



Universität für Bodenkultur Wien
University of Natural Resources
and Applied Life Sciences, Vienna

Research at the Institute of Sanitary Engineering and Water Pollution Control

**BOKU - Department of Water, Atmosphere and Environment
Institute of Sanitary Engineering and Water Pollution Control**

Univ.Prof. Dipl. Ing. Dr. Thomas ERTL (Head of the Institute)

www.wau.boku.ac.at/sig.html

sig-office@boku.ac.at



Universität für Bodenkultur Wien
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BOKU- 14 Departments

-  Department of Material Sciences and Process Engineering
-  Department of Biotechnology
-  Department of Water, Atmosphere and Environment
-  Centre for Nanobiotechnology
-  Department of Chemistry
-  Department of Integrative Biology and Biodiversity Research
-  Department of Food Sciences and Technology
-  Department of Landscape, Spatial and Infrastructure Sciences
-  Department of Economics and Social Sciences
-  Department of Sustainable Agricultural Systems
-  Department of Civil Engineering and Natural Hazards
-  Department of Forest- and Soil Sciences
-  Department of Applied Plant Sciences and Plant Biotechnology
-  Department of Agrarbiotechnology Tulln



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Department of Water, Atmosphere and Environment

- **Institute of Sanitary Engineering and Water Pollution Control**
- Institute of Hydrobiology and Aquatic Ecosystem Management
- Institute of Waste Management
- Institute of Meteorology
- Institute of Hydraulics and Rural Water Management
- Institute of Water Management, Hydrology and Hydraulic Engineering
- Institute of Safety and Risk Sciences

Staff and Resources

- 29 staff, of these are 21 scientific staff
- **Chemical and microbiological laboratories**
- Pilot plant stations; workshops; required infrastructure
- Automatic samplers and devices for online monitoring
- Modeling software for water systems and processes in water supply and urban drainage

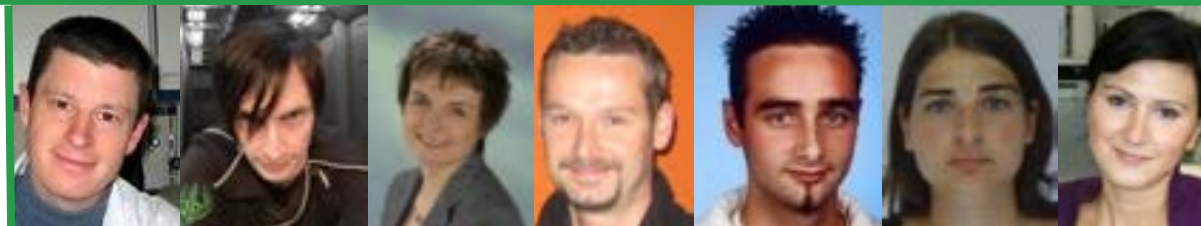


Staff of our institute

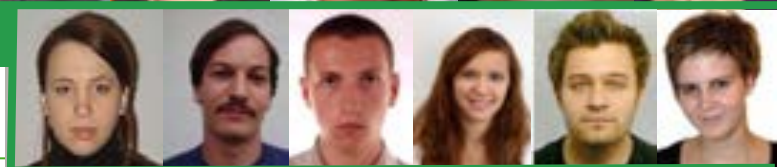


Duties, Services

- Teaching
- Research
- Services
 - internal: Inst, Dept, University
 - external: Nat., Int. Associations, Scientific Advisory Bodies



Students





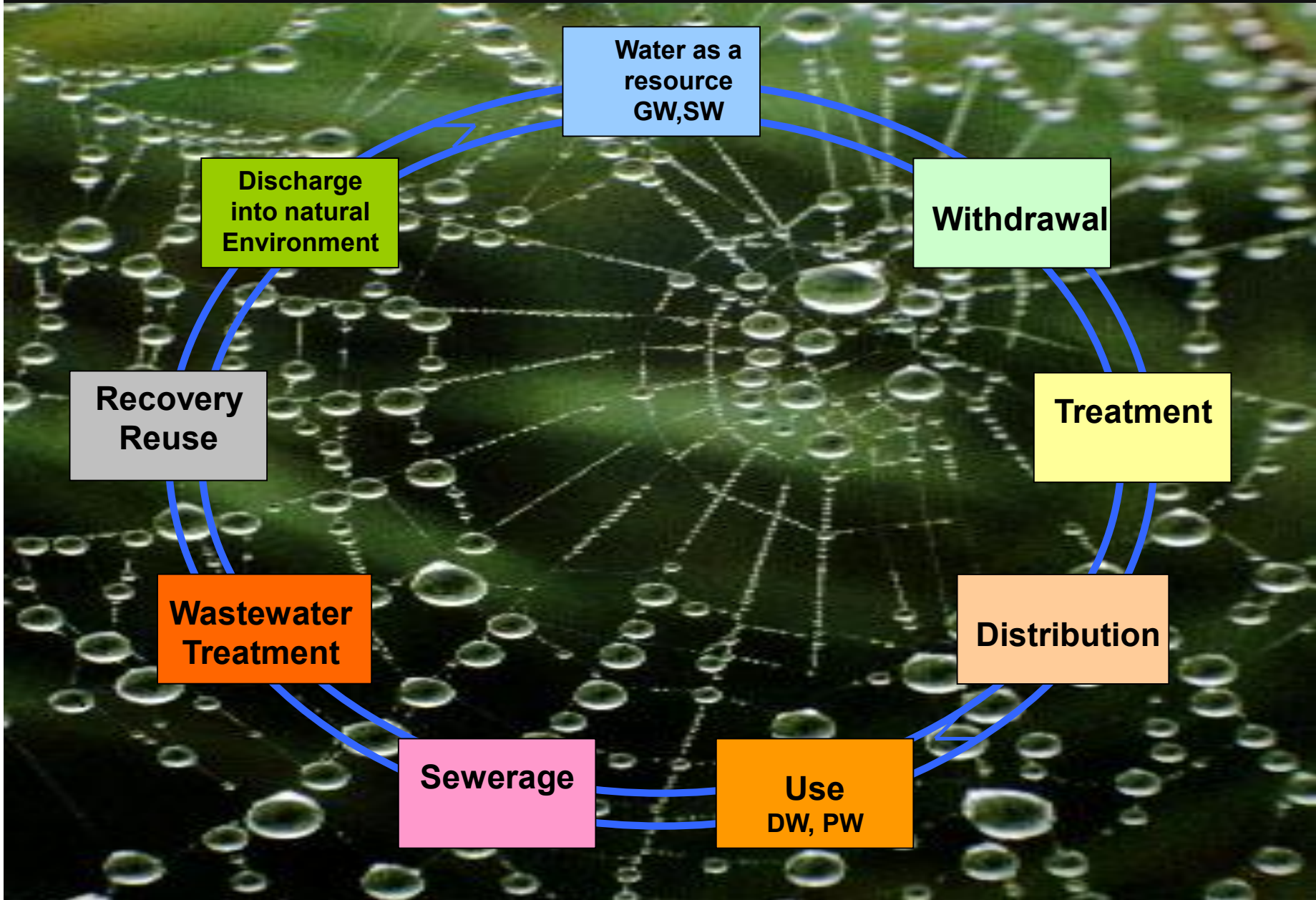
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Mission Statement of SIG

The **main focus** of the activities of our institute is **water**, one of the fundamental natural resources and basis of life.

SIG contributes to the **sustainable quantitative and qualitative availability** of water for different purposes by research and development, education and services.

Water Cycle



Research areas and Expertise



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■ Water Quality Monitoring and Modelling

Environmental and **water chemistry**, aquatic microbiology, **on-line monitoring** networks, modelling in sanitation engineering

■ Water technologies

Drinking water treatment and supply, wastewater treatment, urban drainage and **appropriate technologies**

■ Water management

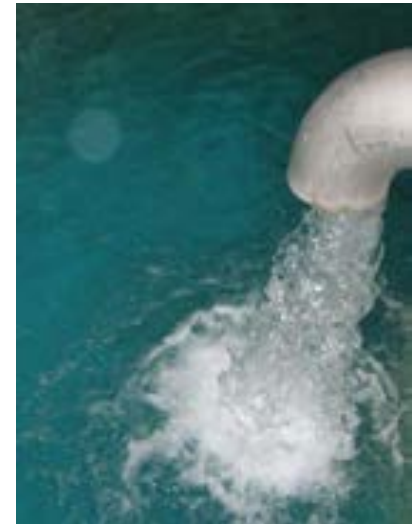
Development cooperation, **sustainable use of water resources**, decision support systems, risk assessment and integrated assessment, actors networks in water supply and sanitation, and management and planning methods and performance evaluation

Risk and quality management in drinking water supply



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- **Benchmarking und best practices in Austrian DW supply (2003-..)**
- **Impacts of meteorological extreme events on safety of drinking water supply in Austria (StartClim2005.A4, 2005-2007)**
- **Use of numerical simulation for strategic planning and design of water supply systems (2005 -)**
- **Water Safety Planning (WSP) for Water Utilities (2006 -)**
- **FEIS Failure Experience Improvement System – Risk-minimization in the case of the critical infrastructure drinking water supply (KIRAS program, 2007-2009)**
- **Drinking water treatment for small water utilities from deep groundwater aquifers (2005-)**
- **Implementation of WHO water safety plan**



Water Quality Monitoring and Modelling



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Water Risk Management in Europe

The project WARMER succeeded on development of an extended system for online water monitoring with main purpose of risk management.

System for European Water monitoring

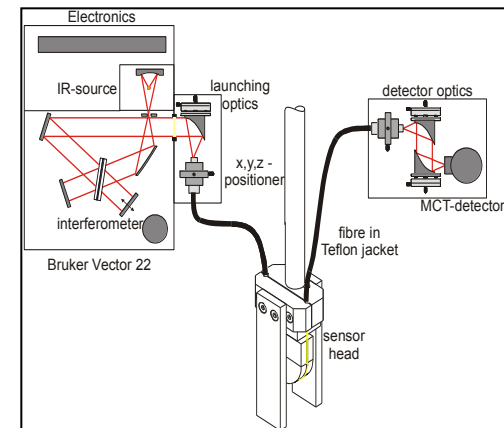
Development of a cheap and easily accessible system for monitoring and early warning of water pollution.



Integrated Modelling Approaches of a Water body on Basis of Continuous Measurements

Online sensing of Volatile Organic Compounds in groundwater using mid-infrared spectroscopy

(Dichlorbenzene, Tetrachlorethylene)



Wastewater management & treatment



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- **Constructed Wetlands**
- **Innovative Treatment Technologies**
- **Sustainable Sanitation – practical Approaches**
- **Integrated Evaluation of Alpine Infrastructure**
- **Inspection, Evaluation and Securing the Efficiency of Sewer Infrastructure**
- **Benchmarking**



Treatment Technologies



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- **Combined Inorganic/Organic Membranes for Water Purification Based on Novel Molecular **Nanosponges****
- **Risk assessment for quaternary ammonium compounds (**QAVs**)**
- **Elimination of specific cytostatics from hospital wastewater (**AKH**)** [AC, MBR, AOP, UV]
- **Austrian research cooperation on endocrine modulators in drinking water (**ARCEM**)**
- **Elimination of priority heavy metals and their compounds from wastewater by ionic liquids**
- **Pollutant elimination from road run-offs; optimisation of appropriate materials and assessment methodology**



Microbiological Research



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Material research: Testing of Drinking water pipes

Microbial evaluation of a testing device

Treatment of drinking- and wastewater by Ozone

Testing of a prototype

Elimination efficiency of membrane bioreactors

(microbiology, genotoxicity)





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Method Development (Microbial and Risk assessment tools)

- Development and evaluation of alternative methods for quality testing in water
- Development/deterioration of microbiological quality of drinking water in distribution systems
- Application of flow cytometry
- Application of human cell models for the prediction of potential human impact (cooperation with IAM)

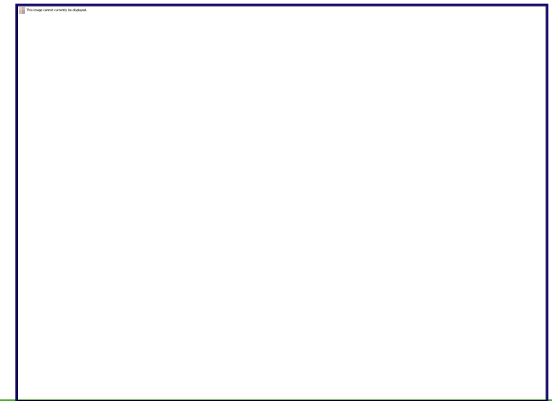
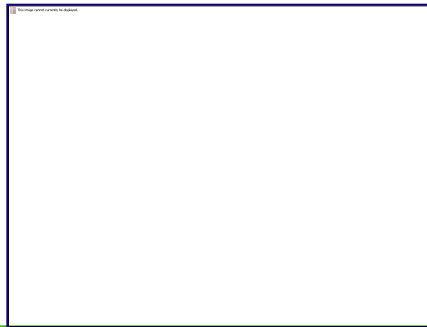
Laboratory analysis

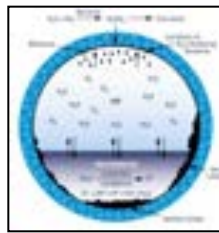


- Head of the lab: Dipl. Ing. Dr. Roza Allabashi
- Responsibilities of the lab: teaching, research and **analytical services**



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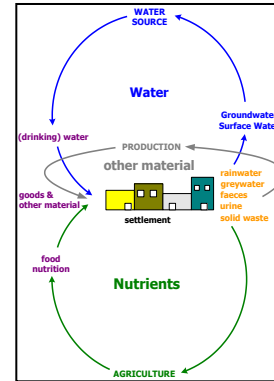


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Question / Problem

Report / Response

Goals



**Laboratory
Analysis**

Sampling

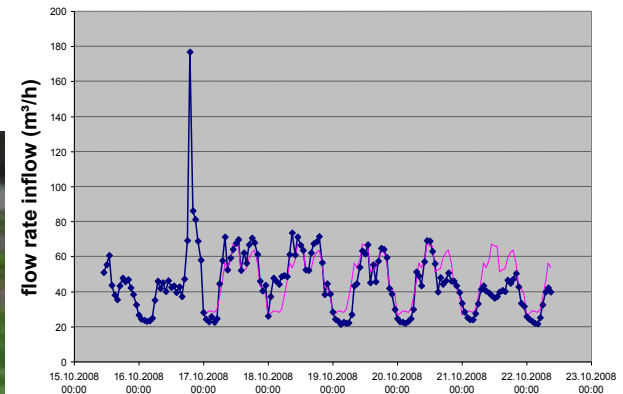


Sampling

- sampling of drinking water, river water, surface water, waste water
- measurement of insitu-parameters like pH, conductivity, ORP, T, O₂, flow-rate,
- spot sampling, 24-hour sampling with modern equipment,...



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Online monitoring

Online parameter:

- Turbidity
- SAK
- DOC/TOC
- pH
- ORP
- Conductivity
- Chlorine
- Phosphate
- Nitrate
- Nitrite
- Potassium
- Ammonium
- Heavy metals (in development)
- Flow rate and speed



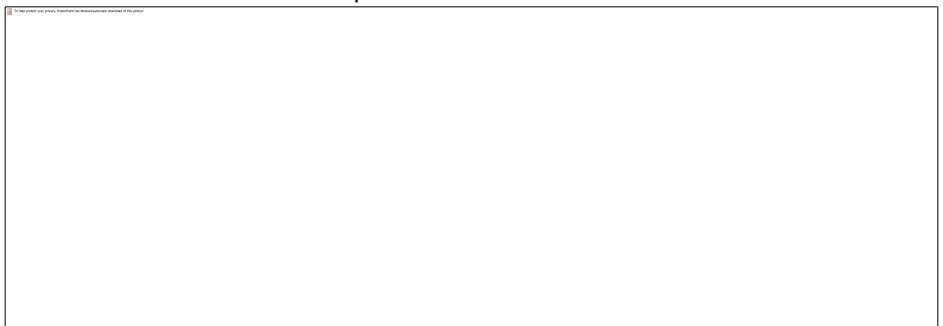
Monitoring station Schwechat - Baden



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DPA-probe



Technical Center

possibility for in-door experiments under applied conditions



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- Pumping station for urban wastewater
- Buffer tanks (2x 6m³)
- Monitoring-, control station



SIG Contribution to Higher Education at



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- 2012/13: 29 Courses, (11 in Engl.)
 - 9 VO: 18 SH, (3 in Engl., 6 SH)
 - 12 VU: 33 SH, (6 in Engl., 14 SH)
 - 1 VS: 3 SH
 - 4 SE: 9 SH (1 in Engl., 3 SH)
 - 2 UE: 6 SH, (1 in Engl., 2 SH)
 - 1 EX: 1 SH
 - Sum: 70 SH, (25 SH in Engl.)
- 6 Univ. and additional Lecturers

Thank you!



Univ.Prof. Dipl.-Ing. Dr. Thomas Ertl

Universität für Bodenkultur Wien

Department für Wasser-Atmosphäre-Umwelt
Institut für Siedlungswasserbau, Industriewasserwirtschaft und Gewässerschutz

Muthgasse 18, A-1190 Wien

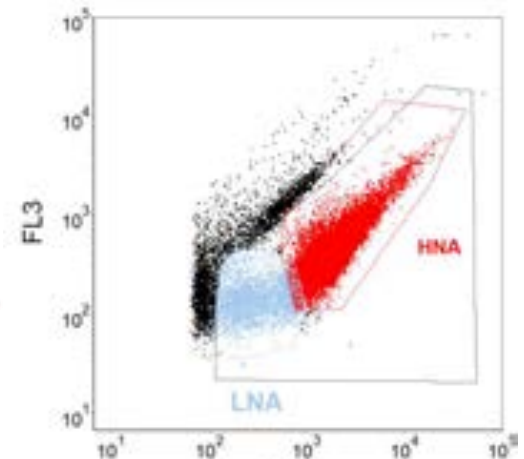
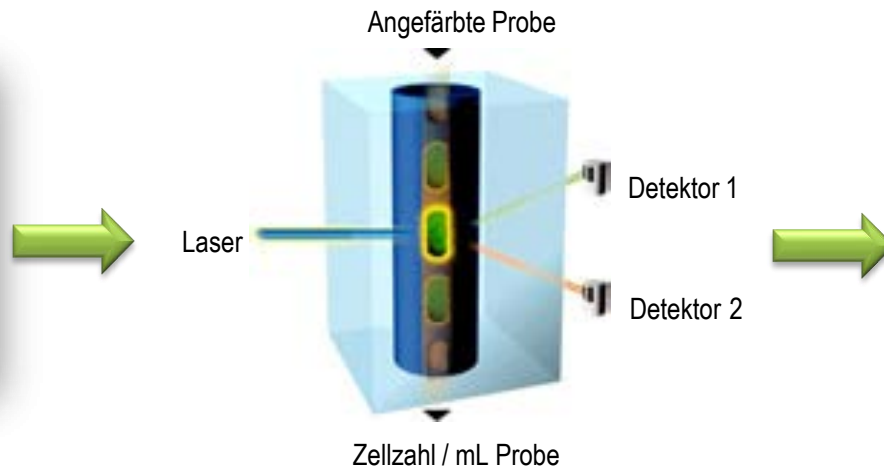
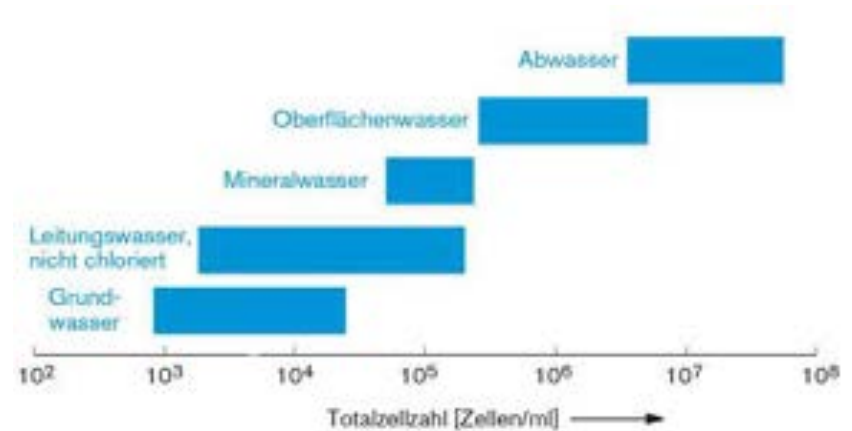
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thomas.ertl@boku.ac.at , www.boku.ac.at

Durchflusszytometrie in der Wasserversorgung – ein neuer Ansatz in der Mikrobiologie im Wasserfach

Mögliche Anwendungsgebiete:

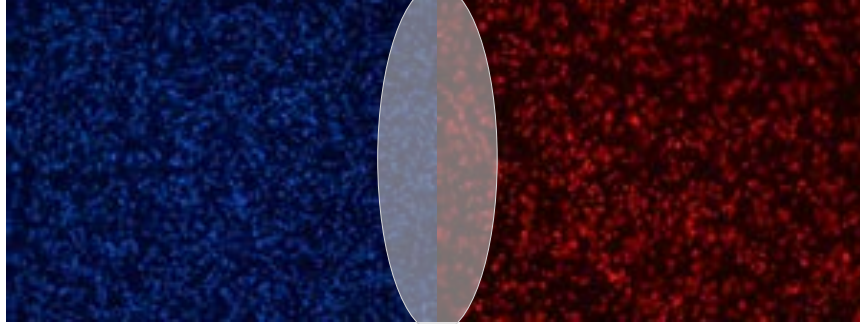
- Zellaktivität
- Totale Zellzahl (\neq KBE)
- Trinkwasserbehandlung, Überwachung
- Filtergängige Bakterien
- Mikroorganismen in Ökosystemen
- Biologische Stabilität in Verteilersystemen
- Beurteilung von Hausinstallationen
- Nachweis von Pathogenen



Dot Plot Analyse einer Trinkwasserprobe:
Gruppierungen entstehen durch Zellgröße und Nukleinsäuregehalt der Zellen →
→ **Fingerprinting**

Durchflusszytometrie – Nachweis der Viabilität von Bakterien

Fluoreszenzmikroskopische
Aufnahmen von Bakterien

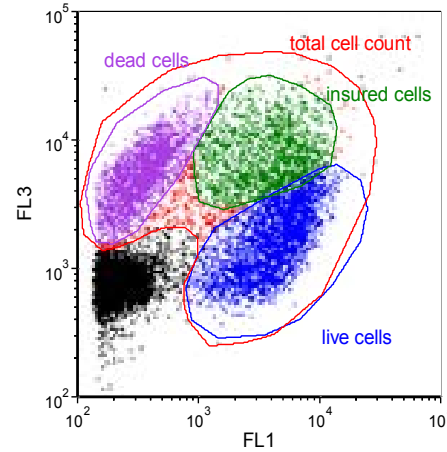


lebend

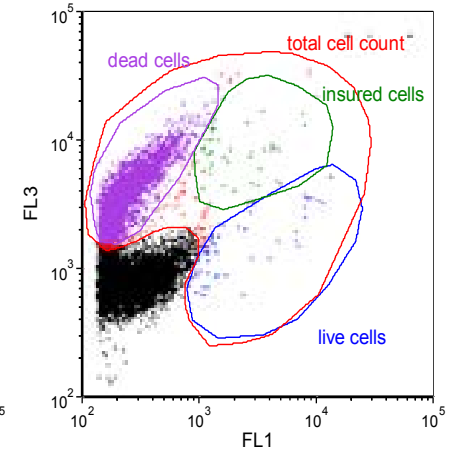
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Schädigung → lebend, aber nicht kultivierbar →
Sicherheitsproblem bei der Beurteilung von Wasserproben

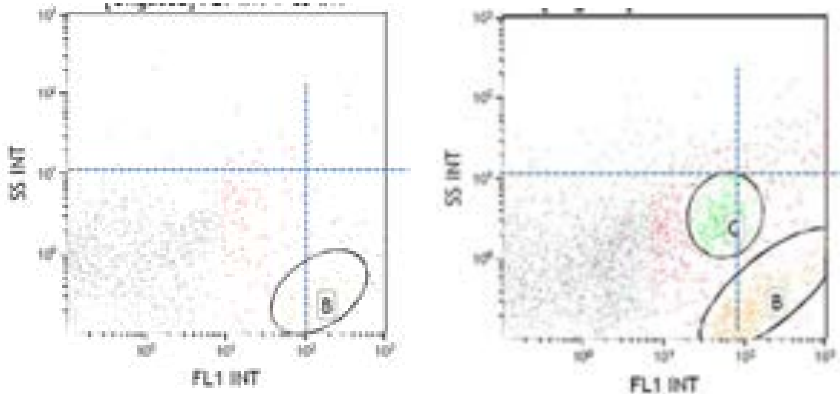
E. coli nach 30 min bei 60°C



E. coli nach 10 min bei 90°C



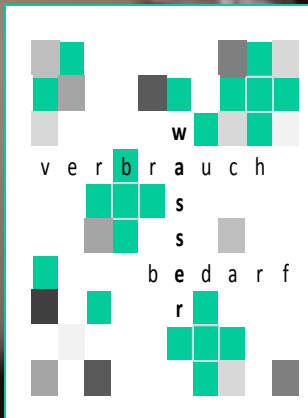
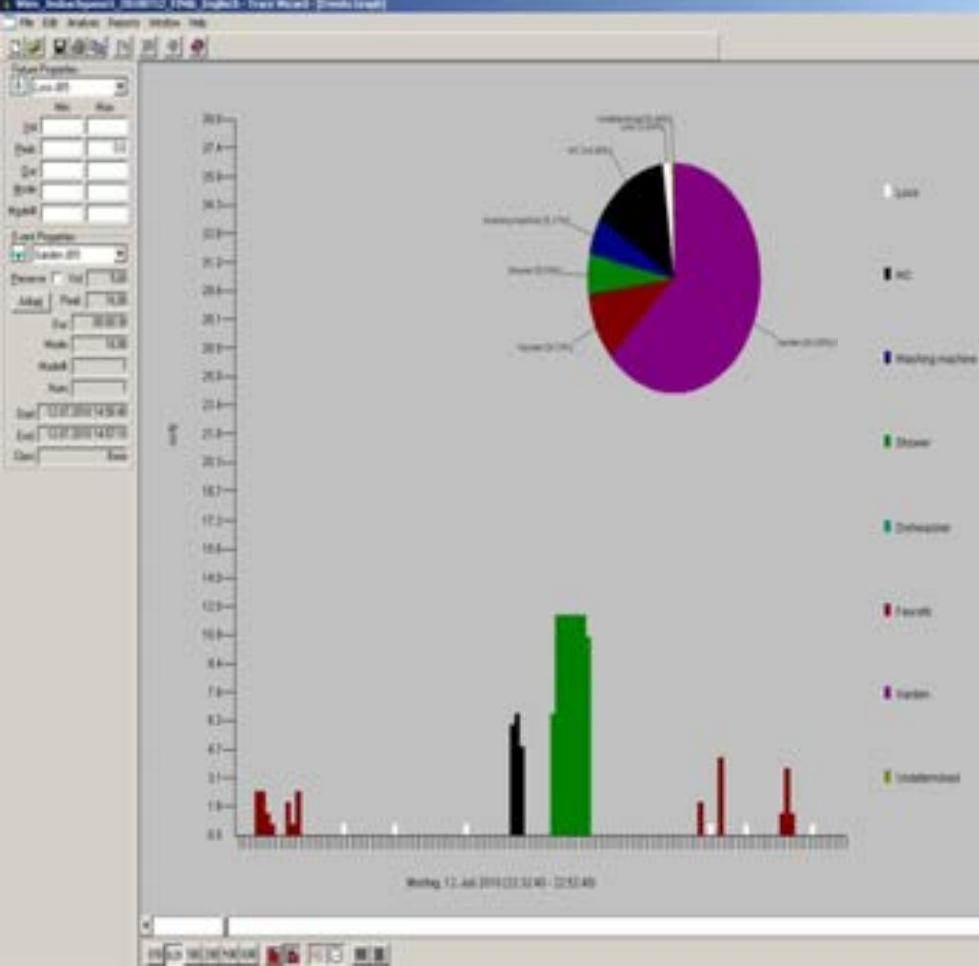
Beispielapplikationen:



Dot plot analysis of TCC (total cell count) of two horizontal filter strands Danube region: left conventional population cluster with low discrimination; right: two pronounced population clusters with sulphurous smell.

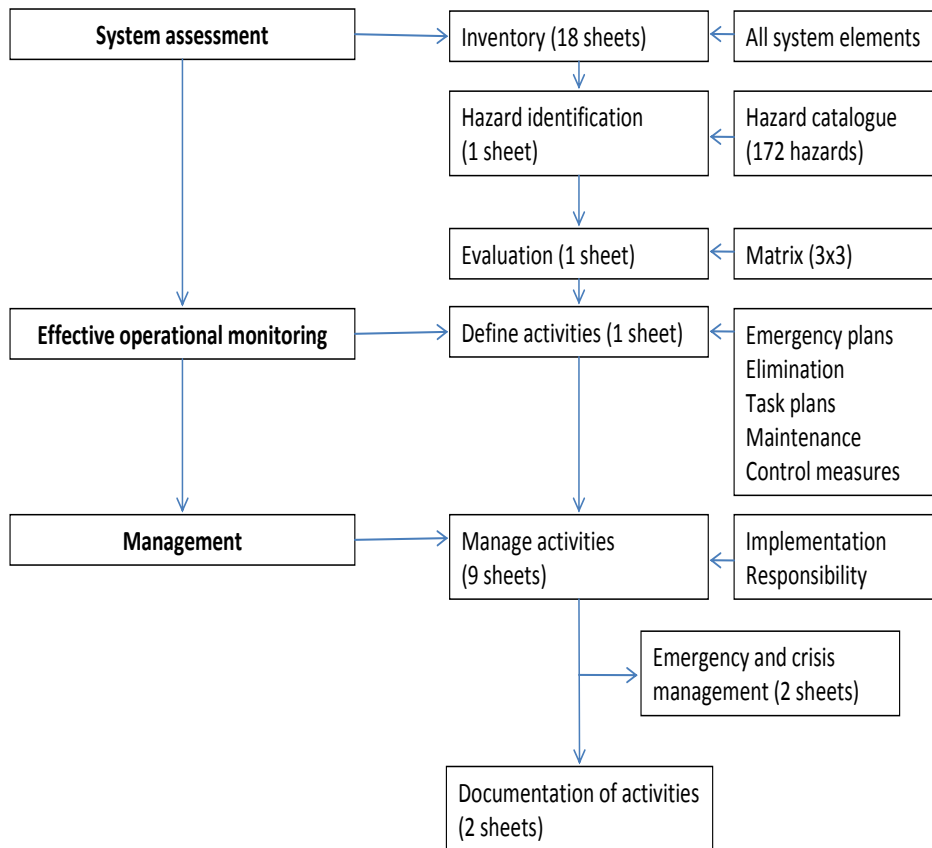
EVALUATION OF WATER CONSUMPTION IN AUSTRIA

Evaluierung des Wasserverbrauchs in



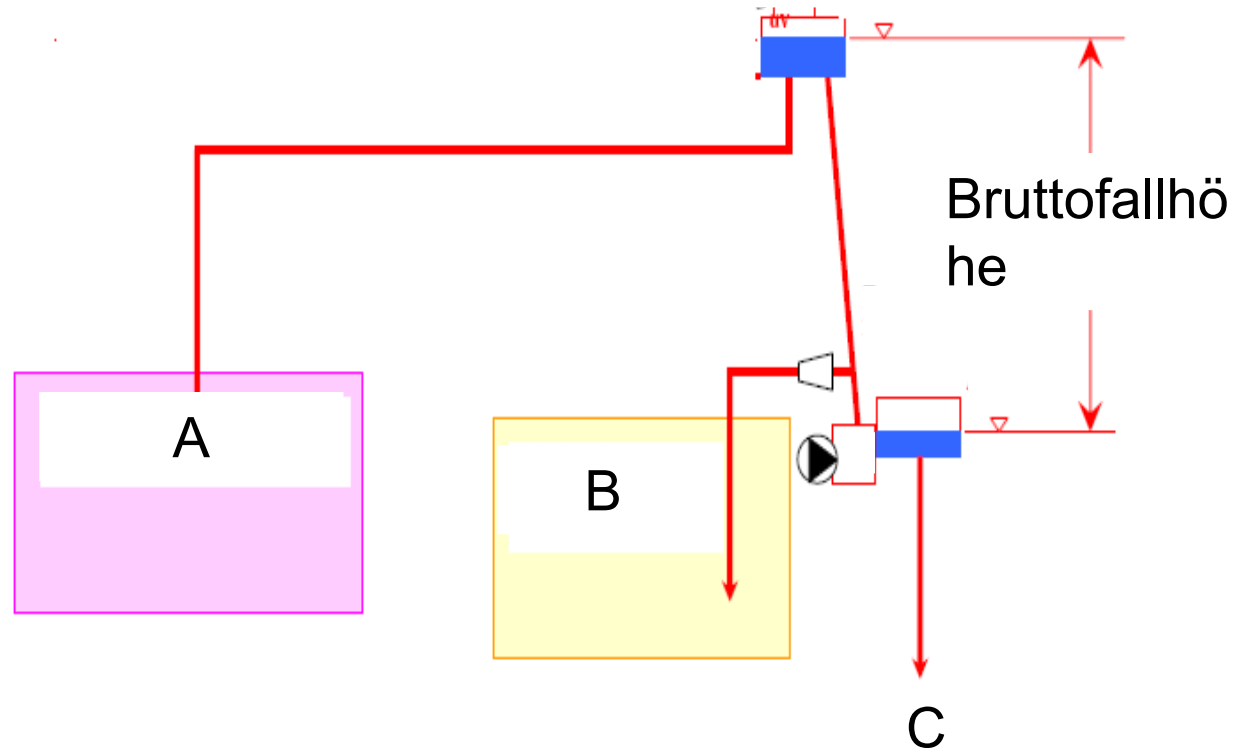
WATER SAFETY PLAN (WSP)

Qualitäts- und Risikomanagement in der Trinkwasserversorgung



ENERGIEEFFIZIENZ

Optimierung der Energienutzung bei Wasserversorgungsanlagen

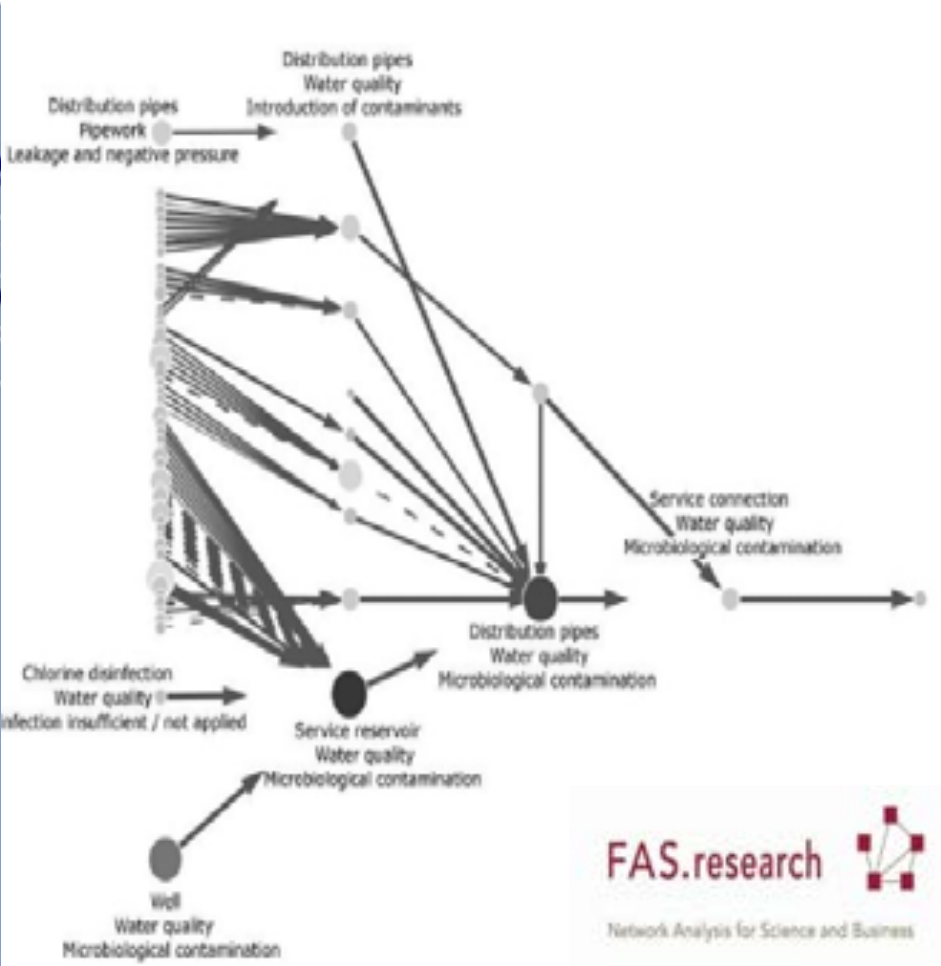
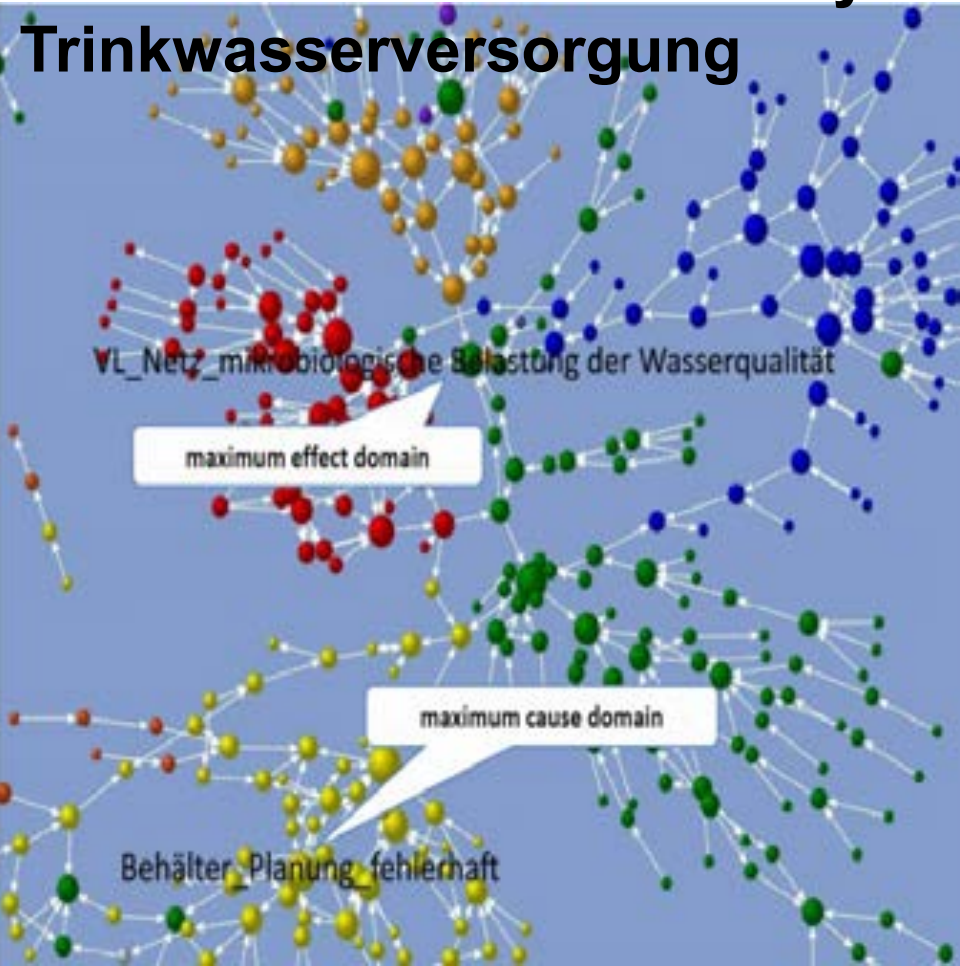


FAILURE EXPERIENCE IMPROVEMENT SYSTEM

- FEIS

Fehlernetz- und Risikoanalyse in der

Trinkwasserversorgung



WATER MANAGEMENT AT VALLEY VIEW UNIVERSITY, GHANA

Trinkwassermanagement in Ghana



RESOURCES-ORIENTED SANITATION IN AFRICA

Kreislauforientierte Sanitärsysteme in Afrika



Sustainable Sanitation Practice



- Introduction to the ROSA project
- From pilot units to large-scale implementation - Ethiopia
- Implementation of OODTs in schools - Kenya
- Urban Agriculture for sanitation promotion
- Operation and maintenance in practice
- Experiences from strategic sanitation planning
- Main findings and main achievements



The ROSA project

sustainable sanitation alliance



Resource-Oriented Sanitation concepts for peri-urban areas in Africa

CONSTRUCTED WETLANDS FOR WATER TREATMENT

Bepflanzte Bodenfilter für die



Optimization, design,
numerical modelling



INTEGRAL EVALUATION OF ALPINE INFRASTRUCTURE

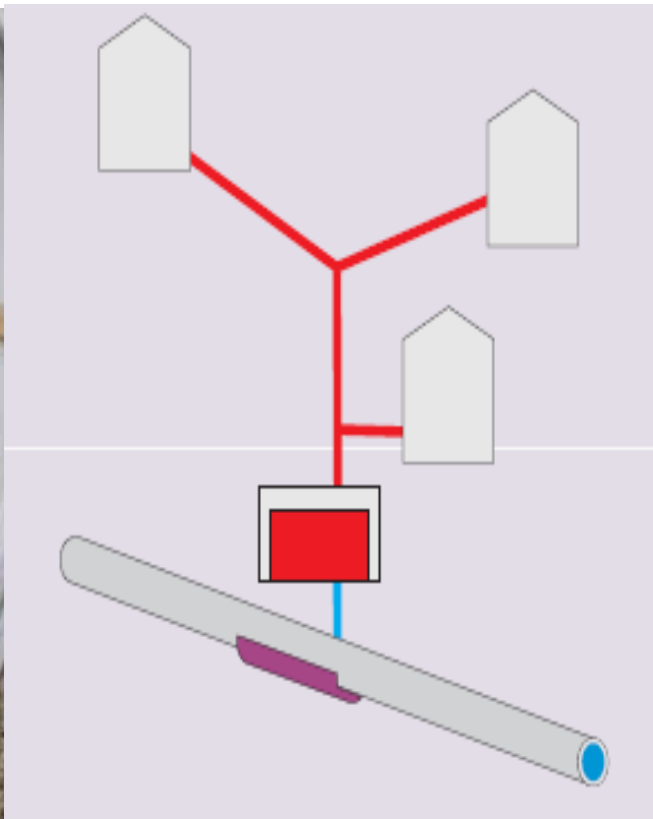
Bewertung von Schutzhütteninfrastruktur



OPERATION & MAINTENANCE OF SEWER PUMPING STATIONS IN RURAL AREAS



ENERGY FROM WASTEWATER – Heat and Cold Extraction from Wastewater Using High Efficient Heat Pumps





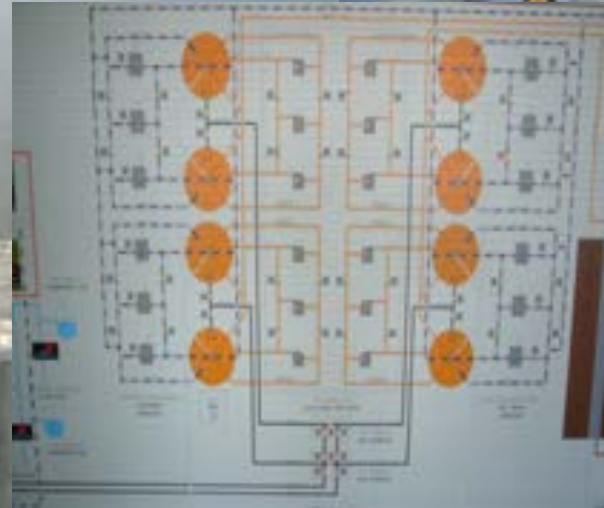
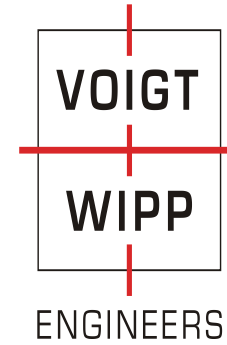
MIT
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DES
lebensministerium.at

INFOSAN - STRATEGIC DATA ACQUISITION FOR SEWER REHABILITATION PLANNING



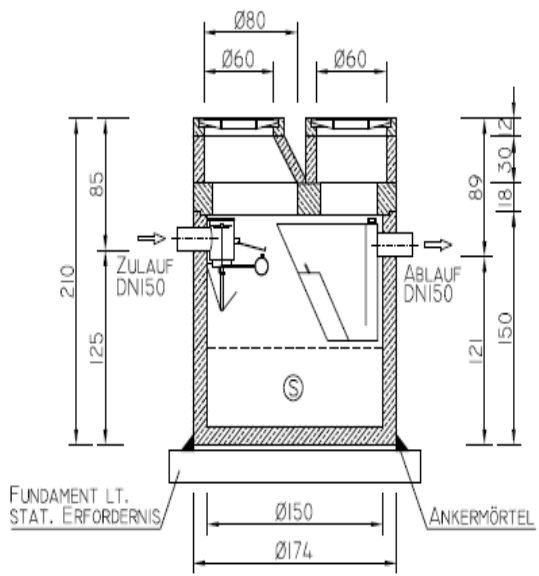
EFFICIENCY IMPROVEMENT OF WASTEWATER TREATMENT

Betrieboptimierung bei Kläranlagen

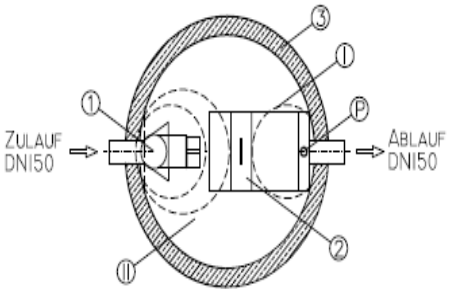
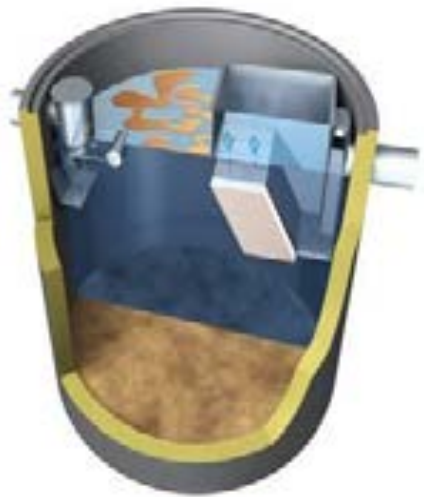


OPTIMISATION OF OIL SEPERATORS FOR BIOFUEL

Optimierung von Ölabscheidern für

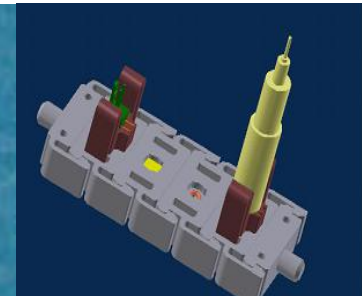
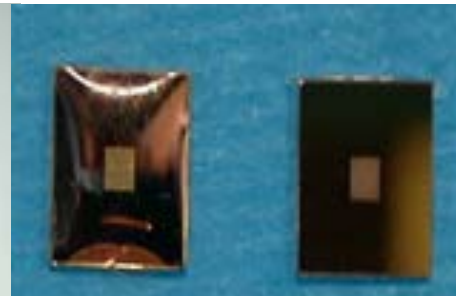


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WARMER - WATER RISK MANAGEMENT IN EUROPE

Innovative Analytik für



INTEGRATED MODELLING APPROACHES OF A WATERBODY ON BASIS OF CONTINUOUS AND VALIDATED LONG-TERM MEASUREMENTS

