



BIOBOX

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1. Introduction

BIOBOX ORIGIN



What is BIOBOX?

The philosophy of BIOBOX focuses on making advanced proprietary technology accessible to all types of companies, which until now has only been available to large plants.

Its approach is centered on solving unique problems and scenarios with customized, cost-effective, automated, and efficient solutions in a minimal space.

Origins of BIOBOX

BIOBOX® is the result of intense research, development, and innovation work backed by years of experience and learning. It works closely with Ingeniería de Obras Zaragoza S.L., thanks to their experience gained in engineering projects and the advanced technology developed by Inngen.io, which integrates into their BIOBOX® plants.



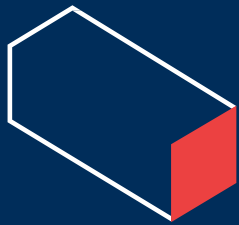
2. Products

BIOBOX

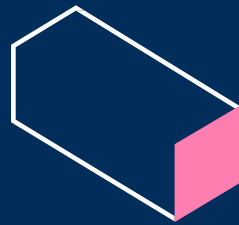


BIOBOX PRODUCTS

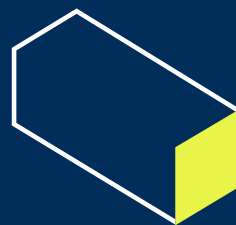
BIOBOX® technology has been implemented to address different types of contaminants present in drinking water, urban wastewater and industrial water.



BIOBOX
NITRATE



BIOBOX
IRON & MANGANESE



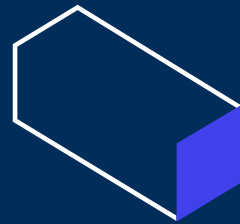
BIOBOX
AMMONIUM



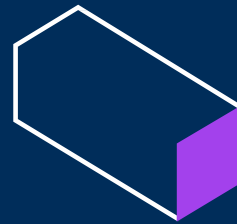
BIOBOX
ORGANIC MATTER



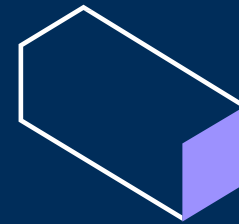
BIOBOX
REUSE



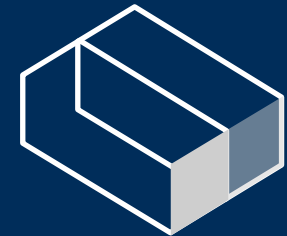
BIOBOX
HEAVY METALS



BIOBOX
PHOSPHORUS



BIOBOX
TURBIDITY



BIOBOX
COMBINED
CONTAMINANTS

2. Products

BIOBOX

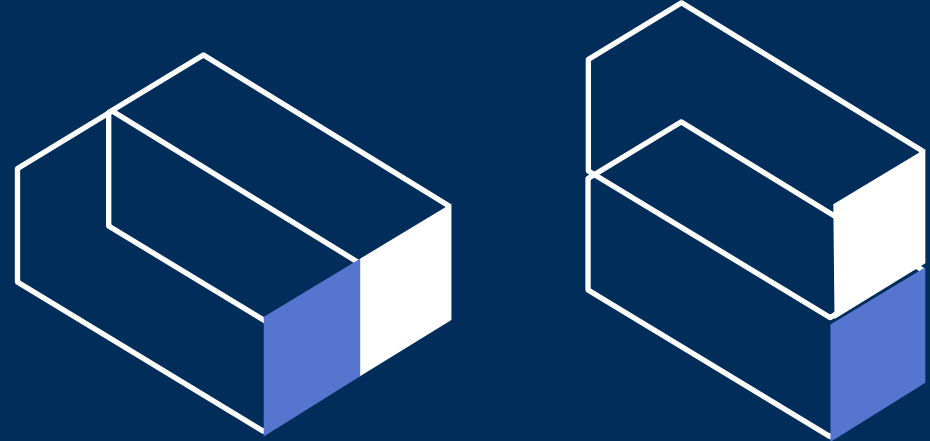
BIOBOX PRODUCTS

For water treatment with **combined pollutant matrices** it is possible to build ad-hoc plants capable of integrating different BIOBOX® solutions in :

A single container and 2 integrated BIOBOX technologies



Two containers operating in series with separate technologies.



**Solutions operating in parallel from the same power supply.*

2. Products

BIOBOX



BIOBOX FORMATS



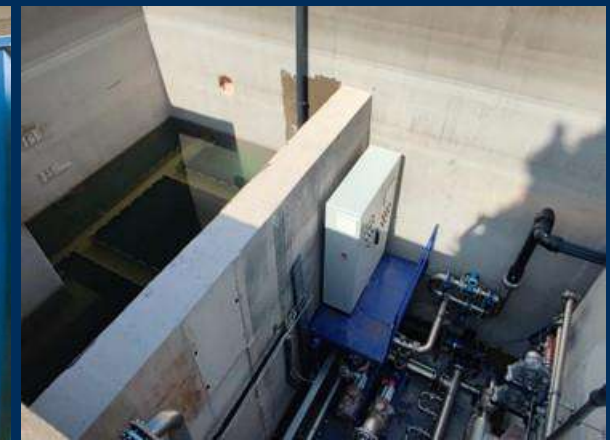
**DEMONSTRATION
SERVICE
(PILOT)**



SKID



CONTAINER



SPECIAL EXECUTIONS

2. Products

BIOBOX



BIOBOX PRODUCTS

What are the main **advantages** of BIOBOX®?



QUICK CONSTRUCTION
3-4 MONTHS



LESS SPACE NEEDED
120m³/h – 120m²



REMOTE CONTROL 4.0



**100% AUTOMATED PLUG&PLAY
PLANTS**



**MORE THAN 25 YEARS OF
EXPERIENCE**



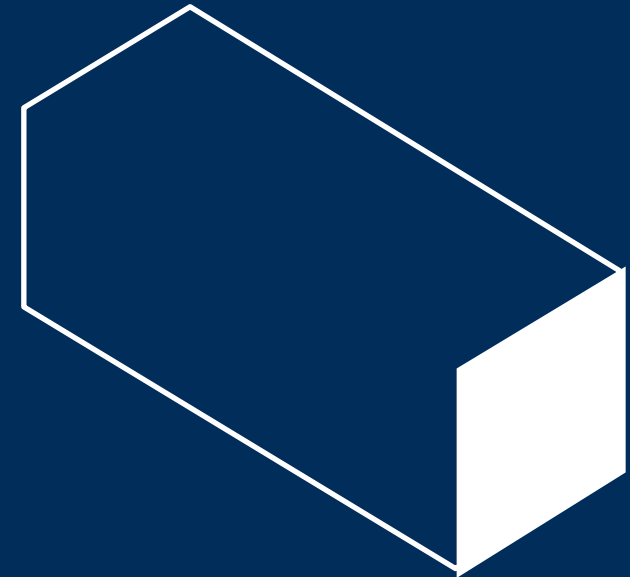
**SUSTAINABLE PROPRIETARY
TECHNOLOGY**

3. Services

BIOBOX

BIOBOX SERVICES

- 💧 **Tailor-made solution design:** *depending on concentrations, flow rates, space requirements, local regulations and availability of reagents.*
- 💧 **Manufacture of the BIOBOX® solution and transport to destination.**
- 💧 **On-site installation, connections (water, electricity) and commissioning.**
- 💧 **Knowledge transfer for operation and maintenance.**
- 💧 **Remote monitoring and consultancy.**
- 💧 **Leasing/renting contract for the BIOBOX® plant.**



4. Positioning

BIOBOX

Who are we targeting?

Market :
Private Industry

Category: :
Water treatment

- Segment:**
- Drinking Water
 - Waste Water

Market:
Public Industry

Category:
Water treatment

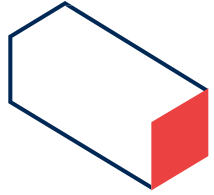
- Segment:**
- Drinking Water
 - Waste Water

Examples of Industries



An overview of each technology

BIOBOX®



BIOBOX NITRATES

 Puremust-sn

Proprietary patented biological denitrification technology



Biologically transforms NO_3^- into N_2 gas
without returning nitrate to the water cycle



OPEX below 0.15 €/m³ with updated prices



Certified by SGS, tested with several references and
accepted by health authorities.



99% of raw water is converted to treated water

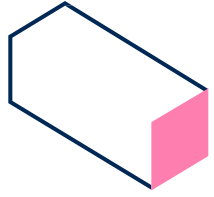
PATENTED

SGS

CERTIFIED



BIOBOX®



BIOBOX IRON & MANGANESE



Capable of removing from 0.5 mg/l to more than 50 mg/l with low OPEX, without the addition of chemicals.



Simple, robust and durable technology.



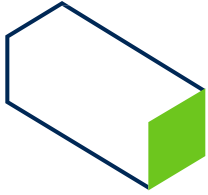
Based on adsorption and precipitation processes, without pre-oxidation below 2 ppm.



It can remove both metals simultaneously.



BIOBOX®



BIOBOX ORGANIC MATTER



"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 858805".



Low OPEX biological technology capable of treating high and low concentrations.



Simple process, no sludge recirculation, no settling. Very little sludge compared to traditional technologies.

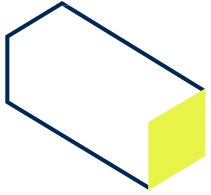


Reduced HRT, less space: less CAPEX.



Modular system. Grows as your needs grow.





BIOBOX AMMONIUM



Low OPEX biological technology suitable for drinking water and wastewater.



Biological technology with a removal efficiency of at least 85%.

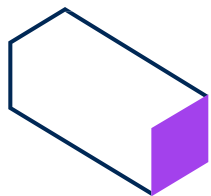


Low HRT, low footprint.



Combined with BIOBOX® Nitrates, it is the most effective total nitrogen reduction technology on the market





BIOBOX PHOSPHORUS



WITHOUT POLLUTING REJECTS.



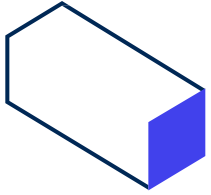
OPERATING COST BELOW 0.15 USD/m³.



CERTIFIED BY SGS.



NO WASTE OF WATER.



BIOBOX HEAVY METALS



Adsorption technologies with high durability due to the large surface area of the material which generates a large isotherm.



No pre-conditioning of water



Validated in Norway under the toughest and the strictest conditions and under the most stringent requirements.

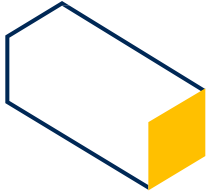


Simple, economical and effective technology, without the use of chemicals.



With HMR filters we are able to remove heavy metals such as:

- *Chrome*
- *Zinc*
- *Cadmium*
- *Iron*
- *Manganese*
- *Arsenic*
- *Copper*
- *Nickel*



BIOBOX ARSENIC [& URANIUM]



High specificity with As and U, they do not retain unwanted ions that reduce their Isotherm.



They do not require the addition of chemicals.



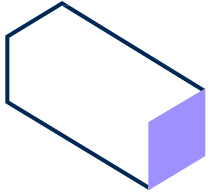
High durability due to the very high surface area and selectivity of the of the material and its selectivity.



No rejects or waste of any kind



BIOBOX®



BIOBOX TURBIDITY



Complies with new draft Royal Decree on Turbidity RD 3/2023



Raw water with high TSS (>40 mg/l)



High filtration speeds (>15 m/h) while maintaining quality.
Reduced footprint.



Simple process with low energy demand and low OPEX.



Guarantees

BIOBOX®



From project conception to operation



We test your water

Tailor-made demonstration pilots in **our own research and development centre and on-site.**



We guarantee results



Training for operation and maintenance



After-sales service

References

BIOBOX®



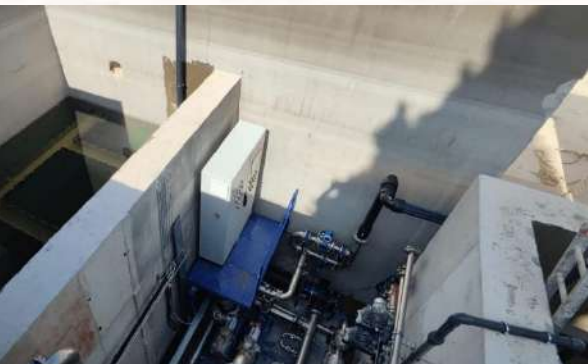
Denitrification water treatment plant in Falset [Tarragona, Spain]:

- Date: 2016–2017
- Treated Water:
Drinking Water
- Technology used:
BIOBOX Nitrates [Puremust-sn ®]
BIOBOX Arsenic
- Plant characteristics:
 - Treated flow rate: 20 m³/hour
 - Inlet nitrate concentration: 71 ppm NO₃ [16 ppm N-NO₃]
 - Nitrate output concentration: < 40 ppm NO₃ [9 ppm N-NO₃]
 - Inlet arsenic concentration: 20 micrograms/litre
 - Outlet arsenic concentration: < 2 micrograms/litre



Denitrification water treatment plant in Calaf [Cataluña, Spain]:

- Date: 2021
- Treated Water:
Groundwater source.
- Technology used:
BIOBOX Nitrates (Puremust-sn ®)
- Plant characteristics:
 - Treated flow rate: maximum capacity 20 m³/h
 - Inlet nitrate concentration: 80 ppm NO₃ [18 ppm N-NO₃]
 - Nitrate output concentration: < 40 ppm NO₃ [9 ppm N-NO₃]



Denitrification water treatment plant in La Eliana [Valencia, Spain]

- Date: 2022-2023
- Treated Water:
Drinking Water
- Technology used:
BIOBOX Nitrates [Puremust-sn ®]
- Plant characteristics:
 - Treated flow rate: 65m³/h
 - Inlet nitrate concentration: 70 ppm NO₃ [15,8 ppm N-NO₃]
 - Nitrate output concentration: < 40 ppm NO₃ [9 ppm N-NO₃]
[RD140/2003 requires less than 50 ppm NO₃]



Denitrification water purification plant in Torrent (Valencia, Spain)

- **Date:** 2022-2023 [under construction currently]
- **Treated Water:**
Drinking Water
- **Technology used:**
BIOBOX Nitrates [Puremust-sn ®]
- **Characteristics of the plant:**
 - Treated flow rate: 120 m³/hour
 - Inlet nitrate concentration: 80 ppm NO₃
 - Outlet nitrate concentration: < 40 ppm NO₃ [RD3/2023 requires less than 50]



Biological nitrogen and phosphorous removal project [Mining exploitation in the Zamora-Chinchipe region, Ecuador].

- Date: 2021
- Treated Water:
Wastewater
- Technology used:
BIOBOX Nitrates [Puremust-sn ®]
BIOBOX Ammonium
BIOBOX Phosphorus
- Plant characteristics:
 - Treated flow rate: 150 m³/h
 - Inlet nitrate concentration: 400 mg/l
 - Total nitrogen output: <10 mg/l in compliance with IFC regulations for discharge into watercourses.



Denitrification of process water at ENCES paper mill (Pontevedra, Spain)

- Date: 2022-2023
- Treated Water:
 - Efluent from WWTP [Tertiary treatment]
- Technology used:
 - BIOBOX Nitrates [Puremust-sn ®]
- Characteristics of the plant:
 - Treated flow rate: 80 m³/hour
 - Inlet nitrate concentration: 80 ppm NO₃ [18.07 ppm N-NO₃]
 - Output nitrate concentration: < 40 ppm NO₃ [9 ppm N-NO₃]



Región de Murcia

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

Dirección General del Mar Menor



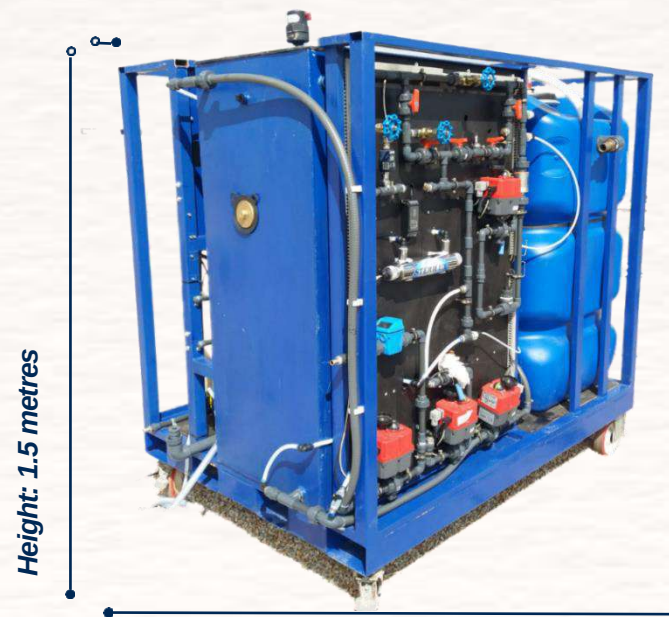
BIOBOX® Nitrates piloting in the Mar Menor:

- **Treated water:**
Irrigation water from the drainages of the fields in Campo de Cartagena, close to Mar Menor, Murcia.
- **Technology used**
BIOBOX Nitrates [Puremust-sn ®]
- **Characteristics of the plant:**
 - Treated flow rate: 0,24 m³/hour
 - Inlet nitrate concentration: 21.28-28.37 N-NO₃
 - Outlet nitrate concentration: 1.19-3.55 N-NO₃
- **Treatment process:**
 1. Prefiltration.
 2. Biological denitrification.
- **Piloting:**
4 months duration [April 2022 – July 2022].

"Pilot project for denitrification of the circulating water in the final stretch of the catchment area leading to the Mar Menor, using a compact denitrification system".



Width: 1 metre



Length: 2 metres

- 240 l/h of treatment in pilot plant
- 97% NO_3 removal efficiency performance
- Fully automated
- No need for operating personnel



BIOBOX® Ammonium piloting : November 2021

- Treated water:
Drinking water .
- Technology used
BIOBOX Ammonium
- Characteristics of the plant:
 - Treated flow rate: 0,24 m³/h
 - Inlet ammonium concentration: 2 - 4 mg/l
 - Outlet ammonium concentration: < 0.5 mg/l
 - Biofiltering material: Filtralite®.
- Treatment process:
 1. Prefiltration.
 2. Biological denitrification.
- Piloting:
November 2021 [4 months]



BIOBOX® Ammonium piloting : December 2021

- Inlet water characteristics: 2 - 4 mg/l
- Results obtained in the output water: < 0,5 mg/l

Results:

- ✓ *The plant has proven its efficacy in removing ammonium over 4 months of piloting.*
- ✓ *Emilio Arnés, head of treatment at the Canal de Isabel II plant: "More than remarkable ammonium removal performances are obtained; in fact, the efficiency of the system ranges between 90 and 100 %"*
- ✓ *No need for operating personnel in the plant : (100% automated)*
- ✓ *Efficient with seasonality and in low water temperatures while maintaining yields*
- ✓ *Clean and environmentally safe technology*
- ✓ *Lower associated operational and investment costs*

Canal&tú

NÚMERO 53 | JUNIO 2022

Canal de Isabel II

JUNIO 2022 | 1-DEAMOS 13/28

BIOFILTROS EN LA ETAP DE PELAYOS: USANDO MICROORGANISMOS EN EL PROCESO DE TRATAMIENTO

Un estudio de Canal de Isabel II demuestra que los microorganismos cultivados sobre un lecho fijo de arcillas expandidas eliminan más del 90% del amonio presente en el agua bruta

La estación de tratamiento de agua potable (ETAP) de Pelayos de la Presa es reconocida, entre los 14 que gestiona Canal de Isabel II, por ser la más nueva de todas. Comenzó a ser explotada un octubre de 2016 y suministra agua de consumo a los habitantes del municipio homónimo, además de a las localidades de Canicentes, Cadalso de los Vidrios, Rozas de Puerto Real y San Martín de Valdeiglesias. En cómputo global, unas 26.000 personas.

Desde comienzos de verano hasta finales de otoño, esta ETAP acostumbra a lidiar, en ocasiones, con aumentos significativos de algunos parámetros contaminantes en el agua que recibe, que proviene de una toma de fondo del embalse de San Juan. Parámetros como la materia orgánica, el hierro, el manganeso o el amonio, que influye de manera decisiva en la primera desinfección del agua.

El proceso convencional para eliminar elevadas cantidades de amonio pasa, normalmente, por dosificar en el agua mucho más cloro del habitual, entre 8 y 10 veces más, lo que supone multiplicar considerablemente el gasto asociado a este reactivo.

Suele ocurrir, además, que el amonio no viaja solo, sino que llega en el agua bruta acompañado de elevadas concentraciones de manganeso, hierro o materia orgánica.

La presencia de los citados elementos añade nuevas dificultades al proceso de potabilización en Pelayos, pues obliga a incorporar otros reactivos como al dióxido de cloro o permanganato potásico. «Esto también provoca una mayor generación de subproductos de la desinfección como los cloratos, trihalometanos o ácidos haloacéticos, lo que limita y podría llegar a impedir el tratamiento de estos aguas o porfir de niveles muy elevados de amonio», explica Luis Eyre, jefe del Área de Tratamiento Tajo-Albarca.

Ya desde hace años, desde esta área de tratamiento (el propio Eyre, con la colaboración de su compañero David de Frutos y, después, Emilio Arnés) se enfocaron en la búsqueda de alternativas de pretratamiento con las que reducir los niveles de amonio del agua bruta que llega a la ETAP de Pelayos. Se estudió en primer lugar, con el Área de Proyectos de Tratamiento, la posibilidad



de captar el líquido en el embalse desde nuevas tomas. También se contempló el uso de resinas de intercambio iónico o de membranas de ósmosis inversa. Sin embargo, estas opciones acabaron siendo descartadas. Más recientemente, con la participación de la Subdirección de I+D+i, Canal ha llevado a cabo un estudio novedoso para intentar hallar la solución definitiva.

En el marco de su estrategia «para garantizar la calidad del agua de consumo», la compañía ha puesto en marcha una planta piloto que emplea biofiltros para transformar de manera natural el amonio en nitrato, que sí se pueden oxidar completamente. En concreto, se han utilizado arcillas expandidas como material de soporte sobre el que se han cultivado diferentes microorganismos. Y es que estos cultivos bacterianos facilitan la nitrificación biológica en el pretratamiento y reducen la cantidad de amonio presente en el agua con que año suponga un problema ni para el proceso de potabilización ni para el sistema de distribución.

Este tipo de procesos biológicos son la base de la depuración de aguas residuales, donde la utilización de biofiltros es más habitual. Sin embargo, en el tratamiento del agua potable esta tecnología es una rareza. Pese a ello, los resultados del empleo

de biofiltros en la ETAP han sido prometedores. «Aunque el proceso biológico tarda unas cuatro semanas en estabilizar su funcionamiento, una vez logrado se obtienen rendimientos más que notables en la eliminación del amonio de hecho, la eficacia del sistema oscila entre el 90% y el 100%», indica Emilio Arnés, responsable de tratamiento de la planta.

Para Lydia Sáez, otra de las profesionales que ha participado en este estudio, el siguiente paso debía consistir en el dimensionamiento del proceso a una mayor escala en nuestra planta, donde los biofiltros actúan ante mayores caudales, durante más tiempo y en un escenario con agua bruta real (en los ensayos, el amonio era suplementado de manera artificial mediante dosificaciones de hidróxido de amonio al 25%, lo que modificaba el pH del agua).

Al menos por el momento, Canal de Isabel II ya cuenta con un importante avance: ha podido validar una tecnología que reduce naturalmente la cantidad de amonio en el agua bruta y que permite optimizar el proceso de potabilización, logrando un agua tratada de mayor calidad y con menor coste operativo, al reducir el gasto en reactivos como el cloro y el dióxido de cloro.

El agua tratada en esta ETAP procede de una toma de fondo del embalse de San Juan



El uso de biofiltros reduce naturalmente la cantidad de amonio en el agua bruta con un menor coste operativo

JUNIO 2022 | 1-DEAMOS 13/28



Innovative DNA for small and medium-sized
flows



THANK YOU!

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