Energy from waste water

- An efficient way to reduce operating costs for heating and cooling
Huber - A Manufacturer

- Over 100 year history
- €200 Million Turnover
- Production Area: 45000 m² Stock Area: 8,000 m².
- 4 Production Lines
- >1000 Employees World-wide
- Stainless Steel consumption of >5,000 T/A.
HUBER Technology in the UK

- Equipment first supplied in 1986
- Currently Supply all UK & Irish Water Companies
- Installed Asset Value of approximately £160,000,000
- Core Equipment Supplied includes
  - 900 Sludge Screens
  - 2000 Inlet Screens
  - 1300 Storm Screens
  - 500 Screenings Handling Plants
  - 200 Sludge Dewatering and thickening
- £1m pa Industrial Business
Waste Water Temperatures

Producer (municipal/industrial) → Sewer → Pumping station → Treatment plant → Receiving waters

Municipal: ~23 °C
Industrial: 60+ °C
~11-14 °C
~10-14 °C
~10-12 °C
Temperature log of a waste water treatment plant in Europe over the course of 3 years.

→ Waste water temperature is fairly constant throughout the year.
Waste water temperatures can vary drastically from the ambient air temperature!
Temperature levels of waste water are more beneficial to heat pump efficiency → lower operational costs!
Yearly Energy Profile of a London Office Building

The main focus of modern buildings is cooling!

Chart data supplied by atelier ten
Huber ThermWin® Solution

1. Draw waste water from the sewer and screen it in RoK4
2. Pump the water to the above ground heat exchanger RoWin
3. Energy can be extracted for heating or dumped for cooling via a heat pump
4. The waste water is directed back into the sewer and flushes the screenings back, too.
Wintower (Winterthur, CH)
Wintower (Winterthur, CH)
2 x heat exchanger RoWin BG 8
Wintower (Winterthur, CH)

- Sewer flow: $Q_{DW}$ ca. 160 l/s
- Flow: 60 l/s
- Therm. power: 605 kW
- Cooling: 480 kW

www.wintower-winterthur.com
Huber Waste Water Heat Exchanger RoWin

- Heating: 40-250 kW
- Cooling: 40-500 kW
- Automatically self cleaning
- Batch-Operation
Huber Waste Water Heat Exchanger RoWin

HUBER RoWin Heat Exchanger

Automated cleaning unit

inlet

E-valve for periodic sediment discharge

pipe modules (heat transfer surface)

sediment removal screw

outlet
In the beginning the heat transfer can occur easily.
Automatic cleaning unit

After some operational hours biofouling will occur and hinder the heat transfer. Reduction in heat transfer due to biofilm up to 60%
To get rid of the biofilm Huber has implemented a fully automatic mechanical self cleaning unit into the heat exchanger. It keeps the exchanger surface clean and guarantees a constant heat transfer.
The solids settle down and get transported by means of a screw towards the outlet valve. From there they are flushed back to the sewer with the outpouring water.
Impact of wastewater on heat exchangers

Biofilm: Made up of microorganisms contained within wastewater which attach to any solid surface

Sediments: Precipitated and settled solids on the heat exchanger surface

Effect: Heat transfer capacity reduction up to 60 %

Solution: Fully-automatic, mechanically cleaned heat exchanger for polluted media
Impact of the biofilm

cleaned heat exchanger surface  
heat exchanger surface with biofilm
Impact of the biofilm

Plate Heat Exchanger RoWin blockage and biofilm
Places of use

Producer (municipal/industrial)  Sewer  Pumping station  Treatment plant  Receiving waters
Nursing home Hofmatt (Münchenstein, CH)
Rest Home, Hofmatt (Münchenstein, CH)

Buffer tank, pre-screening

In-house application

Buffered operation for higher energy recovery

Wastewater flow 40 m³/d

Therm. power: ca. 50 kW
Nursing Home Hofmatt (Münchenstein, CH)

"In-House" solution

"Batch-operation" enables us to draw more energy from the same amount of waste water

Integrated turbulence generator for maximum heat exchange rate

Power: approx. 50 kW
Nursing Home Hofmatt (Münchenstein, CH)

Buffer shaft
Nursing home Hofmatt (Münchenstein, CH)
Rule of thumb for planning

Waste water
- per person 120 l/d @ 23°C
- Cooled down by 13 K → 1.81 kWh/d

Energy efficient building
- Max. energy demand: 55 kWh/m²*a
- @ 170 heating days: 0.32 kWh/m²*d

Possibility
- COP=4 → Heating load = 2.2 kWh/d
- Heatable space per person: 7 m²
During modernisation the energy concept was overhauled

Waste water from the central sterilisation for tools

Heat exchanger had to be separated because of the confined space in the basement

Direct pre-warming of the fresh water via a second plate heat exchanger

Power ca. 60 kW
Klinikum rechts der Isar (Munich)
Klinikum rechts der Isar (Munich)

Confined space in the basement

Part 1 of 3 of the heat exchanger
Advantages of the ThermWin System for In-House Solutions

- Buffered Operation
- Heat exchanger works like a buffer tank
- Low maintenance
- Depending on the waste water no screening may be required
- At high waste water temperatures a heat pump may not be necessary
Applications

Hotels and Apartments

Public Institutions

Breweries and other industries

Hospitals

Swimming Pool

Waste Water Treatment Plants
Target industries for the Huber ThermWin System

- Textile industry
- Paper ills
- Food industry
- Meat processing
- Cleaning facilities
Heat Networks
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References – Why none in the UK

• No Government Incentive – often a long payback
• Need underfloor heating at 45C – difficult with conventional
• Diverse ownership of Assets - who pays
  • Water company
  • Land Owner
  • Building owner/operator
  • Building occupants
• ‘Can’t do attitude’ – e.g. WCs worry about the temp drop in the sewage – (typically 3C in the volume in the RoWin)
• Corporate inability to just have a go, and do the right thing

Scotland Experience

• Government Driven through Scottish Water
• Incentive/Tarriffs
• Used Plate Heat exchangers – no evidence how or if it worked
Summary

- Proven and simple Technology
- Interfaces are complex
  - Different Asset owners
  - Civil interventions and construction tie ins
- Existing Heat
- Cooling is as important as heating and helps justify the cost
- Each Project is different
- Package bespoke to application and needs

Advice on packages from Landmark

www.Land-mark.co.uk

Link to Canadian project write up

Innovative wastewater energy tech to be installed at Toronto Western Hospital - constructconnect.com
HUBER approved Delivery Partner in the UK

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Landmark provide bespoke package to meet specific client needs

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