

Biological Denitrification Pilot Project in the Mar Menor (Murcia, Spain)



Figure 1: Biological Denitrification Pilot in the Mar Menor at 1 GPM / 0.24 m³/h

Technical Summary of the Article:

- **Influent:** Irrigation Water from the Groundwater Table of the Campo de Cartagena
- **Technology:** BIOBOX Nitrate
- **Flow rate:** 1 GPM / 0,24 m³/h
- **Influent N-NO₃:** 20-27 mg/L (**NO₃** 90-120 mg/L)
- **Effluent N-NO₃ :** 1-3 mg/L (**NO₃:** 5-15 mg/L)
- **Plant Features**
 - Pre-Filtration
 - Biological Denitrification through Biofiltration

The Mar Menor lagoon, located in Murcia (Spain), is the largest permanent saltwater body in Europe. It is a unique natural site with significant ecological and landscape value.

Before 2015, it was characterized as a paradisiacal place, surrounded by nature, native species, and crystal-clear waters, creating a very peculiar and self-contained ecosystem. However, it currently faces nutrient pollution problems, primarily nitrates, which have led to a severe eutrophication process of the lagoon.

This has prompted the Mar Menor Directorate to actively seek solutions and invest in more efficient methods for the definitive removal of the excess nitrates that have been threatening the lagoon's biodiversity for decades.

Table 1: Treatment Results

Parameter	Influent	Treated effluent
Flow rate (GPM)	1	
Flow rate (m ³ /h)	0,24	
N-NO ₃ (mg/L)	20-27	1-3
NO ₃ (mg/L)	90-120	5-15

As part of the concrete action plan, it was decided to address this issue using a biofiltration process based on biological heterotrophic nitrification. It was then that BIOBOX® proposed carrying out a pilot project to demonstrate the effectiveness of the BIOBOX® Nitrates technology.

Thus, in April 2022, a pilot plant was installed in the D-7 drainage channel of the Los Alcázares Wastewater Treatment Plant (EDAR).



Figure 2: Images of the Biological Denitrification Pilot in the Mar Menor at 0.24 m³/h

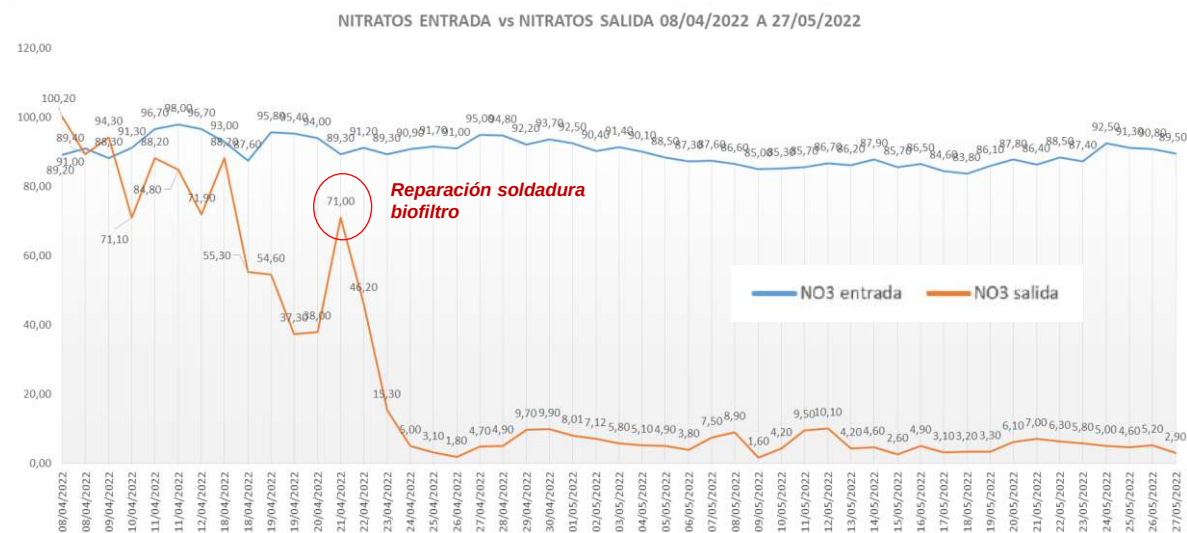
Like all the plants offered by BIOBOX®, this pilot plant integrates advanced technology in both automation and sensing. This allows the plant to operate autonomously and be remotely controlled without the need for on-site personnel.

Operational data and key measurement parameters are continuously monitored and recorded both locally and in the cloud. Having access to this data enables real-time visualization or historical tracking of the plant's performance at all times.

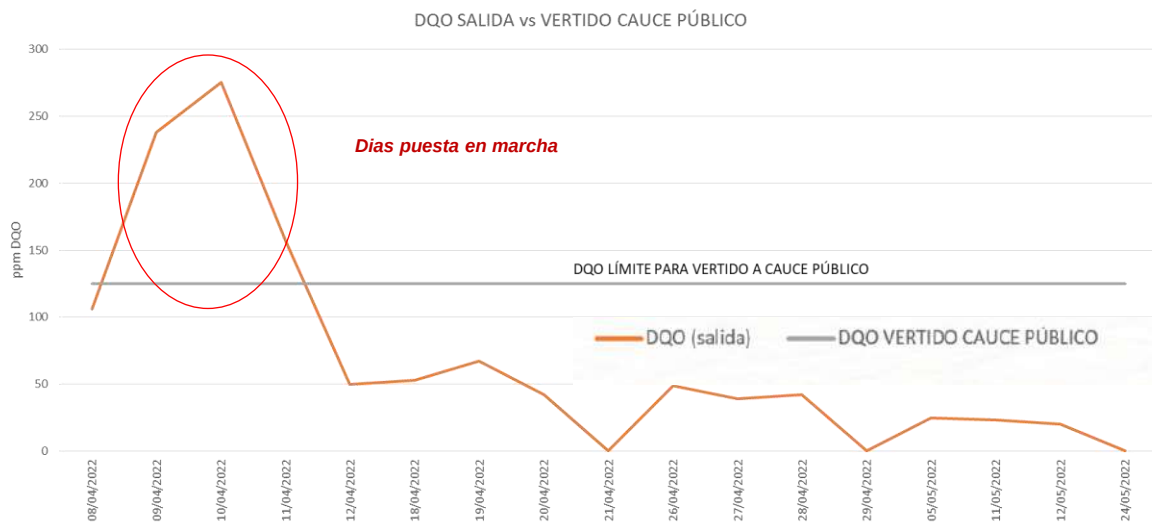
Results:

This four-month pilot project achieved outstanding results:

- Nitrate removal performance above 97%
- Removal rate remains constant and stable
- Outflow COD well below public discharge standards and lower than inflow COD
- Treatment cost below 0.1 €/m³



Graph 1: Pilot Project Results / Nitrate Removal Above 97%. Source: BIOBOX®



Graph 2: Pilot Project Results / Outflow COD (after 4 days of operation) always below public discharge standards. Source: BIOBOX®

The BIOBOX Nitrates® technology is so compact that five plants, each with a capacity of 125 l/s (450 m³/h), can fit within the surface area of a football field (0.6 hectares).

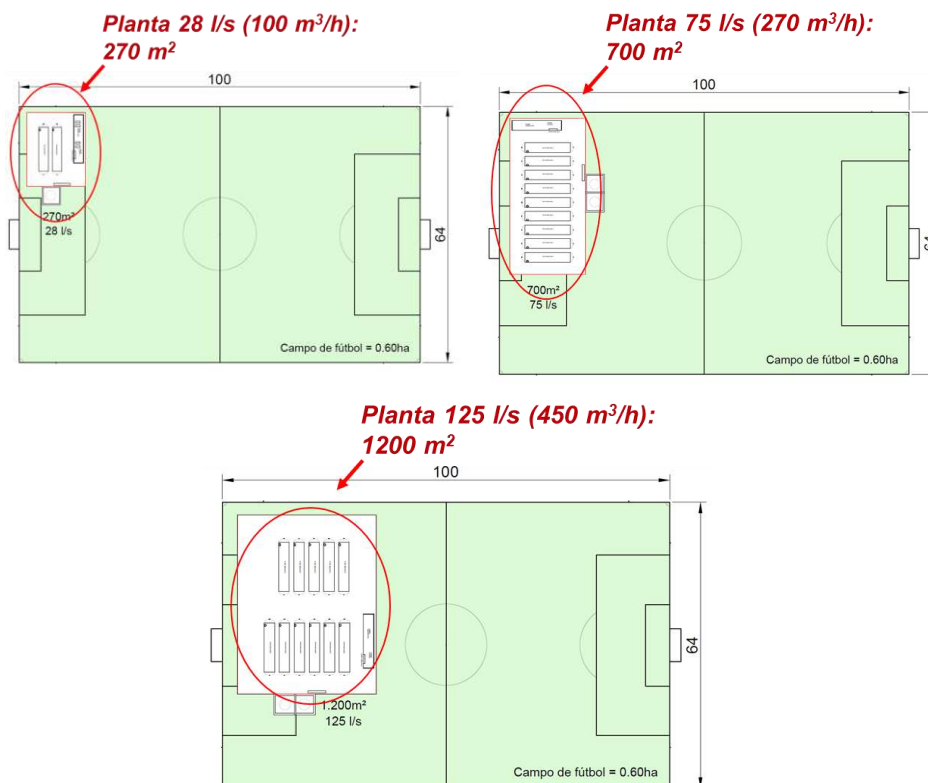


Figure 3: Space Requirements of the BIOBOX Nitrates® Technology

The compactness of the technology allows for multiple locations and possibilities for treatment, ranging from traditional sites to even being installed directly on the streambed.

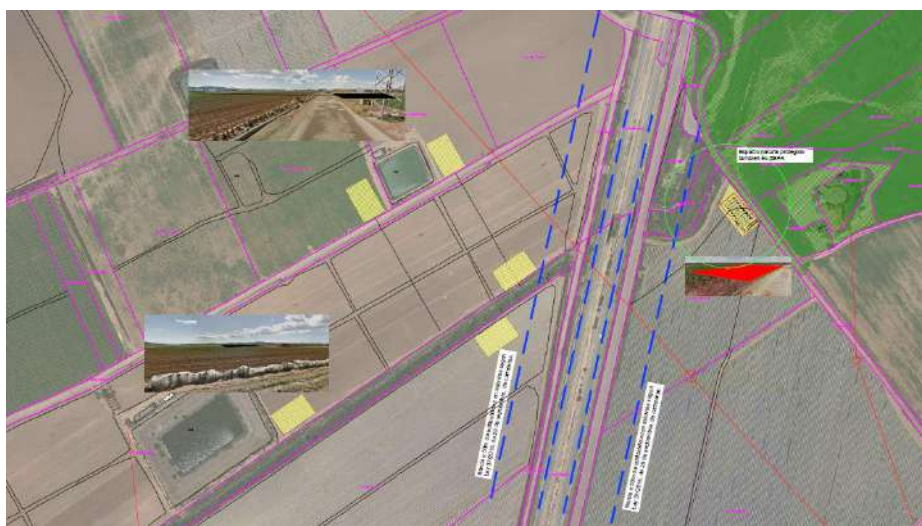


Figure 4: Possible Locations for the BIOBOX Nitrates® Plant

In conclusion:

- ✔ Nitrate removal performance well above the required levels. Control of the rest of the parameters.
- ✔ Very competitive cost per m³ treated and low energy requirement.
- ✔ Stability of the technology, robustness to change, low O&M requirements, real-time data generation.
- ✔ Fast construction (6 months), small space requirements, process guarantees.

On the occasion of EU Green Week 2022, a webinar was created to explain the operation of the BIOBOX Nitrates® technology and the successful results obtained from the demonstration pilot project in the D-7 stream in Los Alcázares, Mar Menor (Murcia).



Link to the webinar recording Language (Spanish) :

https://www.youtube.com/watch?v=3dvOrtKa_LM

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Acknowledgements:



Región de Murcia
Consejería de Agua, Agricultura, Ganadería,
Pesca, Medio Ambiente y Emergencias

Directorate General for the Mar Menor



Mar Menor Canal

CHS

Segura Hydrographic Confederation



UNIÓN EUROPEA
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Regional Entity of Sanitation and Purification

EU Green Week 2022

EU Green Deal - Make it Real

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