Summary

of the presentations held at the 3rd project meeting
(August 2010)

Explanation:

In August 2010, the third meeting was held where all project partners came together. So all partners have presented their latest results. The public parts of their presentations are available in German. The most important slides of their presentations have been translated for you.

If you have further questions, don´t hesitate to contact us:
info@saniresch.de

Yours
Matthias Hartmann & Martina Winker

Contents:

- Presentation 1: Sanitary and in- house installations (Christoph Stein, GTZ)
- Presentation 2: Economic feasibility of in-house installation (Andrés Lazo Páez, TUHH)
- Presentation 3: Agricultural production (Ute Arnold, University of Bonn)
- Presentation 4: Quality of the products / storage of urine (Bettina Schürmann & David Montag, RWTH Aachen)
- Presentation 5: Operating and monitoring of the MAP reactor (Johanna Heynemann, FH Gießen)

Presentation 1:

Christoph Stein

Sanitary and in- house installations:

Wastewater separating system in Building 1: measures and observations undertaken by GTZ

Delay of maintenance

- Cleaning: three years the NoMix toilets were cleaned like normal toilets.

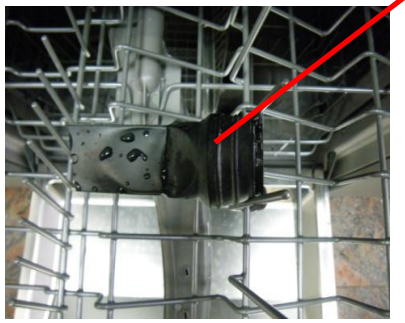
→ Strong depositions in the valves.

→ Introduction of a cleaning routine with Mellerud.

→ Start: 27.11.2009

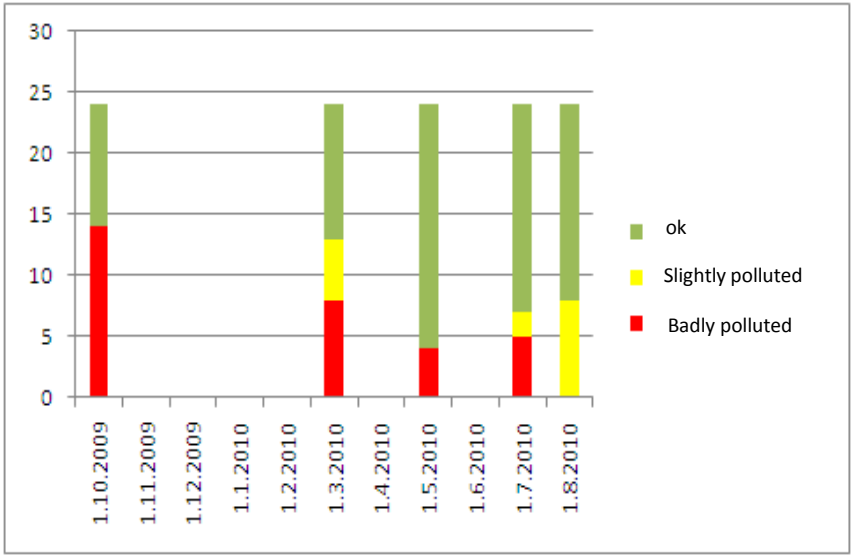
Urinals: Cleaning of the smell stops

- Manual cleaning is necessary
- Work is considered as very unpleasant by cleaning personal
- Cleaning in the dishwasher was discarded



State of the smell stops

- Introduction of a monthly monitoring of the smell stops.
- Improvements noticed.
- With regular and proper cleaning of the smell stops the work is not so unpleasant anymore.
- Second smell stop available for immediate exchange.



Summary

- NoMix toilets:
  - New seals and bowden cables seem to prove themselves.
  - The monitoring of the deposits in the valves will be continued.
- The control of the urinals will be continued.
- How to deal with the flies in the yellowwater system remains unclear (probably not a negative influence).

Presentation 2:

Andrés Lazo Páez
(Diplomant)

Economic feasibility :

Economic studies on the in-house sanitary installation in Building 1 of the GTZ

Methodology

Economic feasibility studies

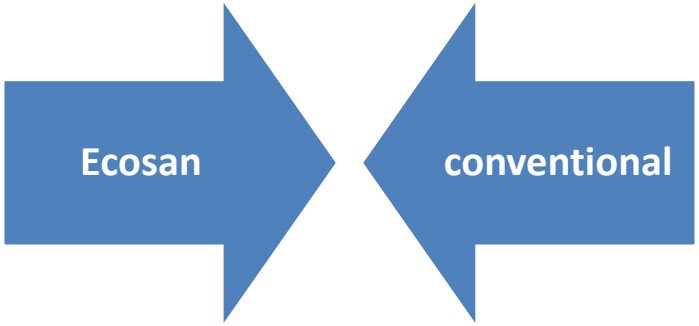
- Economic benefit
- Cost difference: SANIRESCH – conventional sanitation system
- Sensitivity to external variables

Internal sanitary installations for the collection and transmission of the gray-*, yellow-, and brownwater

- Guidelines for the implementation of dynamic cost comparison calculation (LAWA, 2005)
  - Comparability(in Germany)
  - Suitable for infrastructure
  - Dynamic Model

Methodology

- Structure of the model:
  - Investment costs
  - Reinvestment costs
  - Running expenses



- Important parameters:
  - Real interest rate: 3%, according to LAWA (2005); BMF (2010)
  - Survey period: 50 years, according to LAWA (2005); Prager (2002)
  - Useful life: 25-35 years, according to Prager (2002)
  - Discounting factors: (3% real interest rate, 50 years)
  - Reference year: 2010

Results (Investment costs)

Element	*Total price – conventional, P (€)*	*Total price – ecosan[b], P_E (€)*
Pipes & accessories	95,300	138,900
Urinals & toilets	57,100	84,100
Total (€)	**152,400**	**223,000**

[a] GTZ (2004)
[b] Maßalsky (2006)

- Cost difference: €70,600 – 62% of pipes and accessories
- Pipes and accessories vs total price: 63%(K), 62%(E)
- Urinals & toilets: (E) = 1.5x(K)

Results (running expenses)

Element	*Unit*	*convent. system*	*ecosan system*
Staff for the mechanical maintenance	€/yr	200	1,100
Wastewater fees	€/yr	1,800	1,700
Cleaning of the system	€/yr	8,400	8,400
Drinking water consumption	€/yr	200	200
Extra cleaning agent	€/yr	0	600
Service quantities	€/yr	800	1,200
Annual costs (AC)	€/yr	**11,400**	**13,200**

6%

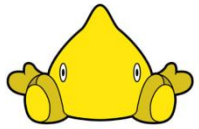
+/- 20%

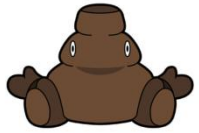
- AC-difference: €1,800 (16%)
- Little water saving: 6% to22%
- Maximum water saving: -20% of the annual costs
- Most important effect on annual costs: Extra cleaning agent

Results (cost comparison)

Element	*unit*	*convent. system*	*ecosan system*
Investment	€	152,400	222,900
Reinvestment	€	65,700	89,300
Annual investment	€/yr	8,100	11,300
Running expenses	€/yr	11,400	13,200
Annual costs	**€/yr**	**19,500**	**24,500**
Investment	€	152,400	222,900
Reinvestment	€	65,700	89,300
Running expenses	€	293,300	339,600
TPC	**€**	**511,400**	**651,800**
DPC	**€/m³**	**11.8**	**15.5**
DPC2	**€/use**	**0.069**	**0.088**

http://www.employeerightspost.com/uploads/image/toilet1%2281%29.jpg





http://www.ahoodie.com/wallpapers/pee-and-poo_wallpaper1.jpg

- Assumption 1: Unit for DPC
- Assumption 2: Criteria for the evaluation of a change

Summary & Outlook

- DPC_E = 0.088 €/use and DPC_K = 0.069 €/use
- Total project costs for GTZ = €651,800 (3% real interest rate; 50 years)
- Investment costs for GTZ = €222,900
- Pipes and accessories are the largest share of investment costs.
- Cleaning of the system + Payment of the wastewater charges represent the largest fraction of the annual financial costs
- Most sensitive aspects:
  - Price Toilets & Urinals
  - Numbers of use

Presentation 3:

Ute Arnold
(University of Bonn - INRES)

Agricultural production:

Agricultural and environmental aspects of urine treatment

Field experiments 2010

Miscanthus experiment

1. Monitoring
2. Mineral fertiliser
3. Yellowwater

Fertilising of existing plants in March 2010

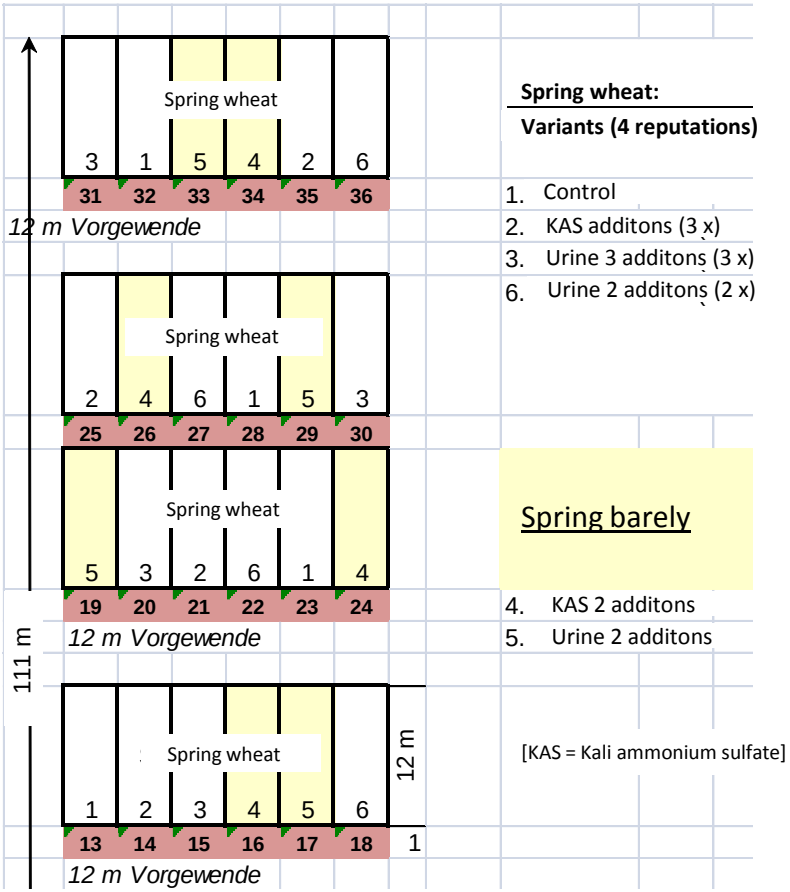
Harvest in January 2011

Field experiments 2010

Spring wheat - experiment

- Variation
  1. Monitoring
  2. Mineral fertiliser
  3. Yellowwater (3 x)
  4. Yellowwater (2 x)

- Spring barley
  1. Mineral fertiliser
  2. Yellowwater



Field experiments 2010

Results

Wheat, 6.7.2010

Field observations

- Difference between the monitored – and the fertilised variant
- No obvious difference between the mineral fertiliser parcels and the yellowwater parcels indentified
- No vermins
- Weeds from the adjacent test detected in the first plots of the last row.

Field experiments 2010

Analysis of the results

- Income
- Dry matter
- Thousand grain weight
- Grain-size distribution
- Straw biomass

→ still to be accomplished

Further Analysis

- Nutrient analyses in the grain
- Analysis on medicament residues in wheat grains (RWTH Aachen)

Conservatory experiments 2010

Short overview

- Preparation (substrate/pots)
- Fertilisation with yellowwater (yw)
- Sowing wheat
- Fertilisation with spiked yw
- Serial irrigation
- Plant protection

- Spring wheat Triso
- Five active substances

Conservatory experiments 2010

Active substances

- Consumption of relevant amounts
- Excretion in the urine
- Environmental relevant (persistent)

  - 17ß Estradiol - hormone
  - Diclofenac - anti rheumatic agent
  - Carbamazepine - anti epileptic
  - Atenolol - beta blocker
  - Verampamil - calcium entry blocker

  in two ore three different concentration levels: 50µg/L ,500 µg/l, 5 mg/L

Conservatory experiments 2010

First results

- The wheat seeds germinated not in all pots with yellowwater fertilisation.
  Observations made:
  → Germ blocking differences between different varieties,
  yellowwater dilution has an effect.

- No reaction of the plants at the second fertilisation after germination seen (Keine Reaktion der Pflanzen bei 2.Düngung nach auflaufen erkennbar)
- Influence of adding active agents is not known yet
- Pests (aphids, fungus) due to the wet weather

→ Experiments are not completed

Presentation 4:

Bettina Schürmann
David Montag
(RWTH Aachen)

Quality of the products / storage of urine:

Urine storage

Operations 2010

- **<u>Storage tests with fresh urine (interim results)</u>**
- Duration: 6 months
- Storage in the dark at 20°C
- Different pH-values adjusted
- Dose ca. 100 µg/l of:
- Bisoprolol
- Carbamazepine
- Chloroquine
- Diclofenac
- Metoprolol
- Sulfamethazine
- Tramadol
- Ibuprofen

Operations 2010

- **<u>Storage tests with fresh urine (interim results)</u>**

22.4.2010

22.7.2010

Operations 2010

Additional investigation planned

- **Attempt to dry the MAP**

  - Temperature: 30°C, 50°C, 70°C, 105°C

  - Determination of total bacterial numbers in the fresh precipitated product and the dried products

  - Detection of N:P:Mg after the drying process

Presentation 5:

Johanna Heynemann
(FH Gießen-Friedberg)

Operating and monitoring:

Operating and monitoring of the MAP-reactor

&

Further project planning

Monitoring of the MAP-reactor

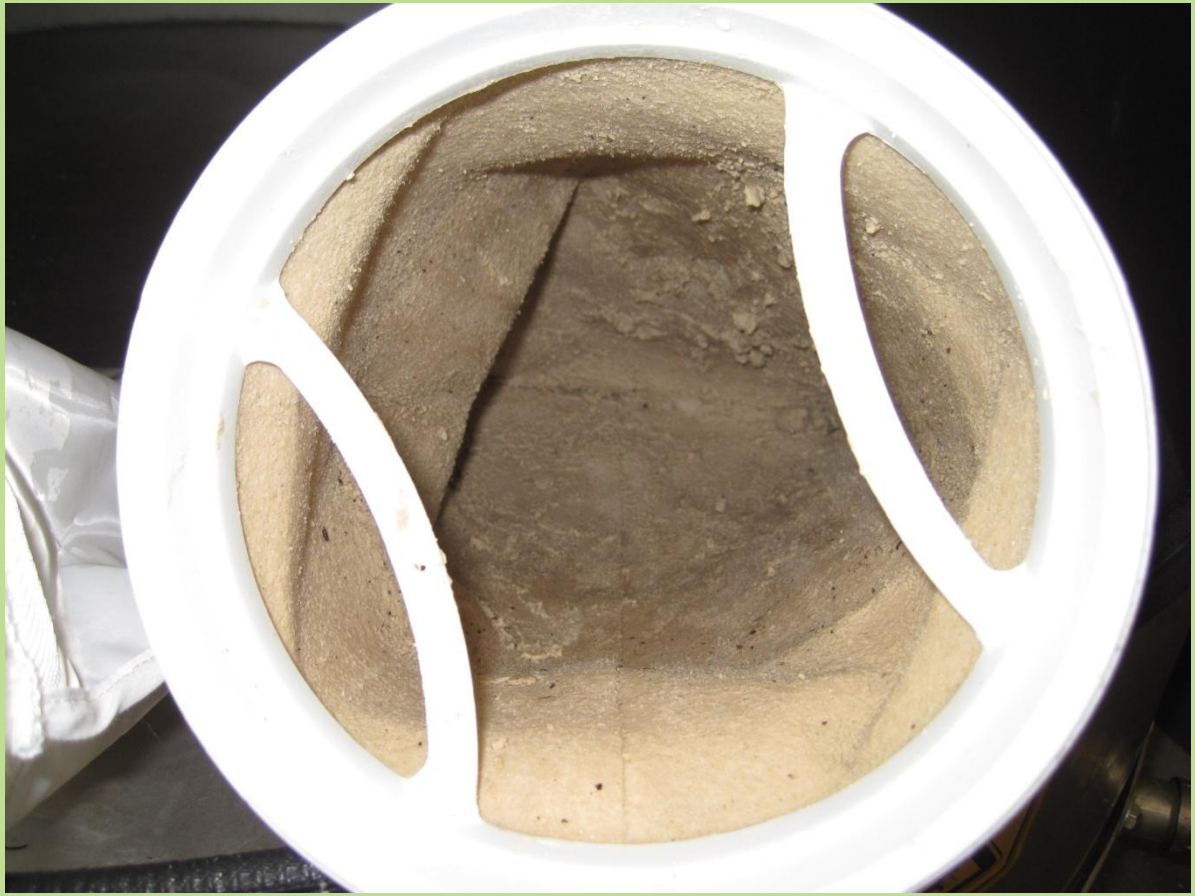
- Every 3 to 4 days (depending on the number of cycles).
- After changing to a new tank.
- Control of the inlet- and outlet values (monthly).

Operation (so far)

- Adjusting the amount of MgO to the phosphate concentrations in the tanks.
- Replacement of the polypropylene filter bags by nylon filter bags for the recovery of struvite.

Comparison of the filter materials

- Polypropylene (needle felt)



Needle felt

loaded

Comparison of the filter materials

- Polyamide (Nylon)

Nylon

loaded

Wet

Further experimental steps

- Quantifying the differences of the filter bag materials.
- Influence of the sedimentation time on to the production of MAP and the crystal size.
- Connected with this: Pore size of the filter material.

Further experiment steps

- Diversifying the number of cycles and check the influence of that on the usability of the filter bags.
- Verifying the β-Factor.
- Comparison of different analytical procedures for specific parameters (rapid test + ion chromatograph).

Further experiment steps

- Influence of the overlap on the already formed struvite
- Influence of stirrer characteristics on the MAP accumulation
- Influence of storage time on the struvite accumulation and the PO_4 concentration in the yellowwater