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**Wastewater treatment in rural areas
with constructed wetlands**

Simply natural treating sewage!




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I want to introduce myself shortly:

Clemens Dwornitzak
Born in 1962, in the City of Goslar,
married, 2 kids
skilled landscaper,
graduate engineer of landscape conversation, degree in 1989
living in Edewecht (next Oldenburg, north of Germany).

**Wastewater treatment with constructed wetlands since 1996,
specialized in do-it-yourself-projects in smaller units with more
than 750 realized projects during this time in Germany, Austria,
Spain and other countries**

Management consultant for landscaping companies in Germany




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What are constructed wetlands ?

Constructed wetlands are gravelfilter overgrown with different aquatic plants, which live together in a biocoenosis of microorganisms in the gravelfilter which nourish from the ingredients of the water.

Constructed wetlands can be used as secondary clarifier with mechanical preliminary cleaning or as independent complete system

A special form of constructed wetlands is the dewatering of sludge of every kind with plants.

Constructed wetlands can also be used for landfill leachate



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Constructed wetlands are not only parts of wastewater treatment, they are a gain of natural environment.

Sometimes you'll find constructed wetlands in private properties also as design-element outside



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How does a constructed wetland work ?

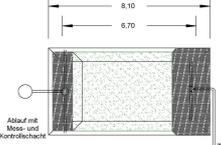
The expiration of preliminary cleaning belongs hypogean to the constructed wetland and passes the filter in horizontal direction. **It works without foreign energy!**

There is no open water to be seen!

At the end the water belongs through a pipe to the duct of control outside the treatment basin. In this duct at the end, water samples for testings can be taken and the waterlevel in the treatment can be adjusted

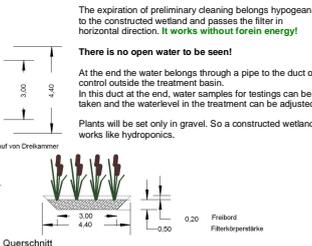
Plants will be set only in gravel. So a constructed wetland works like hydroponics.

Draufsicht / Grundriß

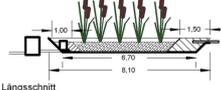


Ablauf mit Mess- und Kontrollschacht

Querschnitt



Längsschnitt





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How does a constructed wetland work ?

The roots of reed and other plants have an important duty:

- Loosening up the filter
- Living space for microorganism
- Oxygenation capacity into the filter
- Assimilation of nutrients from the water / the sewage:
 - (N) Nitrogen is used by the plants for length growth
 - (P) Phosphate is used for flower formation and fruit formation / for maturity
 - (K) Kalium/Potassium is necessary for cell-building

It's always the same process like artificially fertilize:



Roots of reed (Phragmites communis)




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How does a constructed wetland work ?




Ingredients of artificial fertilizers:

N = Nitrogen
P = Phosphate
K = Kalium (Potassium)

Or natural fertilizers:




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How does a constructed wetland work ?

Natural fertilizer: cow dung ...



Ingredients:

The same than in Human wastewater ...




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Laws and regulations for constructed wetlands in Germany
The most important regulation in Germany for constructed wetlands is

DWA – A – 262

which contains the dimensions of the different types of constructed wetlands:
Horizontal filter: 5 m² per person on the bottom of the basin
filterthickness = 50 cm

Vertical filter (since 2006): 4 m² m² per person on the bottom of the basin
filterthickness = 60 cm in addition with 20 cm drainage on the ground (all together 80 cm)

The combination between horizontal and vertical filter are not regulatet, but dimensions und 4 m² will be not approved in Germany.

For preliminary Systems (multi-chamber-systems) DIN 4261 is th ost important regulation in Germany.

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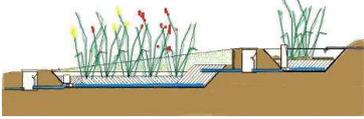
Multi-chamber-systems



Multi-chamber-Systems in Germany must be proved to a volume of 1,5 m³ per person.

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... alternate to multi-chamber-systems ?
Sludge sewage treatment



raw wastewaters are pumped onto the surface of a specified constructed wetland. The sewage sludge continues on the surface of the reedfilter, while the water sinks to the ground of the sealed up basin.
The volume of the sewage sludge will be reduced to 10 % of its inflat volume. The water will be collected on the ground and derived from the basin into the following constructed wetland (reed bed sewage).



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Sludge sewage treatment - a greater one



Klärschlammvererdung Quedlinburg

Because of the high evaporation of reed during the summertime, reed is used to dehydrate / to drain sludge sewage and reduce its value up to 10 % of its inflats. The process is the same than in smaller treatments

Great sludge sewage treatments are working in Quedlinburg (30.000 EGW, Built 1996), Emden (90.000 EGW, Built 1998 and Norderey (22.000 EGW).



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... alternate to multi-chamber-systems !



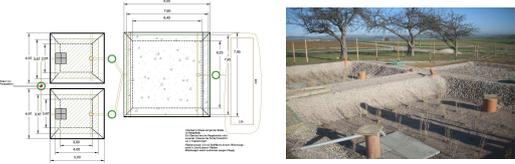
Example from Wolfenbüttel for 80 pers. (Rittergut Altenrode)
Built 2001



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... alternate to multi-chamber-systems !

Grundriss für 8 EGW





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Maintenance of constructed wetlands:

Following Works have to be done:

- Mowing outside the treatment
- Mowing of plants during the late winter
- Control of weeds / pull up weeds
- Cleaning/rinsing the duct of control
- Control of the waterlevel
- Control of gravel cover of the foil gasket
- 1 forein maintenance with laboratory every year





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Maintenance of constructed wetlands:



is regulated by law in Germany
 1 – 2 maintenances every year

Messure of sludge blanket in the multi-chamber-system
 PH-Value, COD-value
 COD= chemical oxygen demand (describes, how many oxygen is needed for oxydation of all organic ingredients in the water (sample)) The COD is the most important index of detergence for a sewage treatment
 Control of mechanical damages
 Control of the multi-chamber-system
 Control of the log book.



Bottom line:

Constructed wetlands are a very simple and safe method for purification of sewage in rural areas:

- Safe for the people who build them
- Safe for the people who use them
- Safe for the nature, which only gets back, we lent before.



Thank you
for your
attention!
