HUBER TECHNOLOGY

HUBER INNOVATION

Research Projects Worldwide

The Quality Company – Worldwide

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Foreword

According to a 2006 report of the United Nations, 1.1 billion people worldwide (one fifth of world population) have no access to clean potable water and around 40% of the global population have to live without proper sanitation and wastewater treatment. In order to achieve the **M**illennium **D**evelopment **G**oals (MDG) to half the number of people without access to clean drinking water and without proper sanitation by the year 2015, it is imperative to develop adapted concepts and customized solutions. Generally, decentralized and resource-saving solutions must be preferred; solutions, achievable with the available resources and adapted to the needs of the people, permitting sustainable development by consequent recycling and integrated management of resources.

Due to its conviction of the ecological and socio-economical relevance of recycling, the Hans Huber AG invests in several research and demonstration projects with the implementation of decentralized wastewater treatment systems that enable the recovery of nutrients as well as the reuse of water. These innovative sanitary concepts are called Decentralized Sanitation and Reuse (DeSa/R®) solutions. It is our objective to promote public acceptance of new complete system solutions and, finally, to improve our chances to export our own technologies, by transfer of know-how and participative processes.

This booklet introduces research projects of the Hans Huber AG that have been carried out with the objective to develop and test, under practical conditions, DeSa/R® systems that generate service water of various quality and recover nutrients as well as energy from wastewater.

Dr. Stefania Paris,
Head of R&D

Berching, Mai 2008

The HUBER Research Team – Global Activities

The HUBER Research Team

We develop and test our new technologies at our headquarters in Berching. To adapt them to the different specific requirements prevailing in the individual countries around the world, additional on site testing is carried out. The implementation of demonstration projects, in cooperation with research institutes, ensures the reliable operation and know-how transfer with package solutions in other countries. Our goal is the development of new technologies and sustainable solutions.

Laboratory

Our new certified laboratory at our headquarters in Berching provides state-of-the-art analysis equipment for the determination of more than 30 different wastewater parameters (hardness, chlorides, etc.) in accordance with the presently applicable standard methods. The floc structure and diversity of microorganisms in activated sludge are analyzed microscopically. Our laboratory carries out among others the required analyses within the scope of regular maintenance of small onsite sewage treatment plants.

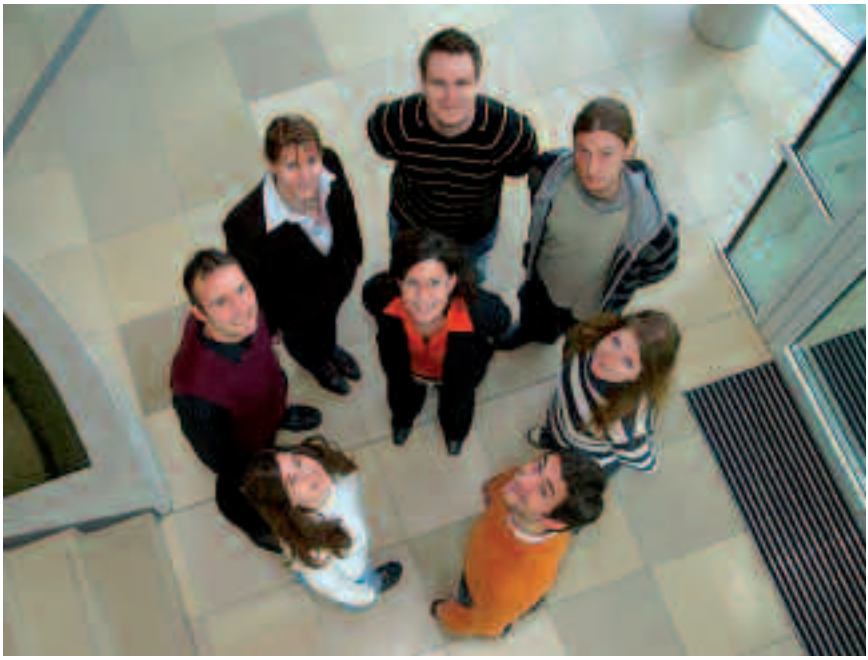
HUBER INNOVATION – Ideas for Water

Introduction

Closing local water, material and energy cycles

The treatment of municipal wastewater close to the source is one of the main goals of DeSa/R® (Decentralized Sanitation and Reuse), so that the treated water can be safely reused for irrigation of agricultural land, infiltration or as toilet flush water.

In cooperation with internationally renowned research facilities, and partly on its own, the Hans Huber AG runs various ambitious research projects worldwide. Its goal is to demonstrate how to close local cycles by means of simple and cost-effective technologies. Wastewater is no longer considered waste material but a "secondary" raw material for the recovery of service water, fertilizer and energy.



The HUBER Research Team

Research Topics

anaerobic

A very promising method of wastewater treatment is the anaerobic treatment technology. The main advantage of this method is the production of nutrient-rich fermentation residues, which can be used as fertilizers or soil improvers. In addition, the produced energy-rich biogas enables the generation of heat and electricity.

mechanical

Mechanical treatment systems are fast and affordable solutions that enable the elimination of most solids from raw wastewater. The conventional liquid-solid separation and the mechanical chemical treatment (precipitation and flocculation) provide a significant improvement of the effluent qualitiy.

membrane

The most innovative technology for biological sewage treatment is the Membrane BioReactor (MBR). The treatment of the MBR is a combination of the well-known activated sludge process and membrane filtration. Our submerged ultrafiltration membranes enables the production of a germ-free effluent, which is suitable for reuse.

urine

Most of the nutrients in wastewater are introduced with urine. Around 87% of the nitrogen and 50% of the phosphorus are dissolved in only 1 to 1.5 l/(P*d) of urine. So it is suggestive to collect undiluted urine, recover its valuable nutrients and eliminate micro-pollutants. Our treatment system consists of a two-step chemical-physical process that is carried out precipitation reactor followed by stripping and absorption columns.

grey water

Grey water is the part of domestic wastewater which is free of faeces. Due to its relatively low content of pollutants, grey water can be treated with comparatively little effort for the production of service water that is available for toilet flushing, laundry washing or irrigation.

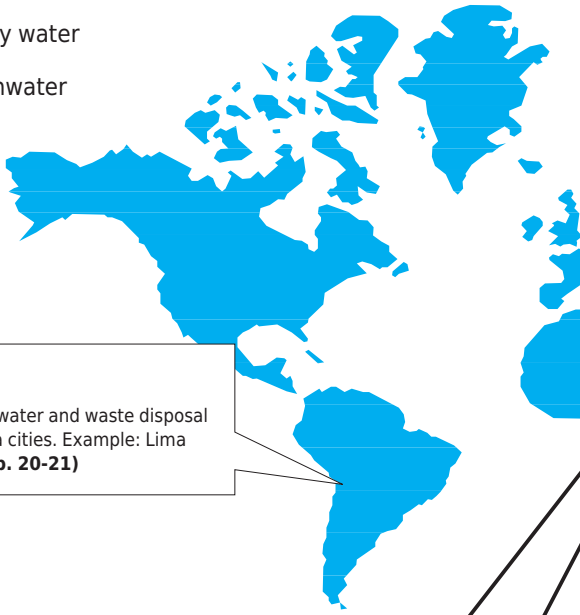
rainwater

Especially in urban areas a decentralized treatment of heavy loaded road runoffs is a sustainable and low-cost alternative to traditional water treatment systems. A multi-stage system provides the adequate treatment of road runoffs both at low investment and operating costs.

Research Projects Worldwide

Topics:

- anaerobic
- mechanical
- membrane
- urine
- grey water
- rainwater



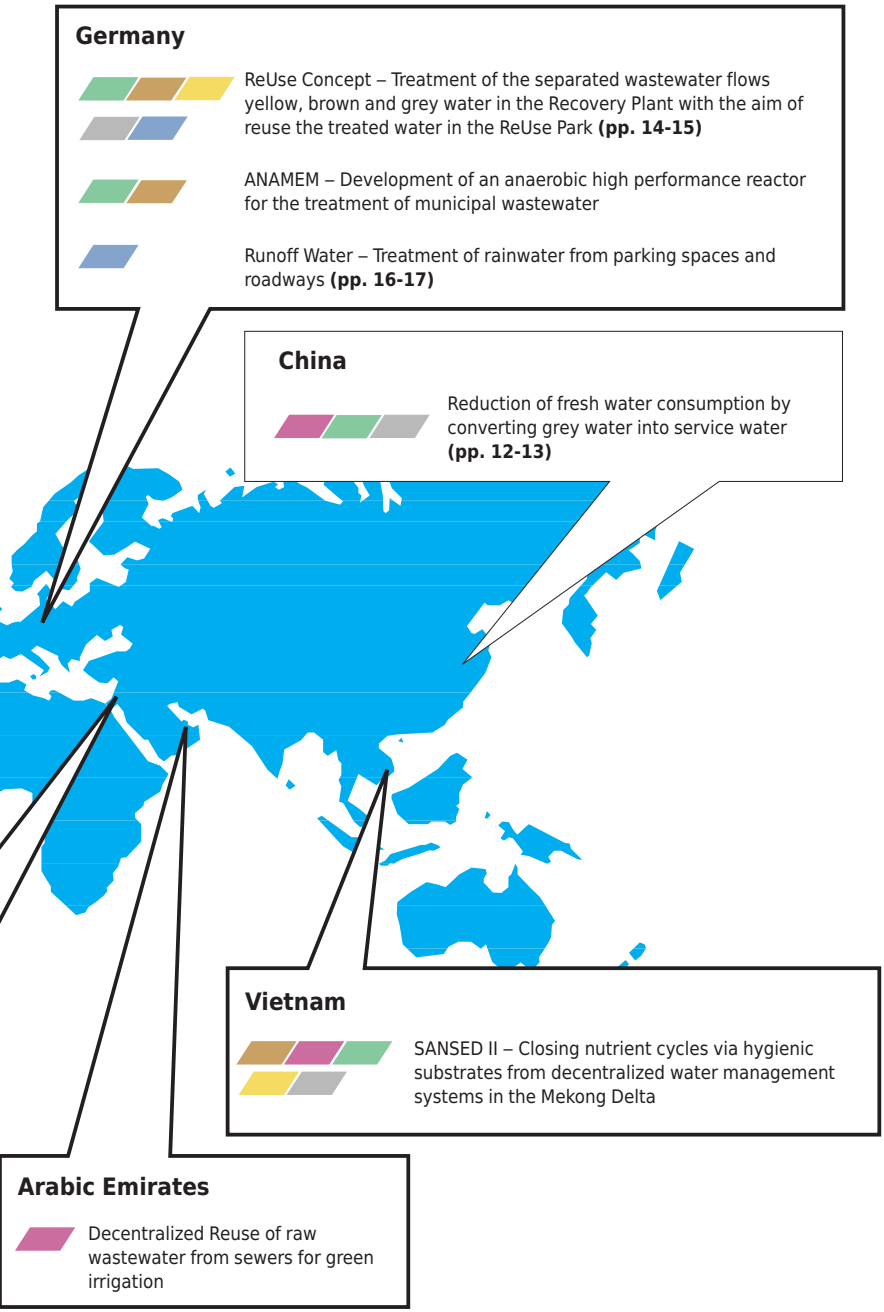
Peru

Integrated wastewater and waste disposal systems for mega cities. Example: Lima Metropolitana **(pp. 20-21)**

Jordan

Development of innovative processes for wastewater treatment with membrane bioreactors and the requirement of groundwater recharge in Jordan Valley **(pp. 18-19)**

SMART: IRWM Lower Jordan Valley – Planning, implementation and start-up of a research and demonstration plant for decentralized treatment of wastewater for reuse


Germany
ReUse Concept – Treatment of the separated wastewater flows yellow, brown and grey water in the Recovery Plant with the aim of reuse the treated water in the ReUse Park **(pp. 14-15)**
ANAMEM – Development of an anaerobic high performance reactor for the treatment of municipal wastewater
Runoff Water – Treatment of rainwater from parking spaces and roadways **(pp. 16-17)**
China
Reduction of fresh water consumption by converting grey water into service water **(pp. 12-13)**
Vietnam
SANSED II – Closing nutrient cycles via hygienic substrates from decentralized water management systems in the Mekong Delta
Arabic Emirates
Decentralized Reuse of raw wastewater from sewers for green irrigation

mechanical | membrane | grey water

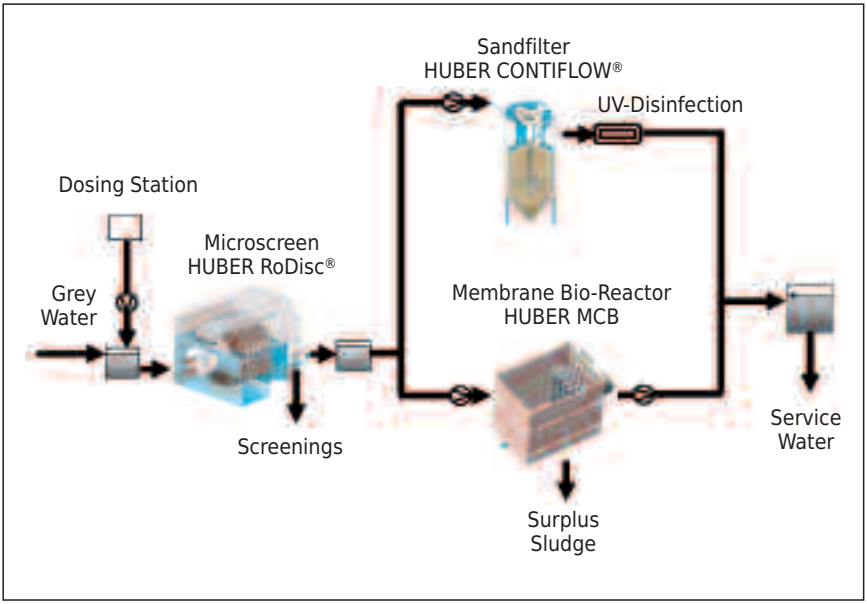
China

Reduction of fresh water consumption by converting grey water into service water

The Situation

All around the world and also in China valuable drinking water is used for menial purposes as irrigation of green or toilet flushing. Such practice often leads to drinking water shortage. Especially big and rapidly growing cities suffer under water scarcity due to population growth and rising consumption.

The fresh water consumption of households can easily be reduced by treatment and reuse of grey water from bathrooms and kitchen skins. Various technical solutions are now available for production of high-quality service water from used water.



Pilot Plant for Grey Water Treatment

HUBER Research

The following technologies represent possible solutions for grey water treatment:

1) Membrane bioreactor system (biological-physical treatment)
2) Precipitation-flocculation and filtration with disc filter (chemical-physical treatment) and
3) Biodegradation and sand filtration (biological-physical treatment).

In the pilot plant the collected grey water is pre-treated by coagulation/ flocculation and micro-screening followed either by MBR-treatment or sand filtration plus disinfection. The objectives of the investigations are the compliance of the effluent qualities with the Chinese requirements for water reuse in households as well as the identification of reliable design data for all process combinations.

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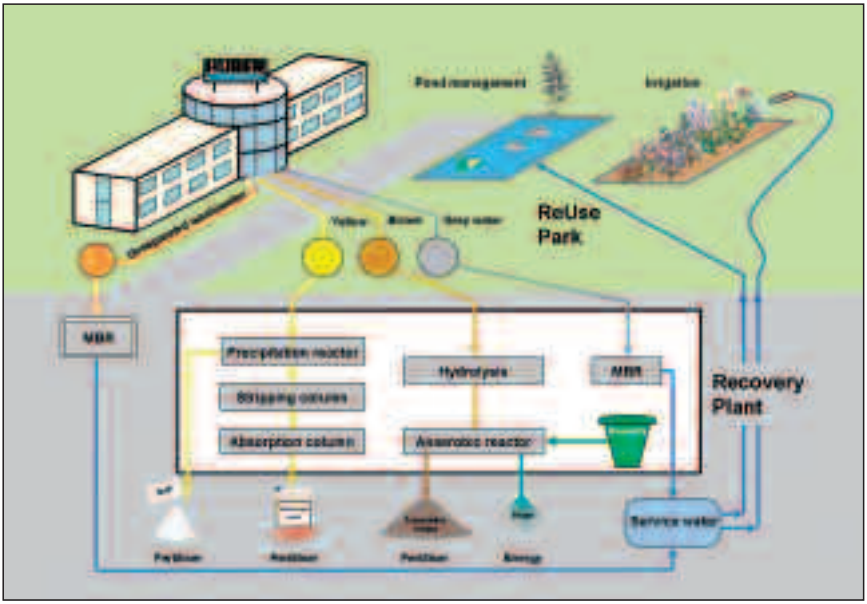
Germany

ReUse Concept – Treatment of the separated wastewater flows (yellow, brown and grey water) in the Recovery Plant with the aim of reuse in the ReUse Park

The Situation

Today 2.6 billion people have to live without adequate sanitary facilities. In regions where water availability is also limited the living conditions are very poor.

Due to the enormous investment and operating costs, the high water consumption and elimination of nutrients, conventional wastewater treatment systems are not an adequate solution for worldwide application



Flow Pattern of the HUBER ReUse Concept at the HUBER Headquarters

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A sustainable development of not served areas is possible by the application of alternative sanitary concepts that are based on separate collection and treatment of the respective wastewater flows for production of service water and recovery of nutrients. The main focus is the reuse of the treated water and the nutrients. The standard equipment of the HUBER office building with NoMix Toilets, waterless urinals and three pipes provides for separate collection of the respective wastewater flows (yellow, brown and grey water).

The specific treatment of the separated wastewater flows is ensured by the innovative HUBER technologies, which are operated as Recovery Plants. Treated wastewater is used for irrigation of the Reuse Park and toilet flushing in the headquarter.

Fountain in the HUBER ReUse Park

rainwater

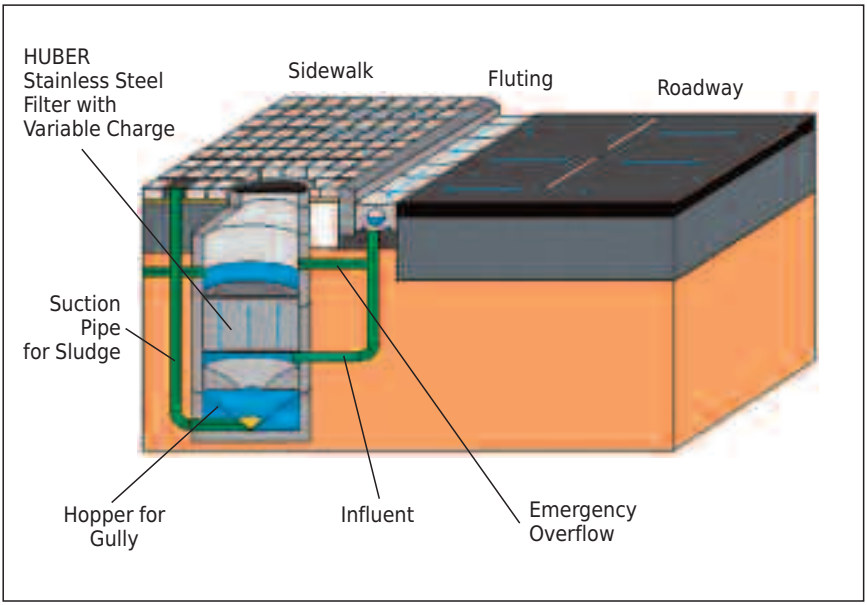
Germany

Runoff Water – Treatment of rainwater from parking spaces and roadways

The Situation

For ecological and economic reasons decentralized precipitation water management is preferred over discharging into the sewage water system. Due to its contamination with organic and inorganic pollutants runoff water particularly from roadways must be properly treated before seeping away.

At present there are however no technically adequate absorbing wells available that could guarantee a reliable and sufficient removal of pollutants.



Decentralized Rainwater Treatment with HUBER Hydro Filt

HUBER Research

Within the project a multi-stage system has been provided for adequate treatment of road runoffs, both at low investment and operating costs. The special filter material prevents the remobilisation of adsorbing heavy metals during cold months. In order to keep investment costs low, only inexpensive filter materials are used.

Due to the modular design of the filter unit also existing infiltration facilities are easy to retrofit. The objective of the investigations is the identification of the elimination efficiency of the system with long term tests as well as dimensioning criteria and product life.

Contaminated Runoffs

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DBU

mechanical membrane

Jordan

Development of innovative processes for waste water treatment with membrane bioreactors and the requirement of groundwater recharge in Jordan Valley

The Situation

Shortage of drinking water combined with fluctuating raining periods requires an innovative water resource management in semiarid regions. In most regions in the mediterranean area and the Middle East groundwater is the basis for daily water supply. However water-bearing layers are overstrained in most cases. The drawdown of groundwater leads often to penetration of salt water. Global warming and population growth will increase the demand of water. Regions like the Jordan valley will depend on efficient and sustainable use of the resource water.

Irrigation with Groundwater

Wadi close to Jordan Valley

HUBER Research

Within the scope of the project a method is being developed that combines various innovative solutions:

- mechanical pre-treatment
- adapted biological treatment with membrane technology
- soil passage with groundwater recharge.

Membrane Bio-Reactor Test Plant

In the developing process, special attention is paid to the complete retention of solids in the membrane system. The absorption of organic pollution components and above all the removal of endocrine substances is examined in detail by adding powdery activated carbon.

Furthermore the use of natural micro-biological degradation processes in the course of groundwater recharge are examined.

TZW

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anaerobic

Peru

Integrated wastewater and waste disposal systems for mega cities. Example: Lima Metropolitan

The Situation

According to UN forecasts, by the year 2030, approx. 5 billion people will live in metropolitan areas. The rapid urbanisation process with its dramatic consequences affects particularly the mega cities in emerging countries, as for example Lima, the fast growing capital of Peru.

More and more people settle on the outskirts of the 8 million metropolis where they live under critical conditions, with lack of water and electricity, education and medical care. In most cases the critical situation can only be remedied with decentralized and specific measures. Also strategies should be developed to manage sustainable recycling and reuse of water and nutrients.

Slum in the Metropolitan Area of Lima, Peru

Biogas Reactor in Carrapongo

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Within the scope of the research project the Hans Huber AG, adapted a two-stage thermophilic biogas reactor to the specific boundary conditions of Lima. The anaerobic reactor is used for integrated treatment of municipal wastewater and organic bio waste. The goal is to produce energy-rich biogas and safe fermentation residues that can be spread onto land as a soil improver.

The experiences gathered from the exemplary implementation will serve as the basis for the transfer of adapted technologies to other mega cities with similar environmental problems.

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Conclusion

Systematic cooperation is necessary for implementation of complex and holistic solutions that are based on integrated water, energy and solid waste management. The ambitious objective of achieving integrated resource management on a small and local scale requires cooperation by experts in various fields, cooperation by consulting engineers, architects, urban planners, politicians and others.

Most important hereby is that we close and consequently integrate local water, material and energy cycles under consideration of preventive health and environment protection. We are convinced that decentralized concepts with adapted technologies are key elements for a sustainable water management. Our goal is the development of new technologies and sustainable solutions.

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