The HAMBURG WATER Cycle® in the settlement Jenfelder Au – challenges of a sustainable sanitation project on a district-scale

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The company

• HAMBURG WATER is the drinking water supply and waste water disposal company for 2 million inhabitants of Hamburg and its metropolitan area

• drinking water grid: 5400 km
  waste water grid: 5700 km

• water conditioning: 100 Mio. m³/a
  waste water disposal: 150 Mio. m³/a
New demands on water management

- HAMBURG WASSER wastewater: ~ 150 Mio. m³/a, energy demand for purification: ~ 165 Mio kWh/a

→ Higher energy efficiency gain more importance

Boundary conditions:

- Increasing number of inhabitants but decreasing water consumption

Important steps:

- Optimization of processes & extension of services
- Fundamental question: Are we optimizing the right system?

→ Execution of large-scale pilot projects

→ HAMBURG WATER Cycle®
Supply via disposal

Source separation as a base for an urban wastewater and energy project
HWC – flagship project Jenfelder Au

- Separate collection of blackwater, greywater and rainwater
- Transportation of the blackwater by use of vacuum technology
- Blackwater recycling allows fermentation with other biomass and therefore a renewable energy extraction on site

→ residential heat and power supply!
Situation and geography

- Revitalization of former military barracks into a new urban district
- Remodeled area: 35 ha
- Realization: 2011 – 2017
- Housing units connected: more than 600
  Residents: circa 2,000
- Low energy and passive houses
- Social, cultural and commercial infrastructure:
  housing (60%), commercial (20%), green spaces (20%)
- Integration of the innovative concept
  HAMBURG WATER Cycle®
International classification and support

• Largest separating sanitation system throughout Europe
• Professional operation by HAMBURG WASSER
• Realisation is supported by two German Ministries and the European Commission
The settlement Jenfelder Au

Existing building (conv. sewer)

Commercial area (conv. sewer)

Housing units connected to HWC
Vacuum toilet

- Central part of the HWC: concentrated blackwater for fermentation
- Reducing drinking water demand: only 0.5 - 1.0 Liter per flush

Vacuum system

- Ambition: construction of a highly reliable, customer friendly, large-scale blackwater vacuum network
- Realisation by redundancy: 3 subnetworks
  → Minimal pressure drop: higher energy efficiency, noise reduction
  → High flexibility (Blockages, maintenance)
Blackwater

Central vacuum station

Meshing points

Pipe junctions between the subnetworks
HWC – flagship project Jenfelder Au

Rainwater & greywater
Operation facility

Combined heat and power plant
(2 MGT with altogether 240 kW\textsubscript{th}, 130 kW\textsubscript{el};
gas conditioning via carbon filter)

Blackwater fermenter
Volume: 750 m\textsuperscript{3}, d= 10 m,
Gas production: 1380 m\textsuperscript{3}/d

Biogas tank
(400 m\textsuperscript{3}, ca. 50 mbar)

Greywater treatment

Machinery and equipment
(incl. blackwater pumping station)
Legal framework:

• HAMBURG WASSER:
  → responsibility ends at boundary between public and private ground
  → interest in smooth & efficient operation including in-house components
  → revision chamber, leakage tests, …

• Wastewater law in Hamburg (HmbAbwG): drainage based on gravity flow sewers and pressure
  → for HWC change of law necessary
  → separate greywater and blackwater transport
Stakeholder analysis

Hamburg Ministry of Finance

District authority Wandsbek

Future Inhabitants

Hamburg Ministry for Urban Development and the Environment

International building exhibition Hamburg

Investors/owners

Architects, building planners

Chamber of Crafts

Plumbers, building companies

HAMBURG WATER
Time schedule

- 2006/2007: first concept- and project idea
- Since 2010: probing and removal of warfare agents
- 2010: name contest: Jenfelder Au
- 2011/2012: start of marketing for the first building block
- 2013: Beginning of site development
- Beginning of 2015: ready for building construction
- 2015/2016: first inhabitants move into the district, initiation HAMBURG WATER Cycle
HWC – Impressions

2009

2012

2013
HWC – Impressions

2014 – Current construction works
HWC – Impressions

In future

source: West 8 urban design & landscape architecture
Summary: Project HWC Jenfelder Au

The HAMBURG WATER Cycle:

• Combination of supply and disposal
• Intelligent integration of wastewater management based on source control with energy generation

Advantages:

• Energy potential & nutrients of blackwater become reusable
• Climate neutral biogas – CO$_2$ neutral local heat supply
• ca. 30% water savings

Special challenges:

• Many stakeholders with different interests
• Legal framework and organizational boundaries had and have to be adapted
Thank you for your attention!

Questions?

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