CONSTRUCTED WETLANDS & DENITRIFYING BIOREACTORS

A natural & proven approach to wastewater treatment

dekonta

Services & technologies
for a better environment

Constructed wetlands (CW) and denitrifying bioreactors (DBR) are wastewater treatment technologies used for more than 25 years. If you are searching for the right **PIN**...

- **P**roven, thousands of CWs and DBRs are installed & functioning around the world.
- **I**nnovative, with a win-win approach for the client and nature.
- **N**atural, that looks more as a garden than a treatment plant, blending into the surrounding landscape.

...then DEKONTA has the right solution for you!

It is a cost-effective investment and has lower operational costs than conventional wastewater treatment technologies.

Why our clients choose us?

- DEKONTA is an international supplier of environmental services and technologies. Established in 1992, it has successfully implemented thousands of projects in Europe, Asia and Africa. Our clients are corporations and medium sized companies in various industrial sectors, as well as international and national organizations.
- Our certifications include: EN ISO 9001, EN ISO 14001, EN ISO / IEC 17025, ISO 45001, Responsible Care®.
- We provide a wide range of services as a one-stop environmental shop.
- Visit our website www.dekonta.com or follow us on LinkedIn to find out more.

FOR MUNICIPALITIES

DEKONTA has already successfully installed many CWs and DBRs in smaller towns, villages and real estates in the countryside and in decentralized areas around Europe. Many regulatory agencies list treatment wetlands as one of their recommended “best management practices”.

FOR INDUSTRIAL CUSTOMERS

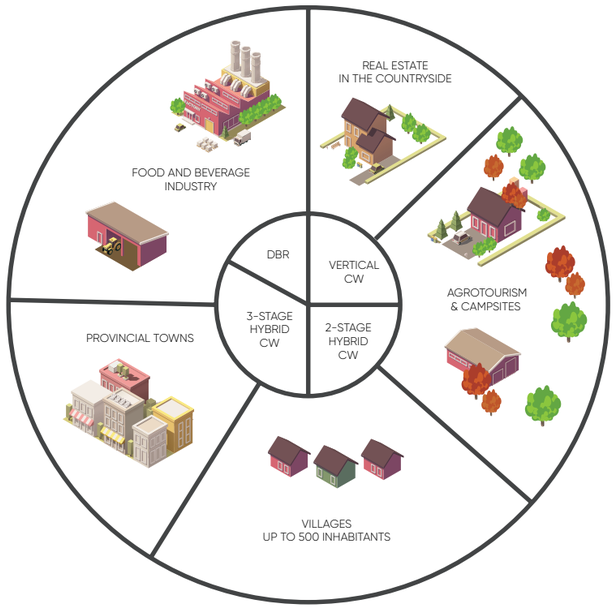
At DEKONTA, we turn your environmental costs into business opportunities.

- Nowadays, customers are searching for sustainable goods and services. By installing our Eco-friendly wastewater systems (CW and DBR), you can put our **Eco-friendly seal** on your website, packaging and invoices/receipts, to prove your commitment to sustainability.
- Our technologies have proved very popular with commercial enterprises in the food and beverage sectors (breweries, dairies, vineries, fisheries...). Farm holiday hotels, agritourism and agricultural companies have also been enthusiastic about these technologies.
- If you have any questions or if you would like more information please contact us.

Eco-friendly
wastewater system
DEKONTA

APPLICATIONS

A simplified scheme to summarize the applications



ABOUT CONSTRUCTED WETLANDS

Constructed or artificial wetlands are engineered systems designed and implemented in order to enhance the natural water self-purification processes of a wetland, taking into consideration the pollutants' composition and concentrations.

The processes that occur there are:

1. Physicochemical (such as filtration, sedimentation and adsorption) to reduce the content of suspended solids.
2. Chemical and biochemical (such as biological decomposition, nitrification-denitrification and plant uptake) to reduce the organic load and the contents of nutrients, like nitrogen and phosphorus.

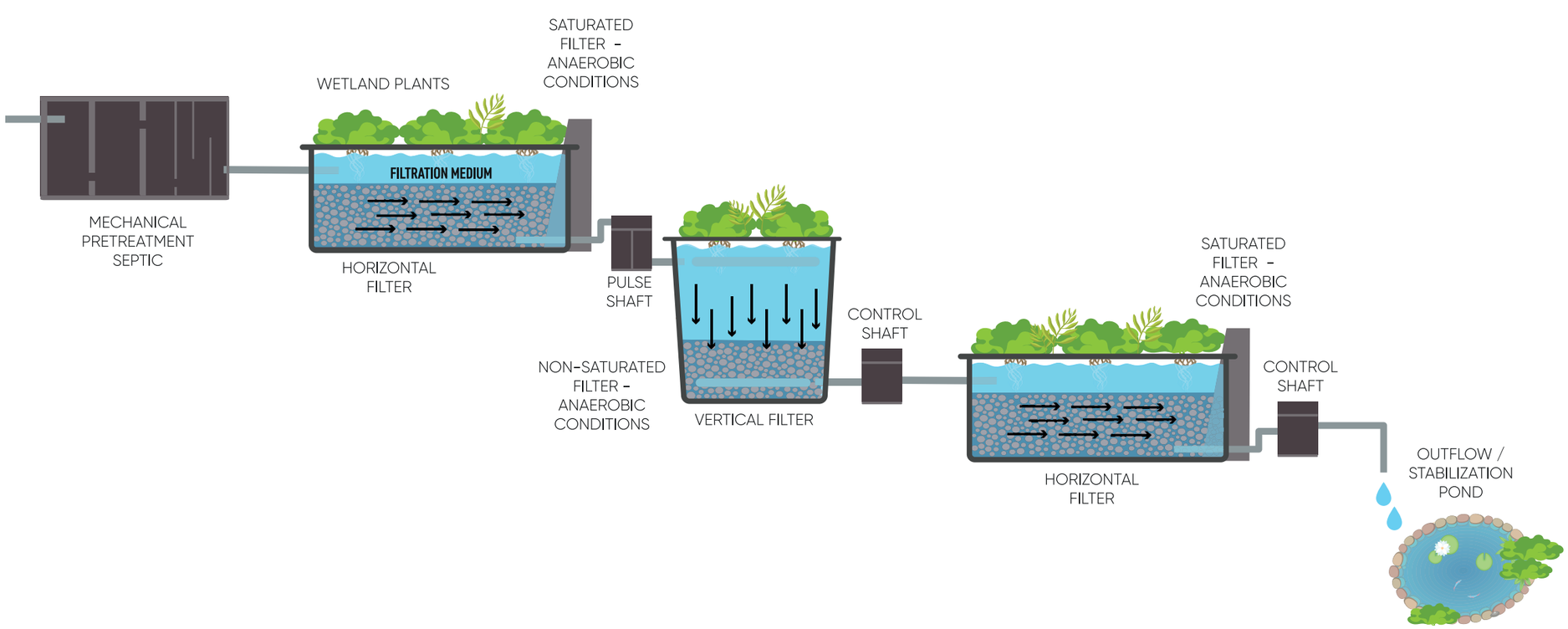
Our experts will suggest to you a customized solution that will fit your needs, among the many options available. Every site requires a specific approach depending on the local conditions, topography, and wastewater quantity and quality.

HYBRID CONSTRUCTED WETLANDS (HCW)

For municipalities with up to a few thousand inhabitants and for the Food & Beverage industry, a Hybrid Constructed Wetland (HCW) system would be the preferred solution. An HCW system uses a combination of Horizontal (HF) and Vertical (VF) filters (or beds), in order to increase overall pollutant efficiency.

THREE STAGE HYBRID CW

A typical HCW consists of mechanical pre-treatment, represented by a septic or settling tank, and 2 or 3 (2 stage or 3 stage) filtration beds with surface or subsurface water flow. Filtration beds with subsurface flow can be classified into horizontal and vertical ones according to the water flow direction, as described in the scheme. The system can operate without the need of any pumps and electricity, and the wastewater flows mainly by gravity: the operating costs are much lower than in any conventional wastewater treatment system.



The wetland plants (e.g. *Phragmites australis, Phalaris arundinacea, Iris pseudacorus*, etc.) have multiple functions. They:

1. stabilize the surface and insulate it against freezing,
2. provide surface area for microbial growth at the plants' roots,
3. mediate transfer of oxygen to the bacterial biofilm in the filters,
4. eliminate some nutrients by plant uptake.

If the HCW is operated and maintained properly, the treated water does not contain any pathological microorganisms and can be reused for irrigation, infiltrated into the groundwater or released into the open water bodies (streams, rivers or water reservoirs).

Hybrid CW arrangement (ellimination efficiency %)	**COD**	**BOD_5**	**P_{total}**	**N_{total}**	**N_{amon}**	**Suspended solids**
VF - HF	75-80	85-90	24-89	55-63	70-88	78-90
HF - HF	86-90	90-98	26-62	49-62	61-86	81-96
VF - VF - HF	84-98	91-99	65-83	78-83	71-99	89-98
HF - HF - VF	90	98	45	73	99	95

VERTICAL CONSTRUCTED WETLANDS (VCW)

If you have real estate in a remote area, a campsite, an agritourism enterprise or a hotel in a decentralized area that is not connected to a municipal wastewater treatment plant, then a single stage constructed wetland is the solution for you. Thanks to our innovative design, the installation area can be smaller than in the case of a usual VCW (3–5 m^2 per inhabitant).

In a VCW, the raw wastewater flows through a 3-chamber (optimally 5 and more) septic tank and then to a vertical filter. Our system uses a circulator pump in order to improve its long-term efficiency and stability.

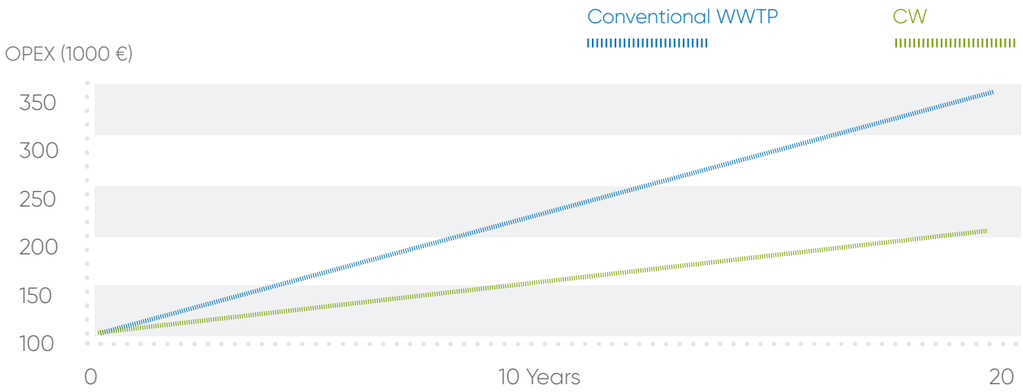
Summary of an HCW system advantages

- High efficiency removal of organic matter and nitrogen
- Can be built on an existing unitary sewage system
- Rain does not influence the removal efficiency
- Enables reuse of the treated water, e.g. for irrigation (parks, fast-growing tree plantations, etc.)
- Maintenance costs are significantly lower than in any conventional treatment plants
- No permanent control and maintenance are required
- Improves the local microclimatic conditions by evapotranspiration
- Can be furnished with a passive sludge treatment system
- Blends completely with the landscape

Summary of a VCW system advantages

- High efficiency removal of organic matter and nitrogen
- Long-term stability even with a variable wastewater load (cottages, hotels, campgrounds)
- Lower installation area needed compared to an HF
- Reuse of the treated water (e.g. for irrigation)
- Ornamental plants can be planted on the CV
- Improvement of the microclimatic conditions by evapotranspiration

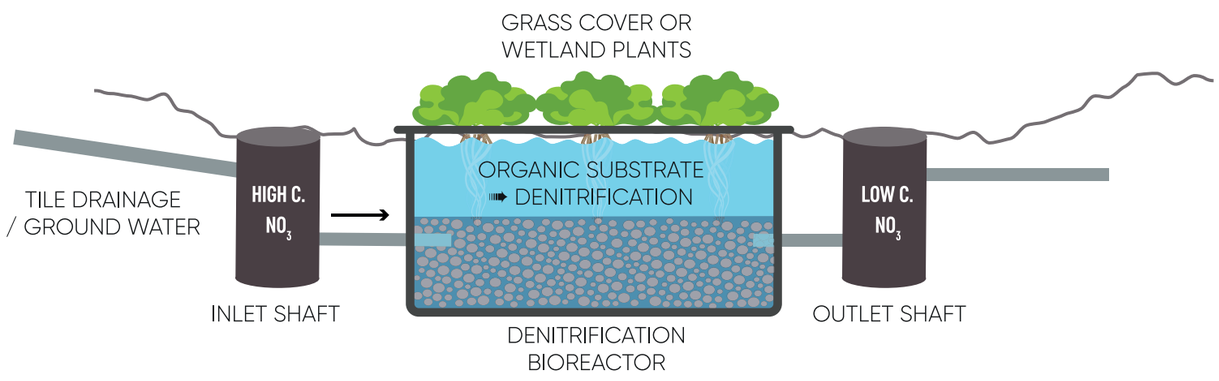
OPEX FOR 250 INHABITANTS – COMPARSION OF CW AND CONVENTIONAL SYSTEM



ABOUT DENITRIFYING BIOREACTORS

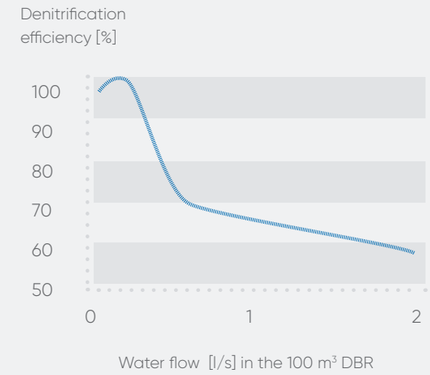
When the wastewater organic load is low and nitrate concentrations are high (like in the case of agricultural drainage water or in some Food & Beverage wastewater), then Denitrifying Bioreactors (DBRs) are the proper solution.

A surface or subsurface raw wastewater polluted with fertilizer residues, pesticides, and other substances, is collected in a tile drainage system and then flows directly into a DBR through a system of pipes and trenches. A DBR has a design similar to a CW, the main difference lies in the filtration media that is fully or partially made up of an organic material (like some special woodchips). It provides a source of carbon for the growth of microorganisms that perform the water treatment function under anaerobic conditions.



Summary of a DBR system advantages

- Low investment costs
- Low operating costs
- Low maintenance costs
- Longer lifetime
- High efficiency in a wide range of climates
- Improves the water holding capacity of the site
- The excavated material is a high-quality fertilizer that can be applied to soil



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A SELECTION OF OUR REFERENCES

HYBRID CONSTRUCTED WETLAND IN HOTEL, RESTAURANT, WELLNESS AND BREWERY

Client: Research Centre Kostelec nad Ohří
Location: Kostelec nad Ohří, CZ
Realization: 2018
Description: 3-stage hybrid HF-VF-VF CW with subsurface flow and stabilization pond for 150 PE

DENITRIFICATION BIOREACTOR FOR TILE DRAINAGE WATERS TREATMENT

Client: Soil Research Institute
Location: Velký Rybník, CZ
Realization: 2018
Description: 3 paralel HF denitrification bioreactors for maximal water flow 8 m^3/hour

SMALL HYBRID CONSTRUCTED WETLAND IN SIEM REAP

Client: Czech Development Agency
Location: Protection Centre Siem Reap, Krousar – Thmeny, Cambodia
Realization: 2019
Description: single-stage hybrid CW unsaturated subsurface flow for 15 PE

HYBRID CONSTRUCTED WETLAND FOR VILLAGE BOGUŠIĆI

Client: Czech Development Agency
Location: Bogušići, town Goražde, Bosnia and Hercegovina
Realization: 2019
Description: 2-stage hybrid VF-HF CW with subsurface flow for 150 PE

TERTIARY TREATMENT HYBRID CONSTRUCTED WETLAND IN SPÁLENÉ POŘÍČÍ

Client: Spálené Poříčí
Location: Spálené Poříčí, CZ
Realization: 2019
Description: 2-stage hybrid CW with subsurface as tertiary treatment for 700 PE

DENITRIFICATION BIOREACTOR FOR GOLF COURSE LOAN DRAINAGE TREATMENT

Client: Engelmann Czech, s.r.o.
Location: Nebřenice Golf course, CZ
Realization: 2019
Description: 6 individual HF or VF denitrification for treatment of drained irrigation waters

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OUR READY-TO-USE SERVICES

01. Identification of the suitable area

02. Design, installation & maintenance

03. Reconstruction of non-functional CWs

04. Monitoring & analytical services

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