

ecop
ooc



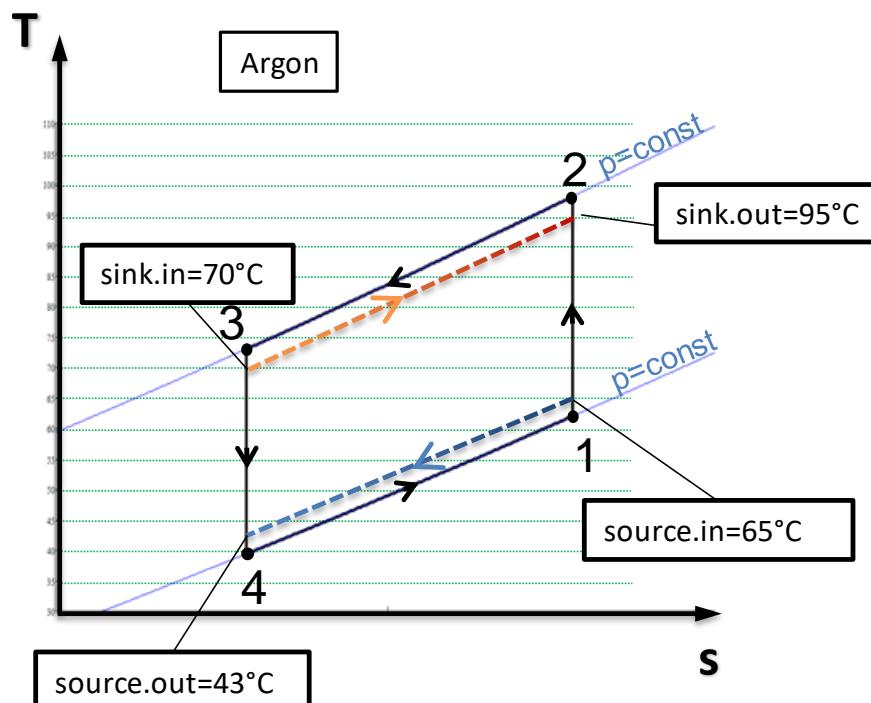
Function, design and possible applications of a Rotation Heat Pump at high temperatures

Agenda

- Technology and Design
- Implementations
- About ecop

We use a 1-Phase Joule Process ...

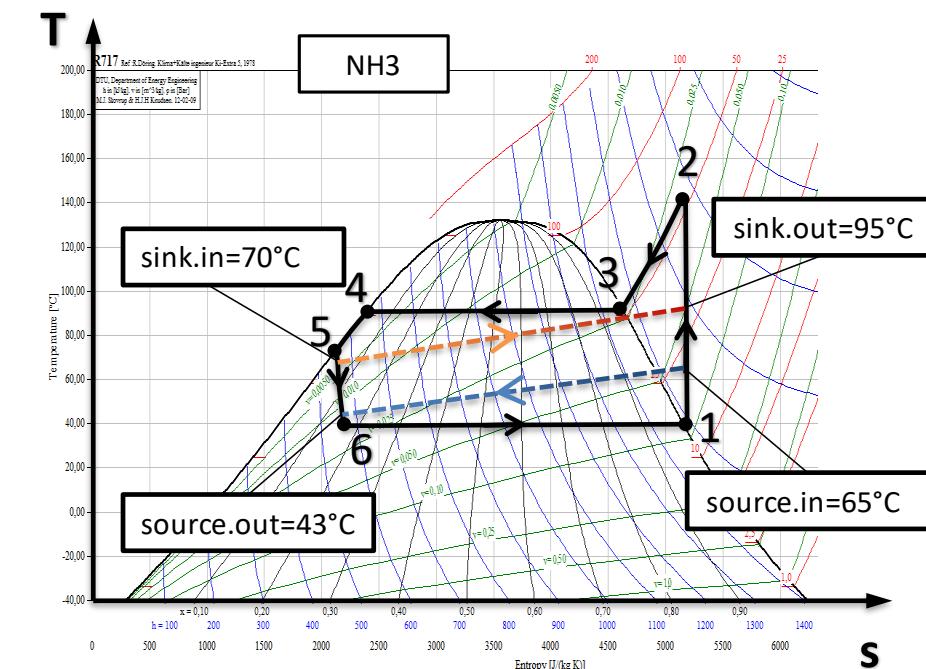
1-Phase Joule Process



example

sink 70°C to 95°C
source 65° to 43°C

2-Phase Carnot process



Technology

... because it is much more efficient than
the Carnot Process ...

1-Phase Joule Process

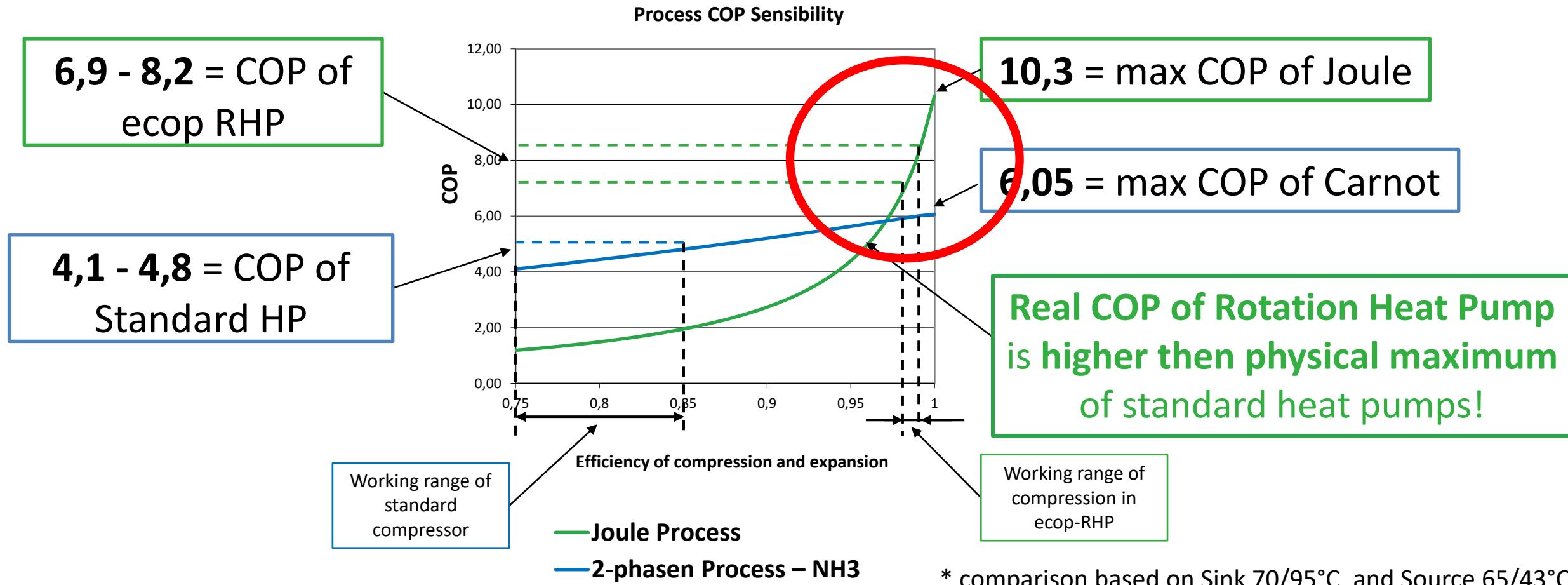
2-Phase Carnot process

Physical maximum COP

$$\text{COP} = \frac{h_2 - h_3}{(h_2 - h_1) - (h_3 - h_4)} = 10.3$$

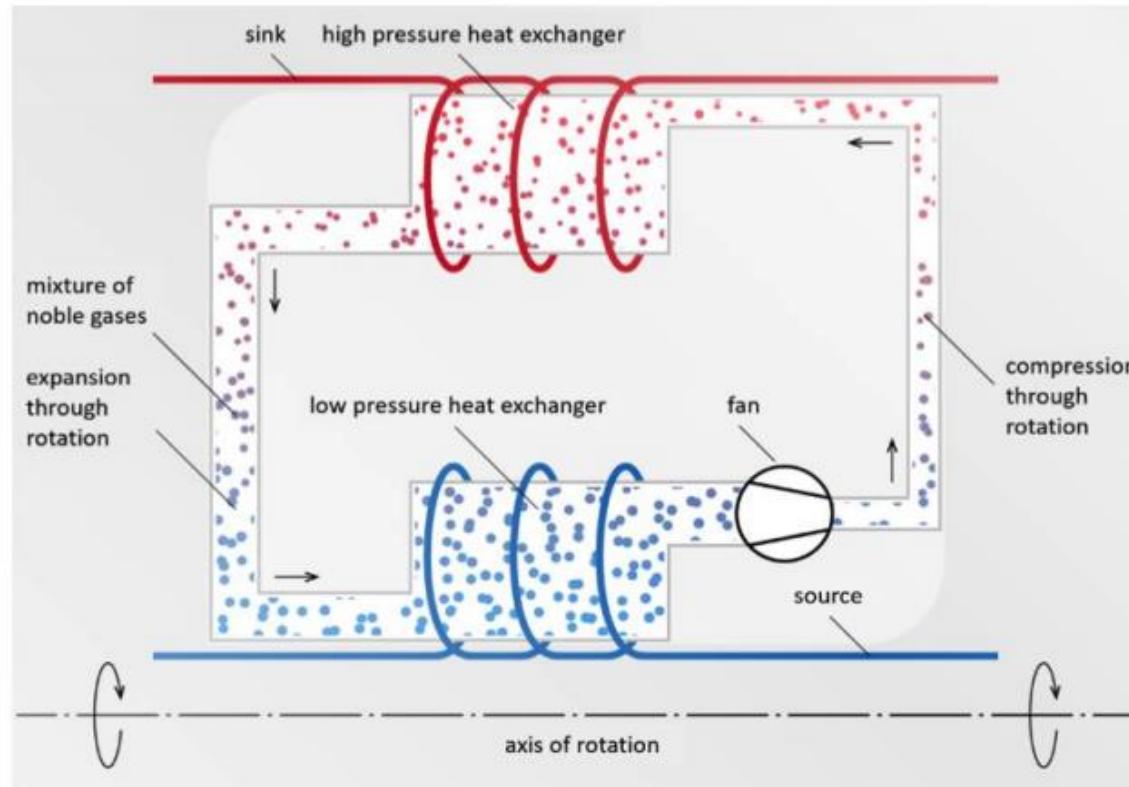
$$\text{COP} = \frac{h_2 - h_5}{(h_2 - h_1)} = 6.05$$

... if a high compression efficiency is achieved.

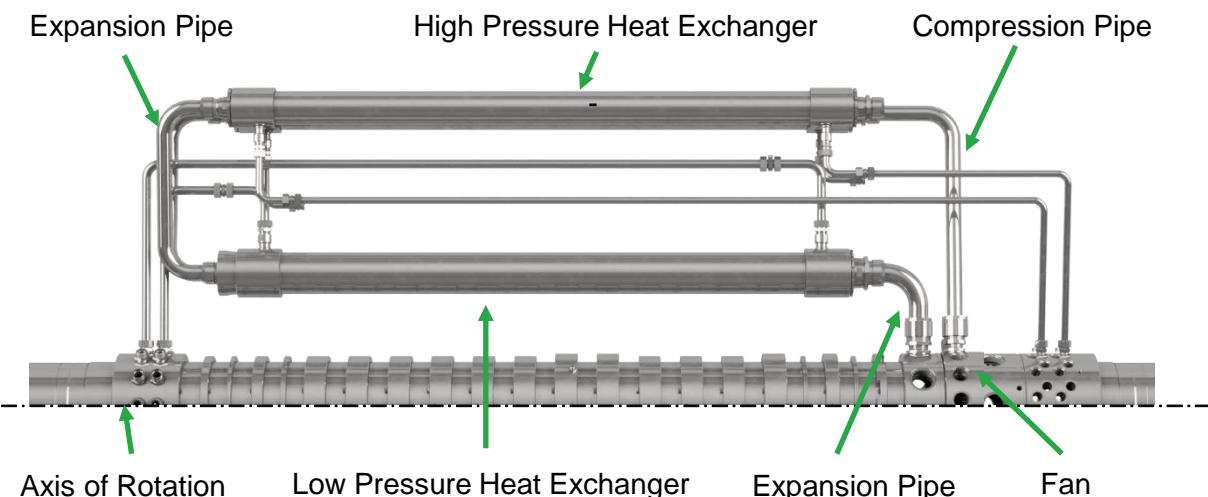
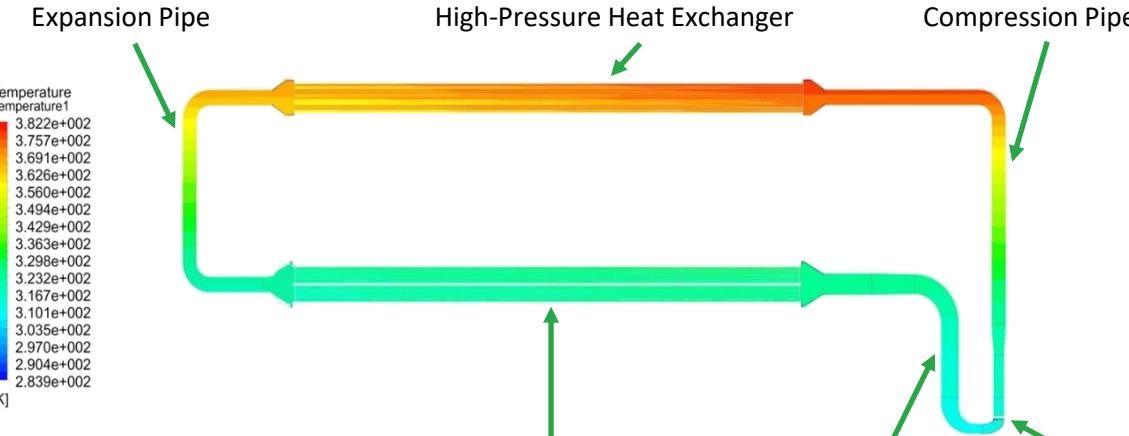


Technology

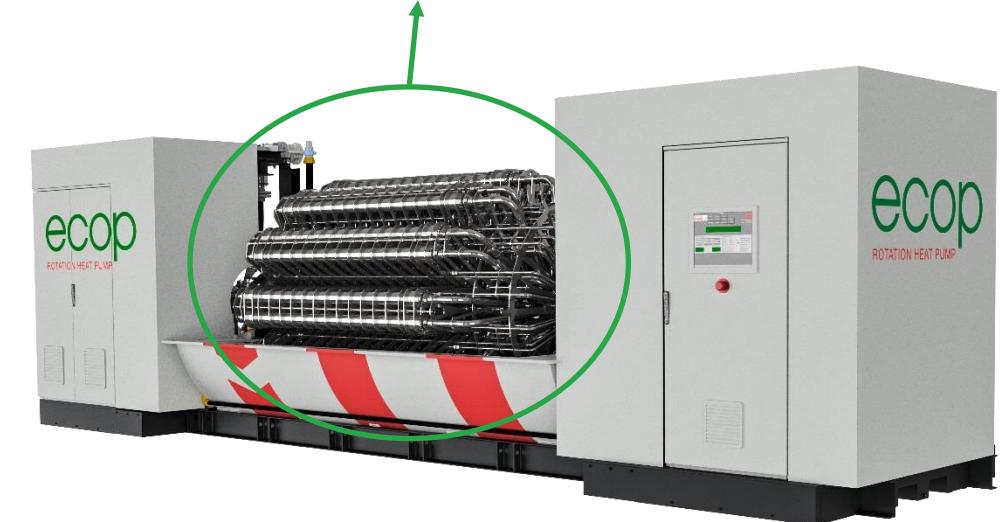
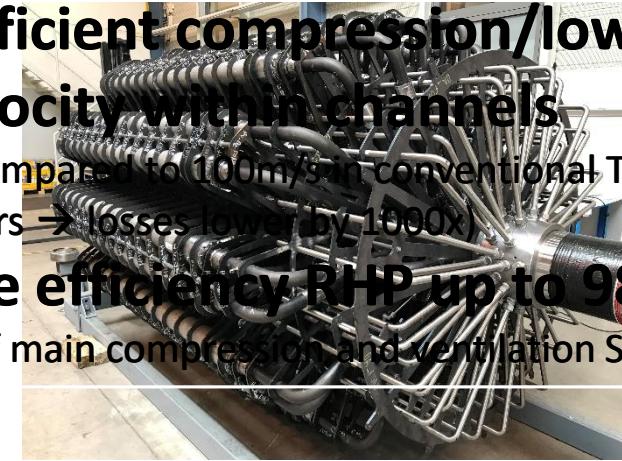
Therefore the core innovation of ecop's technology is an integrated highly efficient compression process...



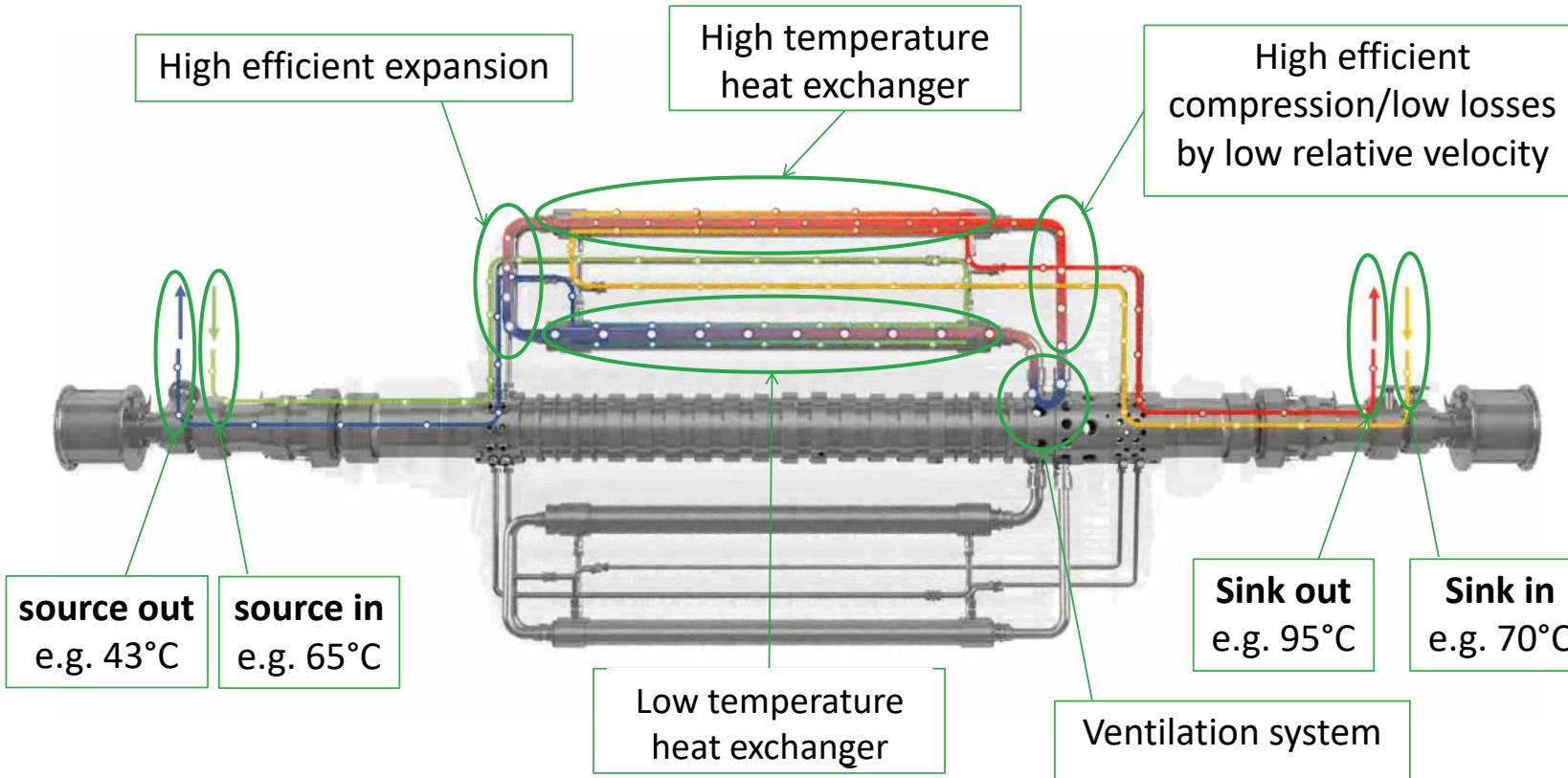
- RHP K7 has a working gas (mix of noble gases) encapsulated in a rotor which rotates at up to 1,800 rpm.
- The rotation results in centrifugal forces.
- The centrifugal force compresses the working gas and increase the temperature at the heat exchanger further from the rotation axis.
- The temperature of the working gas then decreases while expanding it against centrifugal forces.
- Once the gas reaches the high-temperature heat exchanger, this takes up heat.



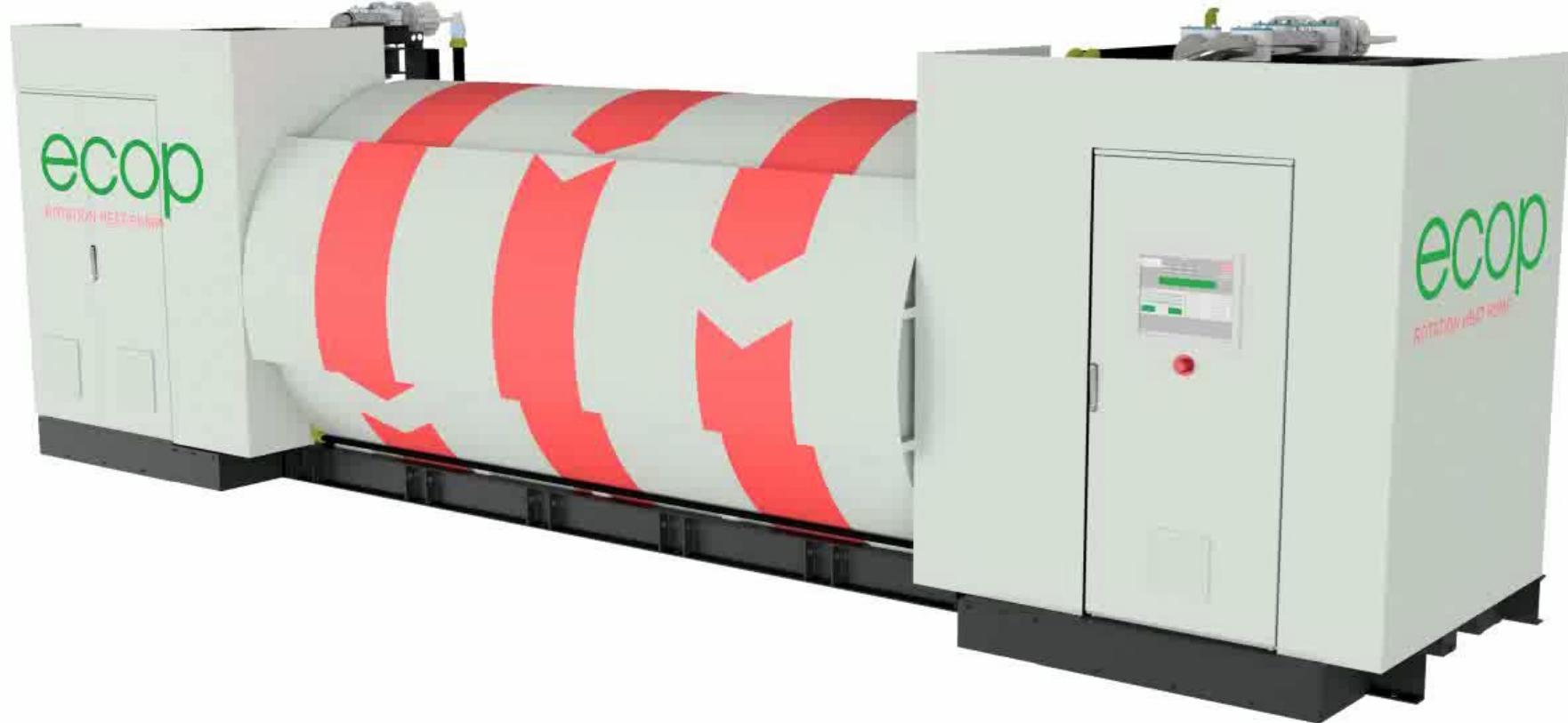
- High efficient compression/low losses by low velocity within channels**
(<10m/s compared to 100m/s in conventional Turbo compressors → losses lower by 1000x)
- Average efficiency RHP up to 98%**
(average of main compression and ventilation System)



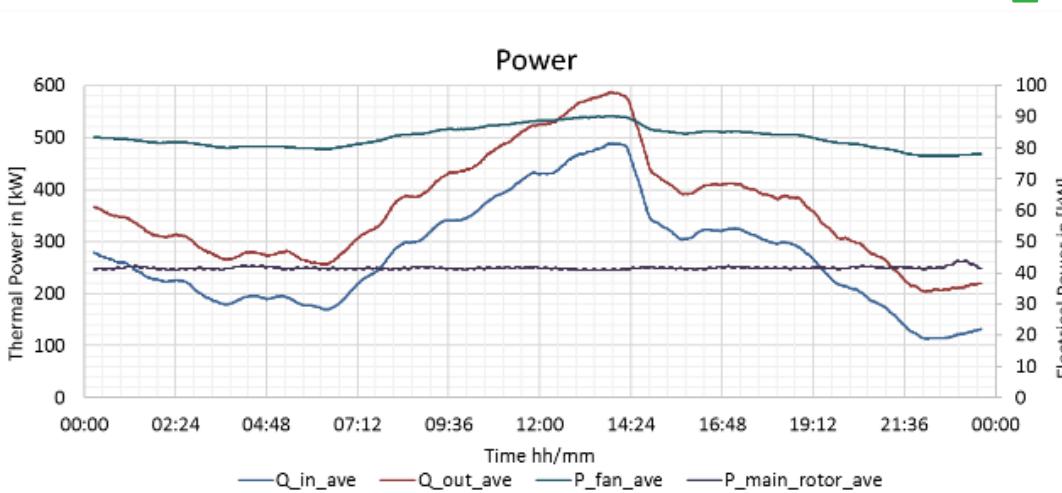
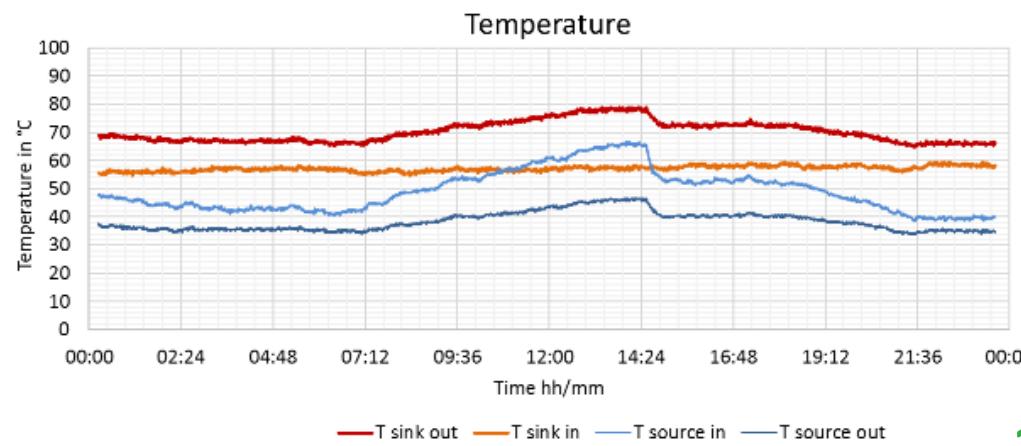
... which has been extensively patented ...



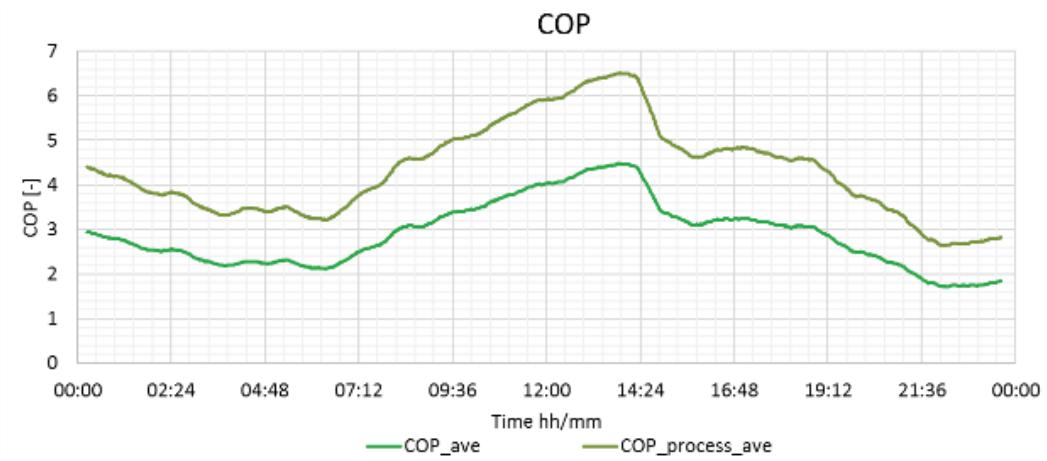
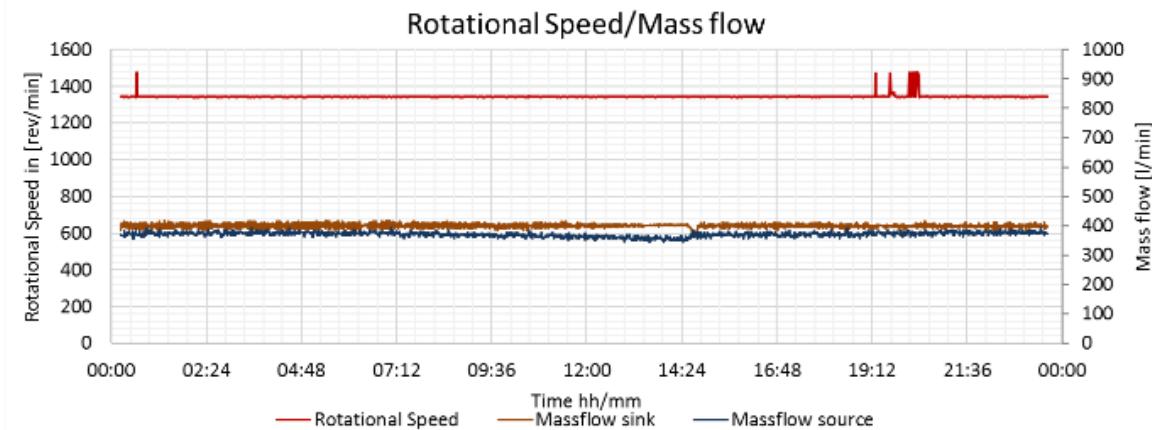
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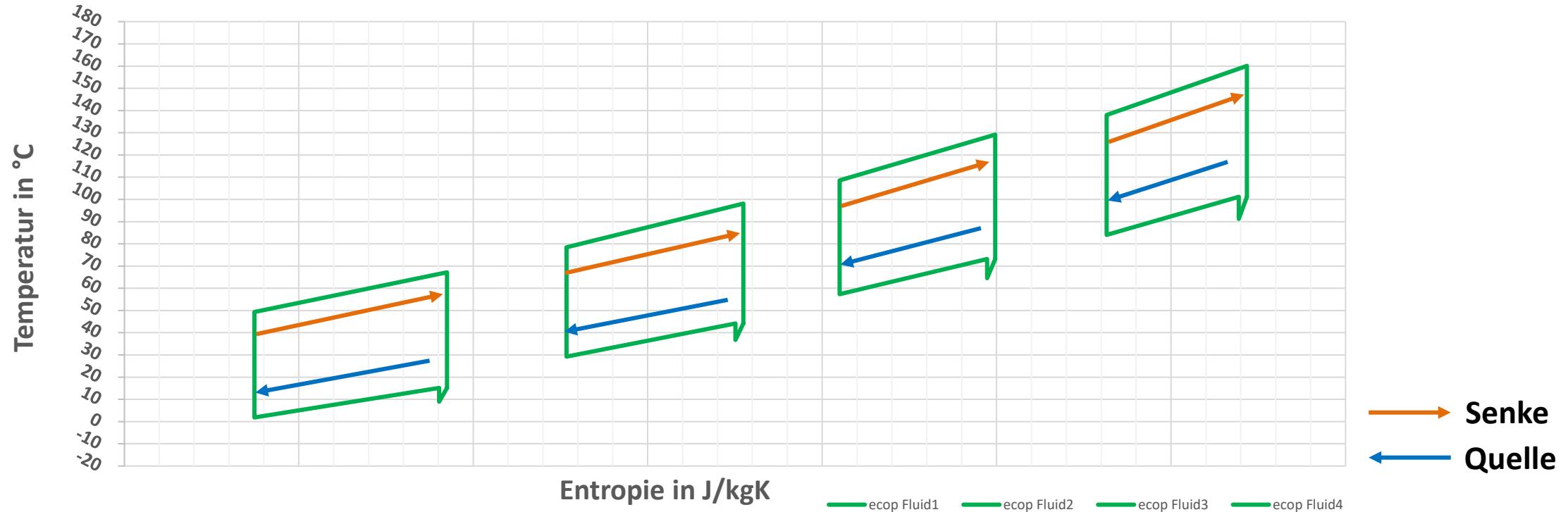


Test results at customers site



1st day

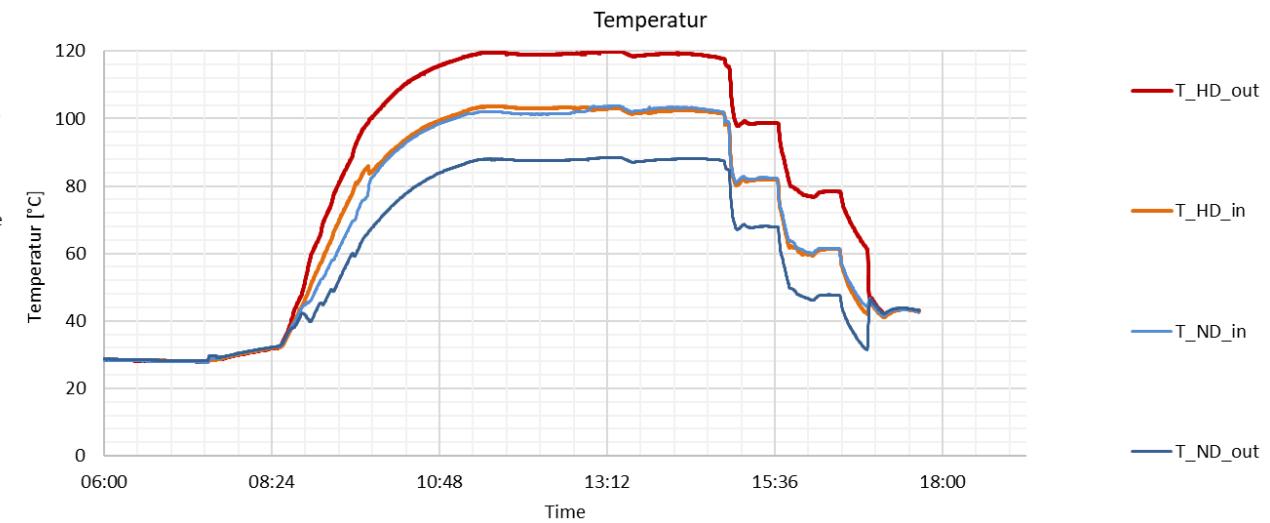
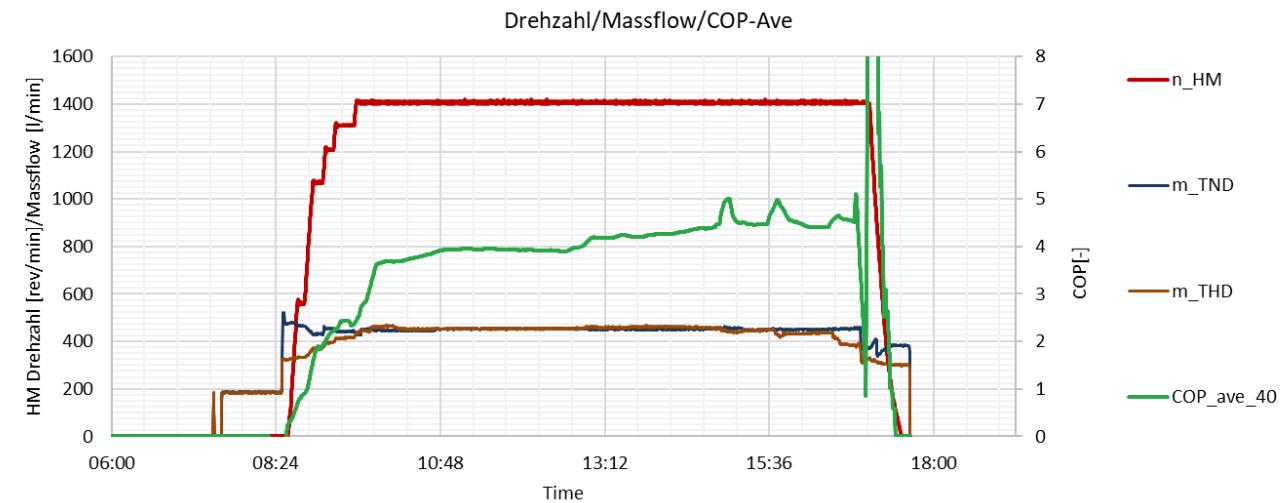
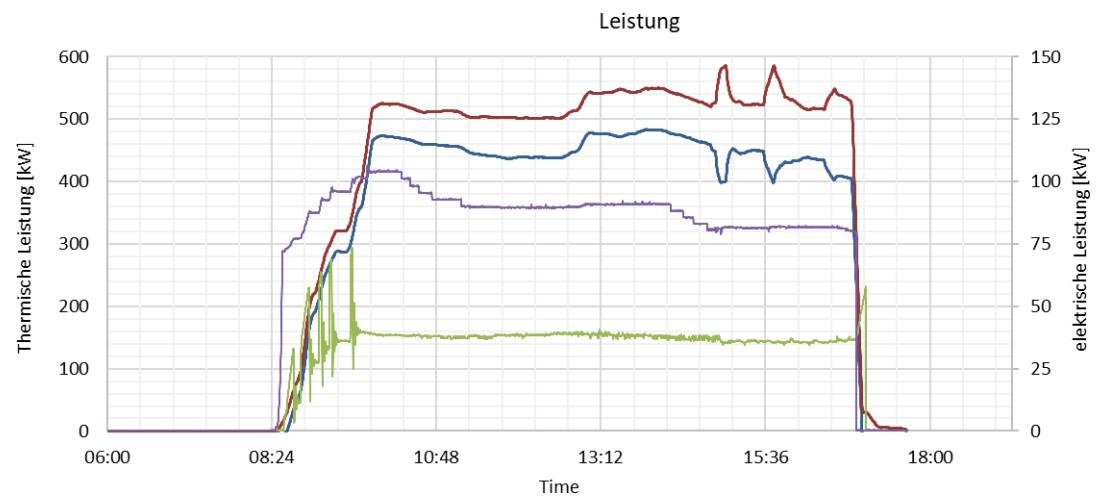


Change of the **temperature level** ➤

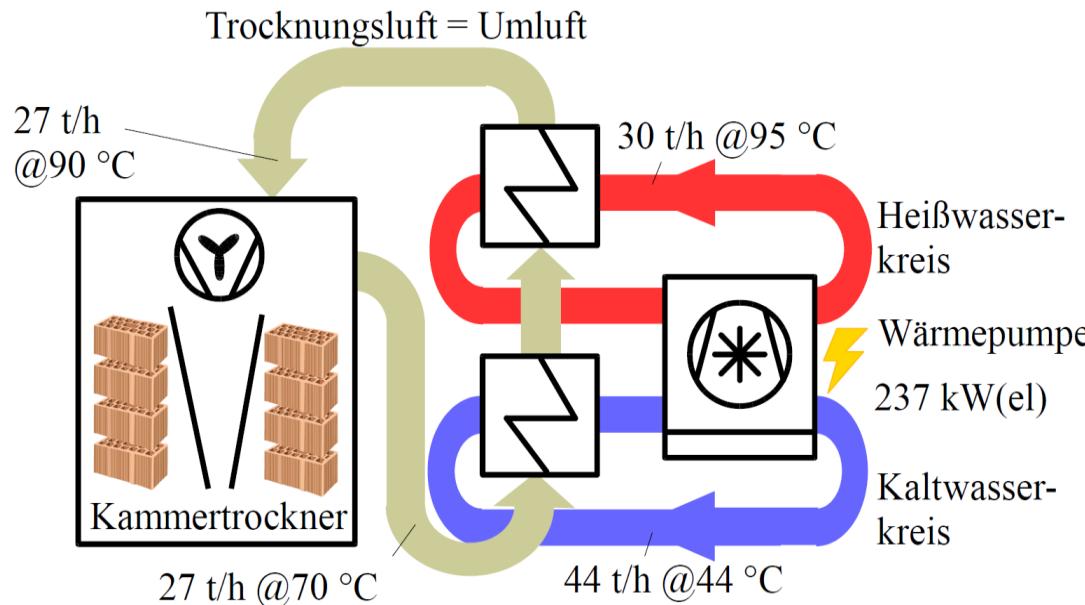
Process operates at different temperature levels →
working fluid automatically adjusts to boundary conditions

Test results – High temperature

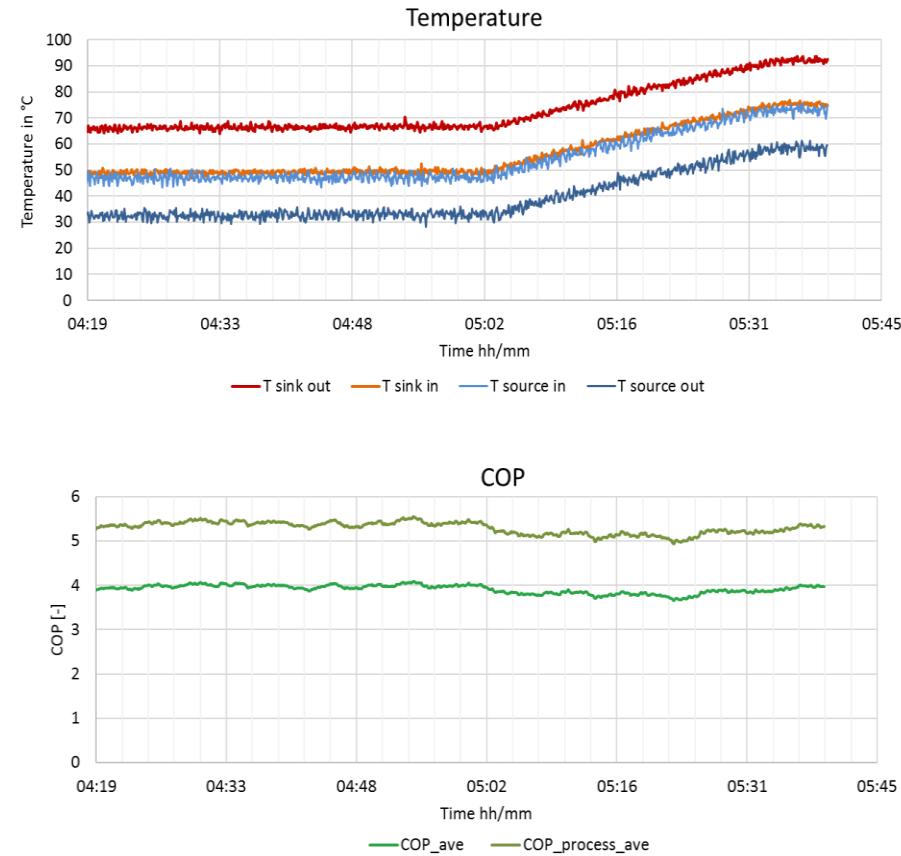
Thermal power
@sink: app. 500kW

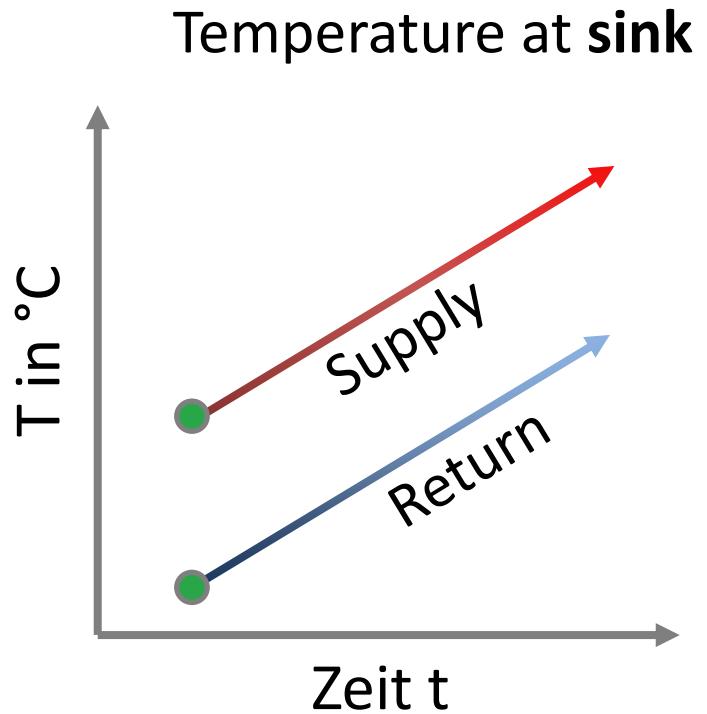
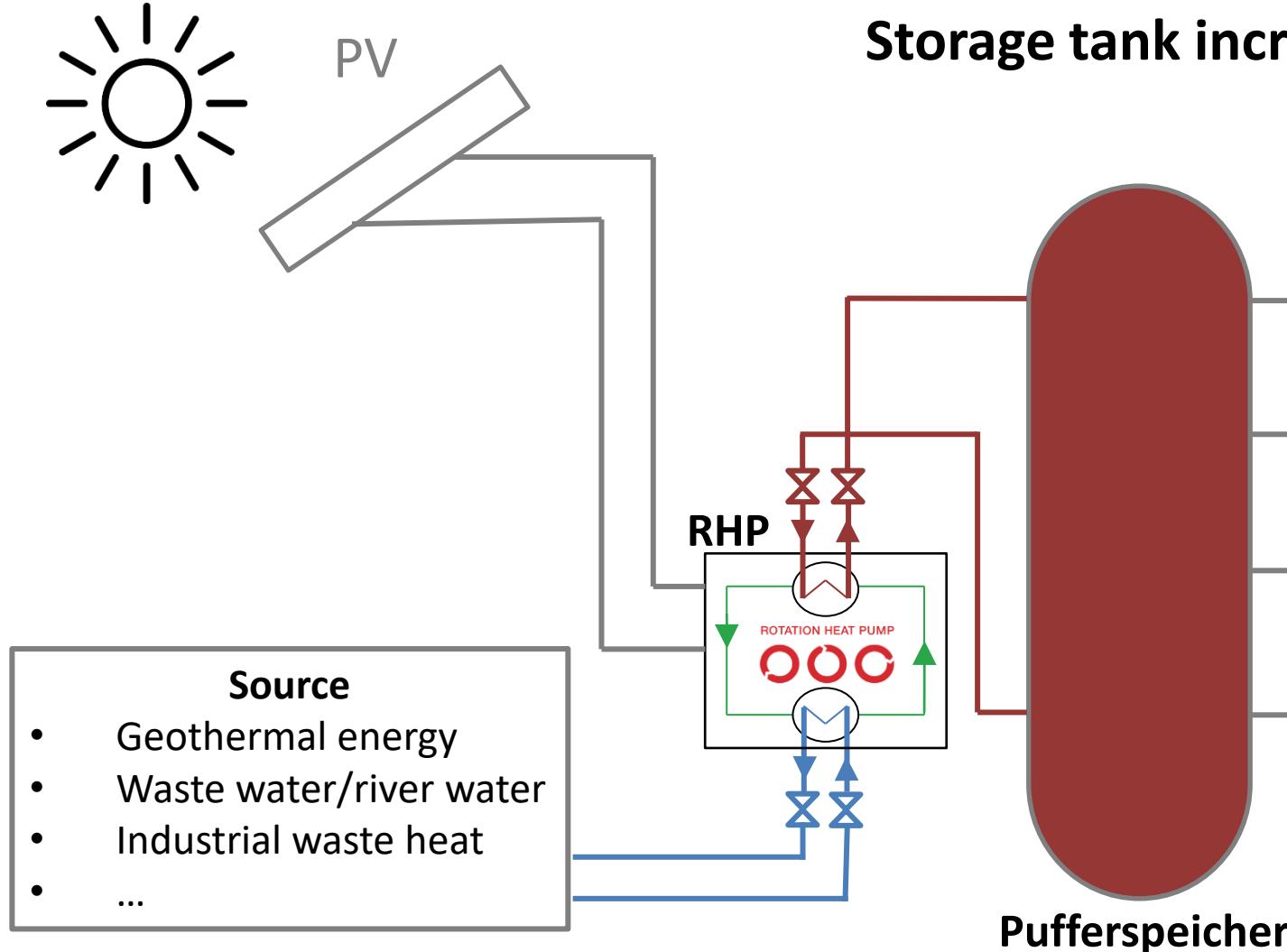


Brick drying



(Quelle: AIT, DKV-2016, Kassel)





... where we are now ...



- Third prototype fully assembled and going on the test stand by the end of 2020 in our production facility in Neuhofen / Upper Austria.
- Currently we are optimizing the system.
- Technical parameters:
 - 16t_o
 - 2,2 x 8,1 x 2,7 m
 - 400 V – 3-N ~50Hz; 500A gL/gG; max 280kW
 - H₂O / DN80



ecop Technologies GmbH

Austria
Lastenstraße 11
4531 Neuhofen an der Krems
www.ecop.at
office@ecop.at

Network & Partners



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TECHNISCHE
UNIVERSITÄT
WIEN



Ein Fonds der
Stadt Wien



scheuch
FAMILY FOUNDATION



austria
wirtschafts
service 

ecop

Längauer Andreas



DI Andreas Längauer
F&E

Telefon: +43-1-865 10 62-27
andreas.laengauer@ecop.at