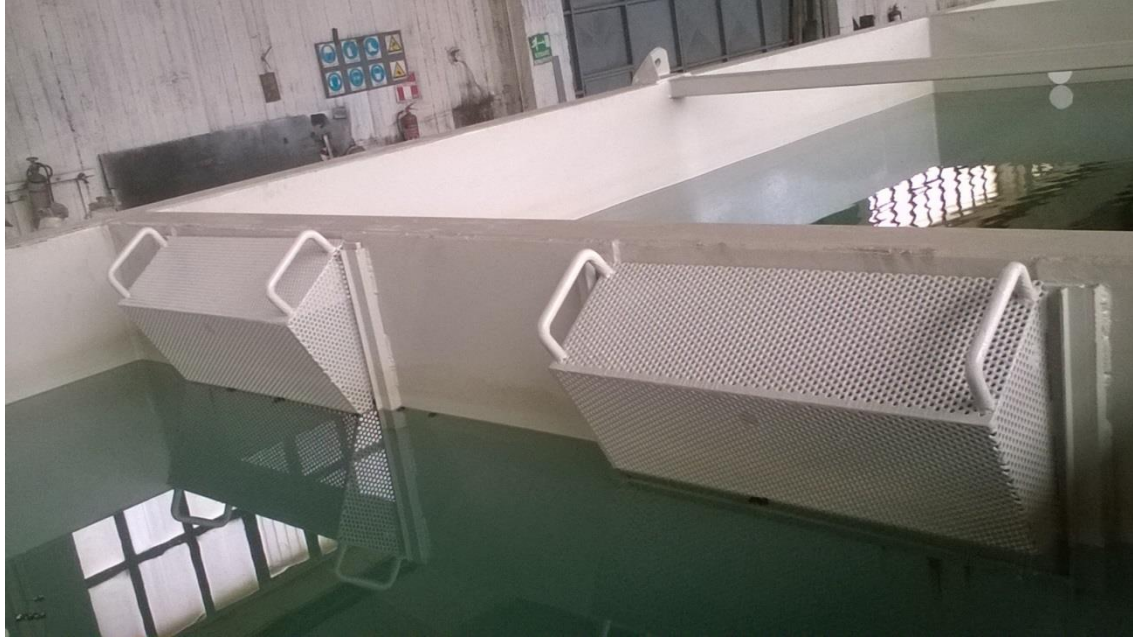




SIRMET

ENGINEERING & MANAGEMENT



COMPACT WASTEWATER TREATMENT PLANTS

using MBBR technology

COMPACT WASTEWATER TREATMENT PLANTS

SIRMET S.A. has extensive experience in the field of wastewater treatment and offers integrated, efficient and reliable compact biological treatment units for small hotels and lodgments with **capacities ranging from 50 m³/day up to 400 m³/day**. The offered systems can also be modified to treat sewage in the case of remote residences.

The plants are delivered ready for installation, connection and start-up with all equipment pre-mounted onto a compact tank.

The ideal solution for the following cases:

- ✓ **Condos**
- ✓ **Small and medium-sized hotels**
- ✓ **Tourist lodgments**
- ✓ **Camping and recreational camps**
- ✓ **Small or medium-sized housing settlements**
- ✓ **Remote military camps**

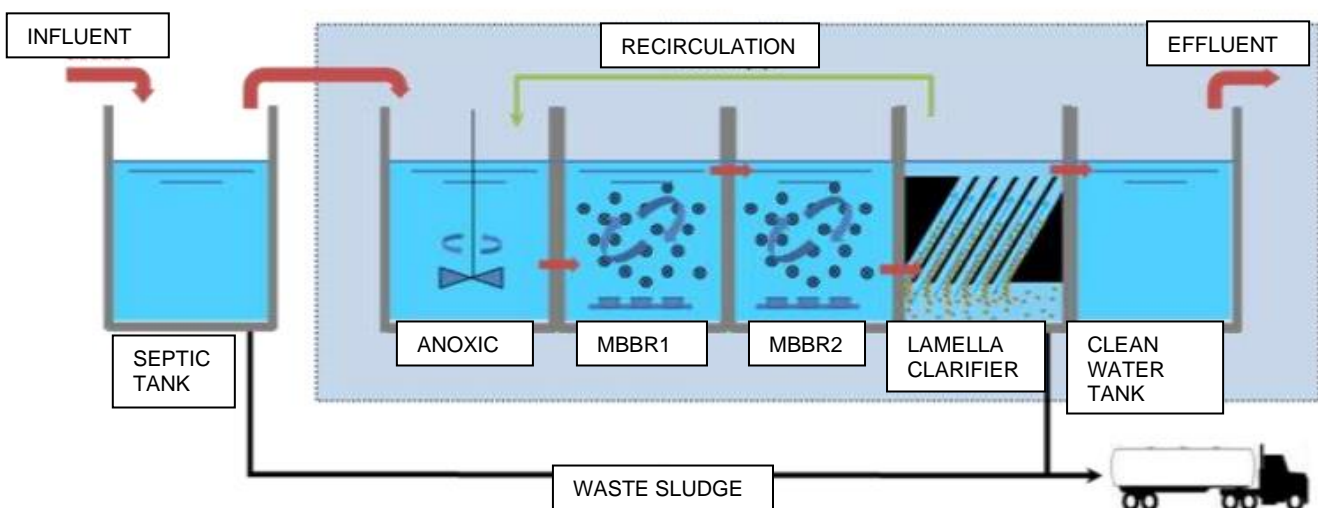
The offered systems utilize the Moving Bed Bio-Reactor (MBBR) method, which combines the conventional process of activated sludge (suspended growth) with the attached growth of biomass on the surface of special plastic carriers inside the mixed liquor. Compared to the conventional biological treatment systems, the MBBR technology can achieve high quality effluent using smaller footprint reactors, allowing the re-use of the treated wastewater for irrigation or firefighting / secondary uses purposes.

The MBBR technology stands out for the following benefits it offers:

- ✓ Low operational cost – no chemicals required.
- ✓ Fast, easy and odorless operation.
- ✓ No monitoring / operator needed and minimal maintenance required.
- ✓ Flexibility in influent variations (quantitative-qualitative).
- ✓ High performance process – reduced energy requirements
- ✓ Small space requirements with the possibility for underground installation to avoid visual impact.
- ✓ Exploitation of treated water for irrigation or firefighting purposes

Parts of the compact plant

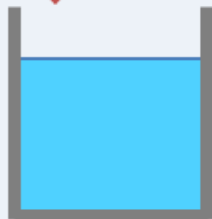
All plants offered are ready for installation and connection in a form of container. This includes all treatment phases, i.e., a compartment operating as an anoxic zone, 2 aerobic zone compartments, a sedimentation tank, a collection tank for the treated waste and a space for electromechanical equipment (engine room). Sodium hypochlorite is dosed in the treated waste tank, as a means of disinfection. The treatment phases performed in the system are presented in the following page.



Indicative arrangement of the plant compartments

5 steps of the process

INFLUENT



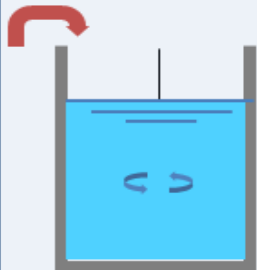
Charging...

Wastewater flows into the septic tank initially, which serves as a buffer tank. Here the depositing solids and suspended oil and grease are removed.

The wastewater then passes the following steps until it is completely purified:

1. Denitrification

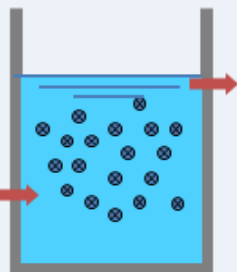
Raw wastewater is pumped to the anoxic tank where denitrification is being performed.



Step 1 : Denitrification

2. Aeration

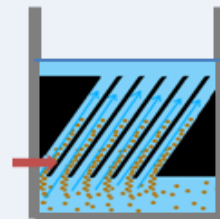
The wastewater is pumped to the aeration tank which consists of two chambers. The aeration is performed through fine bubble diffusers, so that a lot of oxygen is dissolved in the water and keep the biomedica suspended. With the help of this oxygen, the microorganisms (activated sludge) reduce the pollutants and proliferate.



Step 2 : Aeration

3. Sedimentation

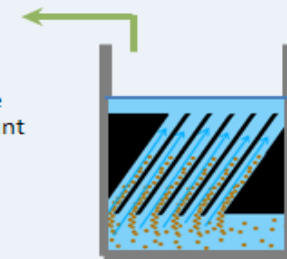
Wastewater settles for a while and sludge is accumulated in the bottom of the tank, using lamellas. In the upper area, a zone of clarified water is generated.



Step 3 : Sedimentation

4. Return of sludge

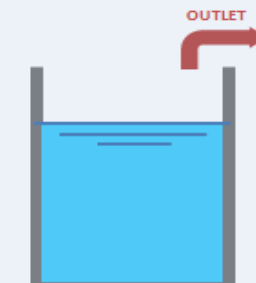
Part of the settling sludge is recycled to the anoxic zone. Recycling preserves the amount of activated sludge constant in the aerobic zone. The rest of the sludge is discharged.



Step 4 : Recycle

5. Treated water

Treated water is pumped to a separate tank in the ancillary chamber for storing and irrigation use. In this tank, treated water is chlorinated in order to ensure safe discharge.



Step 5 : Treated water storage

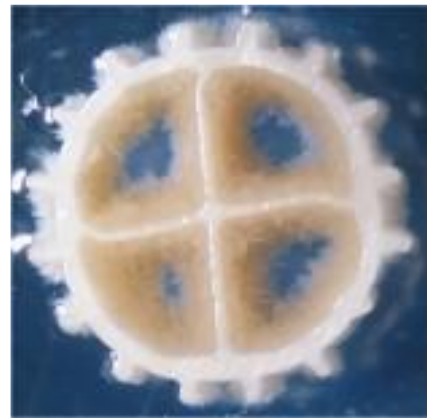
The MBBR technology

MBBR technology refers to the biomass growth both in suspended form inside the reactor, and on plastic carriers with high surface area, which are kept in suspension thanks to air provided in the tank. These carriers are placed inside the bioreactor and provide increased internal surface for the biomass to grow, hence increased treatment capacity in smaller reactor sizes. Their special structure provides the appropriate conditions for the development and protection of biomass in significantly smaller reactor volumes than those required in conventional systems.

The incoming organic load is degraded while contacting the biomass inside the plastic carriers. The degradation is immediate and results in the production of carbon dioxide and biomass, which sustains the decomposition of new incoming organic load.



Carriers inside the reactor



Detailed view of the carrier with the biomass developed in its protected surface

Influent – Effluent Characteristics

Typical characteristics of urban wastewater:

DAILY FLOW	Q_{HM}	150-400 Lt/ eq/ ημέρα
ORGANIC LOAD	BOD_5	67 gr/ eq/ day (~ 340 mg/l)
TOTAL SUSPENDED SOLIDS	TSS	70 gr/ eq/ ημέρα (~ 350 mg/l)
TOTAL NITROGEN	N	11gr/eq/day (~40 mg/l)

The compact biological treatment plants with MBBR technology ensure the maximum performance possible, achieving better effluent quality compared to the conventional

systems or to the quality required by regulations for reuse for irrigation (Joint Ministerial Decision [JMD] 145116, Government Gazette [GG] 345/B/2011):

		Performance)
BOD	mg/lt	≤ 25
COD	mg/lt	< 125
TSS	mg/lt	< 35
TKN-N	mg/lt	< 5
pH	mg/lt	6.5 - 8

The performance of the unit requires proper maintenance and operation according to the directions of SIRMET S.A.

Unit description

The treatment plant is made of a metal body, made of mild steel (St37.2) and coated with epoxy paints, in the form of an ISO container. The container has a closed top with manholes to facilitate its embedment under the ground level. The manholes on the roof are located at points that allow easy removal of the equipment, in the event of maintenance or failures. All systems include ventilation that can be directed to a place where odours cause no nuisance. The operation of the plant is fully automatic, through a PLC panel and a touch screen installed inside the container. With the exception of the machinery room, the rest of the space is configured in tanks that house the biological treatment (denitrification – aeration/ MBBR). Depending on the size of the plant, the MBBR reactor can be divided in two compartments, each with different loading design, in order to provide high quality effluent.



ENGINEERING & MANAGEMENT

309, EL. Venizelou Street, 176 74 Kallithea-Athens

Tel.: +30 210. 9423210

E-mail: info@sirmet.gr

4-6, Filopoimenos Street, 262 21 Patras

Tel.: +30 2610. 623595, Fax: +30 2610. 277086

E-mail: sirmet@otenet.gr



Pictures of indicative compact plants for the treatment of municipal wastewater in hotels and industrial installations.

Standard unit sizes

All compact units are delivered with all the necessary electrical and hydraulic equipment ready to be connected with the sewage flow, the effluent and the electrical power supply.

	M50	M100	M200	M300	M400
EQUIVALENT POPULATION	250	500	1000	1500	2000
DAILY FLOW Q (m³/d)	50	100	200	300	400
No. of Container	1	1	2	2	3
Container Dimension	9,5x2,5x2,5	11.5x2,5x2,5	1x 12x2,5x2,5 1x 9,5x2,5x2,5	1x 11,5x2,5x2,5 1x 13,5x2,5x2,5	2x 11,5x2,5x2,5 1x 13,5x2,5x2,5

INCLUDED EQUIPMENT: Special high specific surface carriers (different types for nitrogen and carbon/organic load removal), anoxic mixer, aeration blower (1 working + 1 stand-by), aeration network (coarse bubble diffusers), hypochlorite dosing pump for disinfection, ventilation, electrical board with PLC and touch screen, with outputs for connection to SCADA/BMS. All necessary instrumentation and automation (level switches, pressure gauges, flow switches, flow meter and pneumatic valve).

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In order to further remove TSS content and disinfect the effluent, the compact MBBR units can optionally include the following equipment that comprises two parallel (1 in duty + 1 stand-by) lines of tertiary treatment. The sizing of the equipment is so that it satisfies the maximum flowrate capacity:

- 2 pcs multimedia sand filters (quartz gravel, quartz sand and hydroanthracite), each with a time-programmed multi-valve. The filters' array is arranged so that when one filter enters the backwash cycle, the other enters into service.
- 2 pcs of high pressure pumps (max 5 bar) for feeding and backwashing each filter.
- 2 pcs of cartridge (PE) filters with a 20 micron mesh
- 2 pcs of UV sterilization systems.

The delivery of the systems includes also a manual of operation and maintenance (Greek / English), as well as supervision of installation, connection, start-up and training. The civil engineering works (such as the construction of a concrete base for placement of the container unit) and the septic tanks are not included and they are considered to be an obligation of the employer/ pre-existing. The above quote does not include the wastewater supply pumps or any provision for the treated effluent, which are considered within the scope of the employer.

TERMS OF DELIVERY:

- Delivery time is set to 10-12 weeks from the date of the order.
- Delivery place is ex-works Piraeus port. Transportation and insurance fees are considered within the scope of the employer.
- The offered systems come with a 12-month mechanical guarantee for the electromechanical equipment, after successful electrical/hydraulic start-up.

Certifications

SIRMET S.A., currently runs its 32nd year of a successful, continuous and developing activity and the services and products they offer are certified with the international standard EN ISO 9001:2015, ISO 14001:2015 & ISO 45001:2018.

