

1st Stage Vertical Flow Constructed Wetland (VFCW)



Constructed wetlands are filters composed of gravel and sand of different granulometry and planted on the top layer with local plants (usually Phragmites), They make use of filtration and biological treatment processes to provide treatment for urban wastewater.

“French” constructed wetlands are composed of two sets of vertical flow constructed wetlands in series. These systems treat raw domestic wastewater and have reached international recognition these last decades. They are specially well suited for small communities in the decentralized sanitation context regardless of the climate. The **first stage** is composed of three beds with different layers of gravel, with 2-6 mm granulometry as the top layer. This allows the system to treat raw wastewater through the accumulation of large solids and associated organic matter on the top of the wetland. Vertical flows constructed wetlands are fed in pulses, to allow for feeding and resting periods. Integrated sludge management, robustness and simplicity of operation are among the main qualities of these constructed wetlands.

KEY POINTS:

- Treatment of screened raw wastewater
- Nature Based Solution (NbS)
- Low maintenance
- Low energy consumption (0-0,15 kWh/m³)
- Possibility to operate without electricity (depending on land configuration)
- Small carbon footprint
- Low COD and TSS effluent
- Resilience to temperature variations, hydraulic and organic loads
- Development of biodiversity
- Suitable for communities from 200 to 2000 PE

MAIN FEATURES

- ✓ Integrated sludge management
- ✓ High tolerance to variations in hydraulic loads, organic loads and temperatures
- ✓ No pumping, by gravity if sufficient difference in level
- ✓ Aerobic process (no odours)
- ✓ Simple operation, no specialised personnel
- ✓ Good landscape integration
- ✓ High Footprint: 1,2 m²/PE
- ✓ Pulse operation with high flow rate in first and second stage

Vertical Flow Constructed Wetland (VFCW)



VFCWs can be used as a **second stage** of a 2-stage VFCW system or after a PUSH system for pre-treatment. Gross solids are removed in the first stage, so the VFCW system can use sand as the top layer since there is a lower risk for clogging of the surface. Sand allows to increase wastewater retention time, allowing a larger contact time with the microbial community in the filter who will treat soluble organic matter and nutrients.

KEY POINTS:

- Treatment of pre-treated wastewater
- Nature Based Solution (NbS)
- Low maintenance
- Low energy consumption (0-0,15 kWh/m³)
- Possibility to operate without electricity (depending on land configuration)
- Small carbon footprint
- Low COD and TSS effluent
- Full nitrification

MAIN FEATURES

- ✓ Integrated sludge management
- ✓ High tolerance to variations in hydraulic loads, organic loads and temperatures
- ✓ High performances in organic matter COD<70 mg/l, BOD5<15 mg/l, SS<15 mg/l, and nitrification NTK<10 mg/l
- ✓ Pathogen removal up to 1-2 log E coli
- ✓ Low consumption ~0,1-0,15 kWh/m³
- ✓ No pumping, gravity fed if sufficient difference in level
- ✓ Aerobic process (no odours)
- ✓ Simple operation, no specialized personnel
- ✓ Good landscape integration
- ✓ Footprint: 0,8 m²/PE
- ✓ Pulse operation
- ✓ Complete nitrification. No denitrification