

Urine diversion in GTZ's main building in Eschborn and utilization of diverted urine – a demonstration and research project

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INTRODUCTION

The Deutsche Gesellschaft f ur Technische Zusammenarbeit (GTZ) GmbH is an international enterprise for international cooperation, working for sustainable development worldwide. GTZ headquarters are located in Eschborn, near Frankfurt am Main, Germany. The main building of the headquarters is currently under renovation. Within the renovation measures, GTZ is currently implementing a modern system for the separate collection and reuse of urine. A treatment and reuse system for black or brownwater will possibly be added within a pilot and research project (GTZ 2005).

The direct aims of the project are to minimize emissions of nutrients and microcontaminants such as pharmaceutical residues and hormones into the public sewer system and receiving water bodies, and to allow the recovery of nutrients for agricultural use.

OBJECTIVES OF THE PROJECTS

Urine separation is a very recent concept in Germany. There are no mature treatment technologies for urine available so far, and nowhere a regular real-scale reuse scheme for urine has been set up until today. The regular and authorized utilization of urine or urine-derived products is not possible in most European countries, as there are still no clear regulations for urine use existing within laws for wastewater management, fertilizer use, soil protection etc.

A controversial issue with respect to urine separation are the chances and risks concerning the environmental impact of microcontaminants such as pharmaceutical residues or hormones that are found in source separated urine. To date there is still little scientific evidence available on the fate of those substances within different treatment systems and in the soils after land application.

Comparative risk assessments for the disposal of microcontaminants in the water bodies versus land application are urgently needed.

The implementation of a joint research and development program together with several universities and private companies is planned as well. The goal will be to develop various treatment technologies for urine treatment and reuse practices up to readiness for marketing. Crucial questions such as user acceptance, environmental and health impact of urine reuse, economics and resource efficiency, as well as the regulatory framework will be studied as well. The project offers a unique chance for research institutions and private companies for applied research on real-scale level on concepts for closed-loop wastewater management.

The project is implemented in two phases:

(1) Construction of urine separation system within the renovation works, financed by GTZ and supported by the Ministry for Environment of the State of Hessen (on-going).

(2) Implementation of urine treatment and reuse, as well as possibly a black- or brownwater treatment and reuse system within a research project, to be financed by the German Ministry for Education and Research and contributions of research partners.

TECHNOLOGIES APPLIED

Urine separation system

The central part of the building, housing about 300 employees, the conference rooms and the restaurant is equipped with a urine separation system:

- ◆ 56 urine separation toilets, water flushed and waterless collection of urine (model Roediger)
- ◆ 25 waterless urinals with membrane smell stop
- ◆ Separate piping system for urine collection
- ◆ 16 m³ urine collection and storage tanks in the basement of the building

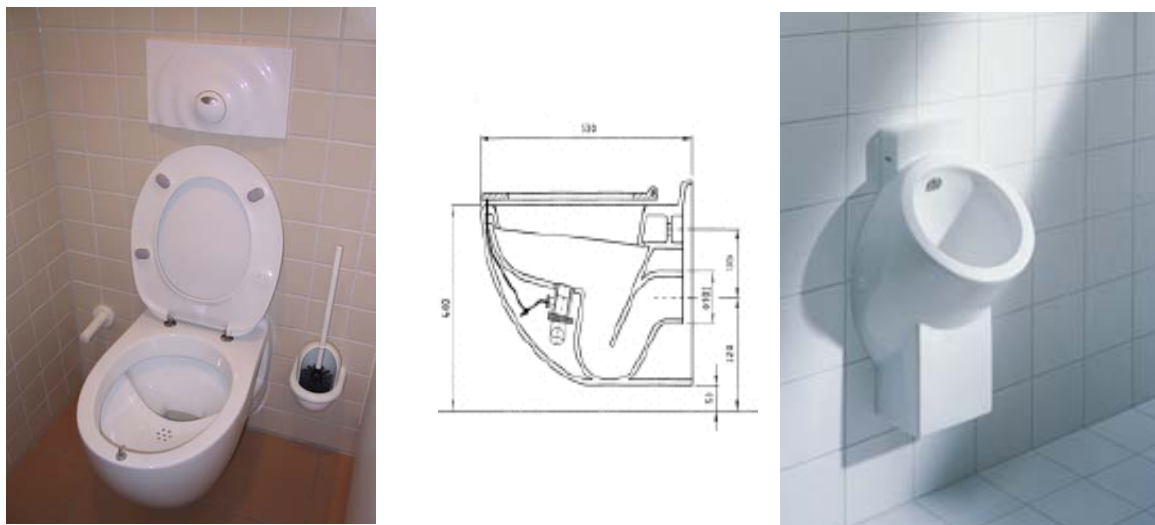


Figure 1. Urine separation toilet (*source: Roediger*) and waterless urinal (*source: Keramag*)

Urine treatment

Urine treatment will be implemented within the research component. Two treatment options will be implemented in real scale:

- ◆ Treatment by prolonged storage for direct application of urine on fields
- ◆ Precipitation of phosphorous and nitrogen from urine (MAP-precipitation), combined with ammonia stripping.

Further treatment options will be tested on laboratory-scale and for demonstration purpose:

- ◆ Nutrient adsorption on zeolithes
- ◆ Thermal urine concentration

Optional black/brownwater treatment

The implementation of a black or brownwater treatment and reuse system is currently being discussed. The considered technical components include:

- ◆ Solid-liquid separation
- ◆ Dewatering and composting of solids
- ◆ Treatment of liquid fraction in an activated sludge reactor with membrane filtration.

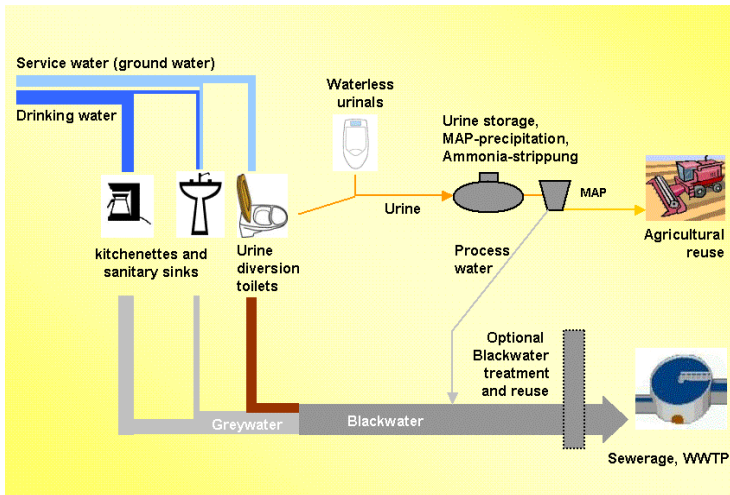


Figure 2. Flowchart of urine separation system in the GTZ main building with optional blackwater treatment

Type of reuse

- ◆ Reuse of treated urine and compost derived from faeces will be realized within the research project. Regular urine reuse in agriculture is not yet possible under German fertilizer laws.
- ◆ Reuse of stored urine and mineral nutrients extracted from urine on agricultural research plots
- ◆ Use of compost on agricultural research plots

CONCLUSION

Urine separation, one of the major concepts for ecological sanitation, is being implemented in the GTZ building as a showcase (GTZ 2005). The feasibility and the advantages of the system will be demonstrated to contribute to the international dissemination of the ecological sanitation concept. The GTZ main building is visited daily by an important number of decision-makers from all over the world and so extremely suitable for such a demonstration project.

GTZ, already very active in the field of ecological sanitation, is underlining its commitment to the promotion of innovative sanitation concepts by implementing this project in its own buildings.

REFERENCES

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