LEADING WASTEWATER TREATMENT TECHNOLOGIES
Joined strategic cooperation between two producers and co-owners of Vertical Flow Labyrinth – VFL® technology for Wastewater Treatment plants.
About VFL® Holding

- 70,000 installations of wastewater treatment plants with VFL® technology
- 15 Mio. EUR turn over in a year
- 50 countries in which we are working and supplying our wastewater treatment plants
- 200 qualified employees
- 17,000 m² total production area for wastewater treatment systems
Vertical Flow Labyrinth – VFL® - Treatment process

The technology uses a continuous-flow activated sludge process with biological nitrogen and phosphorus removal, which combines the following processes in a single tank: mechanical pre-treatment, excess sludge collection, biological treatment using a low-loaded activated sludge process, separation of the treated water from activated sludge in the final clarification chamber, flow balancing of fluctuating inflow of wastewater in the retention chamber. The treatment process consists of several technological processes. Raw wastewater flows into the non-aerated activated sludge chamber with anaerobic and anoxic zones creating and admixture with the recirculated activated sludge, the mechanical pre-treatment of inflowing raw wastewater and the decomposition of coarse impurities, denitrification and accumulation of readily degradable organic contamination is taking place in the non-aerated activated sludge chamber, which is divided by inner partition walls to create a vertical flow labyrinth, where internal circulation is established.

Furthermore, allowing the admixture flow gravitationally into the aerated activated sludge chamber with includes fine-bubble diffusors. In oxic conditions the biological degradation of organic contamination, nitrification and
phosphorus uptake is taking place. The activated sludge flows into the final clarification chamber, where the activated sludge is separated from the treated wastewater. The treated wastewater is discharged into a water flow, infiltrated or recycled and the separated activated sludge is recirculated by air-lifts. A flow regulator is installed at the water level in the final clarification chamber which controls the outflow in order to maintain the water level between the normal and maximum level in the tank (integrated retention chamber). The pressurized air is supplied by blowers for aeration of the activated sludge chamber and for recirculation via air-lift pumps. The recirculation and aeration is controlled by a microprocessor control unit which also enables the wastewater treatment plant to work in various modes depending on the loading.
The method of wastewater treatment with enhanced removal of nitrogen and phosphorus in the AT plus type wastewater treatment plant is characterized by a newly developed intermittent operation control of aeration, recirculation and mixing of the activated sludge. The short aeration pulse periods alternate with short recirculation and mixing periods, wherein the pressure air is directed either into the diffuser circuit or into the circuit of recirculation air-lift pumps.

The switching between daily cycle schedules with fixed or fluctuating duration of aeration period and recirculation and mixing period is ensured by a microprocessor control unit. If it is necessary to adapt recirculation or aeration to changes in quality and amount of wastewater, it can be simply switched to different time schedule manually or automatically based on measured parameters and this change can also be performed remotely, if the treatment plant is equipped with an appropriate communication module, e.g. GSM module.

The method of wastewater treatment with enhanced removal of nitrogen and phosphorus in the AT plus type wastewater treatment plant is characterized by the following processes:

- During the short aeration period, the aeration and mixing of the activated sludge takes place in the aerated activated sludge chamber and, simultaneously, recirculation and mixing of the activated sludge in the non-aerated activated sludge chamber is stopped, or, the intensity of recirculation and mixing in the non-aerated chamber is substantially reduced. In the aerated chamber, a process of aerobic oxidation of organic substances, nitrification of reduced forms of nitrogen compounds and accumulation of phosphorus into the activated sludge takes place. Settling of heavier particles from the raw wastewater and heavier activated sludge floc particles takes place in the anaerobic zone and the
anoxic zone of the vertical flow labyrinth, while recirculation and mixing of the activated sludge mixture is stopped or intensity of recirculation and mixing of the activated sludge mixture is reduced, wherein anaerobic conditions are created closer to the bottom of the non-aerated chamber, under which process of hydrolysis and fermentation of sedimentary and colloidal biodegradable organic substances and activated sludge takes place, wherein easily available substrate is produced for denitrification and phosphor accumulating microorganisms in the activated sludge, resulting in a more efficient removal of nitrogen and phosphorus.

- during the short recirculation period, aeration and mixing of the activated sludge in the aerated chamber is stopped or intensity of aeration and mixing in the aerated chamber is substantially reduced and, simultaneously, in the non-aerated chamber, recirculation and mixing of the activated sludge takes place. In the anoxic zone of the vertical flow labyrinth denitrification process takes place in the presence of easily available substrate for the denitrification microorganisms from the recirculation in the non-aerated chamber. In the aerated chamber, the concentration of dissolved oxygen is decreased by assimilation of organic substances. In the anaerobic zone of the vertical flow labyrinth, assimilation of easily available substrate by the phosphorus accumulating bacteria takes place.

One or more two- or three-way solenoid valves serves for redirection of the pressure air alternatively into an air branch for aeration and air branches for recirculation or increase of air flow into the air branch for aeration while the air flow into the recirculation air branches for recirculation is reduced.

Non-synchronous processes of aeration and recirculation of the activated sludge using the pressure air from blower allow for energy savings for operating the air blower and use of air blower with lower capacity and also make the operation of wastewater treatment plant more comfortable and stabile.

1 - Inflow
2 - Basket screen
3 - Internal recirculation - air-lift pump
4 - Anaerobic and anoxic zones with „Vertical Flow Labyrinth”
5 - Oxic chamber
6 - Fine-bubble diffusor
7 - Final clarification chamber
8 - Recirculation of sludge - air-lift pump
9 - Air blower
10 - Power 230 V, 50 Hz
11 - Control unit AQC Plus (GSM)
12 - Integrated retention chamber
13 - Outflow
14 - Air-lift pump for mixing the content of the basket screen
Efficiency test of WWTP according to the EN 12566-3 made at PIA – Testing Institute for Wastewater Technology in Aachen, Germany.
COD 59 mg/l - BOD₅ 7 mg/l - Nₜot 15 mg/l - NH₄-N 1.1 mg/l - Pₜot 3.7 mg/l - SS 17 mg/l

Efficiency test of WWTP with Sand Filter according to the EN 12566-3 made at PIA – Testing Institute for Wastewater Technology in Aachen, Germany.
COD 42 mg/l - BOD₅ 5 mg/l - NH₄-N 1.3 mg/l - SS 3 mg/l - Faecal coliforms 99.99997% log 7.1

Efficiency test of WWTP according to the EN 12566-3 for ATplus made at PIA – Testing Institute for Wastewater Technology in Aachen, Germany.
COD 45 mg/l - BOD₅ 7 mg/l - Nₜot 5.6 mg/l - NH₄-N 0.2 mg/l - Pₜot 0.6 mg/l - SS 12 mg/l

Efficiency test of WWTP according to the EN 12566-3 for ATplus with additional phosphorous precipitation made at PIA – Testing Institute for Wastewater Technology in Aachen, Germany.
COD 36 mg/l - BOD₅ 5 mg/l - Nₜot 10.5 mg/l - NH₄-N 14.7 mg/l - Pₜot 0.3 mg/l - SS 9 mg/l
Deutsches Institut für Bautechnik (DIBt) is an authority of the German Länder Governments for a uniform fulfillment of technical tasks in the field of public law. DIBt is an authority which issues certificates for WWTP. This certificate is a must for sale in Germany and is also respected in other countries (f.e. Austria, Switzerland).

We fulfill the norms and regulations for sale of wastewater treatment plants in France.

SINTEF (Norway) is a broad, multidisciplinary research organisation with international top-level expertise in the fields of technology, the natural sciences, medicine and the social sciences.

SP Technical Research Institute of Sweden is the national institute for technical evaluation, research, testing and works closely with companies, universities, institutes of technology and other organisations.

Nova Scotia (Canada) provides certification of persons operating classified water and wastewater facilities in Nova Scotia is mandatory under the Water and Wastewater Facilities and Public Drinking Water Supplies Regulations.

Generalitat Valenciana (Spain) – government institution has confirmed the conformity of the declared standards.

PCT (Russia) - The certificate of quality issued by the Russian certification system. Confirms the compliance with regulatory acts.

SPSC (Lithuania) - The main goal of SPSC is to provide services of certification of construction products, assessment of consistency of performance, testing and assessment of internal production control upon clients applications.

Performance test of WWTP with filter - VEOLIA EAU Protocol made at PIA – Testing Institute for Waste Water Technology in Aachen, Germany.

August ir Ko factory is the first production building in Lithuania corresponding to BREEAM environmental assessment standards and in September, 2015 the building received A+ energy efficiency rating.
Residential Wastewater Treatment Plants AT6-AT20

The compact, “one-tank system” wastewater treatment plants from AT6 to AT20 are comprised of a single vertical cylindrical tank, made from polypropylene - the biological reactor. The dimensions of the plants are ideally suited for transporting in a standard shipping sea container or by a regular truck.

The range of residential wastewater treatment plants from AT6 to AT20 is designed for decentralized solutions of wastewater treatment in the range of 0.6 up to 2.7 cubic meters per day (4 PE - 18 PE).

**Accessories for VFL® wastewater treatment plants:**
- Tank for blower
- Treated water tank
- Service kit
- Microprocessor control unit

Wastewater Treatment Plants
High effluent quality:
- Wastewater treatment plant with biological N removal with high efficiency (denitrification over 90% and nitrification over 80%) due to patented Vertical Flow Labyrinth VFL®.
- Wastewater treatment plant biological P removal with high efficiency over 80% due to patented Vertical Flow Labyrinth VFL®.
- Reuse of treated water from wastewater treatment plants is possible.
- P-removal by dosing can be integrated into the tank of wastewater treatment plant.
- Discharge into sensitive water, groundwater, bathing water.

Features and advantages:
- Compact wastewater treatment plants
- Very small footprint of wastewater treatment plant due to patented Vertical Flow Labyrinth VFL®.
- Minimized construction work.
- Quick and easy installation of wastewater treatment plant.
- One-tank wastewater treatment plant system.
### Technical parameters of residential wastewater treatment plants AT6-AT20:

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<th>Type</th>
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<th>No. of tanks</th>
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<th>Daily inflow [m³/day]</th>
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Small wastewater treatment plants from AT30oval to AT225oval
(standard transport with sea container or regular truck)

The compact, “one-tank system” wastewater treatment plants from AT30oval to AT225oval are comprised of a single vertical tank with oval ground plan, made from polypropylene - the biological reactor. **The dimensions of the plants are ideally suited for transporting in a standard shipping sea container or by a regular truck.**

The range of small wastewater treatment plants from AT30oval to AT225oval is designed for decentralized and semi-centralized solutions of wastewater treatment in the range of 4.5 up to 33.8 cubic meters per day (30 PE - 225 PE).

The small wastewater treatment systems comprised of the biological reactors from AT30oval to AT225oval can be gradually expanded up to the capacity of 135 cubic meters per day (900 PE) by installing several units in parallel.
**Accessories:**
- Tank for blower for wastewater treatment plant
- Pumping station with mechanical pretreatment for wastewater treatment plant
- Sludge tank for wastewater treatment plant
- Microprocessor control unit for wastewater treatment plant

**Features and advantages:**
- Compact wastewater treatment plants
- Low operation cost wastewater treatment plants
- Easy to transport wastewater treatment plants
- Reliable operation of wastewater treatment plants
- High effluent quality
- Remote monitoring and control
- Odor free operation of wastewater treatment plants
- Low noise level of wastewater treatment plants

**Technical parameters of oval wastewater treatment plants:**

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Small wastewater treatment plants from AT30 to AT300
(transport with oversize transportation truck)

The compact, “one-tank system” wastewater treatment plants from AT30 to AT300 are comprised of a single vertical cylindrical tank, made from polypropylene - the biological reactor. The biological reactors can be transported ready-for-use by oversize transportation truck “convoi exceptionnel”.

The range of small wastewater treatment plants from AT30 to AT300 is designed for decentralized and semi-centralized solutions of wastewater treatment in the range of 3.8 up to 45.0 cubic meters per day (30 PE - 300 PE).

The small wastewater treatment systems comprised of the biological reactors from AT30 to AT300 can be gradually expanded up to the capacity of 135 cubic meters per day (900 PE) by installing several units in parallel.
Features and advantages:
- Compact wastewater treatment plants
- Low operation cost wastewater treatment plants
- Easy to transport wastewater treatment plants
- Reliable operation of wastewater treatment plants
- High effluent quality
- Remote monitoring and control
- Odor free operation of wastewater treatment plants
- Low noise level of wastewater treatment plants

Accessories:
- Tank for blower for wastewater treatment plant
- Pumping station with mechanical pretreatment for wastewater treatment plant
- Sludge tank for wastewater treatment plant
- Control unit or electrical control panel for wastewater treatment plant

Technical parameters of circular wastewater treatment plants:

<table>
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<th>Type</th>
<th>Max. no. of inhabitants</th>
<th>No. of tanks</th>
<th>Diameter [mm]</th>
<th>Height [mm]</th>
<th>Daily inflow [m³/day]</th>
<th>BOD₃ load [kg/day]</th>
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Large Wastewater Treatment Plants - Centralized Solutions

Range of wastewater treatment plants:
- From 150 up to 4000 cubic meters per day (1000 PE up to 25000 PE).

Intended use:
- For villages, small towns, etc.

Components:
- Biological reactor
- Mechanical pretreatment
- Physical-chemical pretreatment
- Pumping station
- Sludge treatment
- Tertiary treatment
- Control unit
Large Wastewater Treatment Plants
Polypropylene plastic sheet extrusion

Polypropylene (PP) plastic sheets are produced on the extrusion line for plastic sheets. We mainly use this sheets for our own production of wastewater treatment plants. This gives us the independence from different suppliers.

The goal of setting up extrusion line was mainly to cover the internal consumption of PP plastic sheets which we need for the production of wastewater treatment plants. Later we launched the commercial sale of PP sheets.

The connection of modern technologies, many years of know-how in the field of plastic extrusion and long-standing know-how in processing of PP sheets is a guarantee of high quality products and unique possibilities for testing and processing of high-quality raw materials.

Part of extrusion is also the production PP welding wires.
Rotomolding

Rotational moulding, also known as rotomoulding, is unique amongst plastics moulding processes because heating, shaping and cooling of the plastic, all take place inside the mould with no application of pressure. The concept is simple. Cold plastic powder is placed in one half of a cold mould - usually sheet steel. The mould is then closed and rotated biaxially in a heated oven. When all the powder has melted, the mould is transferred to a cooled environment. After the process is completed, the mould is opened and a product is removed. The final products are characterized by good mechanical and chemical properties. No welds are caused by processing, the product is monolithic and 100% waterproof.

Based on the experience, we can offer our clients support in rotomoulding of different products. We support our customers with a wide range of services: design of rotomoulded products, 3D visualisations, static calculations, drawing documentation, production of moulds and rotational moulding of products.

We have been working with several renowned material suppliers all around the world supplying us with quality materials. With the detailed inspection being held in our laboratory as well as high inspection of rotational moulding process, we are able to provide the optimal and stable quality of our products.
CNC Cutting Of Plastics

Our plastic fabrication capacity was increased by high precision CNC cutting machines for plastics. Wastewater treatment plants and other parts which are made from PP sheets are cut out by next generation of CNC stands, which can increase productivity without sacrificing high precision and which guarantees the highest quality shape of all parts.

Polypropylene as material is very suitable for production of wastewater treatment systems of all size. It has high chemical resistance, it can be processed very well and it is low weight compared to lot of other materials.
Certificates

Certifikat SC2129-12

Minirensesværk Augusteco model ATE-AT50

Teknisk
Augusteco AS, Tønsbergveien 2, 1550 Horten.

E-post: info@augusteco.no, Hjemmeside: www.augusteco.no

Produkt

Certifikat

Kvalifikasjoner

AAS-ATE-AT50

Gjeldende

Teknisk godkjenning

SINTEF Certification Nr. 20118

Teknisk Godkjenning nr. 20118

Pia-1146-0-2004-A32.2011, Chapter 8.8

EN ISO 11859-2:2010 - "Flow to fire test - ignitability of products subjected to direct impingement of flame - Part 2: Single flame source test"

1. Testkast og pakningsmåling

2. Produktbeskrivelse

3. Produktbeskrivelse

4. Testresultater

5. Testresultater

Produktet kan brukes i tillegg til slitage og slitasje i undergrunn og medier i undergrunn.

Det er viktig å bemærke at dette produktet er beregnet til industrielle applikasjoner.

Vi er meget glad for at denne produsenter har valgt våre kvalifikasjoner.

Vi er very happy that since 2006 the company Augusteco has chosen our PIA - Testing Institute for Waste Water Technology in Kaiserslautern, Germany for testing their wastewater treatment plants.

We are testing the VFL technology, which is compared to German standardised technologies, rated as common, but the VFL technology shows a high operational stability and very good cleaning performance, which was also proved by attestations during the years.

So we have a very good experience with tested wastewater treatment plants with VFL technology.

We refer to all the individual tests which were made, we can see, that the wastewater treatment plants with VFL technology are very well suited for the European market for cleaning these sewage water.

And we are very happy about the great success which this company has reached.

and more...
Main Performance Results - Residential Wastewater Treatment Plants - up to 50 PT
## Wastewater Treatment Plants References

Wastewater treatment plants made with VFL® wastewater treatment technology.

<table>
<thead>
<tr>
<th></th>
<th>Plant Name</th>
<th>Pe</th>
<th>Type</th>
<th>Year</th>
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</thead>
<tbody>
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<td>Maišiagala, Lithuania</td>
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<td>Municipal</td>
<td>2017</td>
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</tbody>
</table>
Partnership with VFL® Holding

Become a partner of VFL® wastewater treatment technology

Together we will be able to contribute to a cleaner environment and at the same time increase the profit of our and your company. We are delighted to offer you the opportunity of a mutually beneficial partnership:

- **Sale and distribution of our wastewater treatment plants and solutions for decentralized and semi-centralized wastewater systems in your country or region.**
- **Assembling of our wastewater treatment plants based on a treatment technology and know how transfer.**

What we can offer:

- Professional, technical and technological support for design, sale, marketing, installation and long-term maintenance of our products and solutions for decentralized, semi-centralized and centralized wastewater systems.
- Long-term cooperation with you.
- Training and schooling of the workers for installation and maintenance of wastewater treatment plants.
- Common development of the product adaptation to local requirements in your country or region with you.
- Transfer of know-how, technology and expertise, agreement on manufacturing of wastewater treatment plants or other products from polypropylene sheets.
- Technical assistance during the transfer of know-how, technology and expertise.
- Future ongoing research and development of wastewater treatment technologies and water reuse technologies.

www.vflholding.com
Pre-cut wastewater treatment plants prepared for local final assembling
(only for residential wastewater treatment plants AT6, AT8, AT10, AT12)

Steps to start your local assembling factory

1. Contact with VFL® Holding.

2. NDA with VFL Holding.

3. Discussion about prices and details, we do not charge any license fees.


5. Training of your workers in Europa, which includes production, operation and service.

6. Equipment of assembling factory in your location and short training at opening.

7. Opening of local assembling factory.
Assembling overview

Delivery:
- Wastewater treatment plant plastic parts, pipes and components
- Membrane air blowers for wastewater treatment plants
- Covers for wastewater treatment plants
- Tanks for the air blower
- Control unit for residential wastewater treatment plants AT6-AT20
- Packaging

Equipment:
- Local assembling factory equipment

Training:
- Training of your workers and visit from VFL® Holding

www.vflholding.com
Pre-cut wastewater treatment plants prepared for local final assembling
(only for residential wastewater treatment plants AT6, AT8, AT10, AT12)

- **Wastewater treatment plant plastic parts, pipes and components**

<table>
<thead>
<tr>
<th>Type of WWTP</th>
<th>Diameter / Height of WWTP [mm]</th>
<th>Time need for local assembling [hour]</th>
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<tbody>
<tr>
<td>AT6</td>
<td>1400 / 1800</td>
<td>10</td>
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<tr>
<td>AT8</td>
<td>1400 / 2200</td>
<td>17</td>
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<tr>
<td>AT10</td>
<td>1750 / 2000</td>
<td>28</td>
</tr>
<tr>
<td>AT12</td>
<td>1750 / 2200</td>
<td>30</td>
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</tbody>
</table>

**Conditions:**
- Signed contract for assembling.
- Passed training (certified workers).
- Minimum order from one type is 10 pieces.
- Advance invoice payment.
- Time for local assembling depends on the skills of workers.

- **Membrane air blowers for wastewater treatment plants**

**Information:**
- We have recommended air blowers, but you can use locally available models (after confirmation from VFL Holding) with same outputs.
- Check the voltage (230V vs. 115V) and plugs you need.
Pre-cut wastewater treatment plants prepared for local final assembling
(only for residential wastewater treatment plants AT6, AT8, AT10, AT12)

• **Covers for wastewater treatment plants**

Please select one option:
A: Rotomolded cover with stainless steel locking system.

B: Cover welded from PP sheets with stainless steel locking system.

*Information:*
- Cover welded from PP sheets has a reinforcement from plastic on the bottom side.
- Covers for (both types) for AT10 and AT12 includes also reduction piece from diameter 1750 mm to 1400 mm made from welded PP sheets.

• **Tanks for the air blower**

Please select one option:
A: Rotomolded tank for the blower diameter 600 mm height 400 mm with stainless steel locking system and DN50 gasket.

B: Tank for the blower welded from PP sheets diameter 600 mm height 400 mm with stainless steel locking system and DN50 gasket.
Pre-cut wastewater treatment plants prepared for local final assembling (only for residential wastewater treatment plants AT6, AT8, AT10, AT12)

• Control unit for residential wastewater treatment plants AT6-AT20

Information:
- Check the voltage (230V vs. 115V) and plugs you need.

• Packaging

Approx. capacity
40 FT. STANDARD CONTAINER
40-100 pieces

20 FT. STANDARD CONTAINER
20-50 pieces

Information:
- The capacity depends on the combination of the wastewater treatment plants types and use of rotomolded pre-cut PP sheet parts.
Pre-cut wastewater treatment plants prepared for local final assembling
(only for residential wastewater treatment plants AT6, AT8, AT10, At12)

• **How to establish local assembling factory?**
  • You need about **300 m² production place** + outside space as storage.
  • **Two trained workers.**
  • Local market and water law know-how.
  • Right equipment for the assembling factory.

**Equipment for local assembling factory - minimal needed equipment list.**
1. Battery Screwdriver
2. Drilling machine
3. Workshop rack 1 - for tools
4. Workshop rack 2 - for components
5. Workshop rack 3 - for components
6. Workshop rack 4 - for components
7. Chisels flat
8. El. cabinet (sockets .... 230, 400 V)
9. Extruder welding machine
10. Bench plane
11. Pliers
12. Air compressor for butt welding machine
13. Hand welding machine
14. Meter rubberized
15. Knife
16. Burring tool
17. Circular saw
18. Convex circular saw
19. Direct saw
20. Polfusion welder
21. Work table min. 2000x1400x920
22. Prolonger 10 m
23. 300mm angle with swath
24. Clamps
25. Spirit level
26. Butt welding machine
27. Chop

• **Training of your workers visit from VFL® Holding**

  **Training in Europa**
  • two workers for **assembling, maintenance and service** are trained
  • **30 days** intensive and complete training at VFL® Holding
  • **certification** of VFL® assembling worker, maintenance and service of VFL® wastewater treatment plants

  **Local start of the assembling factory**
  • **two persons** are send from VFL® Holding
  • **10 days** or operation starting for the local assembling factory
  • **assembling of first pieces, installations under local conditions**
Residential Wastewater Treatment Plants
Small Wastewater Treatment Plants

OVAL
Small Wastewater Treatment Plants
CIRCULAR
Large Wastewater Treatment Plants
Large Wastewater Treatment Plants