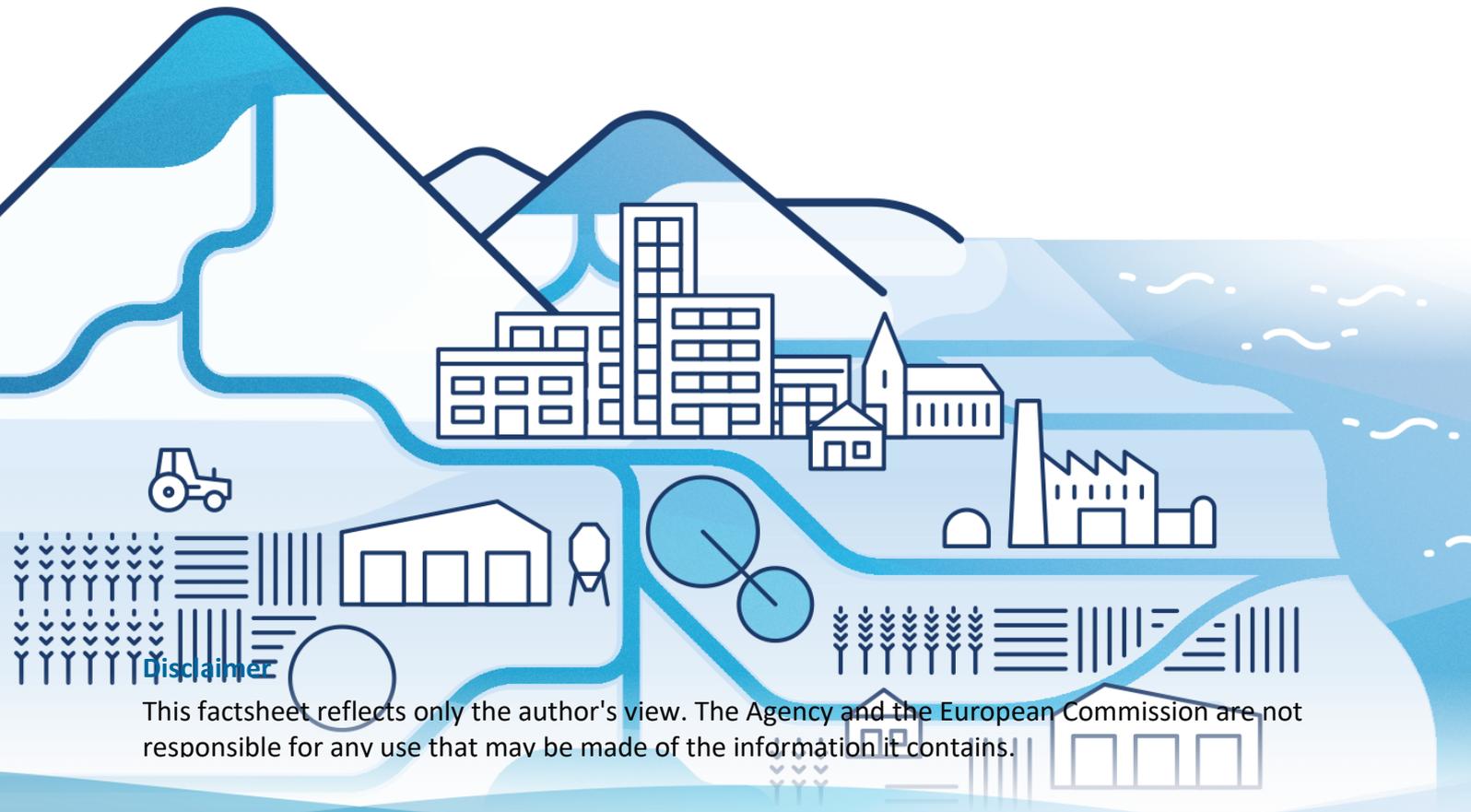


Factsheet – Membrane Bioreactor (MBR)

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Membrane Bioreactor (MBR)



Unique selling points:

- ✓ Compact solution for wastewater treatment and reclamation compared to conventional biological sludge treatment.
- ✓ Regenerated water with high quality which can be reused for irrigation or other non-potable uses.

Description of the technology

Membrane bioreactor (MBR) is the combination of a membrane process like microfiltration or ultrafiltration with a biological wastewater treatment one, the activated sludge process. It is now widely used for municipal and industrial wastewater treatments. Two MBR configurations exist: internal/submerged, where the membranes are immersed an integrated into the biological reactor; and external/sidestream, where membranes are a separate unit process requiring an intermediate pumping step.

MBR are frequently used to reduce treatment footprint while obtaining high water quality that can be reused.

In the NextGen project, the MBR treatment will be applied for sewer water mining, treating water directly extracted from sewer and producing water to be reused for irrigation in an urban green zone. The MBR has been tested up to industrial scale. In the Nextgen project, the capacity of the MBR is around 25m³/d.

The simplified diagram of the process is schematized in Figure 1.





and 3 show some images of the plant.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°776541.

Flow scheme of the technology

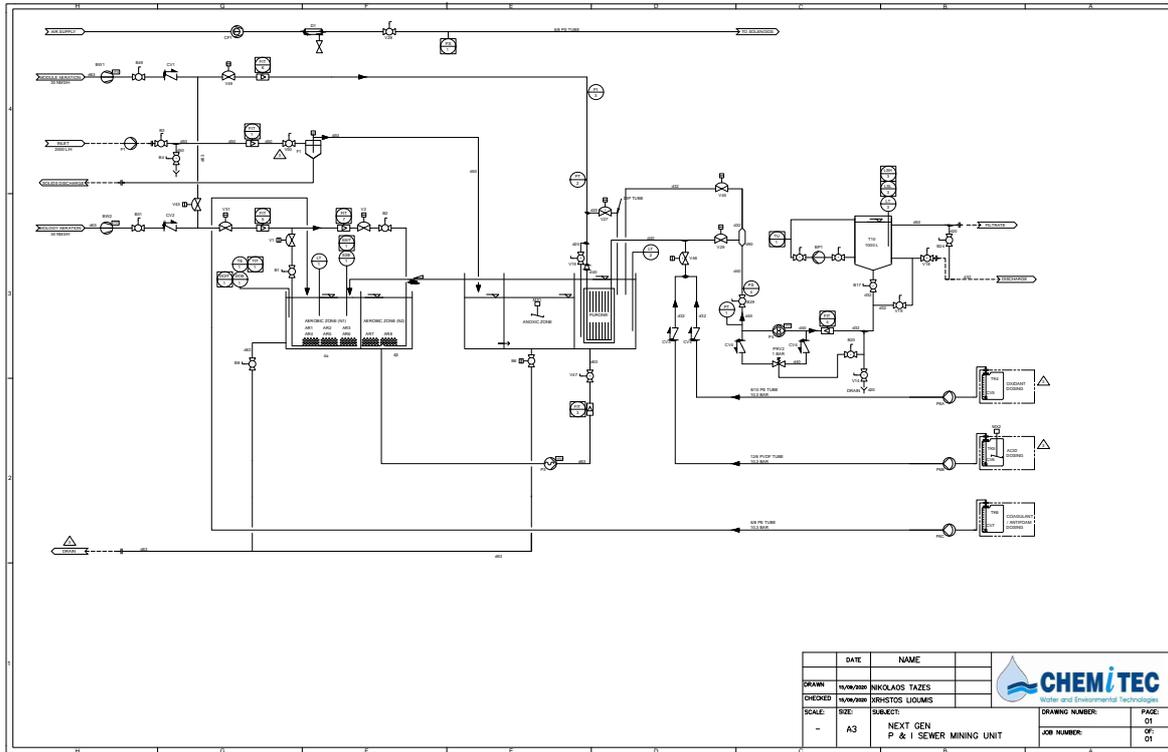


Figure 1. Simplified P&ID of the NextGen pilot plant where MBR system is applied.

Pictures of the technology

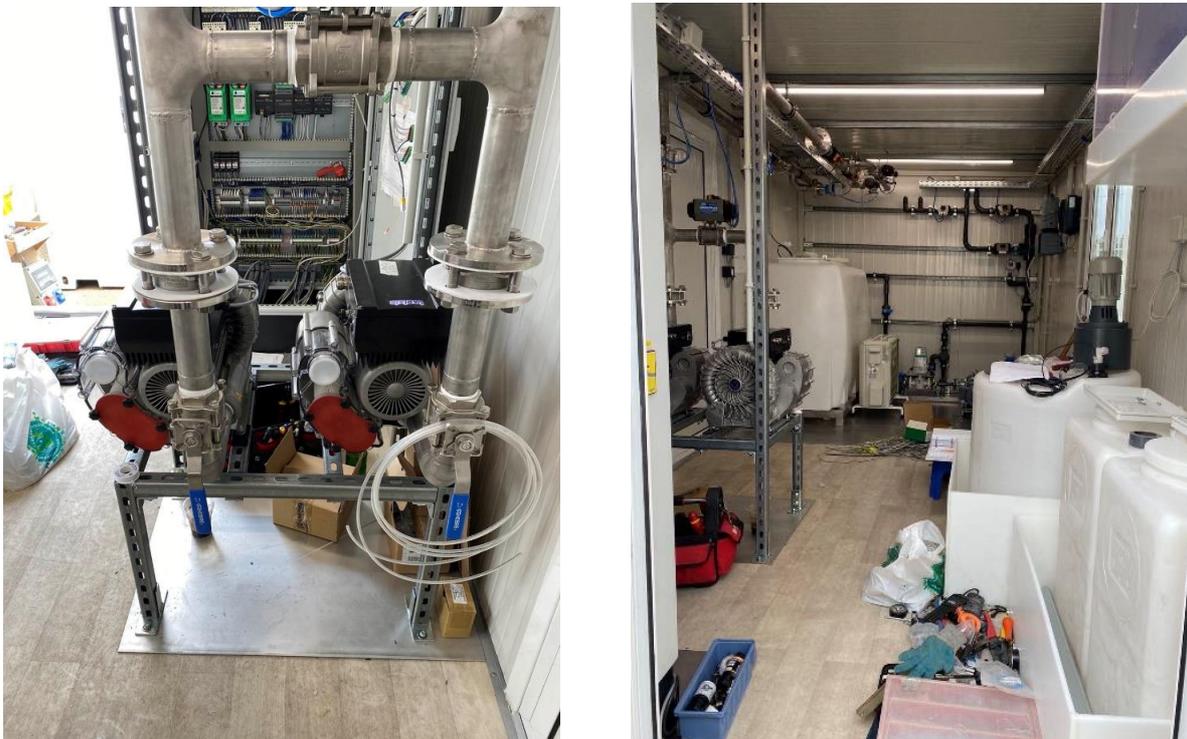


Figure 2. Images of the MBR used in NextGen project.



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Figure 3. Images of the MBR used in NextGen project.

Synergetic effects and motivation for the implementation of the technology

- ✓ **Production of reclaimed water from sewer in the point of use**

MBR with desired sizes can be installed in decentralized systems to treat sewer extracted from the collector. Reclaimed water with high quality can be produced in the point of use, minimizing the costs of distribution.

Requirements of the technology and operating conditions

The following table summarize the most appropriated values of several parameters to take into account for the design and operation of an MBR.

Table 1. Required specifications for an MBR.

Parameter	Units	Min	Max	Reference
Organic Loading Rate (OLR)	Kg/m ³ /d	0.1	13	Depending on the wastewater type (urban or industrial). Holler and Trösch, 2001 Boonyungyuen et al., 2014
Sludge concentration (Volatile Suspended solids)	g/L	4	12	Delgado, et al., 2011
Mixed liquor suspended solids (MLSS) or Total Suspended Solids	g/L	8	12	Delgado, et al., 2011
Solid retention time (SRT)	d	10	20	Delgado, et al., 2011



Specific aeration demand SAD _m	Nm ³ /h m ²	0.30	0.57	Delgado, <i>et al.</i> , 2011
Membrane porous size	nm	10	400	Delgado, <i>et al.</i> , 2011
Gap sizes for the screens used during the pre-treatment	mm	0.5	3	Schier <i>et al.</i> 2009
Operation flux rates	LMH	14	48	Delgado <i>et al.</i> , 2011 Yang <i>et al.</i> , 2009

Key performance indicators

Table 2. KPIs for the MBR in the Athens case study.

Parameter	Units	Min	Max	Reference	Legislation Limits
COD in the MBR effluent	mg O ₂ /L	13	32	NextGen, D1.2	-
BOD in the MBR effluent	mg O ₂ /L	1	2,5	NextGen, D1.2	≤10 ppm for 80% of samples
TSS in the MBR effluent	mg/L	Detection Limit	Detection Limit (2)	NextGen, D1.2	≤2 ppm for 80% of samples
Turbidity in the MBR effluent	NTU	0.1	2.0	NextGen, D1.2	
N-NH ₄ ⁺ in the MBR effluent	mg/L	60	85	NextGen, D1.2	
Total P in the MBR effluent	ppm	5.0	7.0	NextGen, D1.2	
Energy consumption	KW	15	17	NextGen, D1.2	
Sludge generated	L	700	1000	NextGen, D1.2	

Links to related topics and similar reference projects

MBR treatment	Reference
NextGen	Case study "Athens" (NextGen)

References

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Outlook

Case study specific information will be provided, when the results of the other work packages are available:

- Lessons learned from the case study
- Outcome of the assessments
- Legal and regulatory information concerning the whole value chain concerning the technology
- Business opportunities

