Wastewater Treatment in Protected Landscape Areas

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Content of this presentation

- Specifics of an island house
- Specifics of objects in PLAs
- Range of solutions
 – extensive x high tech
- NASS, explanation and usage options
- Case study on specific site with conclusion
- Overall conclusion including recommendations for the ideal technical solution
- Some inspirational examples





Island house - specifications

- Individual water management solutions
- Depending on the resources available
 - Potable water(supply network, well, surface water, rainwater, ???)
 - Process water (ditto)
- According to the possibility of waste water disposal
 - Infiltration
 - Discharge to surface water
- Use dependent (uniform, non-uniform flow)







Specifics of objects in PLAs

- Comfort requirements (often unrealistic)
- Irregularity in use
 - Seasonality, changes during the week
- Above-standard cleanup requirements
- Limited accessibility (no communication)





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Range of solutions

- High tech
 - MBR, SBR (membrane reactors)
- Extensive solutions
 - Root Zone WWTP, ground filter
- NASS solution
 - Urine separation
 - Dry, compost toilets
 - Flowless solution (evaporation, spray)
- Balancing sumps (as the last solution)







High-tech with SBR

 HSBR – possibility of adapting volumes to current (assumed load)







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Application of MBR as a high-tech (HT)





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An example of a HT scheme for extreme conditions



House of Nature

http://www.dumprirody.cz/moravsky-kras/clanky-a-fotogalerie/odlesky-pocatku-domu-prirody-2016/









High tech summary

- Application where high comfort requirements meet high sewage production – reflected in price
- Characteristics:
 - High investment and operating costs
 - Need for skilled operators with knowledge of biological process control or remote access
 - Need to dose the substrate when needed





Extensive options

-Septic (AS-ANASEP) -Nitrification filter(AS-ZEON)





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An example of a large vegetation WWTP





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Be aware of the difference horizontal and vertical









Legislative innovation is a new standard for WWTPs up to 500 EO

 Among other things, there is a substantially changed part for the vegetation treatment plant ... and it already contains the concept of anaerobic separator - see our AS-ANASEP

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Extensive options

- Typically suitable for smaller objects with nonuniform loads in larger buildings, a problem with legislative requirements for nitrogen removal (denitrification) and possibly phosphorus
- Size limitations
- Need to combine, for example, with urine separation, reduction of inflow Nitrogen and Phosphorus – see NASS





NASS Know-How

- What is NASS ?
 - New Alternative Sanitation Systems
 - Umbrella title for wastewater treatment technologies based on water separation giving priority to minimizing and recycling at the point of origin
 - Also known as DESAR or other names
 - NASS is mostly used nowadays in Germany (see DWA -A_272)

.. but basically nothing new, just a return from a dead end ...





Water separation as the cornerstone of NASS







Wastewater types



Urine separation

• Toilet bowls with urine separation







Urinal

• Gents, ladies ...even dogs







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Urine separation

• Waterless urinals









Urine separation



- Why urine separation
 - Removal of nutrients from wastewater (N, P)
 - Easier and cheaper cleaning process (eg 50% savings on investment and operating costs)
 - Removal of operational problems (it is much cheaper to remove urine than problems),
 - Waterless urinals- cheaper urine removal





Composting or dry toilets as a part of flowless systems





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Composting toilets









Information center in the PLA in a busy location (With possible infiltration, without electric power)

- Option (a): Comfortable flush toilets without any water stream separation and a high-tech process for cleaning with substrate dosing, phosphorus precipitation and membrane bioreactors (MBRs) – a solution usually used in luxury mountain chalets in the Alps.
- Option (b): Flush toilets with urine separation in women segment plus waterless urinals; the wastewater solution based on a septic tank (anaerobic reactor), a vertical filter, and urine receivers.





Information center in the PLA in a busy location

- Option (c): Dry toilets for tourists, flush toilets for the staff – cesspools for excreta from dry toilets; the wastewater solution based on a septic tank for the staff, a vertical filter, and urine receivers.
- Option (d): Comfortable flush toilets with the solution: septic tank + vertical filter + sorption filter. (Note: Option (d) has been excluded for legislation reasons, unrealistic demand for the area and problematic removal of N_{total} under the level of 20 mg/l).







Information center in the PLA in a busy location

 Option (e): see Australia – container flush toilets with minimisation of water consumption. Flush toilets for the staff solved through a septic tank plus a vertical filter.







Cost of individual options



a) High tech, b) urine separation, septic + filter, c) waterless toilets+ sumps,d) Flushing toilets and a septic tank with a filter, e) lowflush + sumps





Summary – real favorites

- Dry toilets with minimal water demand and waste disposal at the WWTP (option c – classic dry toilets, option e – containers, see Australia)
- Or flushing toilets with urine separation and extensive type treatment- septic tank and vertical filter (possibly additional sorption filter) – partly discharged into underground water and partly collected and disposed





Example of water separation from Bolivia



The ideal state – separation without discharge



The ideal state-waterless solution





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Australia and type solutions with minimal water consumption



New Zealand- dry toilets



Dry toilets



Toilets without sewerage system

Melinda and Bill Gates foundation



Wrap-up: The best is probably a dry toilet

Even if someone needs to take care of it (aircraft, train)





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