

## Modern Heat exchanger Technology From Germany– an Export product



**„Professional competence in Culvert and Pipe Technology”**

**“The Common phrase „Waste Water“ does not mean for us that the water which flows under our feet every day in the Sewers of our Cities is a waste product.**

**It is for us, a source of unused raw energy.**

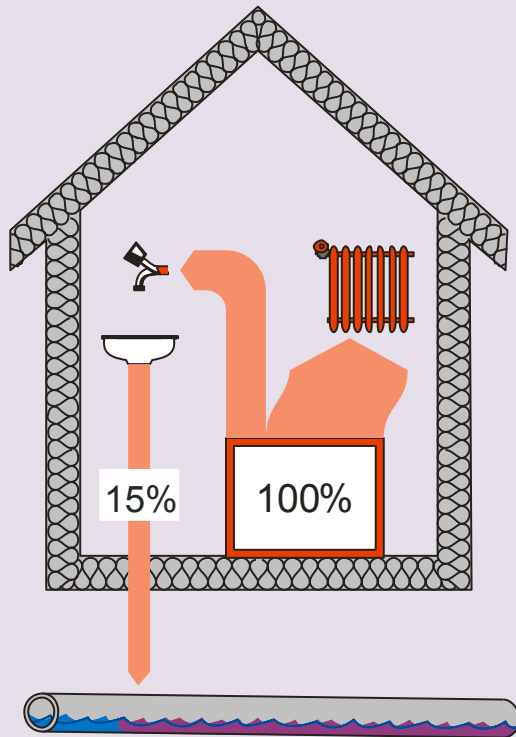
**For the Management and housekeeping of our Sewer networks, we build on Quality, durability and sustainability.”**



- Company Founded: 1963
- Number of Employees: 120
- Turnover: 25 Million €
- Head Office Geisingen / Germany
- Main Fields of work:
  - Civil Engineering
  - Sluice Gate Engineering and Construction
  - Pipe and Culvert Rehabilitation
  - Quick-Lock ® Local Patch Rehabilitation
  - Therm-Liner ® Recovering Energy from Waste Water



## Waste Water – An Energy Leak?



- Every person pours daily approximately 130 Litres of household water (from Showering, Washing machines Toilets) into the Sewer Systems under our Cities
- The Temperature of this Water is approx 20 °C
- **it flows constantly, every day, hour, minute every second**



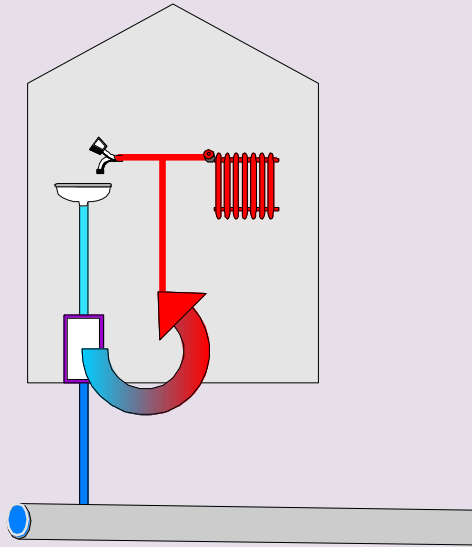
## A Strong Argument

- Heating in Winter and Cooling in Summer
- Waste Water is a secure hidden Energy Source
- The Existing Energy there is recycled
- 40 % Less CO<sub>2</sub> Production
- 1 m<sup>3</sup> Waste Water / per Hour, cooled by 1 Kelvin
  - Produces 1,16 kW from Waste Water
  - Produces with the Heatpump 1,5 kW
  - Produces with a bivalent Heating System 5 kW  
*(Which is the normal requirement for a family household)*



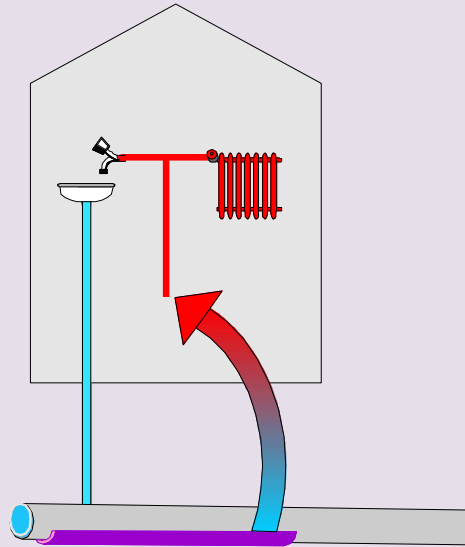
(A Supply of approx. 5% Energy in D is Possible)

## Therm Liner working Principle



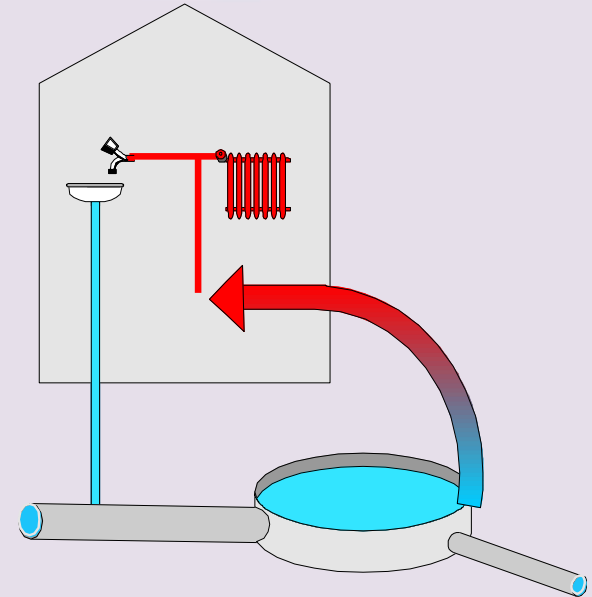
### Recycling „in house“

- Approx 270 Systems
- For heating household water
- Achieving up to 100 kW



### Energy from Sewerage water

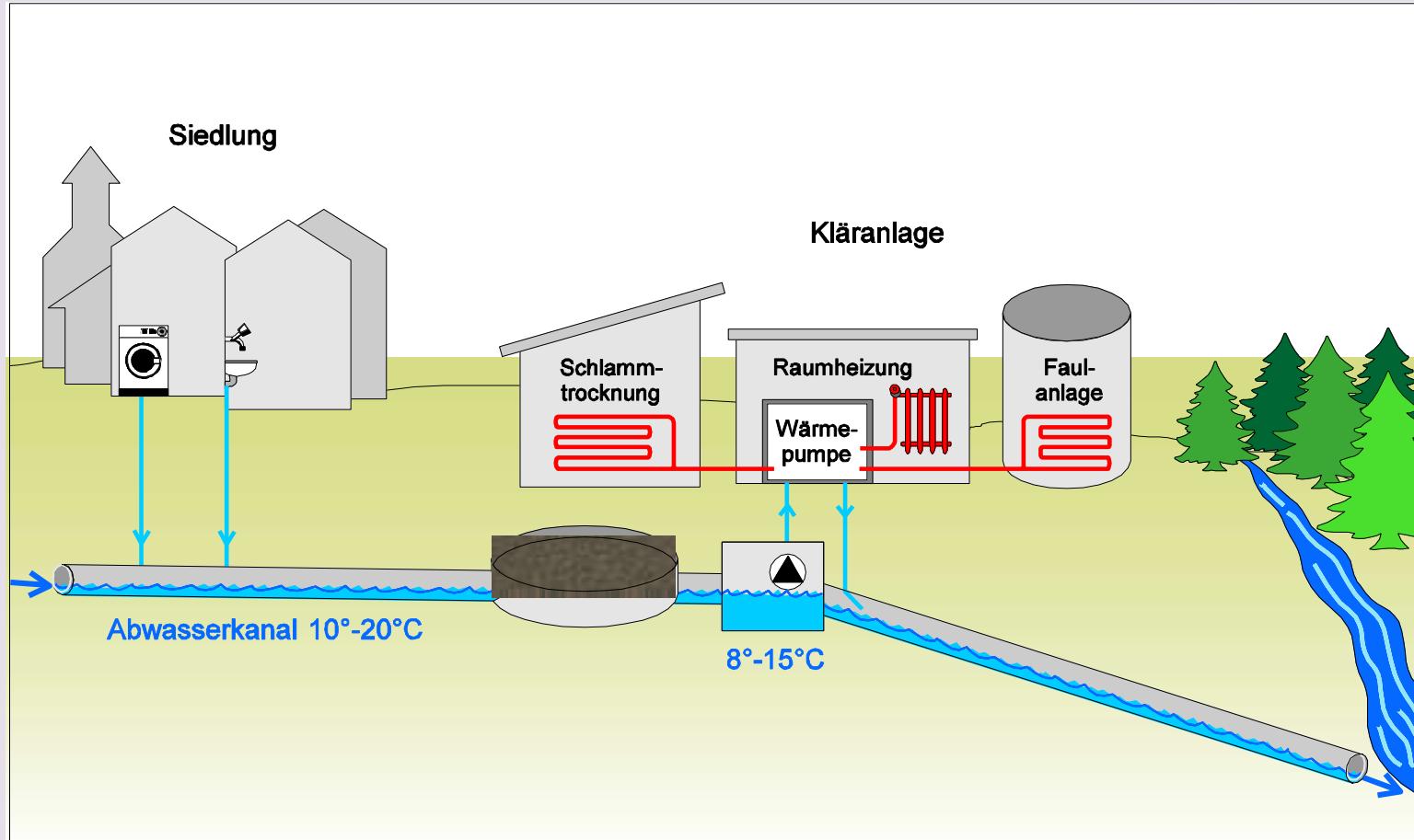
- Approx 30 Systems
- Continuous supply
- Achieving up to 1000 kW



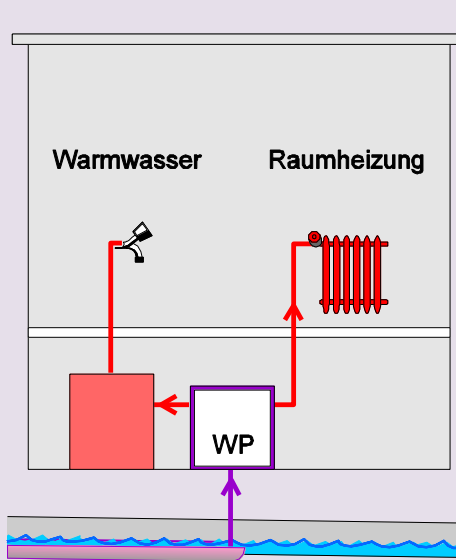
### Energy from Filtered /Cleaned Sewerage Water

- Approx 100 Systems
- Large Potential
- Achieving up to 10 MW

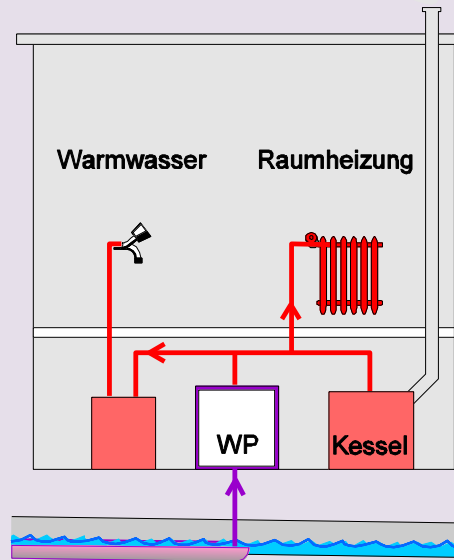
## Use of Energy at the Sewerage Treatment Plant



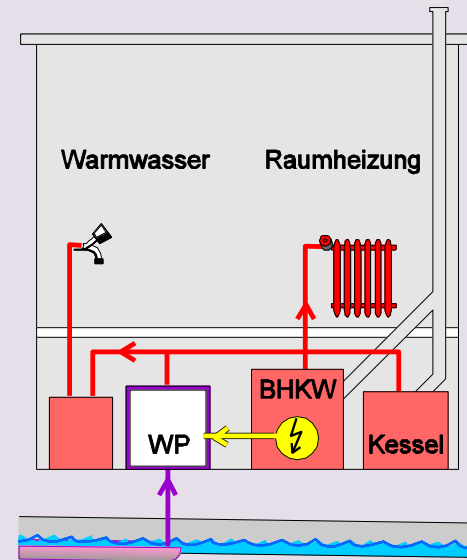
## Heating Systems



- Mono System



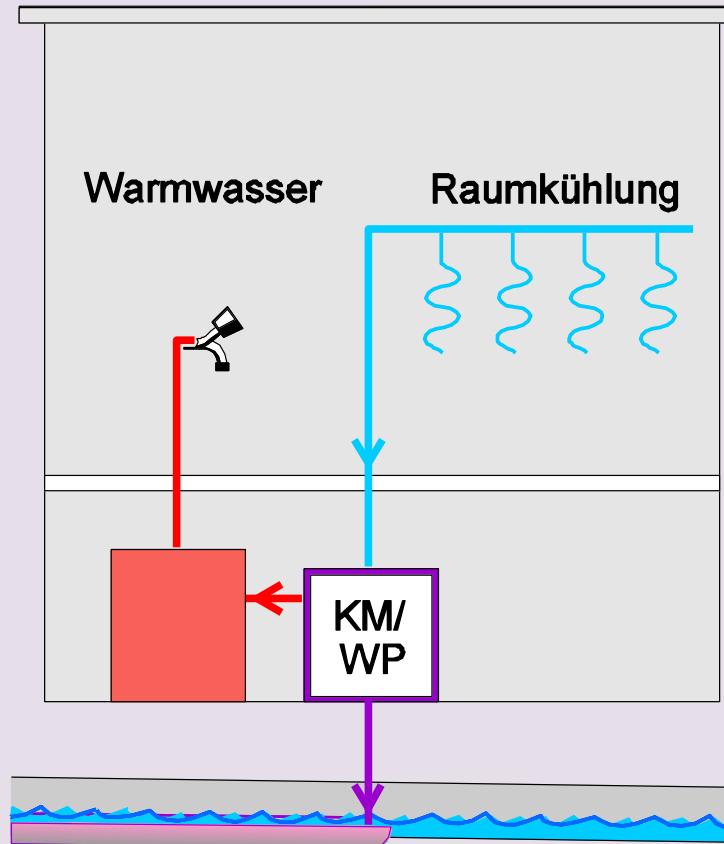
- Dual System



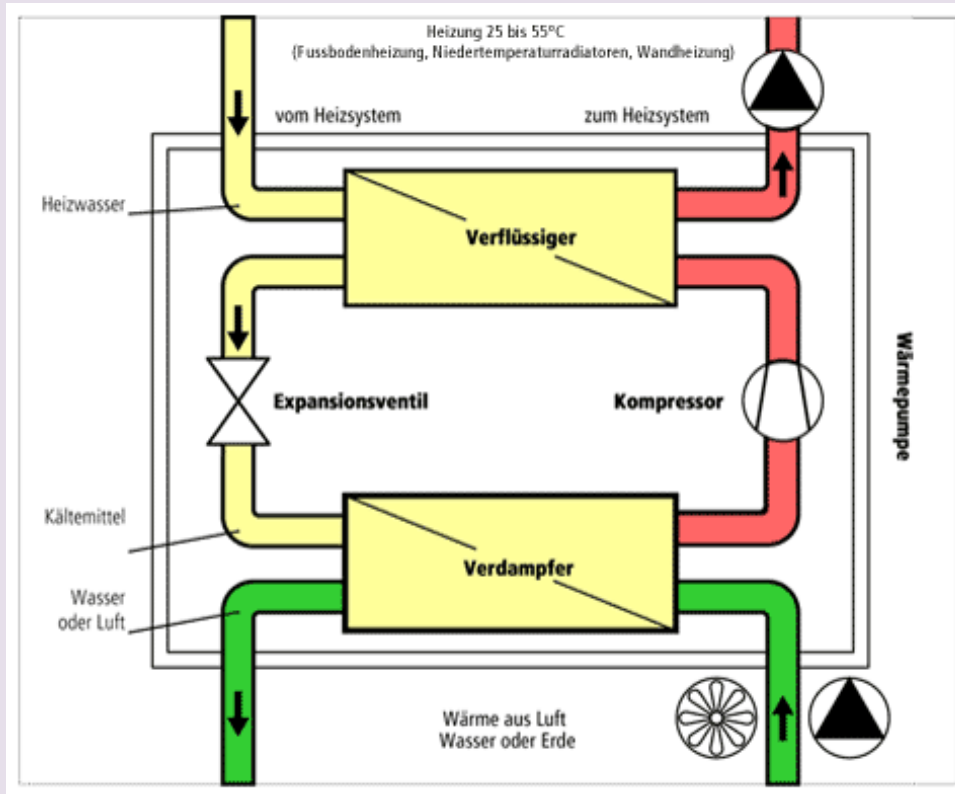
- Multi System



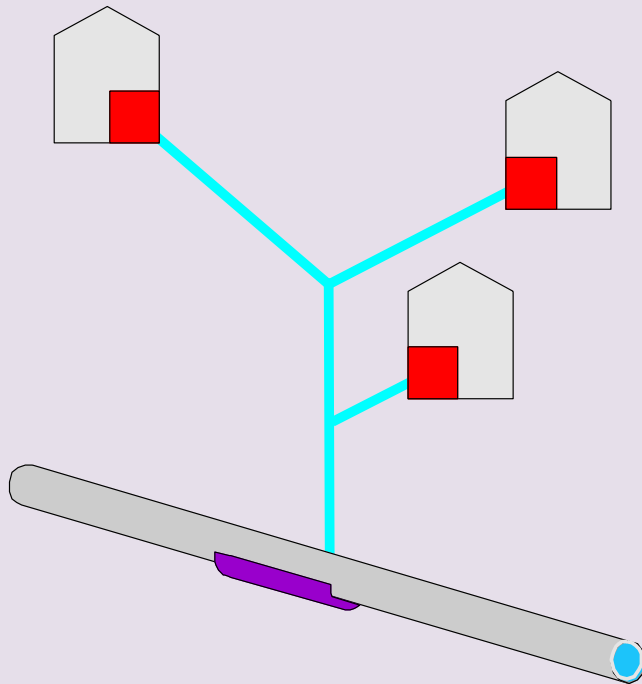
## Cooling with Waste Water



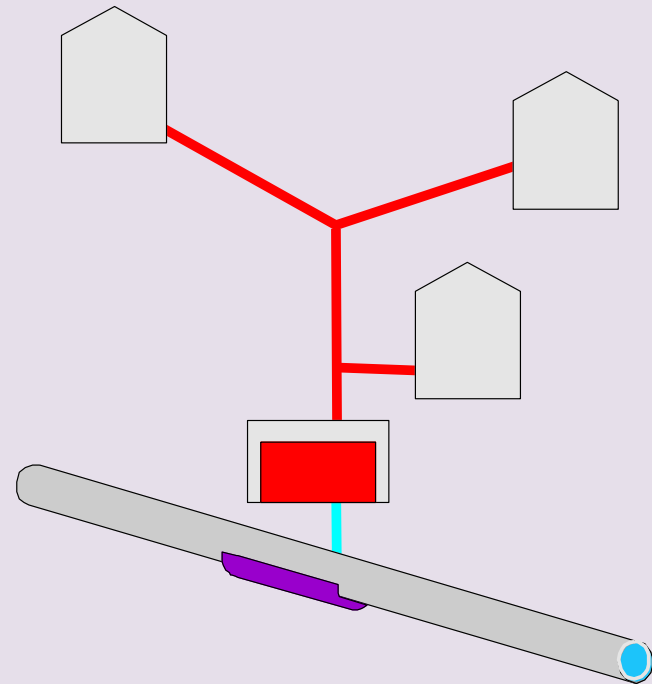
## The working Principle of Heat Pumps



## Method of distribution



Heating with a local system

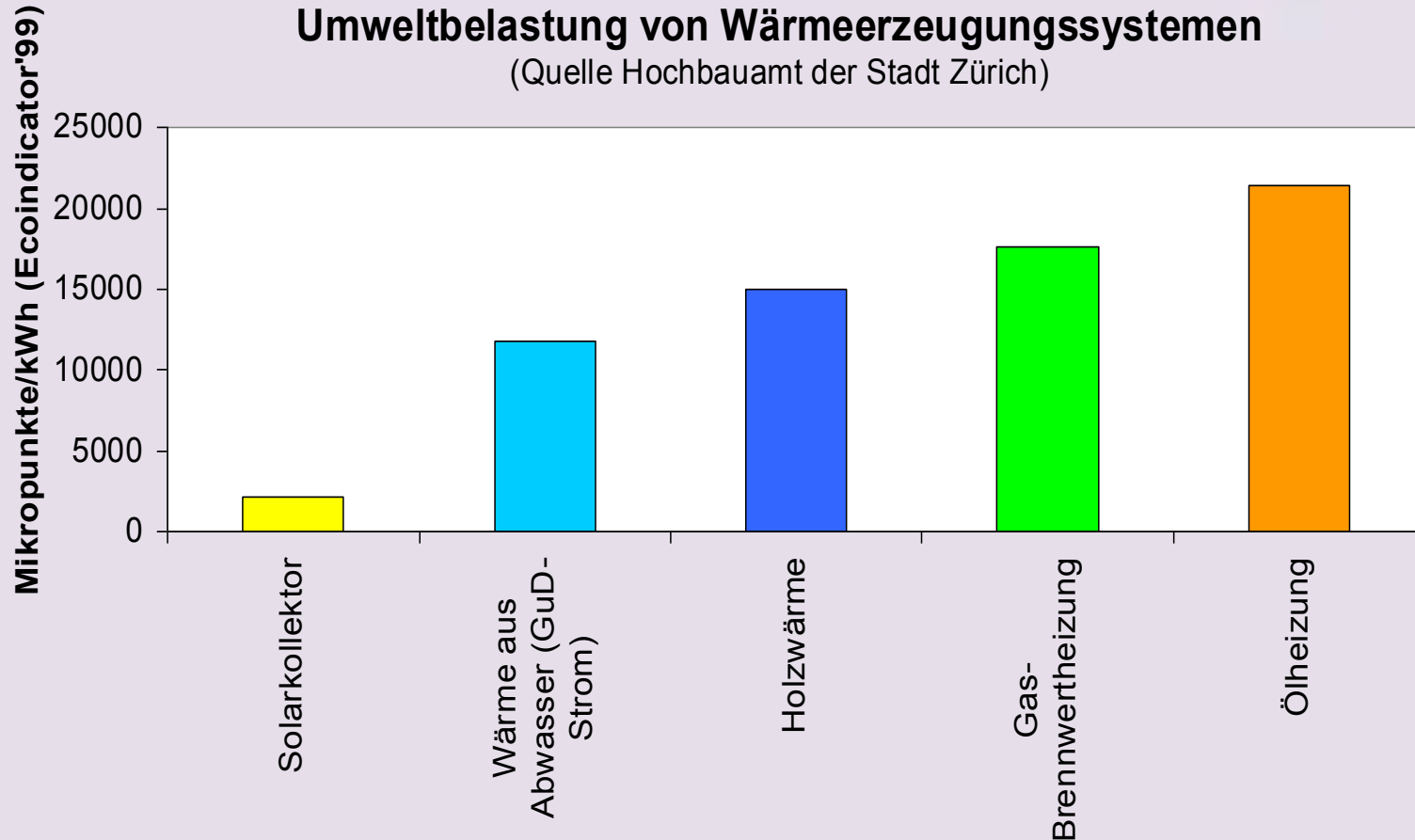


Heating distributed from a central point

## Environmental (Source ETH Zürich)

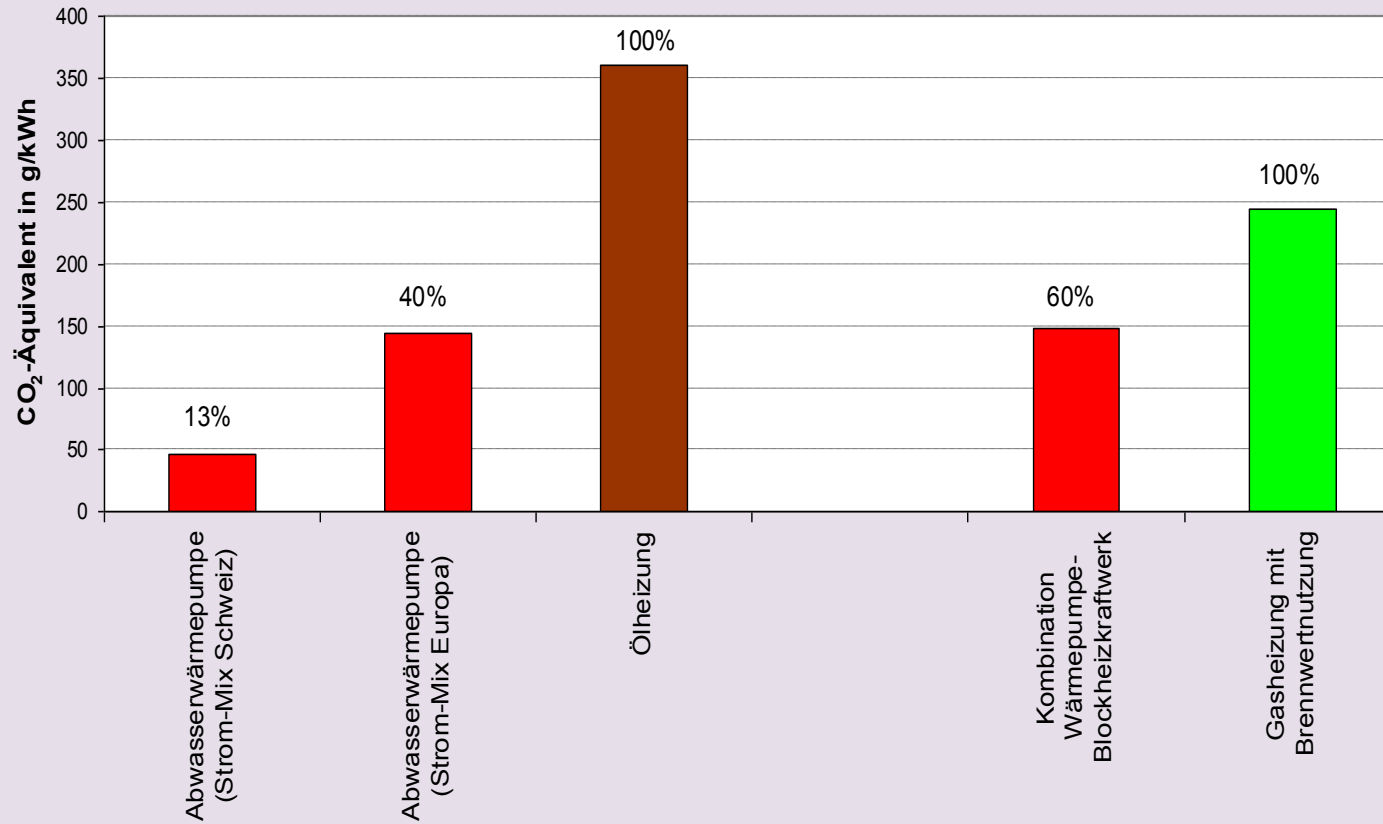
### Umweltbelastung von Wärmeerzeugungssystemen

(Quelle Hochbauamt der Stadt Zürich)





## Summe aller für den Treibhauseffekt relevanten Emissionen in CO<sub>2</sub>-Äquivalenten (Quelle ETH Zürich)



## Heat exchange system for Raw Sewage Water (System Rabtherm)



## Operational Safety with Heat Exchanger Elements in Sewers and Culverts

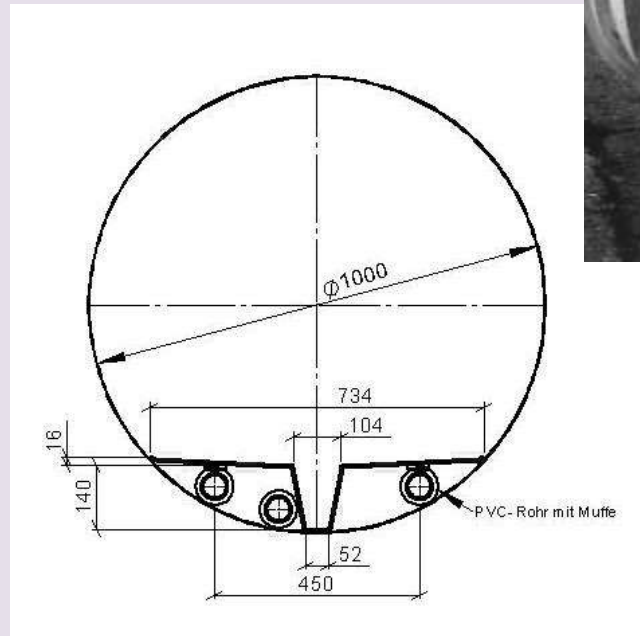
Field Test Report with Heat Exchanger Elements carried out by  
IKT-(Institute for Underground Infrastructure, Dr. Lutz Rometsch,  
Januar 2005

[www.ikt.de](http://www.ikt.de) (Download / Research report)

## Model Dry weather channels

Advantage:

- High rate of Flow
- High flush capacity
- Small narrow cross section  
(DN 1000 approx. 6%)





## Therm - Liner Element data



### Technical Information for Therm-Liner DN 800:

- Material: V4A 1.4404
- Length: 1000 mm
- Width: 634 mm
- TL Surface: 0,86 m<sup>2</sup>
- Performance: 1,8 KW/m<sup>2</sup>  
(50% Bio Film Sediment , T 4 Kelvin)
- Section loss:  $\Delta$  11,33 %

## Bio film Sediment

A study by the EAWAG Federal Institute for Water Supply, Waste Water Treatment and River protection,

Switzerland, 2004

- Has an Influence from 20 to 50% on the Energy Exchange
- Forming depending on rate of flow and the waste water composition
- Small amounts of Bio film Sediment on cold rolled Metal Sheet Surface type 2B
- Reduction of the Bio film Sediment of max. 20 % achieved by:
  - Flood Flush systems
  - Regular High-pressure Jet cleaning



Bio-film forming after 16 Days



Bio-film after System Flushing

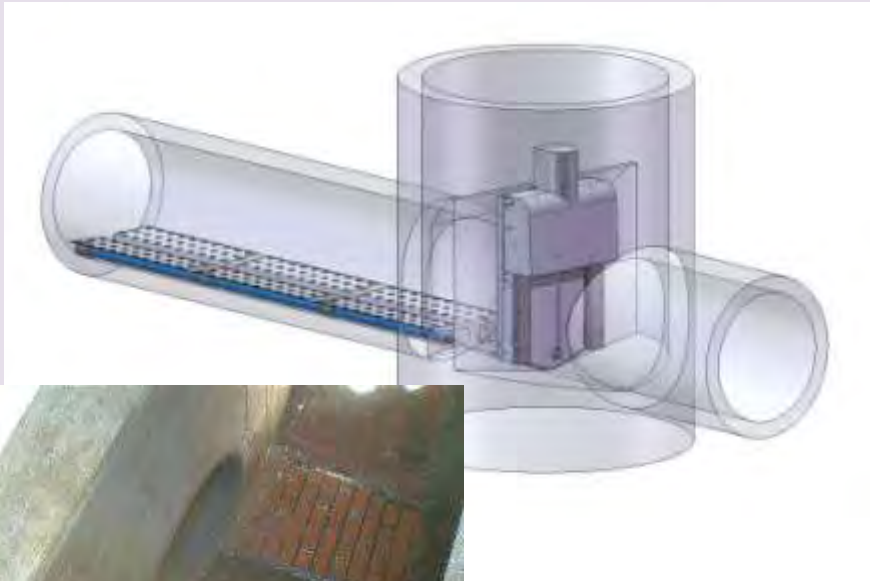
## Therm-Liner – Surface Raw untreated



## Therm-Liner incorporated into the Sewer network housekeeping system

### Advantage:

- A regular cleaning of the Therm Liner reduces the amount of Bio film Sediment to under 20%
- Distribution of the unused peak flows to the weaker flow periods
- The period of flow over the Therm-Liner increases
- Cleaning Sections  
Flush: approx. 1000 m  
Suction: approx. 300 m





## The New development of Therm-Liner Model B



### Advantages:

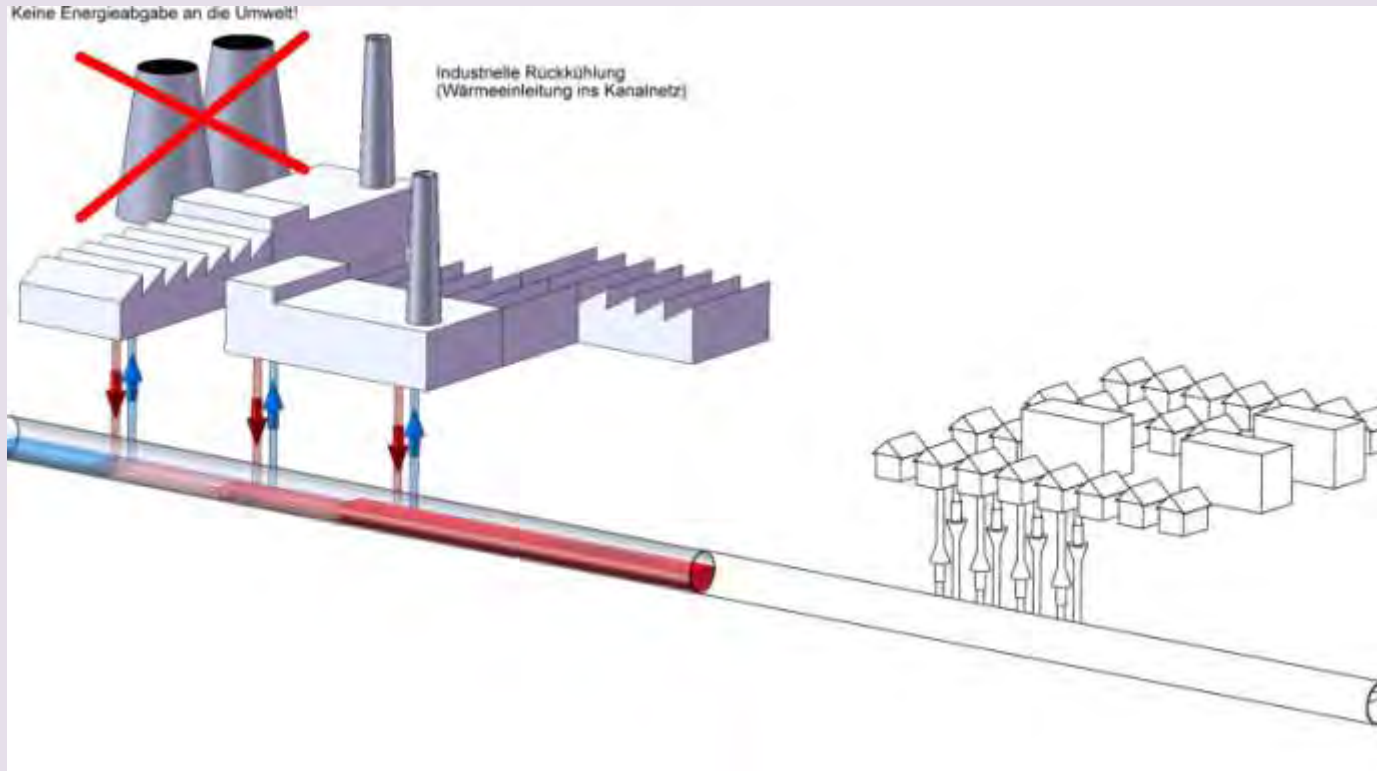
- The pipe system can be Vented from the highest point.
- Simpler Installation
- Smaller System cross-section

## Arguments....

- TL can be installed in the Existing Sewer Networks or in New Sewer networks
- Waste water flow from 10 l/s to -15 l/s is ideal
- Installation through existing Manholes
- Suitable for all pipes and culverts from DN 800
- 
- Can be used for Heating or Cooling
- Easily serviced and maintained
- Therm-Liner module systems are extendable

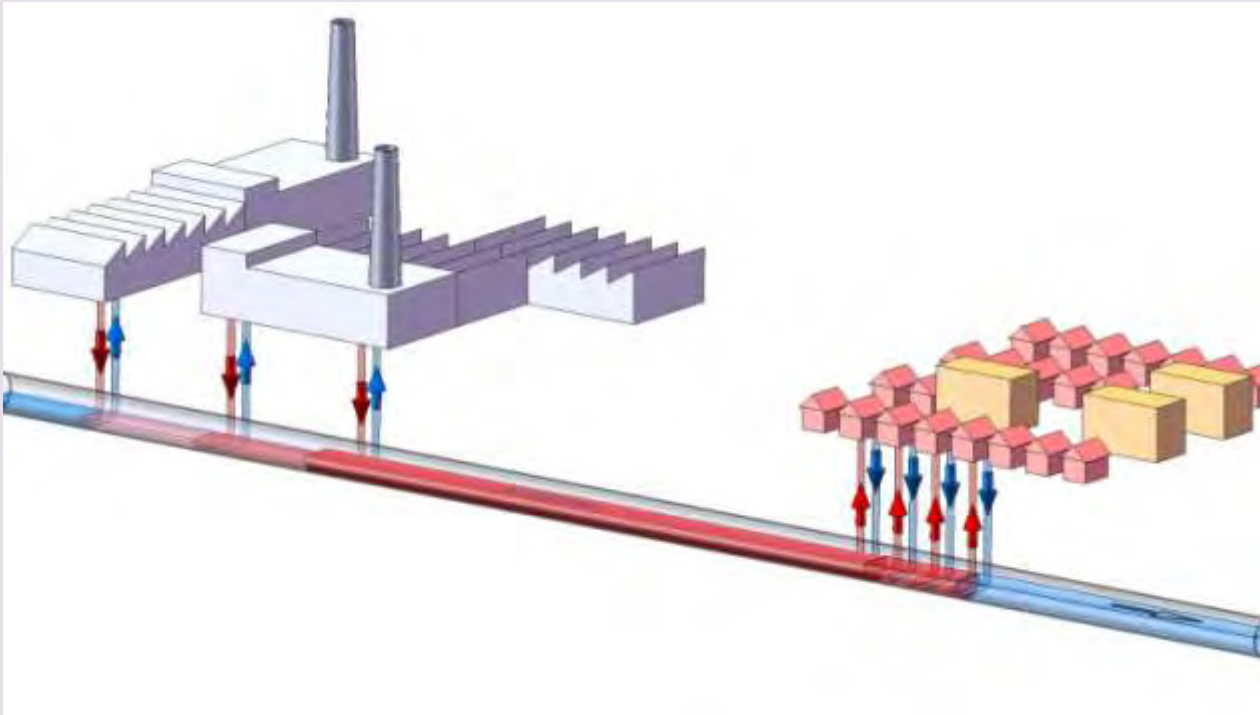
## The Future – The Waste Water network as Energy system

- The industry introduces their waste energy product into the system



## The Future – The Waste Water network as Energy system

- The energy is recycled to heat the town reducing costs and CO<sup>2</sup> emissions





## Installed System Berlin 2006



- Sewer pipe Egg profile 1600 / 1067
- Rate of Flow 40 l/s
- Energy requirement 130 KW
- Energy generated from Sewer 32 KW
- Additional energy source 75 %
- Length of Therm Liner 23 m
- Distance to Building-HP 160 m



**Energy reserve 10 %**

## Installed System Schkeuditz 2008

• Sewer Pipe	Egg profile 1200 x 800
• Rate of Flow	8,3 l/s
• Energy Requirement	80 / 12 KW
• Energy generated from Sewer	43 KW
• Energy Saving	43 %
• CO <sub>2</sub> –Reduction	60 %
• Length of Therm Liner	39 m
• Amortisation	8 / 16 years



## Installed System Chessiere 2008



- |                               |                      |                               |          |
|-------------------------------|----------------------|-------------------------------|----------|
| • Sewer                       | Rectangular 1200x700 | • Energy Saving               | 35 %     |
| • Rate of Flow                | 26 l/s               | • CO <sub>2</sub> – Reduction | 50 %     |
| • Energy Requirement          | 120 KW               | • Length of Therm Liner       | 33 m     |
| • Energy generated from Sewer | 69 KW                | • Amortisation                | 12 years |



## Installed System Bretten 2009



- Sewer
- Rate of Flow
- Energy Requirement
- Energy generated from Sewer
- Energy Saving
- CO<sub>2</sub> – Reduction
- Length of Therm Liner
- Amortisation

RÜB Channel  
60 l/s  
170 kW  
120 kW  
38 %  
60 %  
102 m  
< 12 years

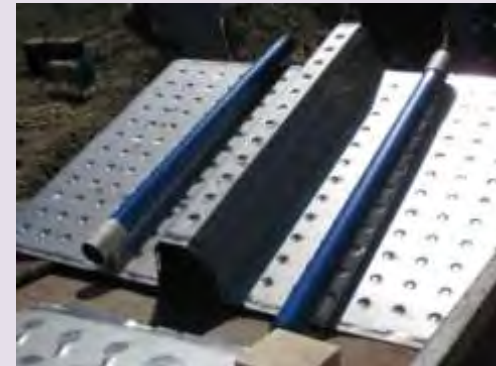




## Installed System Bochum 2009



- Sewer Round DN 3000
- Rate of Flow 140 l/s
- Energy Requirement 200 KW
- Energy generated from Sewer 150 KW
- Energy Saving 48 %
- CO<sub>2</sub> – Reduction 60 %
- Length of Therm Liner 46 m
- Amortisation < 10 years



## Installed System Pinneberg 2009

- Sewer Round DN 1000
- Rate of Flow 96 l/s
- Energy Requirement 150 KW
- Energy generated from Sewer 120 KW
- Energy Saving 41 %
- CO2 – Reduction 53 %
- Length of Therm Liner 57 m
- Amortisation < 10 Years



## Installed System Hamburg 2009



- Sewer Round DN 1200
- Rate of Flow 12 l/s
- Energy Requirement 200 KW
- Energy generated from Sewer 105 KW
- Energy Saving 33 %
- CO2 – Reduction 46 %
- Length of Therm Liner 95 m
- Amortisation < 13 Years



## Installed System Tübingen 2009

- Sewer DN 1500
- Rate of Flow 130 l/s
- Energy Requirement 73 kW
- Energy generated from Sewer 22,5 kW
- Length of Therm Liner 17 m
- Energy Saving 46 %
- CO<sub>2</sub> - Reduction approx. 37 %
- Amortisation < 10 Years





## Installed System Munich 2009

• Sewer	Egg Profile
• Rate of Flow	23 l/s
• Energy Requirement	32 kW
• Energy generated from Sewer	25 kW
• Length of Therm Liner	22 m
• Energy Saving approx.	42 %
• CO <sub>2</sub> - Reduction approx.	57 %
• Amortisation:	<10 Years





Why are you waiting ?

Use the "Raw oil" under our Cities

Thank you for your Attention!