GREY WATER USE IN DENMARK

- EXPERIENCES AND RULES

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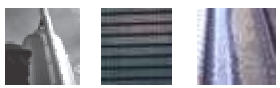


MOE & BRØDSGAARD Consulting Engineers

2 development projects on greywater use.
Financed by the Ministry of Environment

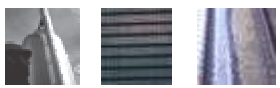
1 development projects on rainwater use in a public swimbaths.
Financed by the Ministry of Environment

Design of two large rainwater systems.

One with 700 users, 20 toilets and one with 400 users 15 toilets.

Greywater plants in Denmark 1991 - 2002

- 35 plants has been established in housings, apartment houses and camping sites
- From 10 plants the treated water has been used in toilets
- 7 plants where still aktive in 2002



Greywater plants in Denmark 1991 – 2002

Technology

- Biofilters in closed tank with or without oxygen supply – approx. 25 plants
- Sandfilter systems – approx. 9 plants
- Biorotator – 1 plant

Development project on Greywater

Financed by the Ministry og Environment

VESTBADET I/S
Public swimbath – 50 m bassin

- 15.000 m^3 greywater/year
  40 m^3greywater/day
- Two large apartment houses as neighbour

Development project on Greywater

Financed by the Ministry og Environment

Technology:

- Pilot test scale 5 m^3/day
- Double sandfiltersystem
- Normal compressor oxygen supply
- Pure oxygen (97%) supply.
- UV-treatment

Development project on Greywater

Financed by the Ministry og Environment

Results:

- The plant could not reduce BOD and detergent efficient, only 40-60%.
- The UV was not efficient because of high content of materials in the sandfilter treated greywater.
- The water quality was very variable
- The plant was closed down

Development project on Greywater

Financed by the Ministry og Environment

"NORDHAVNSGÅRDEN "

Apartment building in Copenhagen with 300 apartments.

In 1991 a plant was closed because of very bad smell.

Development project on Greywater

Financed by the Ministry og Environment

Technology:

- Pilot scale 5 m^3/day, 80 apartments
- Bio rotator – LOKUS GmbH

Development project on Greywater

Financed by the Ministry og Environment

Results:

- Comprehensive measureprogram – chemical and microbiological parametres
- Very high water quality, close to the drinkingwater criteria
- Constant high water quality
- Reliable technology

Development project on Greywater

Financed by the Ministry og Environment

Results:

- Content of chemicals and heavy metals in the untreated greywater is in generel very low and is assessed not to constitue a health risk for use in toilets.

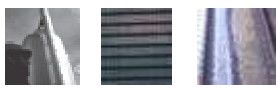
Microbiological parameters

Parameters	Inflow (untreated)	Outflow (treated) after UV
Bacterial counts 22°C *Per ml*	1.500.000 – 36.000.000	3- 25
Bacterial counts 37°C *Per ml*	3.000.000- 12.800.000	1 – 34
Thermo-tolerant coliform, *per 100 ml*	100.000 – 640.000	< 100
Enterococci *Per 100 ml*	70.000 – 1.100.000	< 100
BOD *Mg/l*	65 – 75	1- 2

Rules and legislation for greywater use en Denmark

Drinkingwater criteria, Bkg 2001-09-21 No. 871

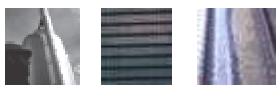
Parameters	Inflow in building
Coliform bacterials, *per 100 ml*	Not measurable
Escherichia coli (E.coli), *per 100 ml*	Not measurable
Bacterial counts 22°C, *per ml*	200
Bacterial counts 37°C, *per ml*	20
Clostridium perfringens, *per 50 ml*	Not measurable
Enterococci, *per 100 ml*	Not measurable



Rules and legislation for greywater use en Denmark

Use of rainwater

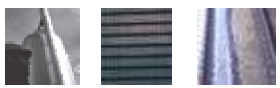
- Allowed for toilet flush and machinewash of clothes in houses, apartment buildings, office buildings and private companies
- Components has to be VA (DIN) approved
- No water quality criteria to comply with
- Technical Instructions for design and installation has to be followed



Rules and legislation for greywater use en Denmark

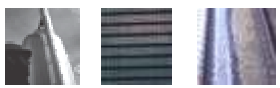
Use of greywater

IT IS NOT ALLOWED



What will happen?

- The Ministry wanted a better knowledge and experience on greywater systems and initiated several development project.
- NORDHAVNSGÅRDEN has ”proved” that a functional, reliable and cost effective technology exist.
- The system can produce water of constant very high quality, near drinkingwater quality



What will happen?

- The basis for the Authorities decision on use of greywater does exist now
- The Ministry of Environment and the Ministry of Health has to decide next step
- I WILL NOT GUESS!