

Biological Denitrification Drinking Water Treatment Plant in Torrent (Valencia, Spain).



Figure 1: BIOBOX Nitrates Biofiltration Plant of 528 GPM (Recirculation, supply 880 GPM) / 120 m³/h (Recirculation, 200 m³/h)

Technical Summary of the Article:

- **Influent:** Well water
- **Technology:** BIOBOX Nitrate
- **Flow rate:** 528 GPM (Recirculation, supply 880 GPM) / 120 m³/h (Recirculation, 200 m³/h)
- **Influent N-NO₃:** 15 - 16 mg/L (**NO₃:** 65-70 mg/L)
- **Effluent N-NO₃:** <8 mg/L (**NO₃:** <35 mg/L)
- **Plant Features**
 - Pumping group + Washing pump
 - Nutrient dosing
 - Bioreactor – Denitrification
 - UV disinfection
 - Fine tuning filter
 - Chlorination

The biological denitrification project in Torrent (Valencia) has removed nitrate from the **drinking water** for more than 700 homes in the Cumbres de Calicanto and Montelevente urbanizations. The plant, with a treatment capacity of 528 GPM, uses BIOBOX® Nitrate technology, which transforms nitrate into nitrogen gas (N₂), ensuring high-quality water and complying with health regulations.

Since February 2024, the plant has reduced nitrate nitrogen (N-NO₃) levels from 15 –16 mg/L to less than 8 mg/L. Although its capacity is 528 GPM, the recirculation system allows it to supply 880 GPM of water with less than 8 mg/L of nitrate nitrogen (N-NO₃). The project maximizes the utilization of 98-99% of the water and is part of the FICUS plan by the Torrent City Council, improving the quality of life for the local population.

Table 1: Treatment Results

Parameter	Influent	Treated effluent
Flow rate (GPM)	528	
Flow rate (m ³ /h)	120	
N-NO ₃ (mg/L)	15 - 16	<8
NO ₃ (mg/L)	65-70	<35
COD (mg/L)	-	<2
Microbiology* (CFU/mL)	-	0

**Aerobic bacteria at 22°C, Escherichia coli, total coliforms, enterococci, Clostridium perfringens*

Process Description:

The biological denitrification plant receives water from the municipal Horteta reservoir, which is fed by two nearby wells. The water is pumped, and the necessary nutrients are added for treatment.

A group of sensors measures key parameters such as flow rate, chlorine, pH, ORP, and nitrate before the water reaches the biofilter. In this biofilter, nitrate is naturally converted into nitrogen (N₂) without generating any contaminating waste.



Figure 2: Interior/Exterior Images of the BIOBOX Nitrate Biofiltration Plant of 528 GPM (Recirculation, supply 880 GPM) / 120 m³/h (Recirculation, 200 m³/h)

After this process, the key parameters are measured again, and the water undergoes final disinfection using an ultraviolet lamp, a fine tuning filter, and chlorination. Finally, the treated water is recirculated to the reservoir.

The plant configuration consists of two prefabricated skid-mounted modules, a biofilter with a 2.5 m diameter and 8 m length, and a fine tuning filter with a 2.5 m diameter and 4 m length.

The entire process is automatically monitored through sensors and a PLC control system, allowing real-time visualization, access to historical data, and the option for remote control via the internet.