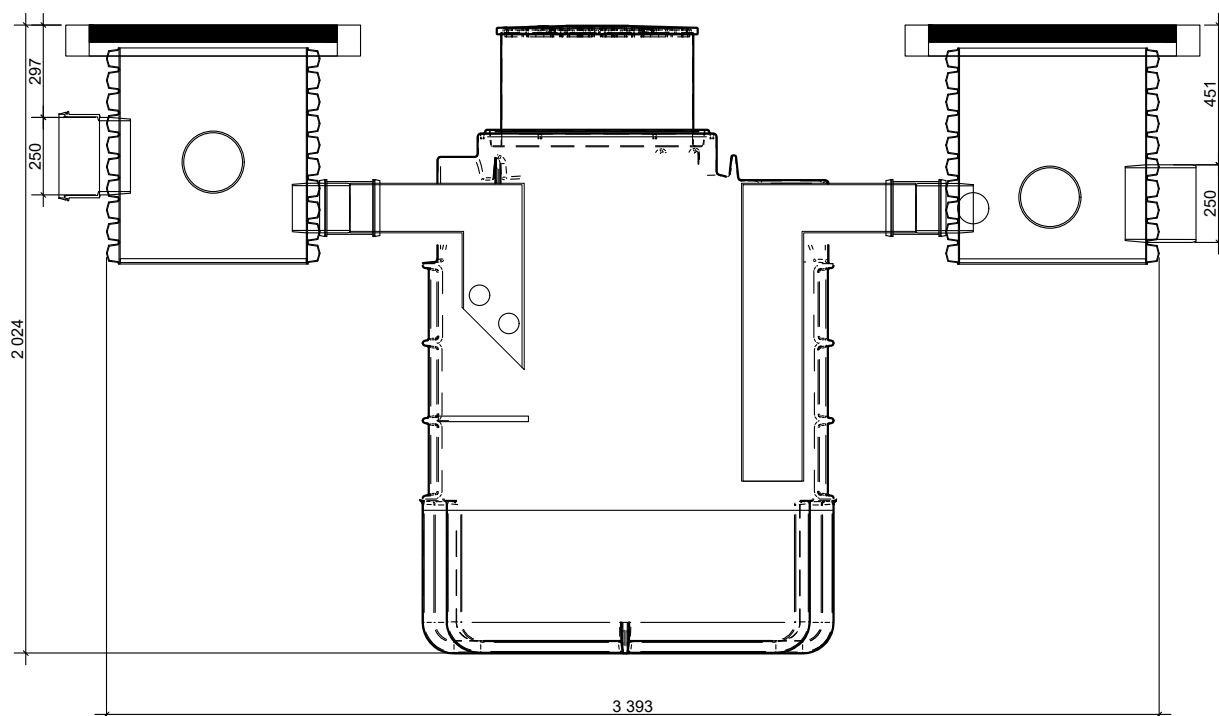
ECO-OILBOX-NS6-TR

OILBOX Class II, 6 l / s - gravity separator separator with extra volume for sludge (300 l).



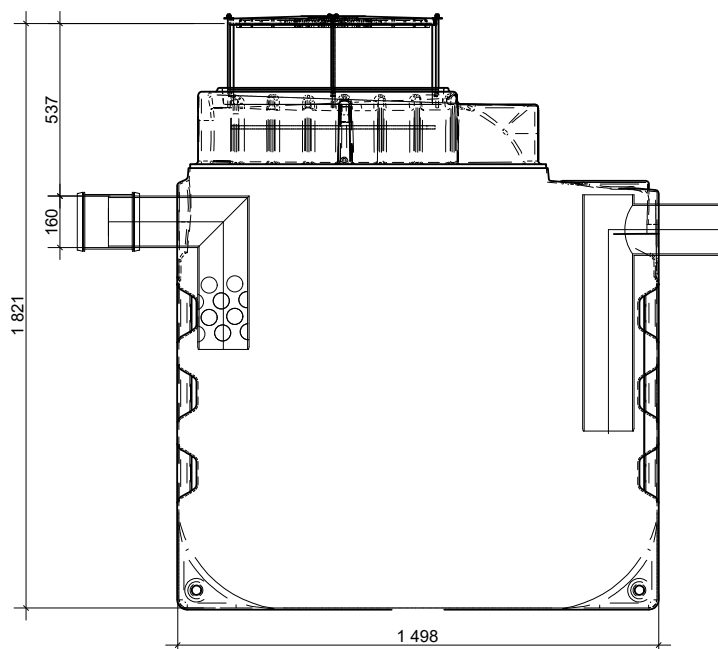
ECO-OILBOX-NS6-60-TR

OILBOX Class II, 6-60 l / sec - oil gravity separator with sludge volume (300 liters) and ProPass system with revision capability to carry incoming water quantity over 6 l / s to 60 l / s



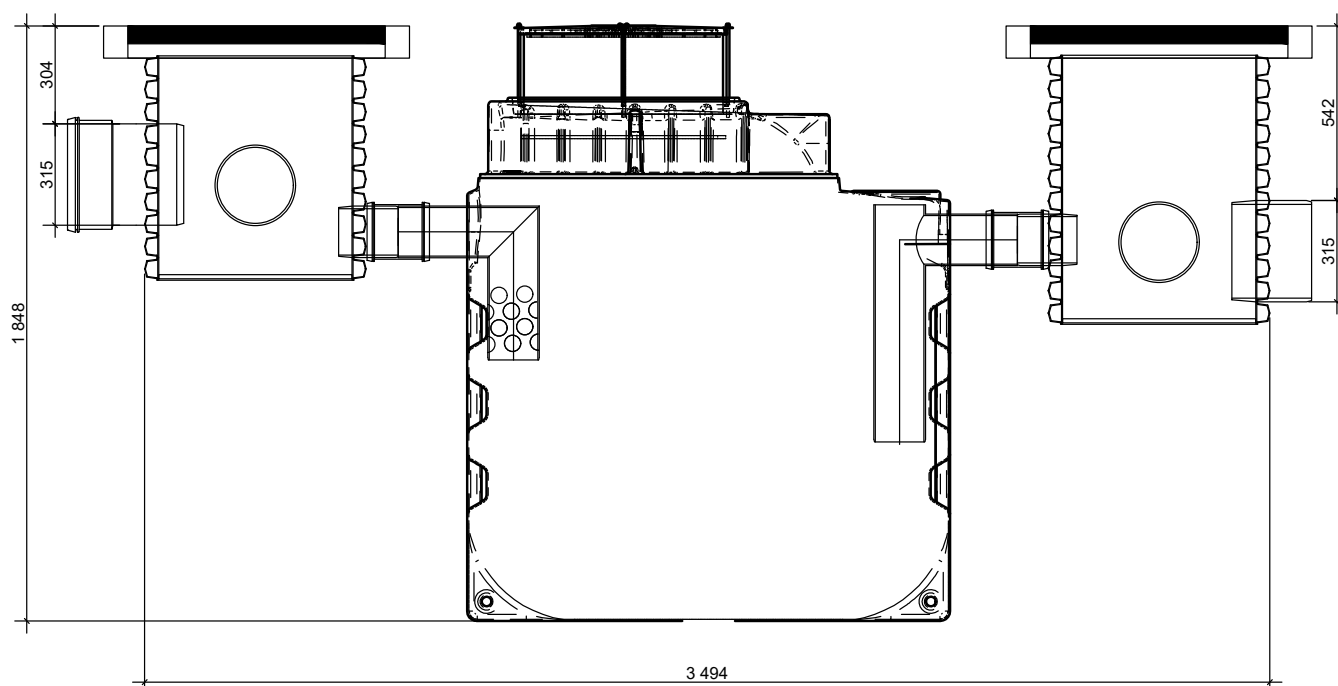
ECO-OILBOX-NS10

OILBOX Class II, 10 l / s - gravity separator separator with extra volume for sludge (400 l).



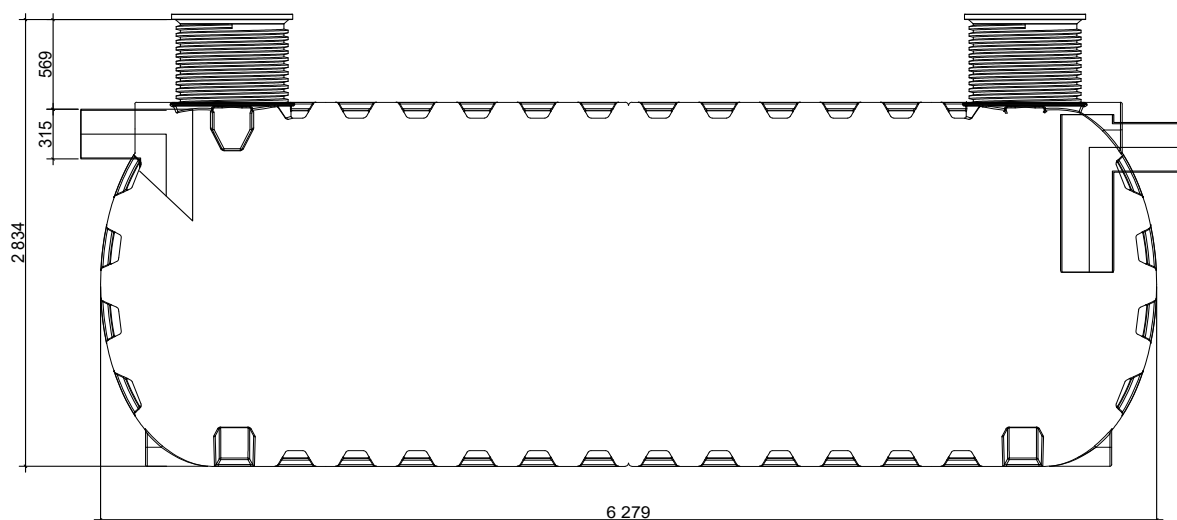
ECO-OILBOX-NS10/100

OILBOX Class II, 10-100 l / sec - oil gravity separator with sludge volume (400 liters) and ProPass system with revision capability to carry incoming water quantity over 10 l / s to 100 l / s



ECO-OILBOX-NS20-NS300-TR

OILBOX Class II, from 20 to 200 l / s - gravity separator separator with extra volume for sludge (l).



Product code	Flow (l/s)	Nominal volume (l)	Working volume (l)	Maximum volume of oil (l)	Sludge volume (l)	Inlet / outlet DN
OILBOX-NS1,5-TPV	1,5	400	270	50	150	DN110
OILBOX-NS3-TPV	3	900	540	100	200	DN160
OILBOX-NS3/30-TPV-ProPass	3/30	900	540	100	200	DN160
OILBOX-NS6-TR	6	1500	1100	200	300	DN160
OILBOX-NS6/60-TR-ProPass	6/60	1500	1100	200	300	DN160
OILBOX-NS10-TR	10	2000	1700	300	400	DN160
OILBOX-NS10/100-TR-ProPass	10/100	2000	1700	300	400	DN160
OILBOX-NS15-TR	15	3500	3700	400	600	DN200
OILBOX-NS20-T	20	5000	5000	600	1200	DN200
OILBOX-NS30-TJ	30	8000	7500	900	1800	DN250
OILBOX-NS40-TJ	40	12000	11800	1200	2400	DN250
OILBOX-NS50-TJ	50	15000	14200	1500	3000	DN315
OILBOX-NS80-TJ	80	20000	18400	2000	4000	DN315
OILBOX-NS100-TJ	100	30000	29200	3000	6000	DN315
OILBOX-NS150-TJ	150	35000	34200	3500	7000	DN400
OILBOX-NS200-TJ	200	40000	38000	3800	7500	DN400
OILBOX-NS250-TJ	250	45000	42400	4200	8500	DN400
OILBOX-NS300-TJ	300	50000	46600	4600	10000	DN400

7.4 Type of the used tanks

The tanks, used for grease separators of the OILBOX system are the following type:

- ECO-PRO: PRO Pipelife manholes are used for vertical assembly. They allow free standing assembly as well as underground assembly. Reinforced construction of the coating – load carrying capacity up to 40 tons. In case of assembly above the surface (basements, storehouses) they can be fitted with devices for measuring the quantity of fats and with a discharge device for periodical measurement of the fats.
 - ECO-T: used for horizontal underground assembly. The tanks are designed for load class A15 but according to the conditions they can be reinforced with a armor concrete frames or a plate and to be assembled in traffic zones. The covers which are mounted in these cases meet the design load.
- All tanks must be equipped with manholes with a diameter DN600. Depending on the design conditions and the client's wishes they can be made with a diameter DN800. If necessary, are possible additional manholes with a diameter DN600 or DN800 (with the exception of ECO-PRO)

7.5 Initial data for design

Initial data	index	data	comment
Waste waters capacity l/s	Q		
Rain waters capacity l/s	Qr		
Pollution origin			
Assembly type – free-standing/buried			
Treatment degree as class I or class II			
Oil density gr/cm ²	fd		
Availability of substances which can hamper The separation (for example detergent preparations)	fx		
Elevation of the leading canal in relation to the terrain, m	H1		
Diameter of the leading canal, m	D1		
Traffic load A15, B125, C250 or D400 (EN 124)			
Underground waters height, m	Z		

Table 14: Initial data

The grease separators are designed right next to the origin of the waste waters if possible out of buildings and streets. They must be with an easy access for maintenance and cleaning.

All products from the OILBOX product range are equipped with a grit separator volume.

For drainage of rain waters from parking lots, street surfaces and others open surfaces Pipelife offers OILBOX with a by-pass.

During rain the initial flow is with highest degree of pollution and gradually increasing capacity. It is accepted by the grease separator. According to the duration and the rain intensity, the capacity increases and this quantity go through the facility by-pass and increase its effectiveness.

7.6 Exploitation costs

The OILBOX exploitation costs are brought to minimum:

- Without additional supplies.
- Service is brought to minimum – a few types of periodical “checks” of the facility condition are necessary:
 - taking of samples from the water after OILBOX
 - cleaning of filter for class I
 - facility prevention

All OILBOX class I (with filters) is equipped with manholes DN800 which allow the filters to be taken out for cleaning and change. This not only facilitates the facility maintenance but also extends its exploitation life and guarantees facility effectiveness.

8 Sludge separator - SANDBOX

8.1 What is the treatment technology?

- Retains sand and mineral substances.
- Precipitation principle – particles heavier than the water settle down on the bottom.
- They separate with the speed of minimum 0,15-0,20 m/s.
- Sizing time for stay in the water is accepted 3 min.
- The necessary fluid surface for precipitation 0.25 m² per liter/second.
- Separation effectiveness is more than 92%.

8.2 Why is SANDBOX necessary?

- For normal work of the sewage system.
- For normal work of the wastewater treatment plants.
- It is designed before grease and oil separators.

8.3 SANDBOX product range and technical data for design

All the oil separators Class II from the OILBOX-NS series can also be used as sludge separators for the respective flow they cover.

8.4 Type of the used tanks

The tanks, used for grit separators of the SANDBOX system are the same used in the Class II oil separators from the OILBOX-NS series.

8.5 Initial data for design

Initial data	index	data	comment
Waste waters capacity – l/s	Q		
Assembly type – free standing / buried			
Necessity of grating before SANDBOX			
Elevation of the leading canal in relation to the terrain, m	H1		
Leading canal diameter, m	D1		
Traffic load A15, B125, C250 or D400 (EN 124)			
Underground waters height, m	Z		

Table 15: Initial data

They are calculated on the basis of precipitation surface, stay and treatment effect of the separated heavy admixtures and insoluble settled substances with a density bigger than the water one.

8.6 Exploitation costs

SANDBOX exploitation costs are brought to minimum:

- Without additional supplies.
- Periodical facility prevention is necessary when taking out the accumulated pollutants.

TANKS

1. Reservoirs for conditional water from polyethylene, designed for burial (underground installation).



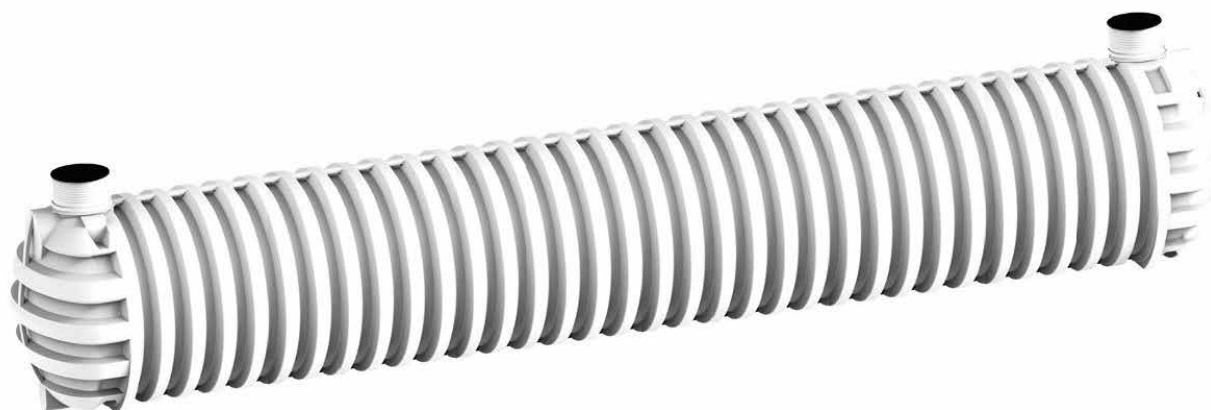
Tanks type T, TRdr and type TJ can not be free standing!

Tanks can serve as waste water retainers, rainwater retention, anti-fire, etc. Tanks can be fitted with inputs and outputs of different diameters and at varying heights depending on the design conditions. The laying of the tanks must be carried out in accordance with a construction plan. For additional information, please refer to Pipelife Product Managers.

<https://www.pipelife.bg/bg/03>Contact/03/Product Managers.php>

Product code	Description	Nominal volume (L)	Tank's working volume (L)	Material	Diameter of the in/outlet pipes	Belts (pcs.)	DN in/outlet	Effective height in/outlet	Length / Height of the tank (m)	Cover load
ECO-TPH1000	Tank 1 000 l, in/outlet, with 1 inspection hole and a cover	900	750	PP	up to DN160	-	400	300	2.17 / 1.06	A15
ECO-TPH1500	Tank 1 500 l, in/outlet, with 1 inspection hole and a cover	1.400	1130	PP	up to DN160	-	400	300	3.21 / 1.06	A15
ECO-TPH2000	Tank 2 000 l, in/outlet, with 1 inspection hole and a cover	1.800	1500	PP	up to DN160	-	400	300	4.24 / 1.06	A15
ECO-T3000	Tank 3 000 l, in/outlet, with 1 inspection hole and a cover	2.600	2390	PE	up to DN160	1	600	400	2.16 / 1.88	200 kg
ECO-T5000	Tank 5 000 l, in/outlet, with 1 inspection hole and a cover	4.600	4690	PE	up to DN160	2	600	400	2.82 / 2.17	200 kg
ECO-TR900-V	Tank 1 700 l, in/outlet, with 1 inspection hole and a cover	900	900	PE	up to DN161	-	600	500	Ø1.30 / 1,3	200 kg
ECO-TR1200-V	Tank 1 700 l, in/outlet, with 1 inspection hole and a cover	1.200	1200	PE	up to DN162	-	600	500	Ø1.30 / 1,55	200 kg
ECO-TR1500-V	Tank 1 700 l, in/outlet, with 1 inspection hole and a cover	1.500	1500	PE	up to DN163	-	600	500	Ø1.30 / 1,8	200 kg
ECO-TR1700-V	Tank 1 700 l, in/outlet, with 1 inspection hole and a cover	1.700	1700	PE	up to DN164	-	600	500	Ø1.20 / 2.00	200 kg
ECO-TR2000-V	Tank 2 000 l, in/outlet, with 1 inspection hole and a cover	2.000	2000	PE	up to DN160	1	600	500	Ø1.20 / 2.25	200 kg
ECO-TR2350-V	Tank 2 350 l, in/outlet, with 1 inspection hole and a cover	2.350	2350	PE	up to DN160	1	600	500	Ø1.50 / 2.07	200 kg
ECO-TR2700-V	Tank 2 700 l, in/outlet, with 1 inspection hole and a cover	2.700	2700	PE	up to DN160	1	600	500	Ø1.50 / 2.32	200 kg
ECO-TR2200	Tank 2 200 l, in/outlet, with 1 inspection hole and a cover	2.100	2100	PE	up to DN160	1	600	500	1.84 / 1.55	200 kg
ECO-TR2600	Tank 2 600 l, in/outlet, with 1 inspection hole and a cover	2.200	2300	PE	up to DN160	1	600	500	2.15 / 1.55	200 kg
ECO-TR3000	Tank 3 000 l, in/outlet, with 1 inspection hole and a cover	3.000	2650	PE	up to DN160	1	600	500	2.40 / 1.55	200 kg
ECO-TR3500	Tank 3 500 l, in/outlet, with 1 inspection hole and a cover	3.500	3500	PE	up to DN160	1	600	500	1.98 / 2.08	200 kg
ECO-TR5000	Tank 5 000 l, in/outlet, with 1 inspection hole and a cover	5.000	4900	PE	up to DN160	2	600	500	2.48 / 2.08	200 kg
ECO-TR6000	Tank 6 000 l, in/outlet, with 1 inspection hole and a cover	6.000	5800	PE	up to DN160	2	600	500	2.88 / 2.08	200 kg
ECO-TJ8000	Tank 8 000 l, in/outlet, with 1 inspection holes and a cover	8.000	8000	PE	up to DN160	2	600	500	2.68 / 2.73	200 kg
ECO-TJ10000	Tank 10 000 l, in/outlet, with 1 inspection holes and a cover	10.000	9900	PE	up to DN160	2	600	500	3.04 / 2.74	200 kg
ECO-TJ12000	Tank 12 000 l, in/outlet, with 1 inspection hole and a cover	12.000	12000	PE	up to DN160	3	600	500	3.76 / 2.75	200 kg
ECO-TJ15000	Tank 15 000 l, in/outlet, with 2 inspection hole and a cover	15.000	15000	PE	up to DN160	4	600	500	4.48 / 2.76	200 kg
ECO-TJ17000	Tank 17 000 l, in/outlet, with 2 inspection hole and a cover	17.000	17000	PE	up to DN160	4	600	500	4.48 / 2.76	200 kg
ECO-TJ22000	Tank 20 000 l, in/outlet, with 2 inspection holes and a cover	20.000	20000	PE	up to DN160	6	600	500	6.28 / 2.77	200 kg
ECO-TJ20000	Tank 22 000 l, in/outlet, with 2 inspection holes and a cover	22.000	22000	PE	up to DN160	6	600	500	6.28 / 2.77	200 kg
ECO-TJ25000	Tank 25 000 l, in/outlet, with 2 inspection holes and a cover	25.000	25000	PE	up to DN160	7	600	500	7.37 / 2.78	200 kg
ECO-TJ27000	Tank 27 000 l, in/outlet, with 2 inspection holes and a cover	27.000	27000	PE	up to DN160	7	600	500	7.37 / 2.78	200 kg
ECO-TJ30000	Tank 30 000 l, in/outlet, with 2 inspection holes and a cover	30.000	29300	PE	up to DN160	10	600	500	8.45 / 2.79	200 kg
ECO-TJ35000	Tank 35 000 l, in/outlet, with 2 inspection holes and a cover	35.000	34300	PE	up to DN160	10	600	500	9.89 / 2.80	200 kg
ECO-TJ40000	Tank 40 000 l, in/outlet, with 2 inspection holes and a cover	40.000	39300	PE	up to DN160	11	600	500	10.97 / 2.81	200 kg
ECO-TJ45000	Tank 45 000 l, in/outlet, with 2 inspection holes and a cover	45.000	43300	PE	up to DN160	12	600	500	12.41 / 2.82	200 kg
ECO-TJ50000	Tank 50 000 l, in/outlet, with 2 inspection holes and a cover	50.000	49200	PE	up to DN160	13	600	500	13.49 / 2.83	200 kg

2. Reservoirs for drinking water from polyethylene intended for burial (underground installation).



Tanks type T, TRdr and type TJ can not be free standing!

Type T, TRdr and type TJ containers are made from polyethylene, a primary certified drinking water material. The tanks can be provided with inlets and outlets of different diameters and at different heights depending on the conditions of the project. The laying of the tanks must be carried out in accordance with a construction plan. For additional information, please refer to Pipelife Product Managers.

https://www.pipelife.bg/bg/03_Contact/03_Product_Managers.php

Product code	Description	Nominal volume (L)	Tank's working volume (L)	Material	Diameter of the in/outlet pipes	Belts (pcs.)	DN in/outlet	Length / Height of the tank (m)	Cover load
ECO-TRdr2200	Tank for drinking water 2 200 l, in/outlet with 1 inspection hole and a cover	2.100	2100	PE	up to DN160	1	600	1.84 / 1.55	200 kg
ECO-TRdr2600	Tank for drinking water 2 600 l, in/outlet with 1 inspection hole and a cover	2.200	2300	PE	up to DN160	1	600	2.15 / 1.55	200 kg
ECO-TRdr3000	Tank for drinking water 3 000 l, in/outlet with 1 inspection hole and a cover	3.000	2650	PE	up to DN160	1	600	2.40 / 1.55	200 kg
ECO-TRdr3500	Tank for drinking water 3 500 l, in/outlet with 1 inspection hole and a cover	3.500	3500	PE	up to DN160	1	600	1.98 / 2.08	200 kg
ECO-TRdr5000	Tank for drinking water 5 000 l, in/outlet with 1 inspection hole and a cover	5.000	4900	PE	up to DN160	2	600	2.48 / 2.08	200 kg
ECO-TRdr6000	Tank for drinking water 6 000 l, in/outlet with 1 inspection hole and a cover	6.000	5800	PE	up to DN160	2	600	2.88 / 2.08	200 kg
ECO-TRdr8000	Tank for drinking water 8 000 l, in/outlet with 1 inspection hole and a cover	8.000	8000	PE	up to DN160	2	600	2.68 / 2.73	200 kg
ECO-TRdr10000	Tank for drinking water 10 000 l, in/outlet with 1 inspection hole and a cover	10.000	9900	PE	up to DN160	2	600	3.04 / 2.74	200 kg
ECO-TRdr12000	Tank for drinking water 12 000 l, in/outlet with 1 inspection hole and a cover	12.000	12000	PE	up to DN160	3	600	3.76 / 2.75	200 kg
ECO-TRdr15000	Tank for drinking water 15 000 l, in/outlet with 2 inspection holes and a cover	15.000	15000	PE	up to DN160	4	600	4.48 / 2.76	200 kg
ECO-TRdr17000	Tank for drinking water 17 000 l, in/outlet with 2 inspection holes and a cover	17.000	17000	PE	up to DN160	4	600	4.48 / 2.76	200 kg
ECO-TRdr20000	Tank for drinking water 20 000 l, in/outlet with 2 inspection holes and a cover	20.000	20000	PE	up to DN160	6	600	6.28 / 2.77	200 kg
ECO-TRdr22000	Tank for drinking water 22 000 l, in/outlet with 2 inspection holes and a cover	22.000	22000	PE	up to DN160	6	600	6.28 / 2.77	200 kg
ECO-TRdr25000	Tank for drinking water 25 000 l, in/outlet with 2 inspection holes and a cover	25.000	25000	PE	up to DN160	7	600	7.37 / 2.78	200 kg
ECO-TRdr27000	Tank for drinking water 27 000 l, in/outlet with 2 inspection holes and a cover	27.000	27000	PE	up to DN160	7	600	7.37 / 2.78	200 kg
ECO-TRdr30000	Tank for drinking water 30 000 l, in/outlet with 2 inspection holes and a cover	30.000	29300	PE	up to DN160	10	600	8.45 / 2.79	200 kg
ECO-TRdr35000	Tank for drinking water 35 000 l, in/outlet with 2 inspection holes and a cover	35.000	34300	PE	up to DN160	10	600	9.89 / 2.80	200 kg
ECO-TRdr40000	Tank for drinking water 40 000 l, in/outlet with 2 inspection holes and a cover	40.000	39300	PE	up to DN160	11	600	10.97 / 2.81	200 kg
ECO-TRdr45000	Tank for drinking water 45 000 l, in/outlet with 2 inspection holes and a cover	45.000	43300	PE	up to DN160	12	600	12.41 / 2.82	200 kg
ECO-TRdr50000	Tank for drinking water 50 000 l, in/outlet with 2 inspection holes and a cover	50.000	49200	PE	up to DN160	13	600	13.49 / 2.83	200 kg

9 ECOSYSTEM ASSEMBLY

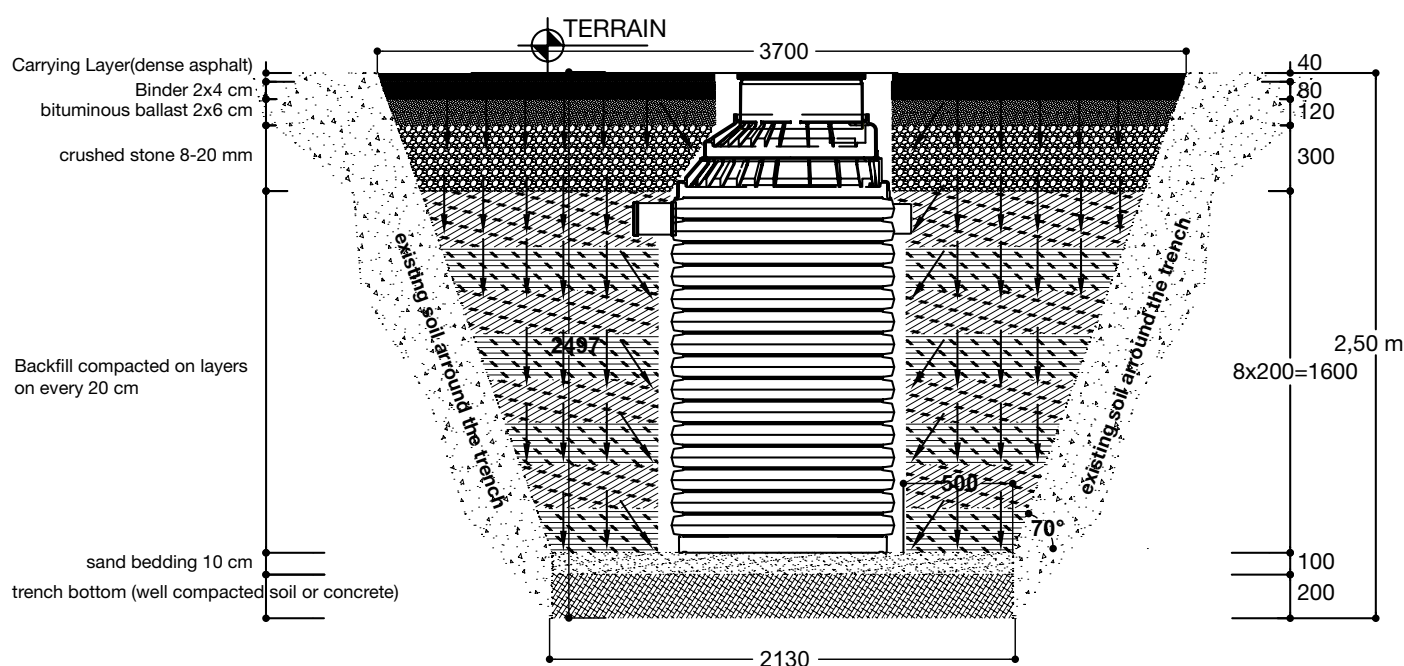
9.1 Introduction and general requirements

Facilities assembly must in accordance with the design and the terrain conditions. Their proper assembly guarantees long and flawless exploitation life. When submitting the necessary design data see Tables 12, 13, 14, 15. Pipelife prepares free assembly plans.

9.2 Advantages of ECO laying

- Quick and easy assembly.
- Different variants of laying.
- Final product ready for laying.
- Variant for consolidation against high underground waters.
- Modularity – an opportunity for increasing the facility capacity.
- An opportunity for extending the inspection holes to the necessary elevation.
- There is no need of specialized mechanization for laying the vessels.
- There is no need of shuttering works.

9.2.1 Laying of ECO-TPV tanks



Note: For ECO-TPV tanks, the maximum depth installation measured from the terrain level to the bottom of the tank is 3.50 meters.

The thickness and the contents of the road surface are in accordance with the design conditions of the Client. The backfill includes most types and classes of naturally granulated materials with a maximal size of the particles not exceeding 10% of the nominal pipe's diameter or size of up to maximum 60 mm. The material for the backfill must not contain foreign materials (admixtures) like snow, ice or frozen masses of earth.

Characteristics of the material for backfill:

material	particles diameter [mm]	notes
gravel crushed stones	8-22, 4-16 8-12, 4-8	The most appropriate soil material, maximum 5 to 20% particles with the size of 2 mm
gravel	2-20	Appropriate soil material, maximum 5 to 20% particles with the size of 0,2 mm
sand, moraine gravel	0.2-20	Relatively appropriate soil material, maximum up to 5% particles with the size of 0.02 mm

asphalt m³
 binder m³
 bituminous ballast m³
 crushed stone m³
 backfill m³
 sand cushion m³
 bedding m³

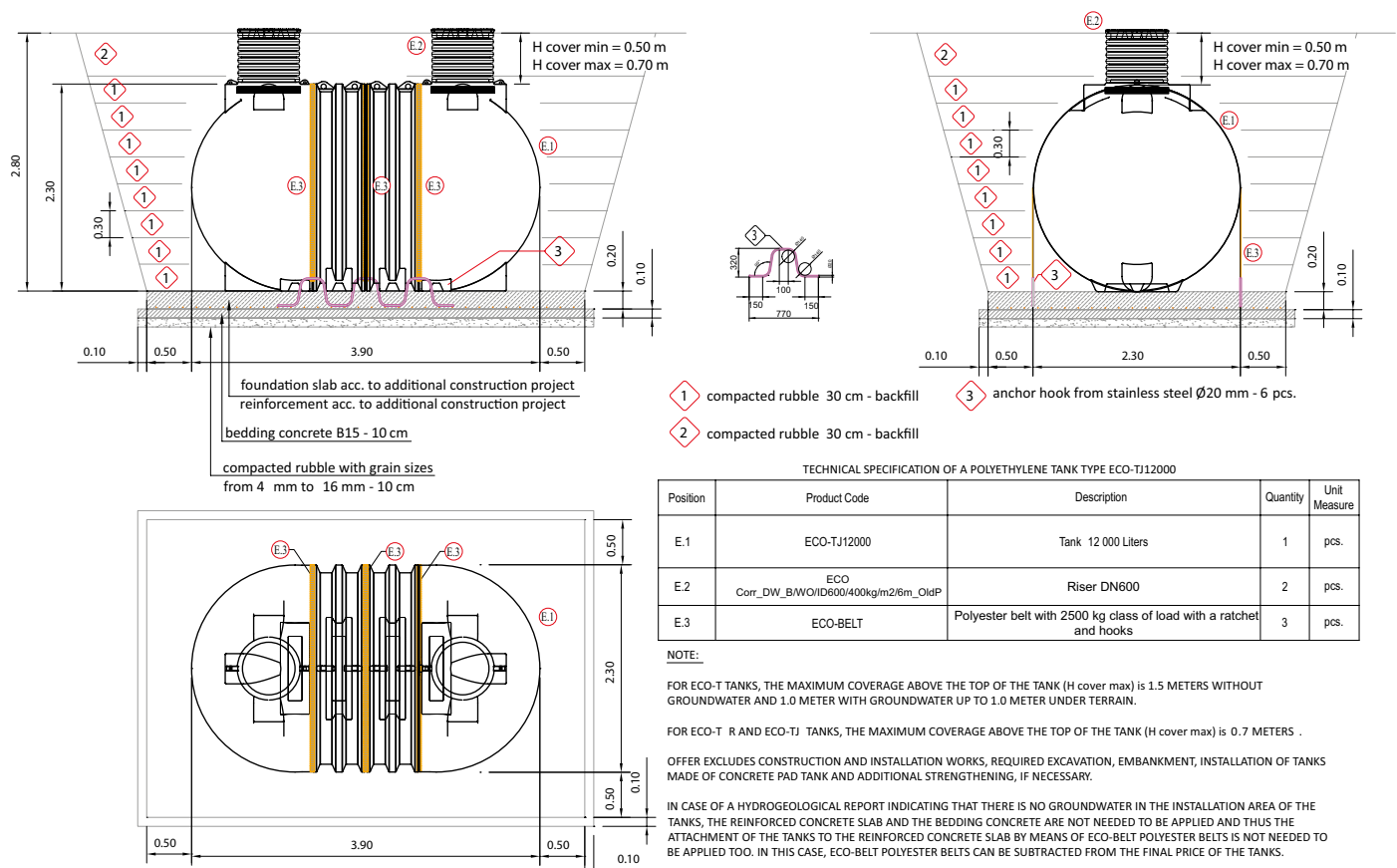
The sand cushion must be well sealed up to 95% according to Proctor.
 Excavation bottom – well sealed soil or concrete bedding.
 In the zones around the inlet and outlet the sealing must be manually made.
 The sealing must be with 95% density according to Proctor.
 The sealing direction given in the plan must be kept.

Figure 27: An assembly plan for laying of ECO-TPV type of tank

What is necessary for the appropriate tanks assembly:

- An assembly plan, prepared according to specific design and terrain data and conditions.
- An trench and leveled bedding, in accordance with the assembly plan.
- The tanks to be checked for cracks and defects of the body in case they have appeared during transportation and storage. Inlet and outlet connections have to be made.
- To lay and level the tanks by a lifting device or by ropes. When dropping in the trench they have to be grabbed at the designated spots.
- The instructions described in the assembly plan must be followed when covering and sealing the different layers.
- Before final covering and sealing the tank must be connected with the corresponding sewage network. Manual sealing must be done around the connections.
- In the zone around the cover a manual sealing must be done and additional support with bricks or with a concrete belt, on which the ring and the cover of the tank will lay.

9.2.2 Laying of ECO-T, ECO-TR and ECO-TJ type of tanks



Assembly instruction for polyethylene tank type ECO-T, ECO-TR and ECO-TJ

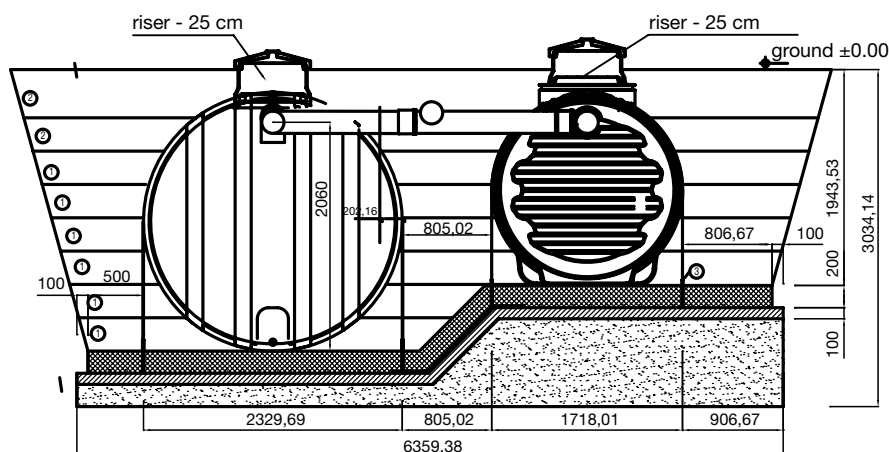
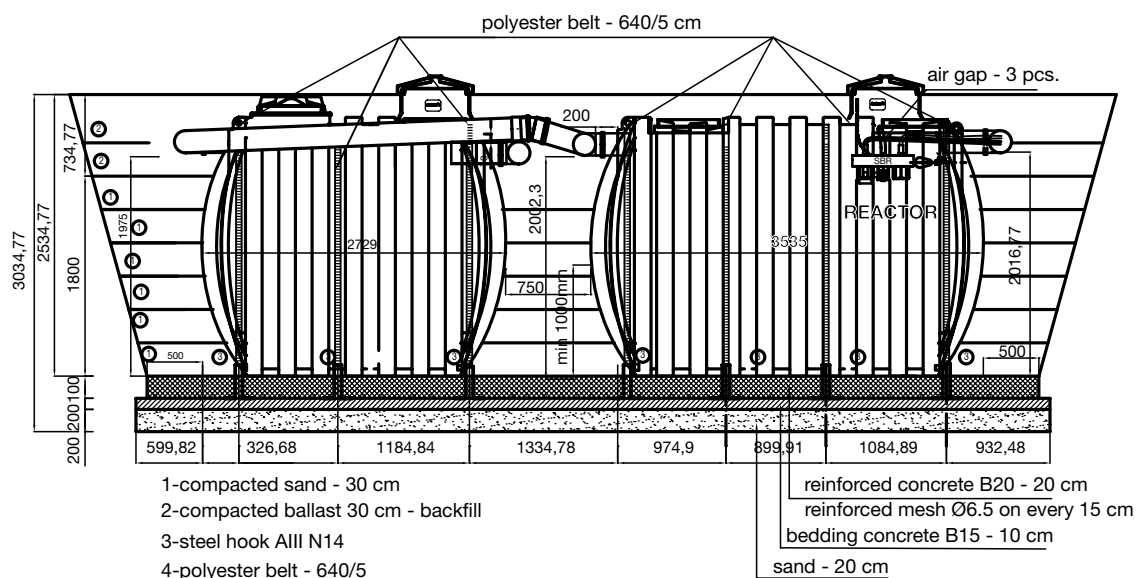
Trench has to be made, according to the sizes and elevations specified in the drawing. 50 cm are needed between the trench walls and the tanks for easier installation and connection of the pipe system. When the trench is excavated the trench bottom is compacted, 10cm rubble bedding is laid with grain sizes from 4 mm to 16 mm and above it 10cm bedding of b15 concrete is cast. On the concrete bedding a reinforced concrete slab is cast with a lower reinforcement grid by individual structural design project.

Before casting the concrete hooks should be embedded. Polyester belts which hold the tanks will be hooked up on these hooks. Places of the hooks are shown in assembly plan depending on the situation and the type of the treatment facility. The anchor hooks are made by stainless steel Ø20 mm. Laying of the tank happens after the bedding is ready and reach the necessary strenght. The tank must be checked for factory damages or cracks as result of storage and transportation. After this check, the tank can be placed in the pit.

Dropping of the tank into the pit is being made by crane, lifting facility or via cables. Dropping should be done carefully and slowly, without impacting the tanks. If dropping the tank by crane - consider the center of the load to avoid any possible slipping or flattening of the tank. Minimum coverage above the tank is 0.50 m, and the maximum is 0.70 m. The tanks are equipped with telescopic riser dn600 for inspection and repair. In case of installation in traffic zone reinforced concrete cover slab must be made, which to bare the traffic loads.

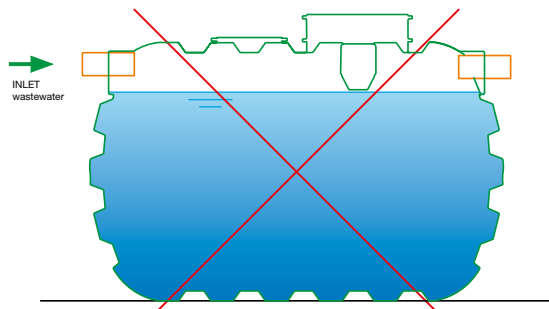
After laying the tank in the trench, on the finished bedding the tank should be backfilled in its bottom part carefully with compacted rubble with grain sizes from 4 mm to 16 mm. Special care should be given of compacting the sand and the rubble in the area below the middle part of the tank and around the sides, but mostly in the area under the tank. You should check the area near the tank to assure that there are not sharp objects near the tank that could damage it.

During the installation, the tank must be filled partially with water i.e. the water level during the installation should always matches the height of the compacted backfill. This is required for the stabilization and correct positioning of the tank. The tank must be fixed to the ground with polyester unstretched belts with nominal capacity of 2500kg, attached to pre-set hooks in the reinforced concrete slab or in the concrete bedding.

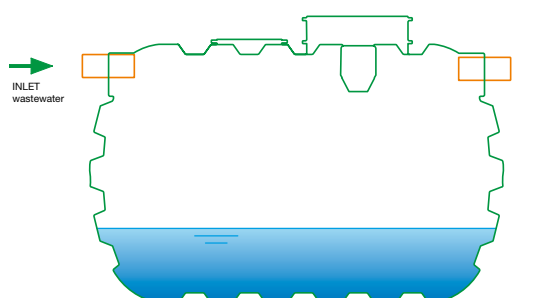


9.2.3 Filling of plastic tanks

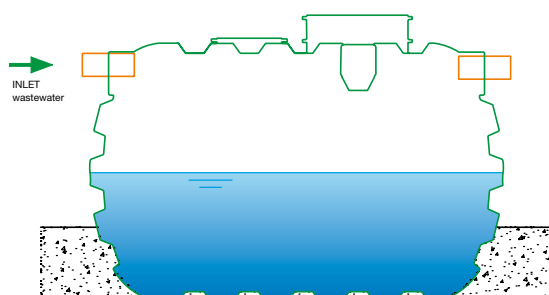
IT IS STRICTLY FORBIDDEN TO FILL THE TANK WITH WATER WITHOUT BEING FORTIFIED SIDEWARD WITH COMPACTED BACKFILL!!!



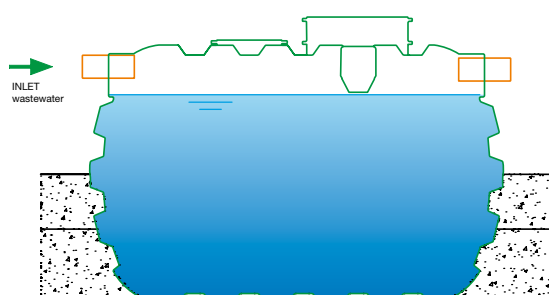
STEP 2 - TANK PARTIALLY FILLED WITH WATER.



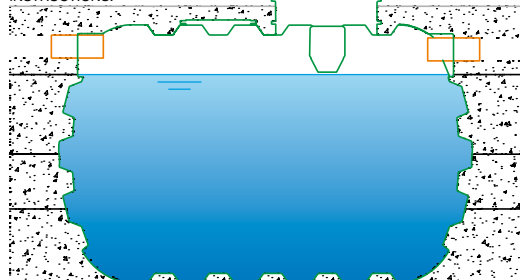
STEP 4 - TANK PARTIALLY FILLED WITH WATER.



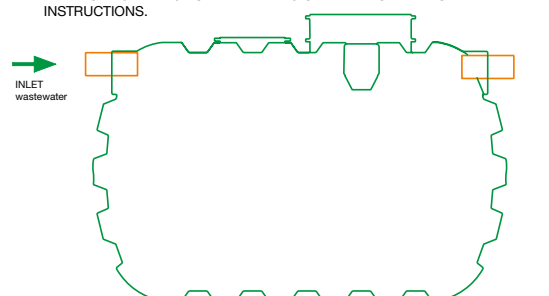
STEP 6 - TANK PARTIALLY FILLED WITH WATER.



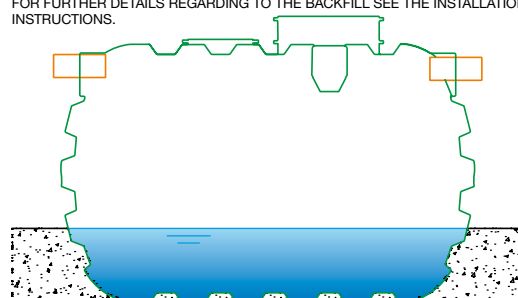
STEP 8 - BACKFILL LAID AND COMPACTED TO THE WATER LEVEL IN THE TANK. FOR FURTHER DETAILS REGARDING TO THE BACKFILL SEE THE INSTALLATION INSTRUCTIONS.



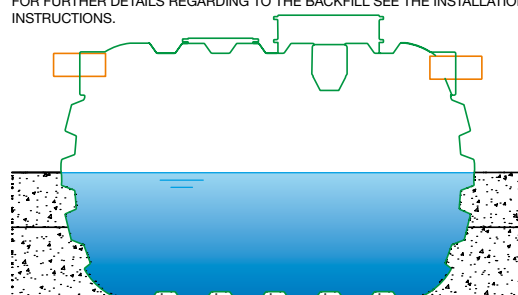
STEP 1 - EMPTY TANK LAID ON PREPARED BEDDING. FOR FURTHER DETAILS REGARDING TO THE BEDDING SEE THE INSTALLATION INSTRUCTIONS.



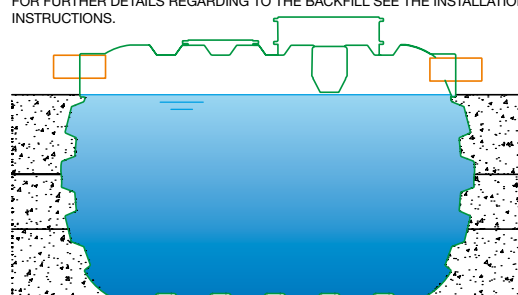
STEP 3 - BACKFILL LAID AND COMPACTED TO THE WATER LEVEL IN THE TANK. FOR FURTHER DETAILS REGARDING TO THE BACKFILL SEE THE INSTALLATION INSTRUCTIONS.



STEP 5 - BACKFILL LAID AND COMPACTED TO THE WATER LEVEL IN THE TANK. FOR FURTHER DETAILS REGARDING TO THE BACKFILL SEE THE INSTALLATION INSTRUCTIONS.



STEP 7 - BACKFILL LAID AND COMPACTED TO THE WATER LEVEL IN THE TANK. FOR FURTHER DETAILS REGARDING TO THE BACKFILL SEE THE INSTALLATION INSTRUCTIONS.





What is necessary for proper assembly of the tanks:

- An assembly plan in accordance with the concrete design and terrain data and conditions.
- A trench and leveled bedding which has acquired the corresponding strength qualities in accordance with the assembly plan.
- The tanks must be checked for body cracks and defects in case they appear during transportation and storage.
- The inlet and outlet connections of the corresponding manhole must be checked.
- To lay and level the tanks by a crane, lifting device or by ropes according to the used tanks type. When dropping in the trench they have to be grabbed at the designated spots.
- The tank must be fixed to the ground with the help of non-stretchable polyester belts with a nominal capacity of 2500 kg. Depending on the tank's size the number of the polyester belts is described in Table 16:

Tank Code	Polyester Belts	Manholes	Standard depth of the facility from the terrain level to the bottom of the tank (with one riser ring)	Nominal Volume	Type of the Tank
-	бп.	бп.	м	м³	-
ECO-TPV_800-580	0	1	2	580	vertical
ECO-TPV_800-620	0	1	2,08	620	vertical
ECO-TPV_800-705	0	1	2,24	705	vertical
ECO-TPV_800-745	0	1	2,32	745	vertical
ECO-TPV_800-825	0	1	2,48	825	vertical
ECO-TPV_800-865	0	1	2,56	865	vertical
ECO-TPV_800-910	0	1	2,65	910	vertical
ECO-TPV_1000-1015	0	1	2,34	1015	vertical
ECO-TPV_1000-1110	0	1	2,46	1110	vertical
ECO-TPV_1000-1210	0	1	2,58	1210	vertical
ECO-TPV_1000-1400	0	1	2,83	1400	vertical
ECO-TPV_1000-1495	0	1	2,95	1495	vertical
ECO-TPV_1000-1590	0	1	3,07	1590	vertical
ECO-TPV_1000-1685	0	1	3,19	1685	vertical
ECO-TR2350-V	1	1	2,15	2350	vertical
ECO-TR2700-V	1	1	2,5	2700	vertical
ECO-T3000	1	2	1,89	3000	horizontal
ECO-TR3500	1	1	2,55	3500	horizontal
ECO-TR5000	2	1	2,55	5000	horizontal
ECO-T5000	2	2	2,17	5000	horizontal
ECO-TR6000	2	1	2,55	6000	horizontal
ECO-TJ8000	2	2	2,9	8000	horizontal
ECO-TJ10000	2	2	2,9	10000	horizontal
ECO-TJ12000	3	2	2,9	12000	horizontal
ECO-TJ15000	4	2	2,9	15000	horizontal
ECO-TJ17000	4	2	2,9	17000	horizontal
ECO-TJ20000	6	2	2,9	20000	horizontal
ECO-TJ22000	6	2	2,9	22000	horizontal
ECO-TJ25000	7	2	2,9	25000	horizontal
ECO-TJ27000	7	2	2,9	27000	horizontal
ECO-TJ30000	10	2	2,9	30000	horizontal
ECO-TJ35000	10	2	2,9	35000	horizontal
ECO-TJ40000	11	2	2,9	40000	horizontal
ECO-TJ45000	12	2	2,9	45000	horizontal
ECO-TJ50000	13	2	2,9	50000	horizontal

- When covering and sealing the different layers, the following requirement must be met:
 - The tanks must be sealed carefully in their lower part with sand and rubble with grain sizes from 4 mm to 16 mm.
 - The tank must be filled with water to the level of the height of the layer for the next backfill.
 Filling of tanks with water is recommended before their exploitation during the assembly works is necessary and recommended in order to:
 - Protect the tank from the ground pressure when covering and sealing the trench around the tank.
 - Avoid surfacing of the tank as a result of the underground waters rising during assembly.
 - Every time after filling with water and before sealing the next layer of backfill, the covers of the revision hatches must be installed.
 - You must be sure that there are no sharp objects close to the tank which can harm it.
 - Before covering and sealing the tank it must be connected with the corresponding sewage network. Manual sealing must be done around the connections.

10 ADDITIONAL ELEMENTS PRODUCT RANGE





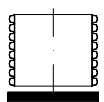



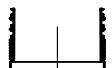


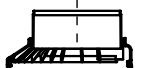






diagram/drawing	product code	description	way of application
	PRO-TS-400	"Additional riser DN400-smooth end with 200 mm effective height for ECO-TP tanks"	"It can end with a plastic cover KGDOV400-A15 or to be extended with a socket KGU400 and KGEM 400 pipe"
	PRO-TSO-400	"Additional riser DN400-with a socket with 200 mm effective height for ECO-TP tank"	"It is used in combination with PPDWRISER400/1 and a PRK400 sealing ring and ends with a KGDOV400-A15 cover"
	PRO-TS-PVC200	"Additional inlet/outlet DN160 and DN200 for smooth pipe for ECO-TP tank"	
	PPDWRiser400/1	Extension pipe, Pragma DN/OD 400, without a socket for ECO-TP tank	
	ECO Corr_DW_B/ WO/ID600/400kg/ m2/6m_OldP	ID600 riser pipe for type TR, and for type TJ with a length of one meter	
	PRK400	Sealing ring for DN/OD 400 used for ECO-TP tanks	
	KGDOV400-A15	"Polypropylene cover DN400 for 1500 kg of load for ECO-TP tank"	
	ECO-TS200/315	"Additional inlet/outlet DN200, DN250 and DN 315- smooth pipe, for ECO-TPRO, ECO-T, ECO-TR tanks"	
	PRO-Riser800-WO-L	"Additional riser DN800 without steps with 500 mm effective height for ECO-T tank"	"It is assembled with a PRO-SEAL800 sealing ring and ends with a PRO-COVER800-B125 cover"
	PRO-Seal800	Sealing ring DN 800 used for ECO-T tanks	
	PRO-Cover630-B125-pl	Polymer concrete cover DN600 for 12500 kg of load for ECO-T tank	
	PRO-Con800/630+Fix	Cone 800/630 with TFE element for fixed inlet for ECO-T tank	"It is assembled with a PRO-SEAL800 sealing ring and ends with a PRO-COVER630-B125 cover"
	PRO-Cover800-B125	"Polymer concrete cover DN800 for 12500 kg of load for ECO-T tanks"	
	ECO-TRR600x540	Additional Telescopic Riser DN600, 540 mm effective length for TR type	Finishes with a cover type ECO-TRDOV600-200 or ECO-TRDOV600-600. It is mounted directly on a thread on an ECO-TR type container or on an ECO-TRROFR600x640 extension
	ECO-TRROFR600x640	Additional Telescopic Riser of the Riser DN600, 640mm effective length for TR type	It is mounted directly on a thread on an ECO-TR container hole, whereas on its thread another extender type ECO-TRROFR600x640 or ECO-TRR600x540 can be mounted.
	ECO-TRDOV600-200	Cover from PE DN600 for 200 kg load for TR type	
	ECO-TRDOV600-600	Cover from PP DN600 for 600kg load for TR type	
	ECO-BELT	Polyester belt with 2500 kg class of load with a ratchet and hooks for ECO-T, ECO-TR and ECO-TJ tanks	They are fixed to anchor hooks embedded in the foundation reinforced concrete slab. They grip the ECO-T, ECO-TR or ECO-TJ containers and thus fix them on the foundation reinforced concrete slab.

Table 17: Additional elements product range

11 WARRANTY, MAINTENANCE AND EXPLOITATION

11.1 Facilities warranty

Facility type	Warranty	Exploitation life
ECOBIX	24 months	20 years
FATBOX	36 months	20 years
OILBOX	36 months	20 years
SANDBOX	36 months	20 years

Table 18: Facilities warranty

11.2 Maintenance

The facility maintenance and exploitation are performed by by:

- Specialized companies when a contract is signed for subscription service, or
- The final user after free training from Pipelife Bulgaria employees.

The facility is released to the end user after assembly on site, start and adjustments. When passing the following documents are issued:

- A written statement for entering into exploitation.
- A warranty card.
- A manual for exploitation and maintenance.
- A written statement for passed training.

11.3 Exploitation and cleaning

The transportation and taking of surplus sludge from the Pipelife modular and conventional treatment facilities must be made by the authorized for this purpose firms according to the local requirements and orders.

The waste material which is in the tanks must be removed and transported for further treatment to the nearest city wastewater treatment plant.

During the maintenance, the side walls of the tank, the inlets, the waste discharge pipe and the other parts must be cleaned by machines with high pressure. The vertical pipes, the covers and the external parts must be visually checked.

After finishing the facility cleaning fill the tanks with pure water in order to assure the system proper functioning from the moment of its running into exploitation.

11.4 ECOBOX exploitation and cleaning

Pipelife – ECOBOX modular wastewater treatment systems require cleaning of sludge only from the sludge tanks. There is where the accumulation and storage of big undissolved pollutants happen.

The frequency of their transportation by specialized firms which deal with this activity depend on tanks' capacity and their filling up. The initial investment in bigger sludge tank leads to rarer system cleaning. Visual notion the client can acquire by the following principles (see Figures 30, 31).

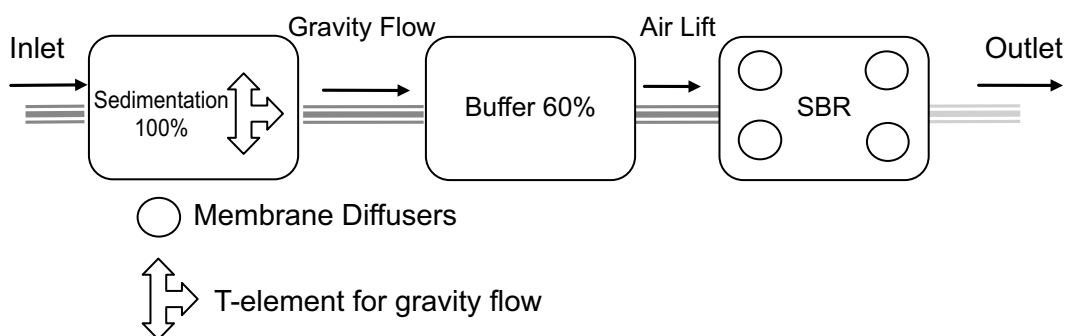


Figure 30

- The settlements from which the reactor is filled must not be filled with more than 50% sludge in case of pump passing of waste waters.
- The initial settlements which serve as a sludge tank can be filled with 100% sludge.
The fluid passes to the next phase due to the force of gravity. A T-element is installed which hampers big-size wastes towards the next tanks.

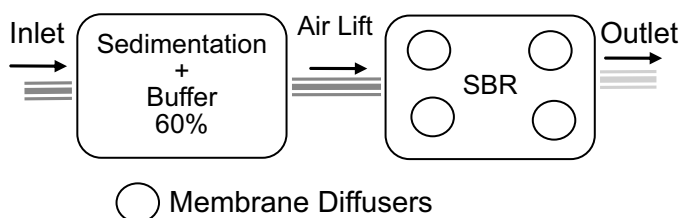


Figure 31

The settlements from which the reactor is filled must not be filled with more than 75% of sludge in case of gravity passing of the waste waters. A T-element is installed which hampers big-size wastes towards the next tanks.

On the basis of our knowledge and our capabilities in the field of the thermoplastic materials, the development, the construction and the different separation methods, we are capable of manufacture besides the serial products, special products which are in accordance with your requirements.

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