WTG
WATER TREATMENT GMBH

Minimising the ecological footprint of cash

New solutions for the far end of the banknote printing process

Company

WHO WE ARE

WTG Water Treatment GmbH, was founded in Austria. We are a group of experts for:

- **Environmental technologies**
- **Energy management and renewables**
- **Machine manufacturing**

We provide:

- **Patented solutions for wiping solution treatment in security printing**
- **Individual design and special purpose machinery**

Since 2012

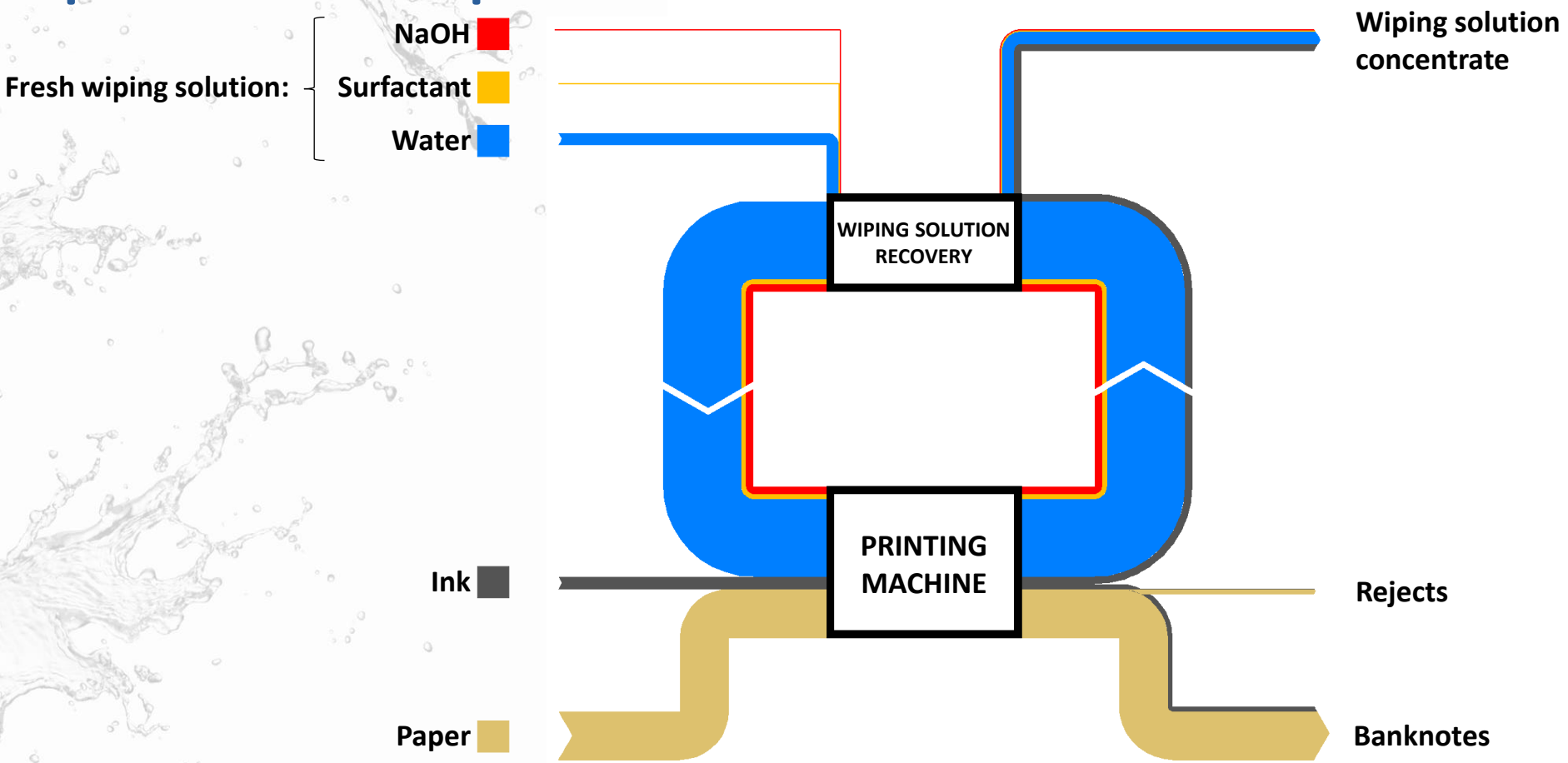
united **expertise**, **technical knowledge and manufacturing facilities**

Ecological footprint of a banknote

Environmental impact during the whole banknote production and circulation process:

- **Raw materials – paper, inks, and chemicals**
- **Energy demand – electrical and thermal energy, fuels**
- **Product and waste output – treatment of rejects, effluents, and „end-of-lifetime“-banknotes**

Material flow during the banknote production process

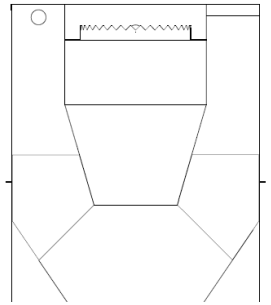


Attention – non-linear scale: $width \sim \sqrt{\dot{m}}$

Solutions used for treatment of UF effluents

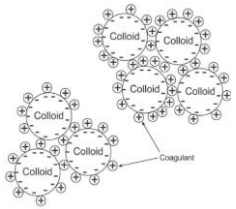
Mechanical processes:

- Settling tanks, Centrifugation



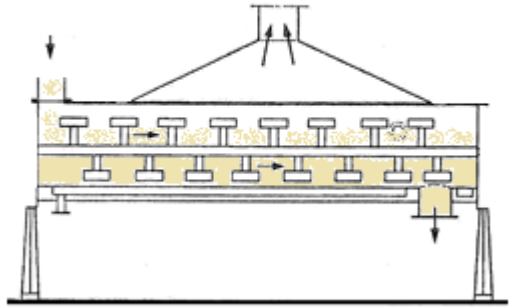
Chemical/mechanical processes:

- Chemical separation: precipitation, coagulation and flocculation



Thermal processes:

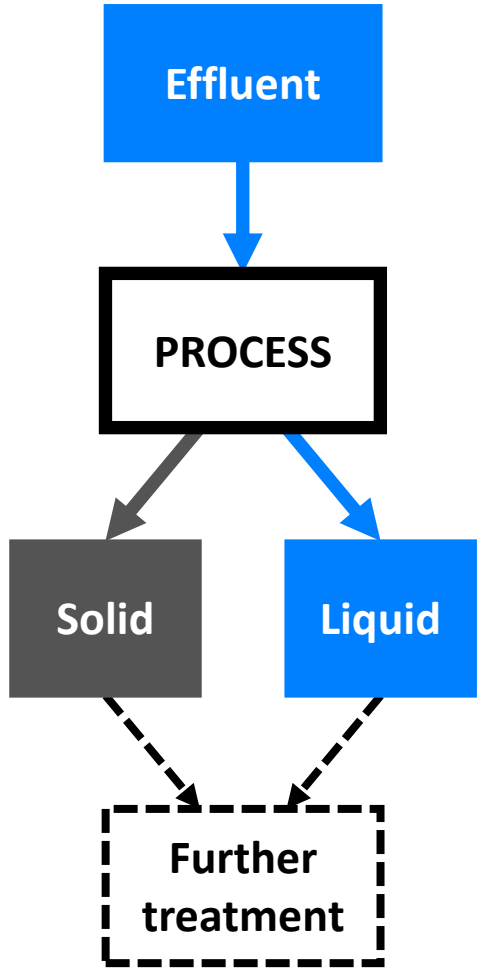
- Vacuum distillation
- Contact dryers: drum dryer, paddle dryer
- Air dryers: Spray dryer, belt dryer



Why use thermal processes instead of mechanical or chemical?

Characteristics of mechanical and chemical processes:

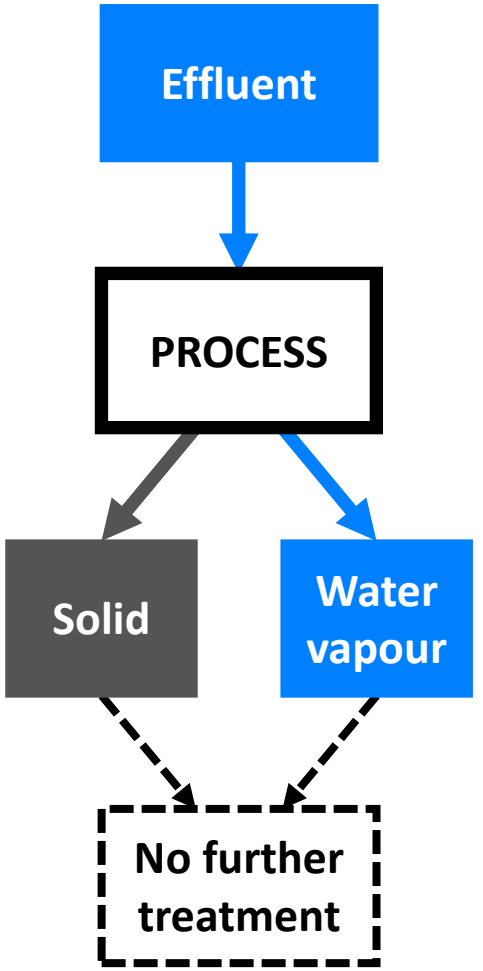
- Lower energy demand
- Output of high solid fraction (mainly ink residues + printing chemicals + treatment chemicals) and low solid fraction (mainly water)
  - High solid fraction is still wet and needs further treatment
  - Low solid fraction is also not reusable or disposable (nor sent to be back to the recovery plant) without further treatment because of contaminants



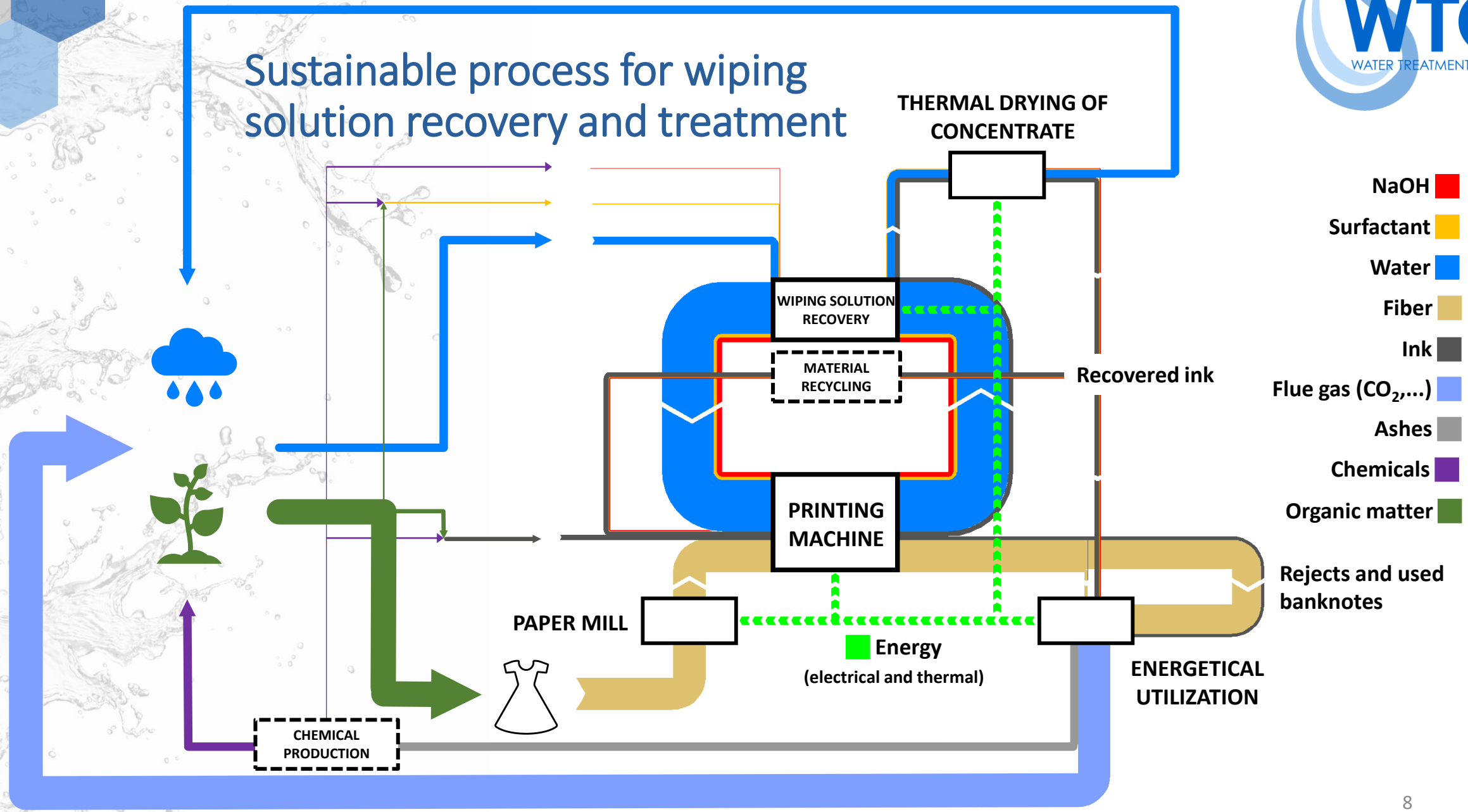
Why use thermal processes instead of mechanical or chemical?

Characteristics of thermal processes:

- Higher energy demand
- Output of solid fraction (only ink residues + printing chemicals) and water vapour
  - Solid fraction usable for material or thermal recycling
  - After simple filtration over activated carbon water vapour can be released to the environment or condensed for usage as water source



Sustainable process for wiping solution recovery and treatment

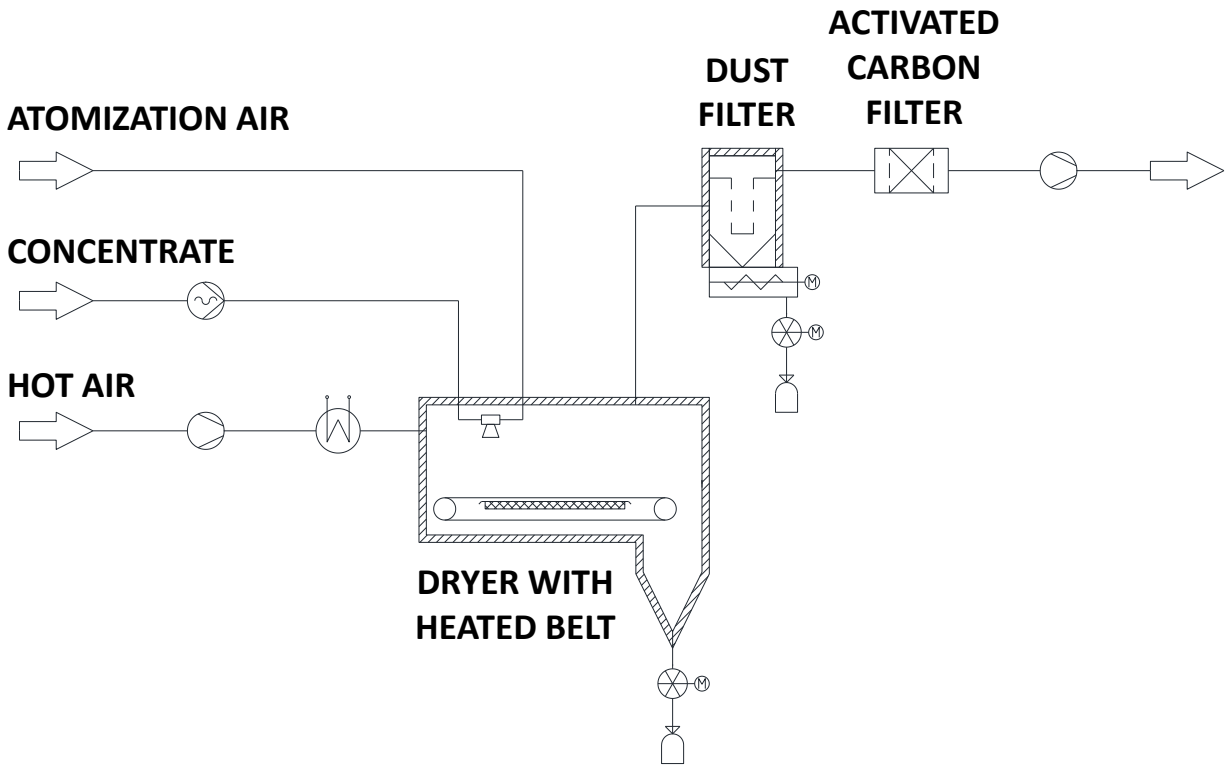


Established: Spray drying of the concentrate

- Atomization of the concentrate into a **hot air** stream for evaporation of water
- Drying at moderate temperature **avoids evaporation of organic compounds**
- Filter removes **dry powder** from the hot air stream
- Activated carbon **removes pollutants** from off-gas

New design: SPRAY BELT DRYER “City Design”

- Atomization of the concentrate into a **hot air** stream for partly evaporation of water
- Spray hits **heated belt**, where the slurry finally dries
- **Dry product** is dropped from belt at the bend and falls into bunker
- A dust filter and an activated carbon filter ensure that **no pollutants** remain in the off-gas



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New design: SPRAY BELT DRYER “City Design”

Advantages of the new dryer system:

- **Smaller equipment** -> better suitable for limited space applications
- Possibility to **control the residual moisture content** of the product by regulation of belt temperature and residence time

New design: SPRAY BELT DRYER “City Design”

Advantages of the new dryer system:

- **Lower energy demand** at lower temperature level -> more options for selection of the heat source

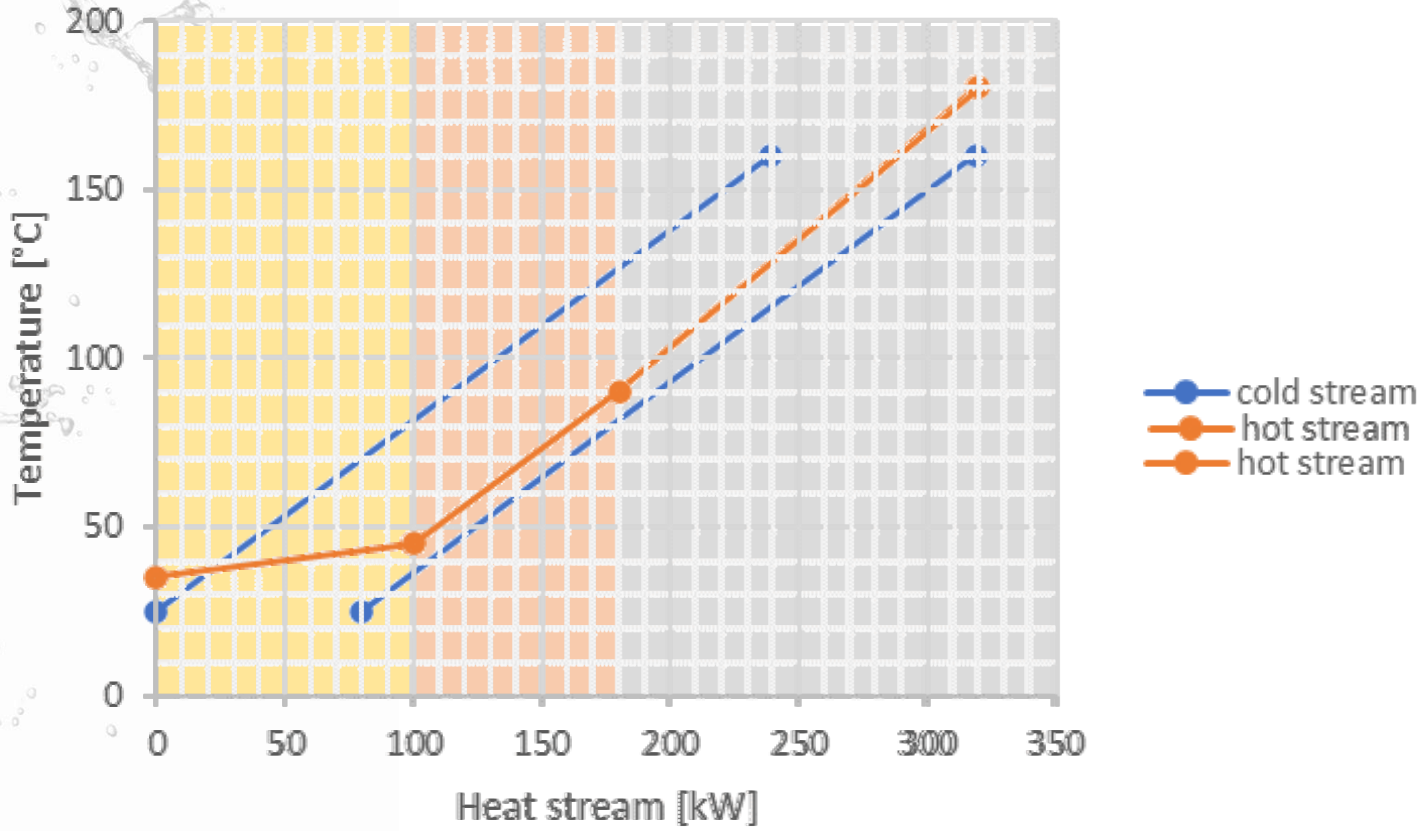
Integration of a dryer system into a heat network – Spray dryer

Off heat AC
100 kW, 35/45°C

District heating
80 kW, 45/90°C

Electricity or gas
140 kW, variable temperature

Spray dryer
240 kW, 25/160°C



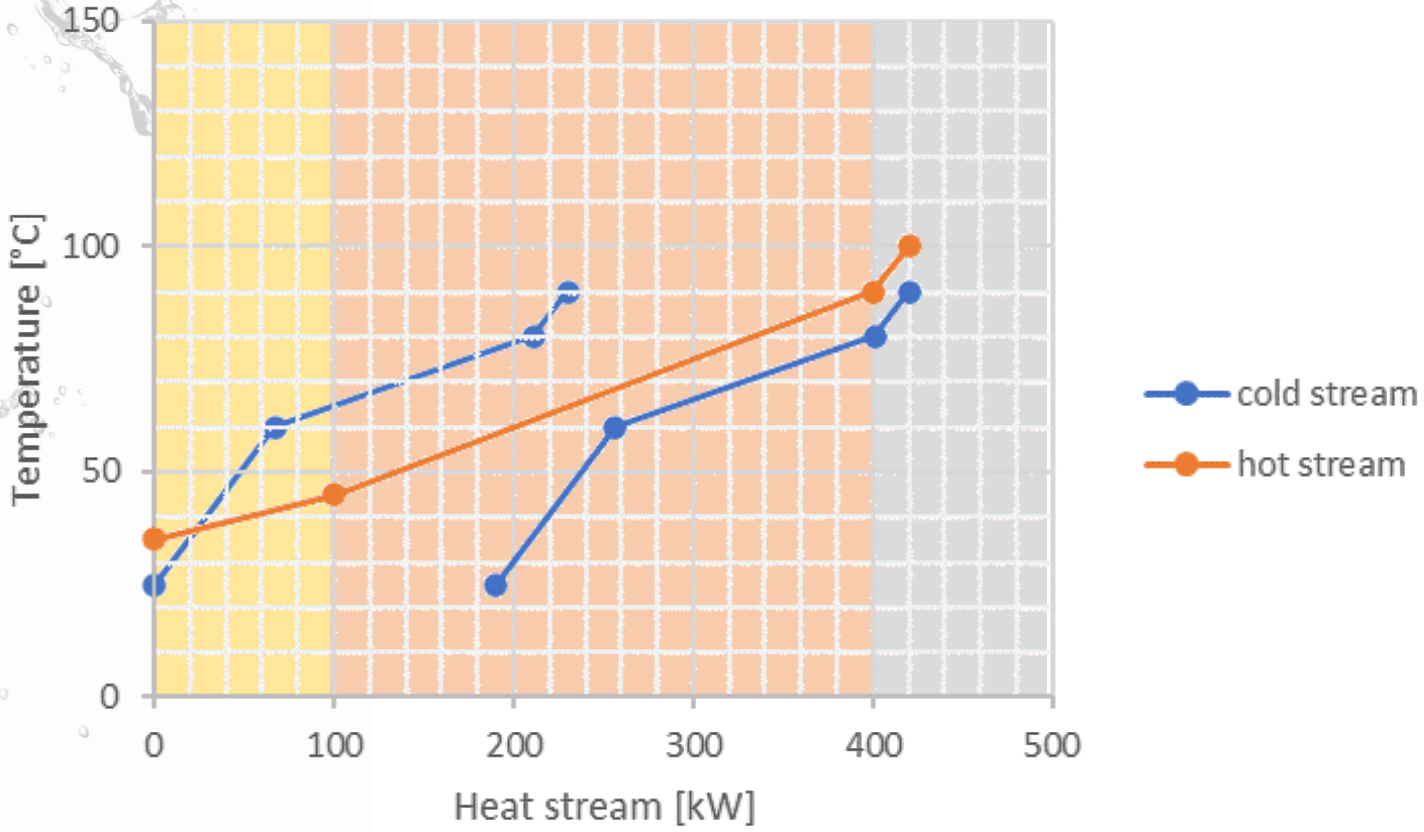
Integration of a dryer system into a heat network – Spray-Belt-Dryer

Off heat AC
100 kW, 35/45°C

District heating
210 kW, 45/90°C

Electricity or gas
20 kW, variable temperature

Spray-belt-dryer
230 kW, 25/90°C



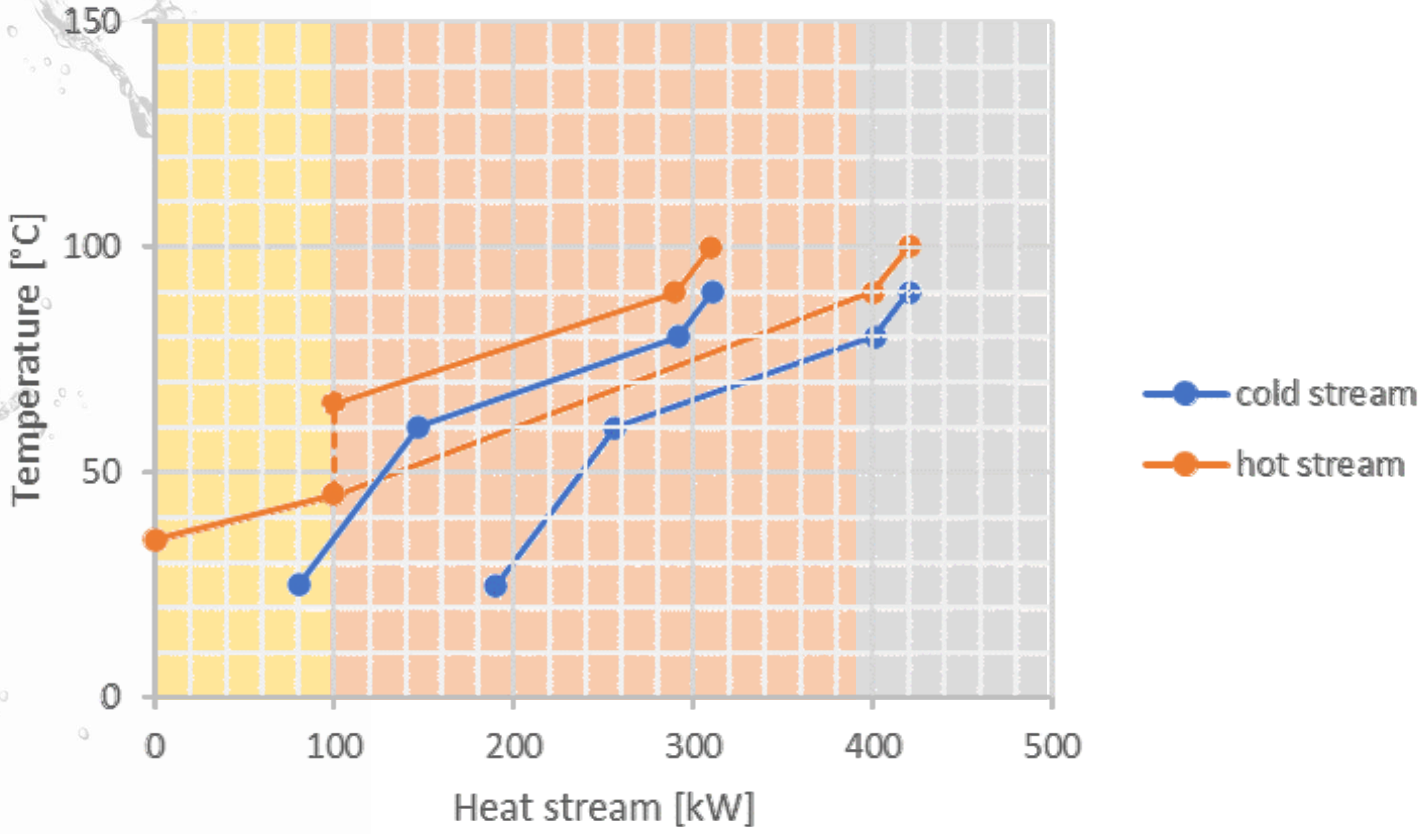
Integration of a dryer system into a heat network – Spray-Belt-Dryer

Off heat AC
100 kW, 35/45°C

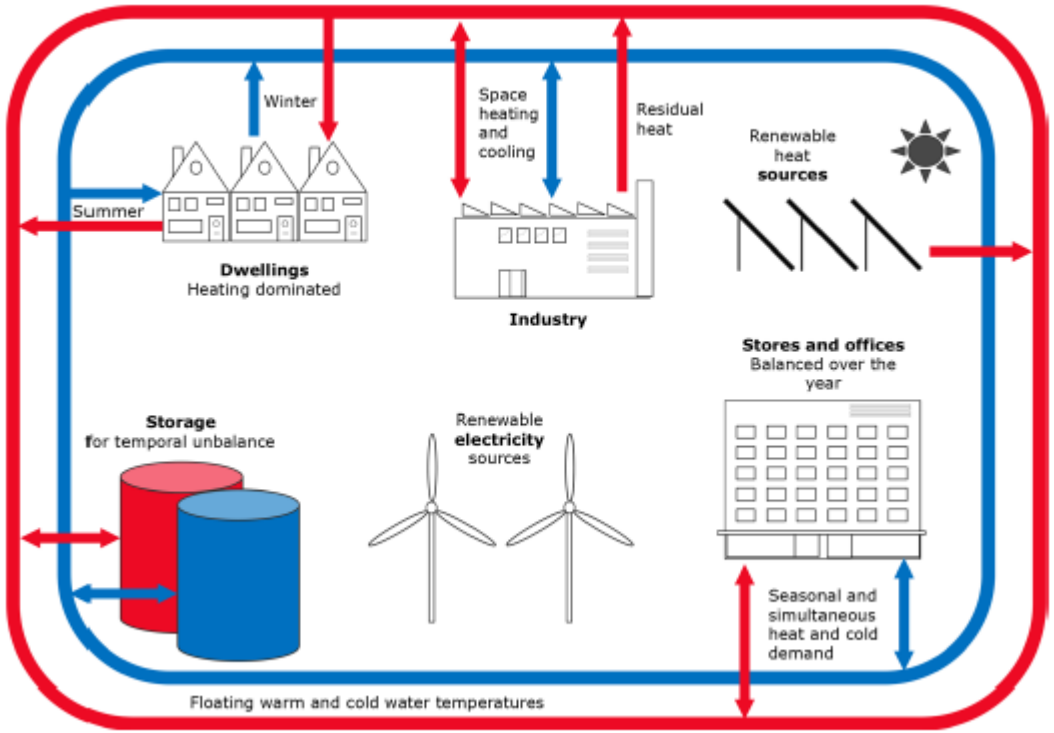
District heating
190 kW, 65/90°C

Electricity or gas
20 kW, variable temperature

Spray-belt-dryer
230 kW, 25/90°C



Utilization of renewable energy: excursus to cold heating networks



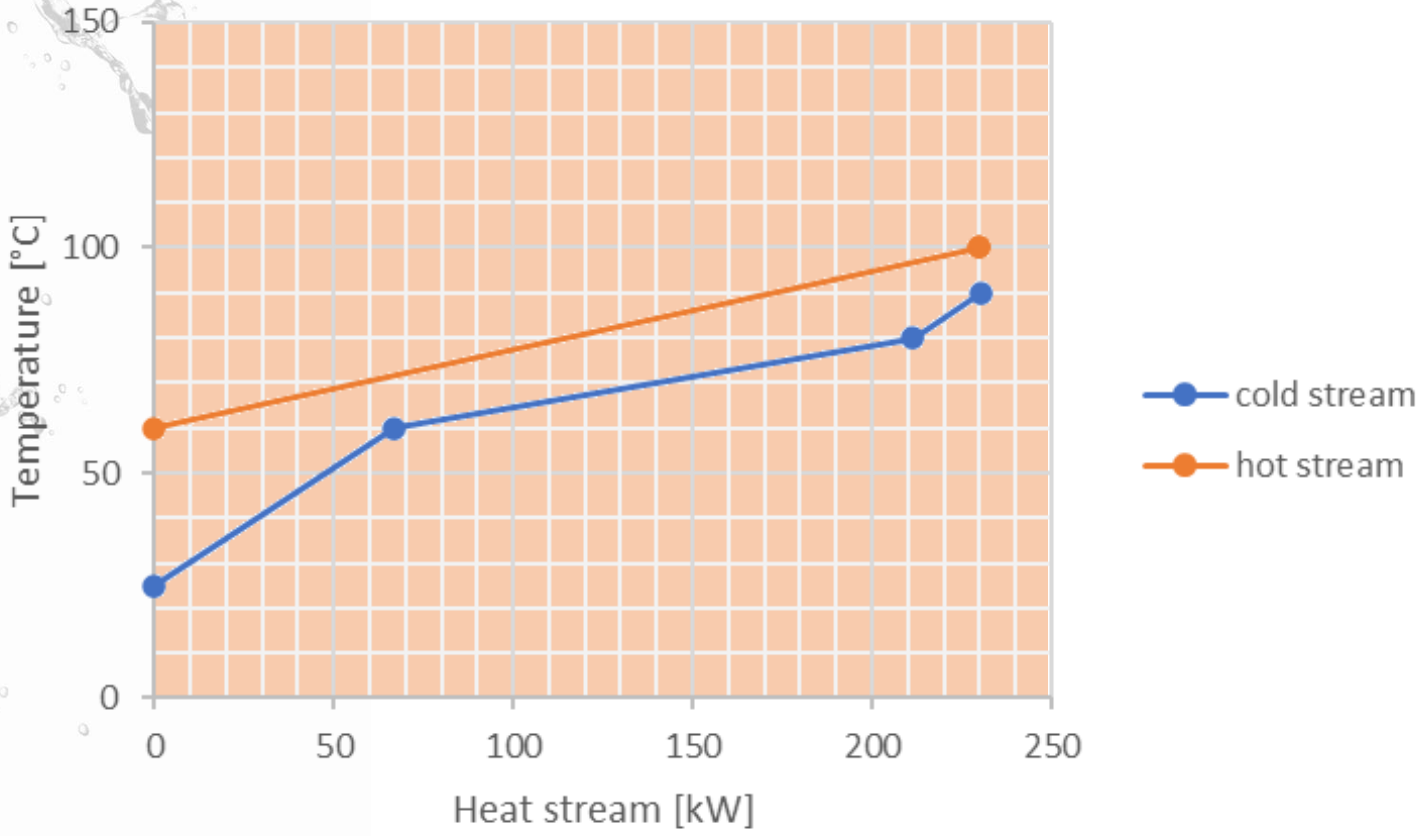
Stef Boesten, Wilfried Ivens, Stefan C. Dekker, Herman Eijdems: 5th generation district heating and cooling systems as a solution for renewable urban thermal energy supply. Adv. Geosci., 49, 129–136, 2019.

- Network is usually operated between 10 and 25°C
- Required temperature level is reached via heat pumps
- Each consumer can act as heat source or heat sink

Integration of a dryer system into a cold heating network – Spray-Belt-Dryer

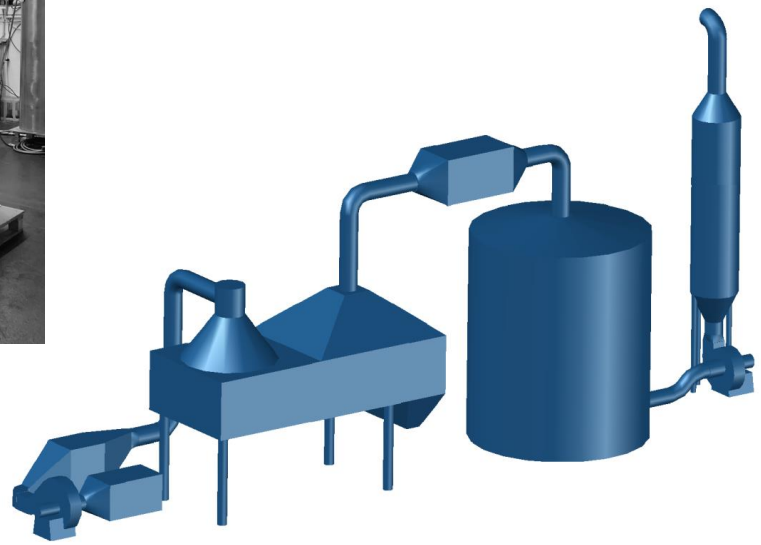
Cold heating network (e.g. off heat from AC) via heat pump
230 kW, 60/100°C
COP ≈ 3

Spray-belt-dryer
230 kW, 25/90°C



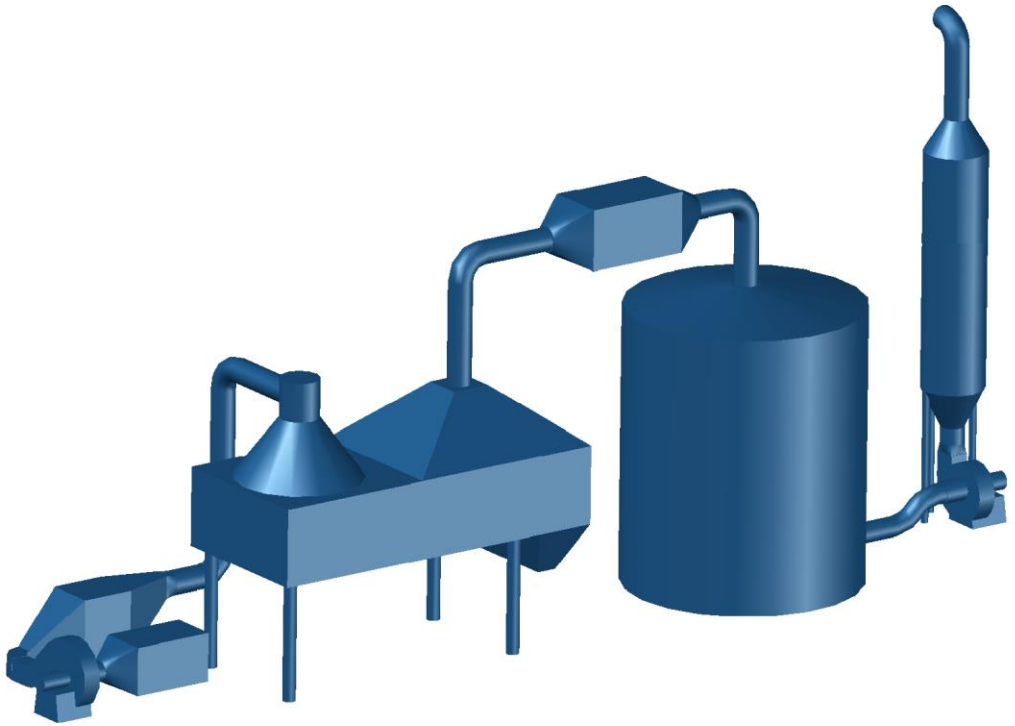
Current state of development

- **Intensive testing** of the pilot plant at the WTG site in Traiskirchen/Austria with real wiping solution concentrate
- **Scale-Up calculations** and **design** for full size plant



Conclusion: indeed a City Design Dryer

- Due to the **small size** and reduced **height** it fits easily into existing buildings.
- Coverage of the **heat demand via district heating** or **utilization of off-heat** is easily possible.
- Like as all other WTG solutions, operation **free of greenhouse gases** is already implemented and just depends on local electricity source.



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Thank you very much for your attention