Experience of usage of plastic tubes in DH networks

Christian Engel - Austroflex

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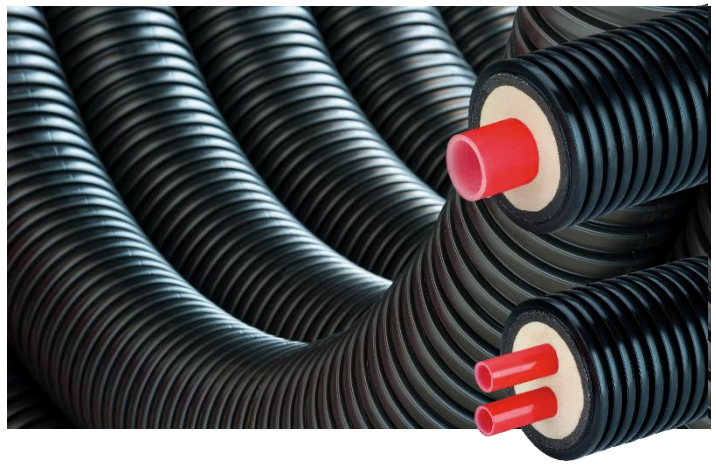
40 years of experience with plastic pipes in DHC

Christian Engel
Business Development Manager / Austroflex

- 1981-89: Development of the first flexible DHC pipes & installations throughout Europe and NZ
- 1990-99: Further plastic systems developed in Europe
- From 2000: CEN expert in the field of district heating and cooling
- From 2010: DHC expert in IEA and EU-H2020 projects



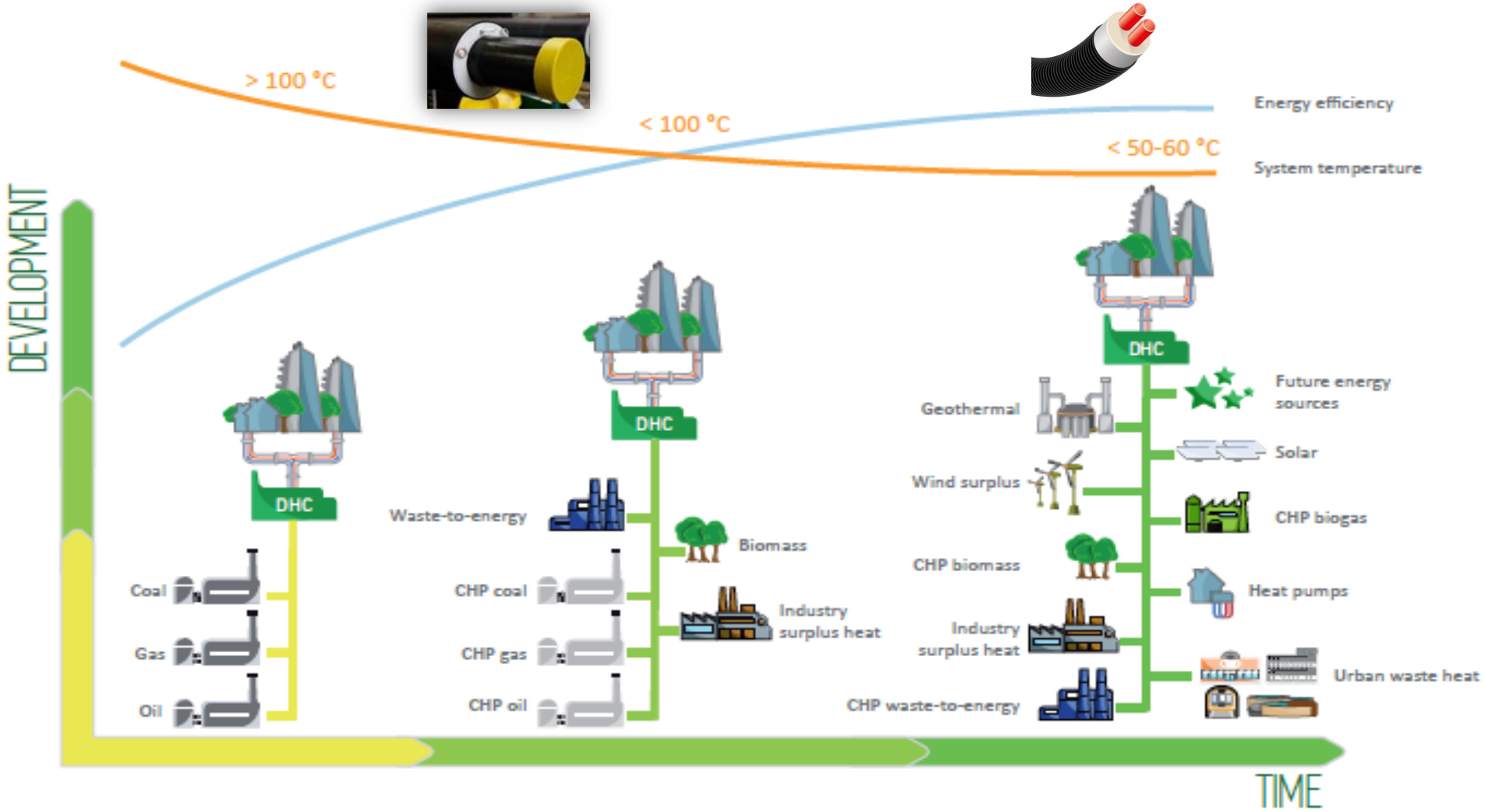
What you will learn in this training:

How LT DH and plastic pipes will help to

- Obtain a higher yield from renewables
- Lower initial investment
- Speed up the installation of networks
- Lower operation cost
- Increase Efficiency and lower CO2 emissions
- Icrease system life-time

EU Green Deal - Integrating all kind of Renewables

The evolution of DHC to lower network temperatures



... higher efficiency, more renewables and greater flexibility leading to a better energy system.

It start with Network Design

DHC networks need to perform for the next 50-100 years!

Challenges for existing Buildings and networks

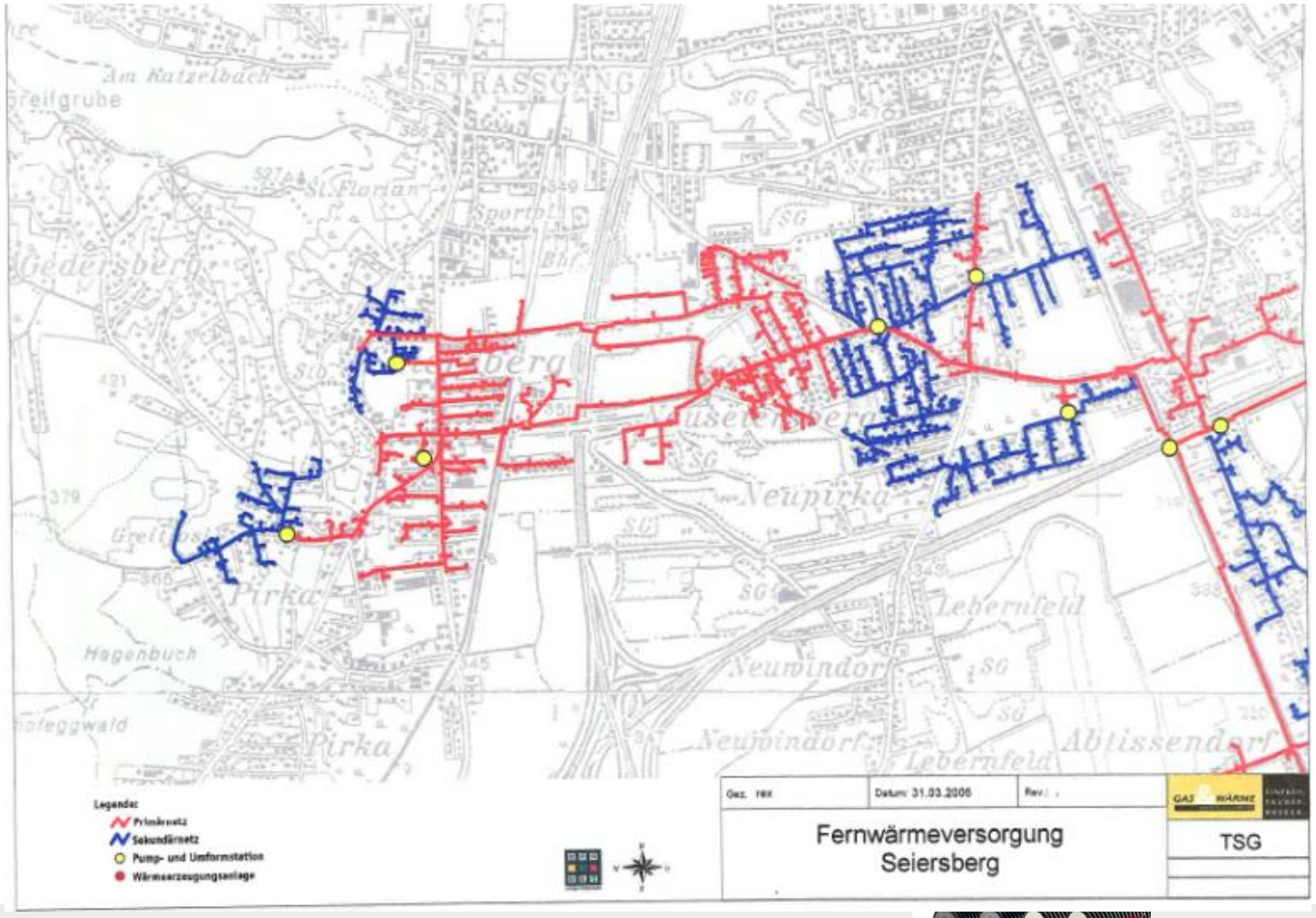
If you like to have lower temperatures in the net

- Supply temperatures might be to low for older buildings
- Existing heating installations are not optimized or not suitable
- For existing DH networks – transport capacity is too at lower ΔT

Solutions for existing networks

- Higher Temperatures for the Main Lines (red) = Steel pipes

- Lower Temperatures for Secondary Lines (blue) = Plastic pipes



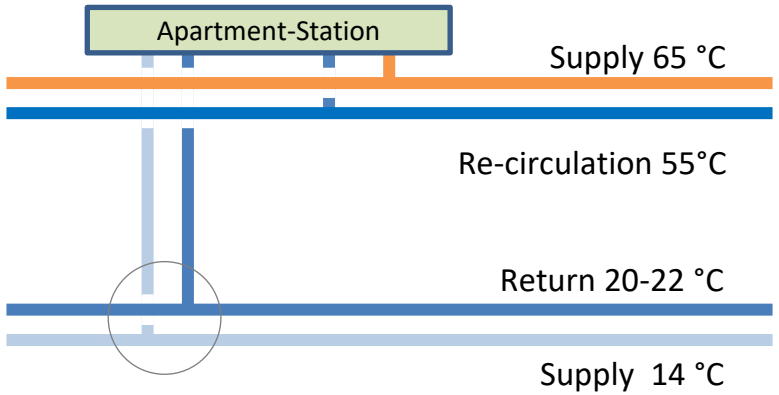
Challenges for new built areas

They are already designed for low temperature and we face

- Minimized Heating loads in low energy buildings
- Domestic hot water requires minimum 60°C for Legionella Prevention
- Heating installations are not optimized (hydraulic balancing etc)

Solutions for New Districts: 4 DH Heating & Cooling

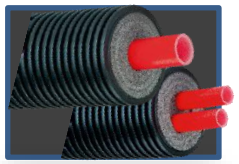
4 line solution with max. 65°C

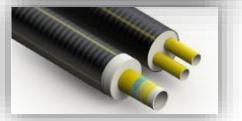


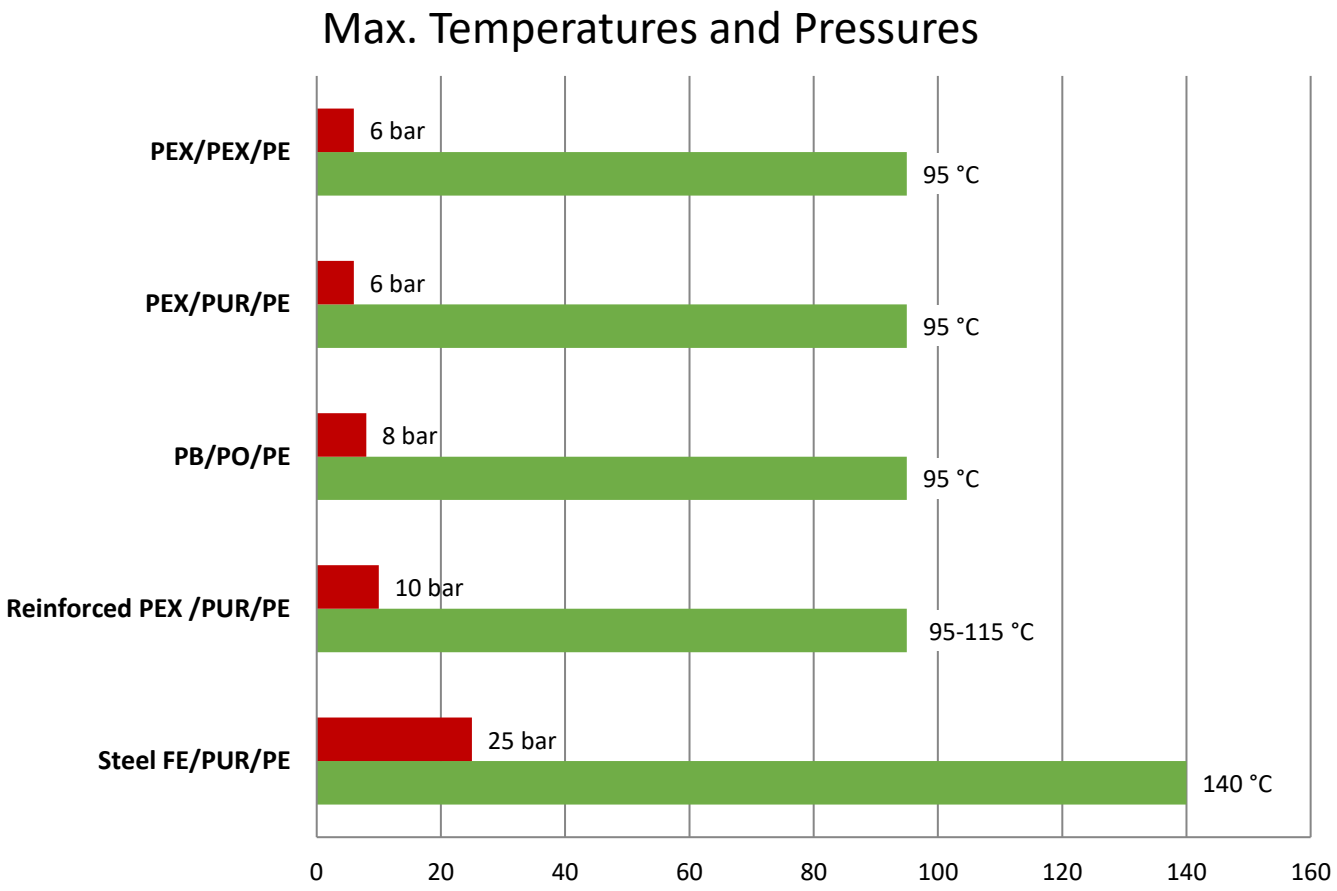
Heating

Cooling

Selction of DHC piping systems





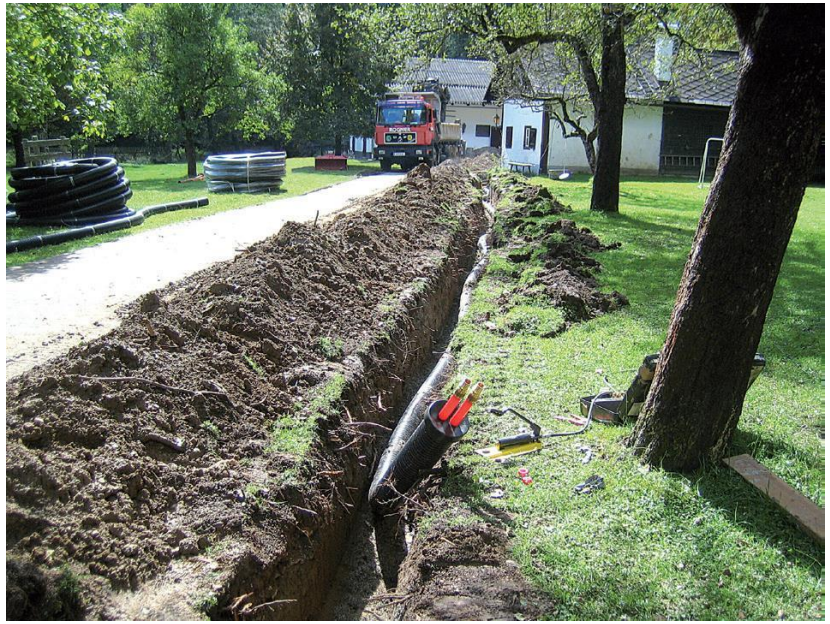


Flexible plastic pipes - the alternative to steel

Expansion loops with steel

Adavantages of Plastic

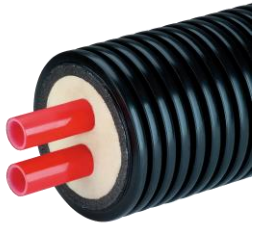
- 75% less connections,
- Flexible routing 7% shorter
- double water speed
- Largely self-compensating system



Largely self-compensating plastic system

One thing you should keep in mind with plastic pipes – bonded or non-bonded

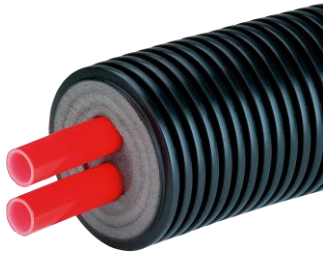
AustroPUR



Bonded plastic pipes acc. to EN 15632-2

Longitudinal water migration is minimized due to bonding between PUR foam and PE-X carrier pipes

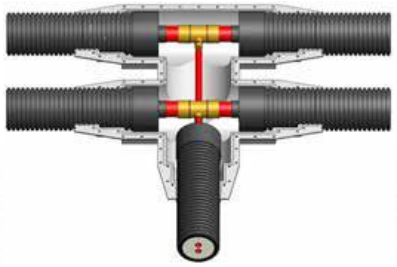
AustroPEX



Non-Bonded plastic pipes acc. to EN 15632-3

Longitudinal water migration is possible due to missing bond between foam insulation and PE-X carrier pipes. Water migration is blocked by water-tight end caps at the connections

Cost of District Heating Networks



Pipes & Accessories

Installation

Civil works

Practical experiences Plastic vs Steel

Cost and installation time DN 20 to DN 150

75%

Installation time savings

30-40%

Smaller trenches = less civil works

65-80%

Less socket connections

0-50%

Additional costs for the plastic pipes (only 20-30% of the total costs)

When using the highest quality plastics acc to EN 15632

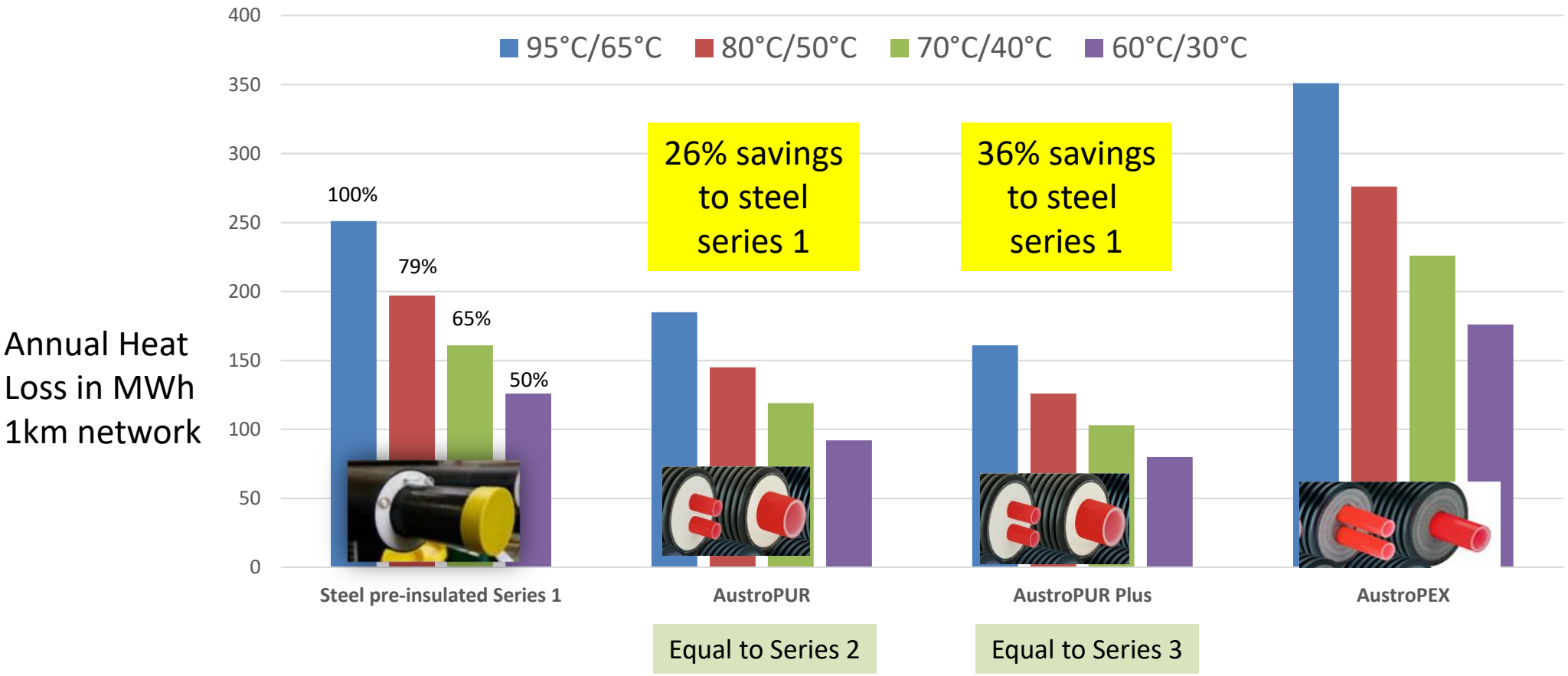
10-20%

Overall savings with Plastic Pipes

Lessons lerned – Installation

- Work together with an experienced construction company.
- Choose systems that are manufactured according to EN-253 and EN-15632
- Never experiment with cheap solutions
- Your network shall operate for 30, 50 or even 100 years

Low operation cost with lower network temperatures and the best insulated pipes

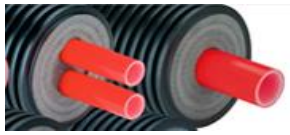


You safe 59% at 70/40°C with AustroPUR Plus compared to 95/65°C with Steel Series 1

38% savings with best insulated DH pipes

Annual

Heat losses of DH pipes typically used today

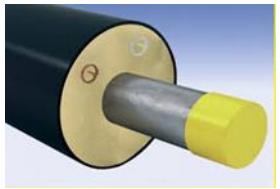


188,0 MWh/km (typical product mix)

38,17 t CO2 – Equivalent per km

Annual

Heat losses of best insulated DH Series 3



115,0 MWh/km

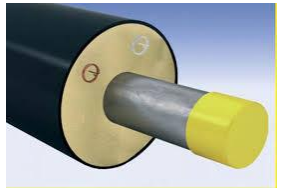
23,35 t CO2 – Equivalent per km

14,82 t CO2 – Savings per km (= 38%)

Based on Diameter Range DN20 – DN 100

Savings with best insulated DH pipes in AT/GER

CO_2 –Equivalent for new DH networks built 2021-2030



→2030 Austria: 40.800 t CO_2 - Equivalent

→2030 Germany: 408.000 t CO2 -Equivalent

Km – Equivalent Tesla Mod S

2030 Austria: 460.000.000 km **equals to 23.000 TESLA***

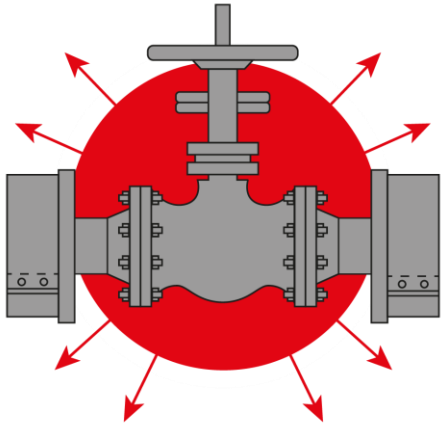
2030 Germany: 4.600.000.000 km **equals to 230.000 TESLA***

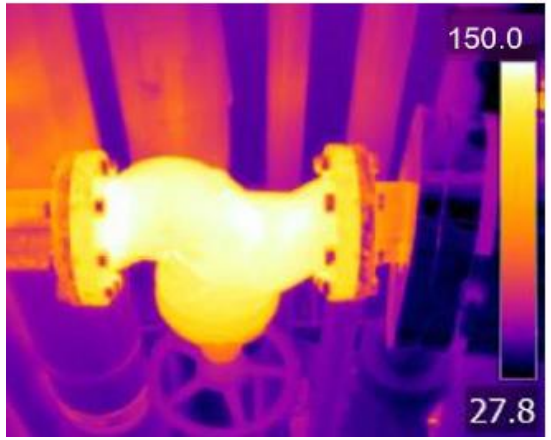
*Calculated with 20.000km annual usage

Savings with Valve insulation equal to 20.000km

NON-**INSULATED** VALVE

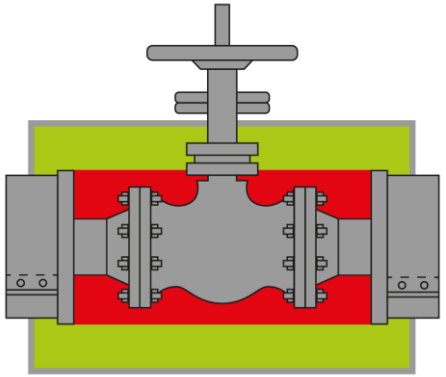
- Size: DN 150
- Temperature: 150 °C
- Operational time: 8.760 hours/year
- **Energy loss per year: 10.600 kWh**

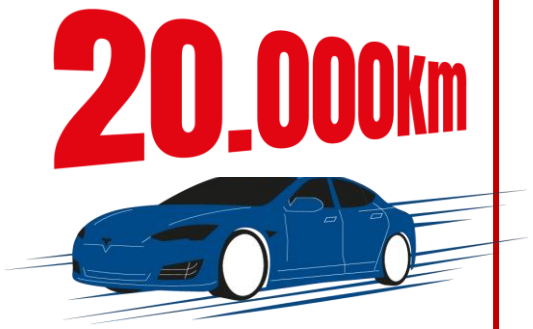




INSULATED VALVE

- Size: DN 150
- Temperature: 150 °C
- Operational time: 8.760 hours/year
- **Energy loss per year: 600 kWh**
- **Savings equal to 20.000km Tesla Mod S**





EiiF Study 2021 – www.eiif.org

Life-time increase to 100 years with 65°C and below

acc to EN 15632 for PE-Xa

Operation-temperature °C	Max. Pressure mit SF 1,25 bar	Minimum-Lifetime Jahre
50	10,5	100
55	9,9	100
60	9,4	100
65	8,8	100
70	8,3	95
75	8,0	55
80	7,6	32
85	7,2	19
90	6,9	11
95	6,6	7

Operation-temperature °C	Example 1 Annual Operation time h	Example 2 Annual Operation time h	Example 3 Annual Operation time h	Example 4 Annual Operation time h
50	0	0	185	0
55	0	0	160	4380
60	0	0	145	4380
65	0	504	130	0
70	0	3720	120	0
75	0	840	115	0
80	8468	3528	110	0
85	0	168	4500	0
90	292	0	0	0
95	3,3	0	0	0
Gesamt	8763,3	8760	5465	8760
	30 years + 100h	**> 50 years**	**34 years**	**> 100 years**

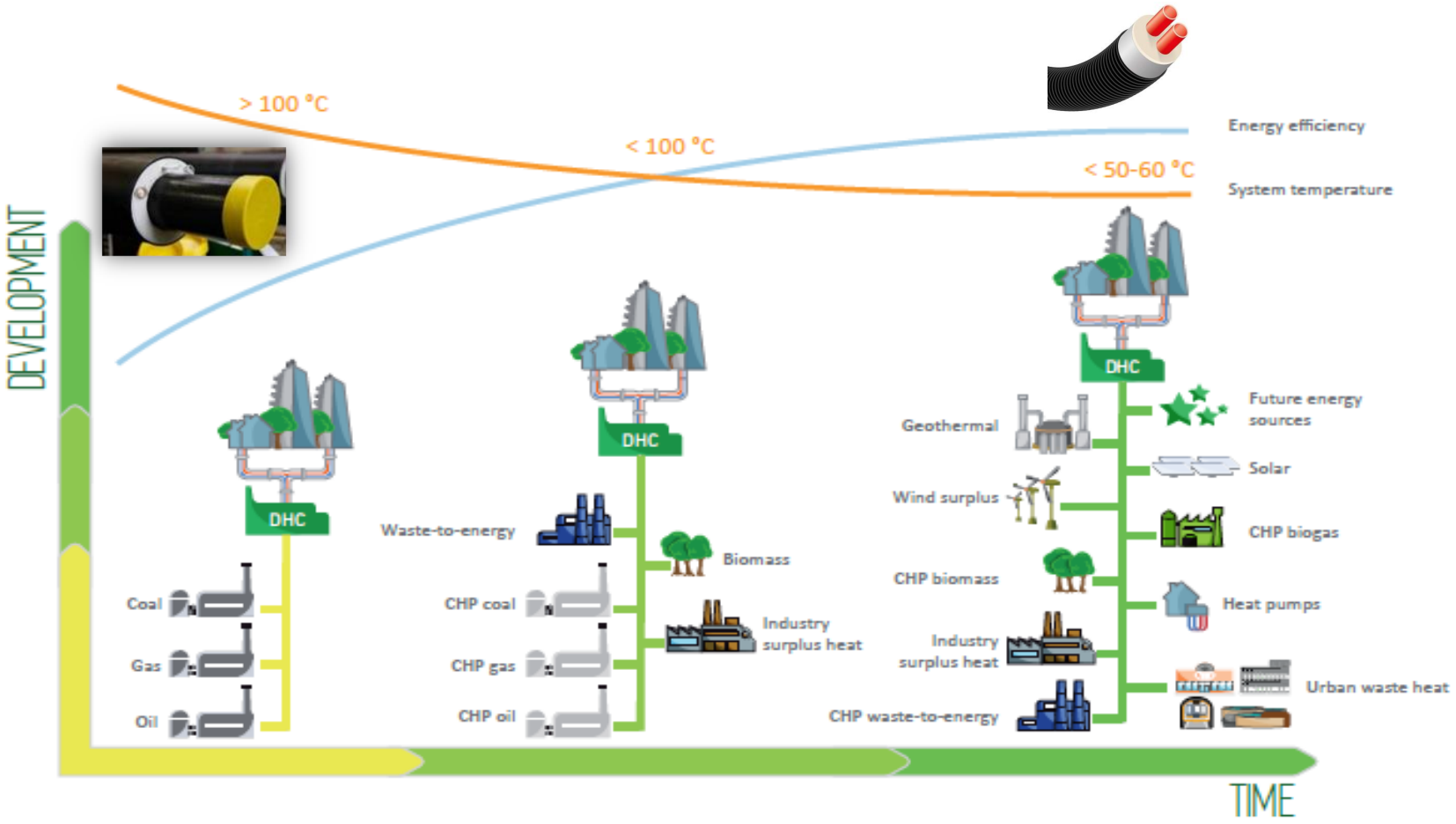
By lowering the temperatures, the service life can be increased to 50-100 years

Resulting total lifetime for medium-PE-Xa pipes according to EN 15632-2 chap. 4.1 and chap. 5.2.1

Your Learnings about plastic pipes for DH

What you can win with LT DH and plastic pipes

- ✓ Higher yield from renewables
- ✓ Lower investment
- ✓ Faster installation with flexible pipes
- ✓ Lower operation cost
- ✓ Efficiency and CO2 savings
- ✓ Icreased system life-time



... higher efficiency, more renewables and greater flexibility leading to a better energy system.

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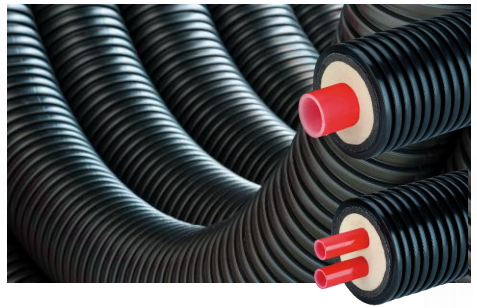

Flexible Pipes for efficient District Energy Networks