NEWEA 2022 Spring Meeting

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UHRIG

Energy from Wastewater

A Renewable Resource

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UHRIG

Problem: Demand for green buildings increasing rapidly

- Buildings are responsible for 28% of worldwide carbon emissions
- Emissions from heating, cooling, lighting buildings
- Renewable energy is a key factor in the decarbonization of the building sector
- Dense urban areas are unsuitable for traditional on-site renewables → lack of renewable energy sources available on site

Solution: Use the energy that is already there!

- Potential: ≈ 15% of heating/cooling needs in the Western Hemisphere

- Key benefits:
  - Renewable energy source
  - reduces CO_2 emissions
  - counts as Combined Heat and Power (CHP) certificates in many states' Renewable Portfolio Standards (RPS)
  - takes pressure off the power grid → climate resiliency

- Key advantages over other renewables:
  - Stored underground
  - Present in abundant quantities
  - operates 24/7/365 with virtually no maintenance
  - No noise caused
  - No large tracts of land needed
  - No sun required

How does it work?

A Heat exchanger

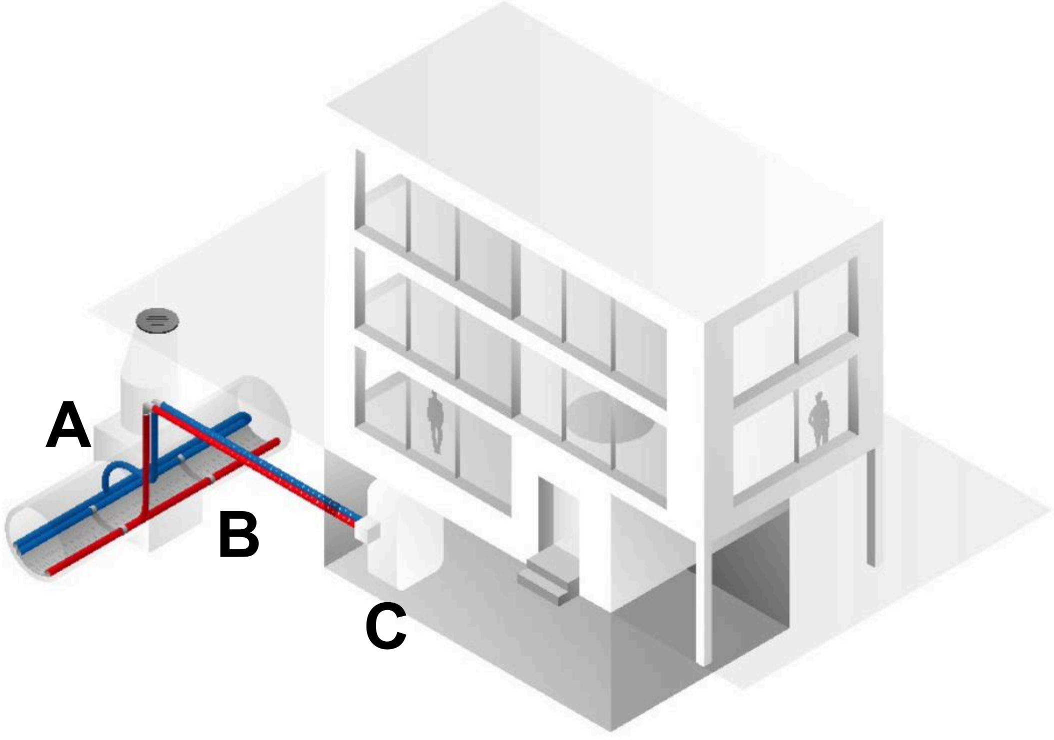
- Extracts energy from the wastewater flowing above
- The wastewater continuously supplies energy

B House connection (lateral)

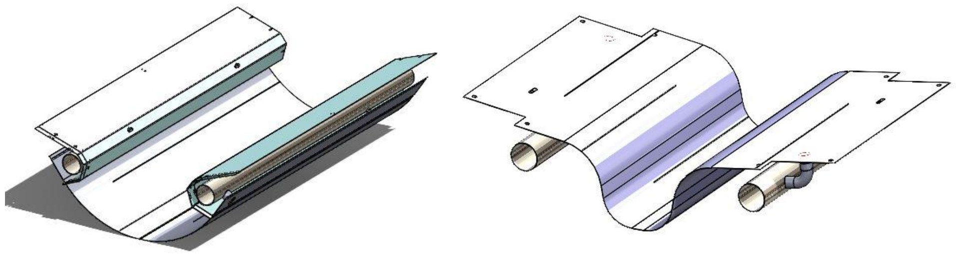
- Connects the heat exchanger and heat pump
- Brings the transport medium (water or water-glycol mixture) to the heat pump back and forth

C Heat pump

- Regulates the temperature level in the heating circuit in the building or in the heat network
- Uses some electrical power to raise the temperature level of the thermal energy



Therm-Liner Heat Exchanger



Case study: Stuttgart, Neckarpark, Germany, 2018

Tasks

- Harness 2.1 MW of thermal output from a municipal sewer near the project site
- Design, build and install a low-maintenance system to recover energy directly in the sewer
- Developing a solution that combines both cost and environmental benefits

Starting conditions

- Public sewer line available nearby
- Wastewater flow rate: 170 l/s
- Minimum wastewater temperatures: 51 °F

Project specifics: Stuttgart, Neckarpark, Germany, 2018

Framework data / UHRIG Therm-Liner specifications		
Sewer profile		Box
Profile width / height	2,400	mm
Minimum wastewater flow	170	l/s
Minimum wastewater temperature	51	°F
Thermal output THERM-LINER	2,100	kW
Inlet temperature THERM-LINER	32	°F
Outlet temperature THERM-LINER	39.2	°F
Coefficient of performance heat pump	4.2	COP
Primary circuit: Water-Glycol. Glycol share:	25	%
Total length THERM-LINER	985	Ft
Maximum wastewater temperature drop	3.03	K

Energy savings and avoided CO_2: Stuttgart, Neckarpark

- Energy concept: Bivalent solution with wastewater heat and combined heat and power plant
- Concept: 74% of heating demand satisfied with heat from wastewater
- Energy savings over 20 years: 109,674,783 kWh
- Avoided CO_2 over 20 years: 16,482 tons
  (compared to Stuttgart district heating: 174g/kWh)
- CO_2 emissions from heat from wastewater depend on the electricity used in the heat pump
  (German electricity mix. Averaged over period: 67g/kWh)

Framework data HEAT FROM WASTEWATER Solution		
Thermal Output THERM-LINER	2,100	kW
Heating hours per year	2,600	h
Thermal energy per year	5,485,739	kWh
Heating energy per year (behind heat pump)	7,722,000	kWh

Conclusions and take aways

- Successful implementation:
  - Exemplary plant successfully in operation and continuously monitored
  - A total of 100+ UHRIG plants in operation in Europe

- Climate friendly:
  - Reduces CO_2-emissions drastically → CHP certificates
  - Exemplary plant avoids almost 1.000 tons CO_2 annually
  - German UHRIG plants avoid more than 6.000 tons CO_2 annually

- Transferable approach:
  - Applicable in almost any public sewer
  - Can be installed in both new and existing sewers
  - Sewer > 16 inch
  - Wastewater discharge > 10 l/s
  - Distance sewer < 2,000/3,000 ft

Thank You!

UHRIG North America

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