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RENEWABLE HEATING AND COOLING WITH ENERGY FROM WASTEWATER - More flexibility in district heating

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ISEC 2022 - Lessons from ThermaFlex project

Demonstrator renewable heating and cooling from wastewater “Wien Kanal” headquarter

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- Use of wastewater energy for heating and cooling of the new headquarters of Wien Kanal in Vienna – Blumental/ 4000 m²
- 76 m heat exchanger Therm-Liner in 1500x2000 mm sewer
  - Heating 215 kW (max. 450 kW) on heat pump
  - Cooling 400 kW (max. 500 kW) on heat pump
  - Innovative monitoring system included
- Heat pumps: 2 pc., each of them with
  - 215 kW heat power, COP 3,6-4,0
  - 400 kW cooling power, EER 4,1
- Trial operating and commissioning: Oct – Nov 2021
- Regular operation beginning from Dec 2021
- Continuous monitoring
- 100 % heating and cooling with energy from wastewater
- **Project part of the research initiative ThermaFLEX**

Demonstrator renewable heating and cooling from wastewater “Wien Kanal” headquarter

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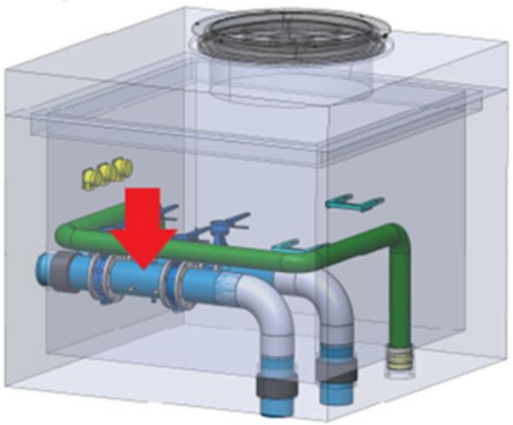
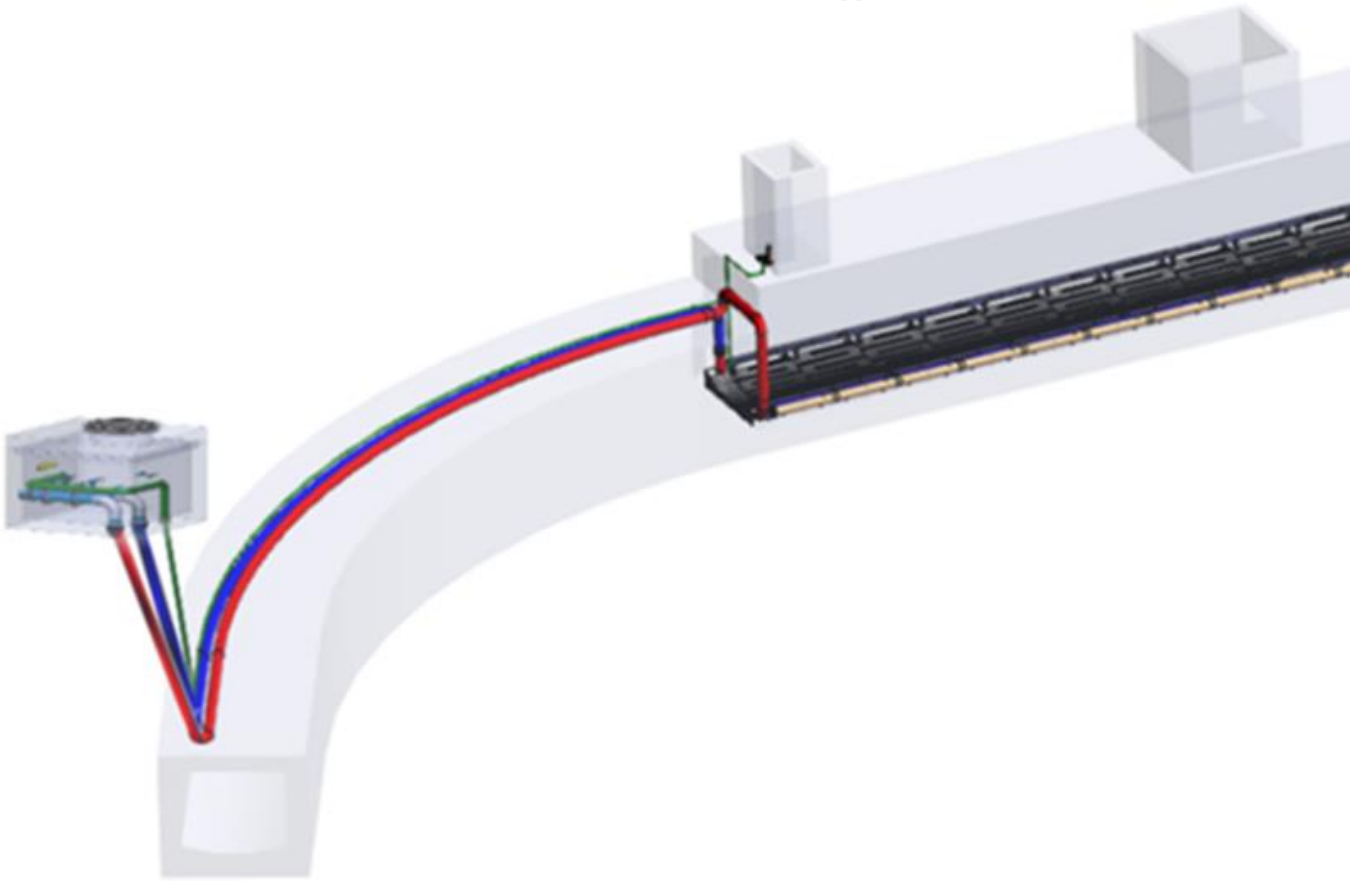
- Diagram of heat exchanger, cable routing sewer monitoring shaft





Installation of complex monitoring and data transfer /control technology

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Heat exchanger and monitoring

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- Installation of the supply and return lines as well as the monitoring system in the sewer, view of the level sensor

Monitoring – with connected heat pumps and buffer for heating/cooling

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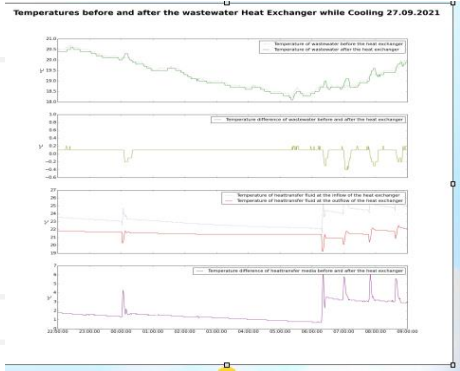
Schematic diagram



Energy from waste water
Wien Kanal Zentrale
Heating/ Cooling + Monitoring
Cooling case

Monitoring data portal

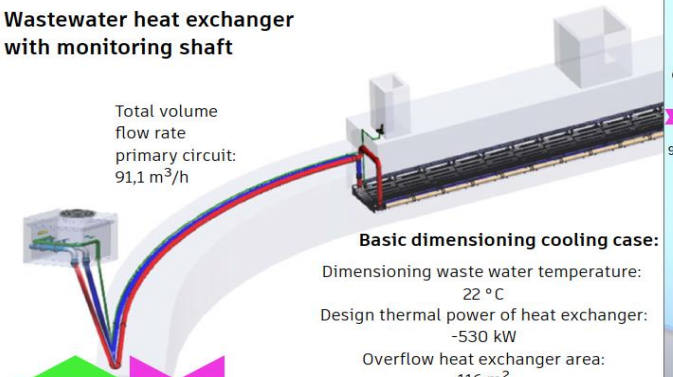
switch cabinet

Data concerning Heat exchanger fluid and wastewater

Waste water: temperature and level
Heat exchanger fluid: temperature, flow and pressure

Wastewater heat exchanger with monitoring shaft

Total volume flow rate primary circuit: 91,1 m^3/h



emitted heat

sewer

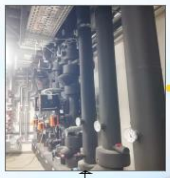
Basic dimensioning cooling case:

Dimensioning waste water temperature: 22 °C
Design thermal power of heat exchanger: -530 kW
Overflow heat exchanger area: 116 m^2
Waste water heat exchanger total length: 76 m

Inlet-Temperature 33,8 °C

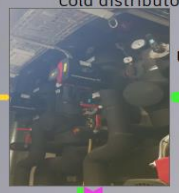
Outlet temperature 28,8 °C

heating manifold



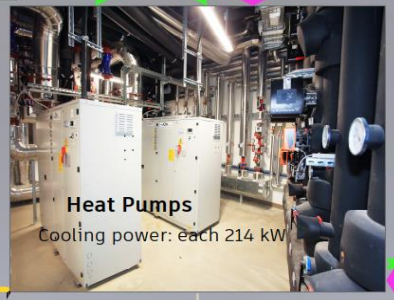
control technology

Cold distributor



Utilized cooling

Air conditioners and servers



Heat Pumps

Cooling power: each 214 kW

Heating buffer tank

electrical energy, EER of the heat pumps=4,09

Cold buffer storage

Example of continous monitoring

Temperatures before and after the wastewater Heat Exchanger while heating 22.03.2022

Results and experiences demonstrator Wien Kanal

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- **Renewable heating and cooling from Wastewater/Vienna – implemented successfully**
- **Continuous Operation (starting with 11/2021)**
- **100% energy supply with renewable energy from wastewater (heating AND cooling)**
- **Innovative Monitoring - first time in Austria**
- Development and demonstration of new, innovative monitoring, remote management and operation control in connection with temperature, volume/pressure, filling level etc. management to increase the efficiency of the wastewater energy utilization
- Continuous system evaluation
- Transferring experiences from demonstrator to new projects

Challenge and lessons learned

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- Framework conditions must be carefully checked before
- Installation and operation without additional maintenance need for sewer operator
- Monitoring system and connection to central control system
- Constantly adapting of monitoring system to the needs of operator (sewer AND client for heating and cooling)
- Expected decrease (heating case) or rise (cooling case) of wastewater temperature lower than expected!
- No negative influence on sewer operation/WWTP-operation

Conclusions and roll-out

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- Wastewater is a year-around, 365-day energy source and can be used with modern heat exchangers and heat pumps
- Renewable heating and cooling from wastewater in district heating and cooling– valuable contribution to the energy transition and to decarbonisation
- Innovative monitoring ensures the optimal operation of the sewer system, influence on waste water treatment plant and the energetic use
- Important for energy planning and circular economy
- **Active application of knowledge gained and innovative technology from demonstrator project**
  - **2 new projects under implementation (200 kw heating- 1,2 MW heating/ 6 MW cooling) in Austria**
  - **Numerous ongoing studies national and international**
- Flagship project and high media presence

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THANK YOU FOR YOUR ATTENTION!

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