Factsheet – Sewer Mining Technology

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Sewer Mining

Unique selling points:

- ✓ Produces irrigation water on-site where the demand exists
- ✓ Has small footprint, fits into a container, can be used in dense urban environments
- ✓ Demonstrates high replication potential
- ✓ Enhances resilience of cities to climate change especially for arid urban environments such as cities in the Med

Description of the technology

Sewer Mining is a treatment plant in a container in which:

- ✓ extracts wastewater from local sewers that run under every location of a city
- ✓ treats it directly on site in a distributed system
- ✓ produces high quality water (at the point of demand) suitable for irrigation of green areas, groundwater recharge and other urban uses.

The Sewer Mining unit consists of a membrane bioreactor unit (MBR) and a UV disinfection unit. The unit is integrated in a container of limited dimensions and the treatment is performed locally, where the demand exists.

The main idea of this technology is that a resource (wastewater) that lies beneath every part of a city is used to produce clean water and reduce pressures due to water scarcity.

The capacity of the technology is from pilot to industrial scale. In NextGen the capacity is 25m^3/day.

Sewer Mining technology is a distributed, flexible and autonomous circular economy solution.

The simplified diagram of the process is schematized in **Figure 1**.
Figure 2 shows an image of the plant tanks.

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Flow scheme of the technology

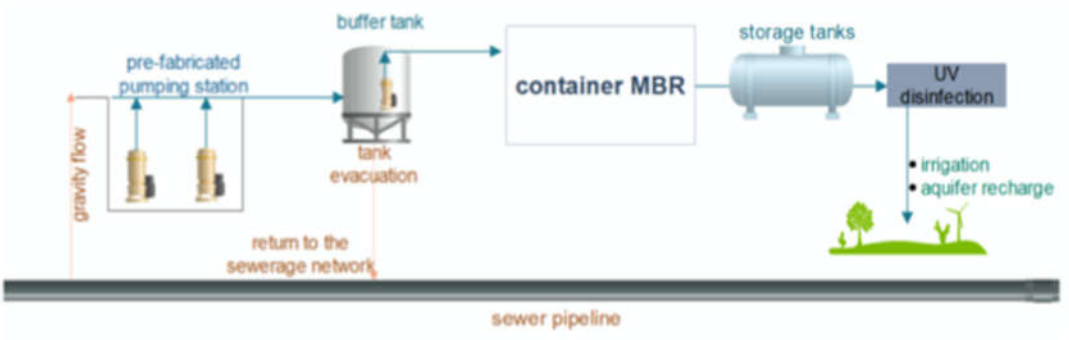

Figure 1. Configuration of the Sewer Mining technology.

Pictures of the technology

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Figure 2. Image of the Sewer Mining technology tanks 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, minimizing the costs of distribution.
- ✓ Proven to be stable in operation and efficient in terms of treatment
- ✓ Produces high quality water rich in nutrients (N,P) with a positive effect on plants and biodiversity of the local ecosystem
- ✓ Reduces wastewater flows, transport costs and drinking water demand, protecting the natural resources

Requirements of the technology

The following table summarize the most appropriated values of several parameters to take into account during the MBR operation.

Table 1. Required specifications for influent water quality for an MBR.

Parameter	Units	Min	Max	Average	Reference
COD	mg O_2/L	330	490	410	**Plevri *et al.*, 2021**
BOD	mg O_2/L	140	210	175	**Chon, KyongShon and Cho, 2012**
TSS	mg/L	150	220	183	**Dialynas and Diamadopoulos, 2009**
TN	mg/L	124	200	164	
TP	mg/L	9.6	10.9	10.3	**Yang, Shang and Wang, 2009**

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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	Medium	Reference
NextGen	Water	**Case study "Athens" (NextGen)**

Reference

Chon, K., KyongShon, H. and Cho, J. (2012) 'Membrane bioreactor and nanofiltration hybrid system for reclamation of municipal wastewater: Removal of nutrients, organic matter and micropollutants', Bioresource Technology. Elsevier, 122, pp. 181–188. doi: 10.1016/J.BIORTECH.2012.04.048.

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Plevri, A., Monokrousou, K., Makropoulos, C., Lioumis, C., Tazes, N., Lytras, E., Samios, S., Katsouras, G. & Tsalas, N. (2021). Sewer Mining as a Distributed Intervention for Water-Energy-Materials in the Circular Economy Suitable for Dense Urban Environments: A Real World Demonstration in the City of Athens. Water 13 (19).

Yang, Q., Shang, H. T. and Wang, J. L. (2009). Treatment of municipal wastewater by membrane bioreactor: a pilot study. *International Journal of Environment and Pollution, 38*(3), pp. 280–288.

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