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16-17 March 2015 in Brussels

A propane water-to-water heat pump booster for sanitary hot water production

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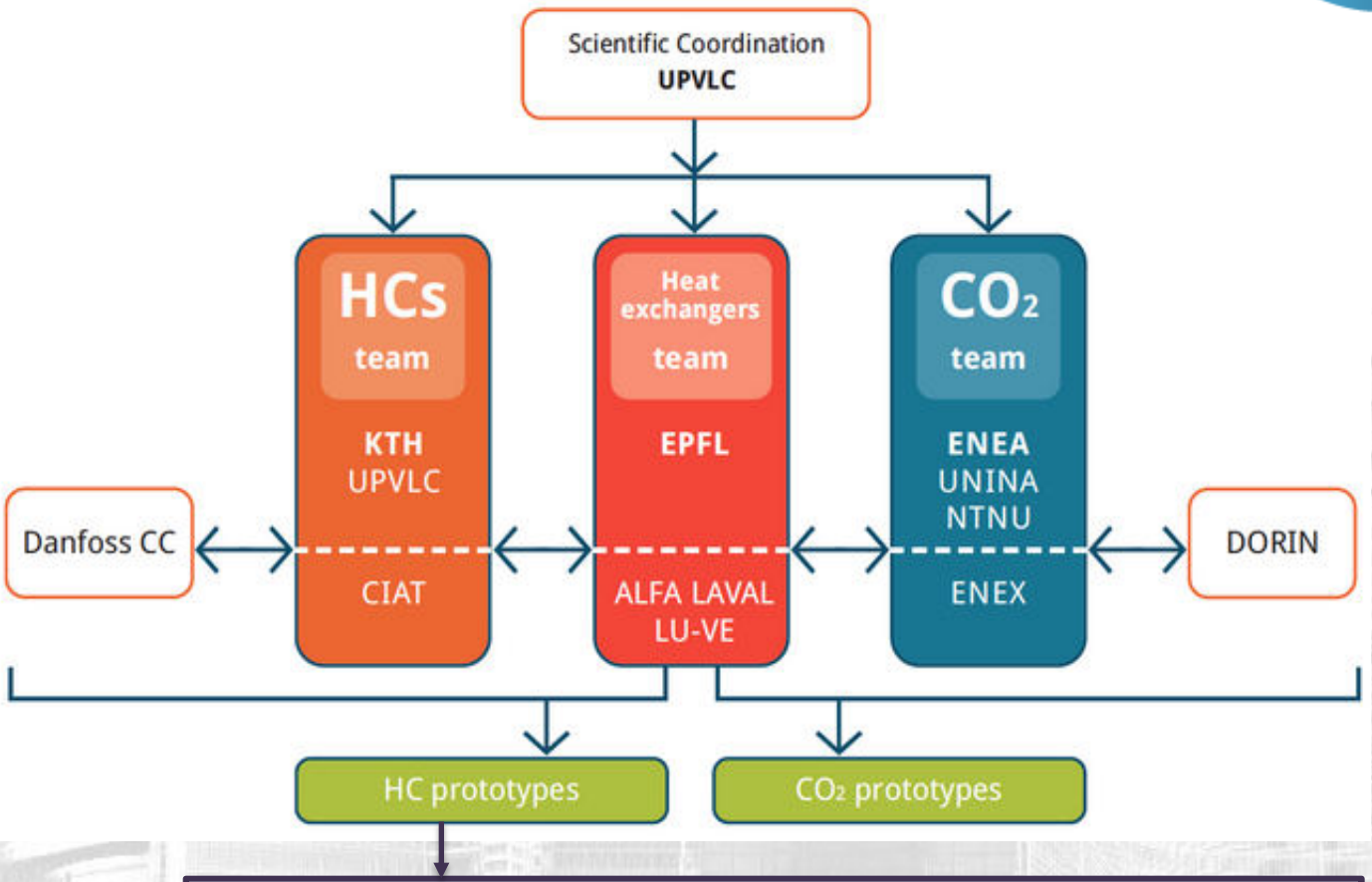
"Next Generation of Heat Pumps working with Natural fluids"

Next Heat Pump Generation
NxtHPG



Propane Heat Pump Booster
"water-to-water heat pump working with Propane that produces domestic hot water at 60 ºC from a waste heat water source"

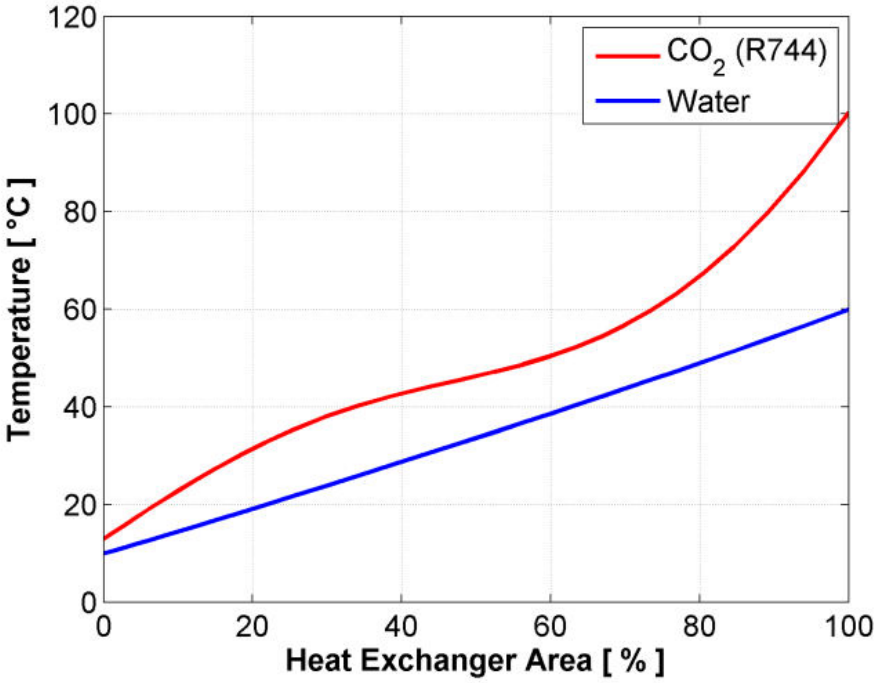
http://www.nxthpg.eu/

This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No [307169]".

Production of DHW

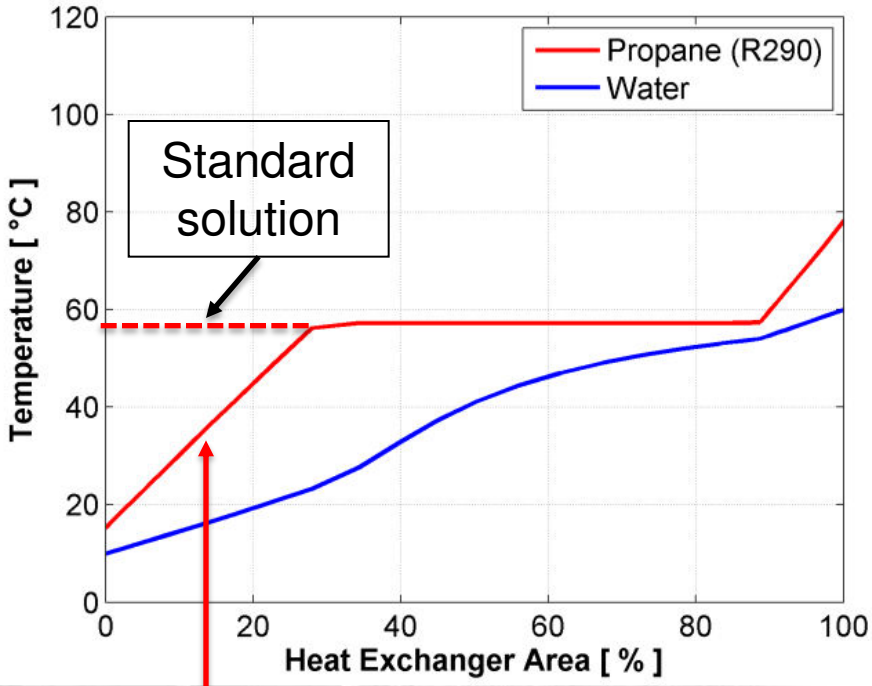
Heat Pump booster → DHW production, at 60 ºC from a waste heat water source: sewage water, condensation loop…

CO2 HP



Typical temperature profiles in a **CO_2 transcritical** heat pump

Propane HP



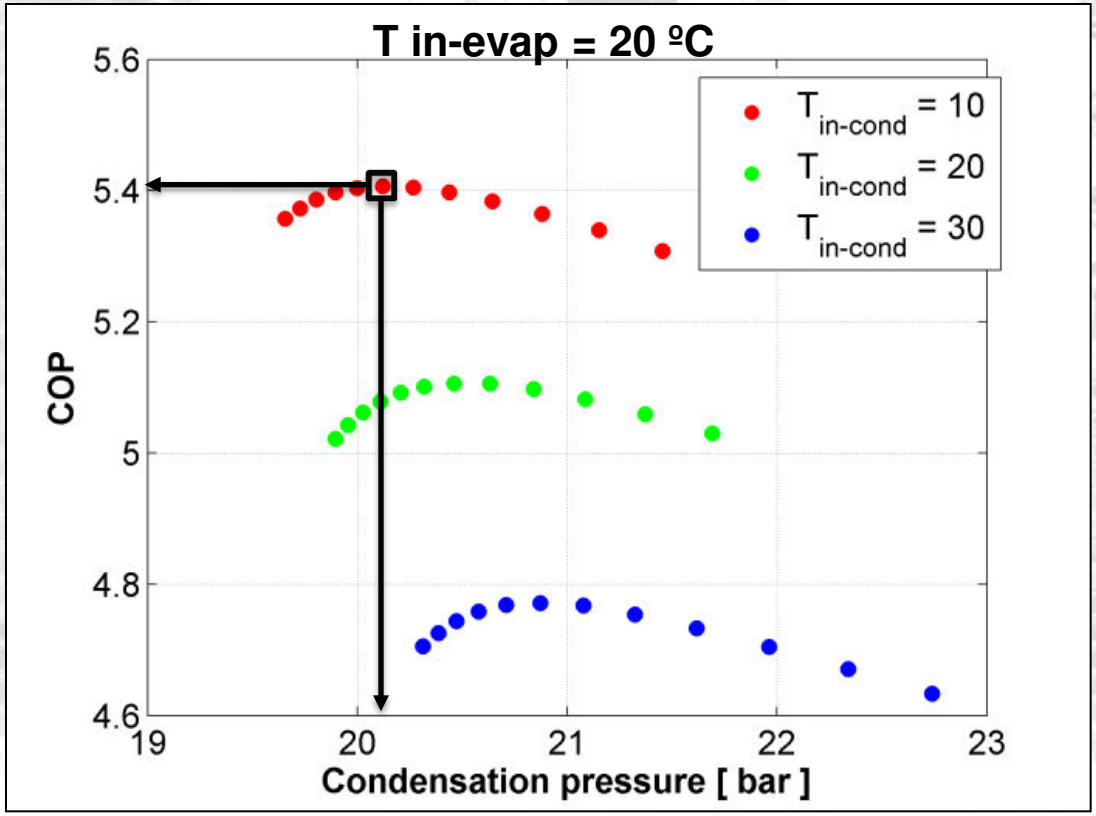
New solution: **Propane** heat pump **with optimal subcooling**

Subcooling optimization

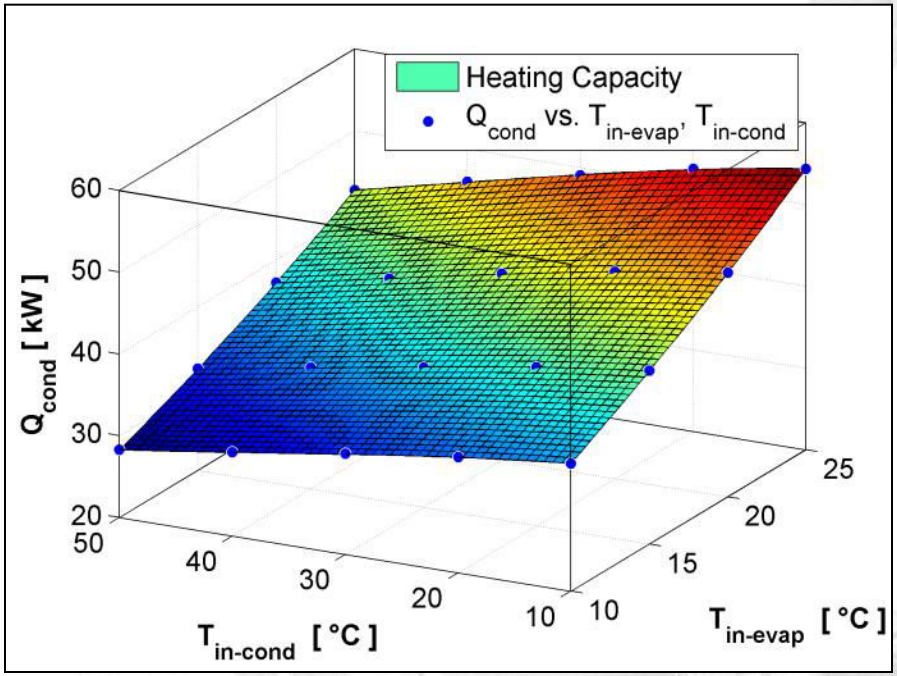
Heat Pump model

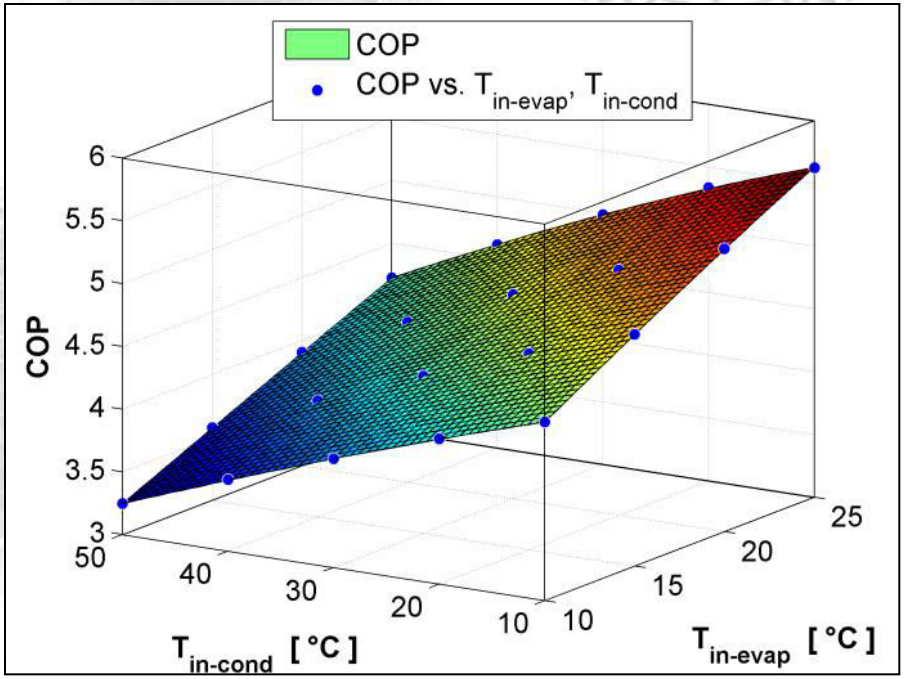
IMST-ART®

- Advanced performance simulation, computer-aided engineering design software. For any single vapor compression refrigeration system: heat pumps, chiller, air conditioning systems, dryers…

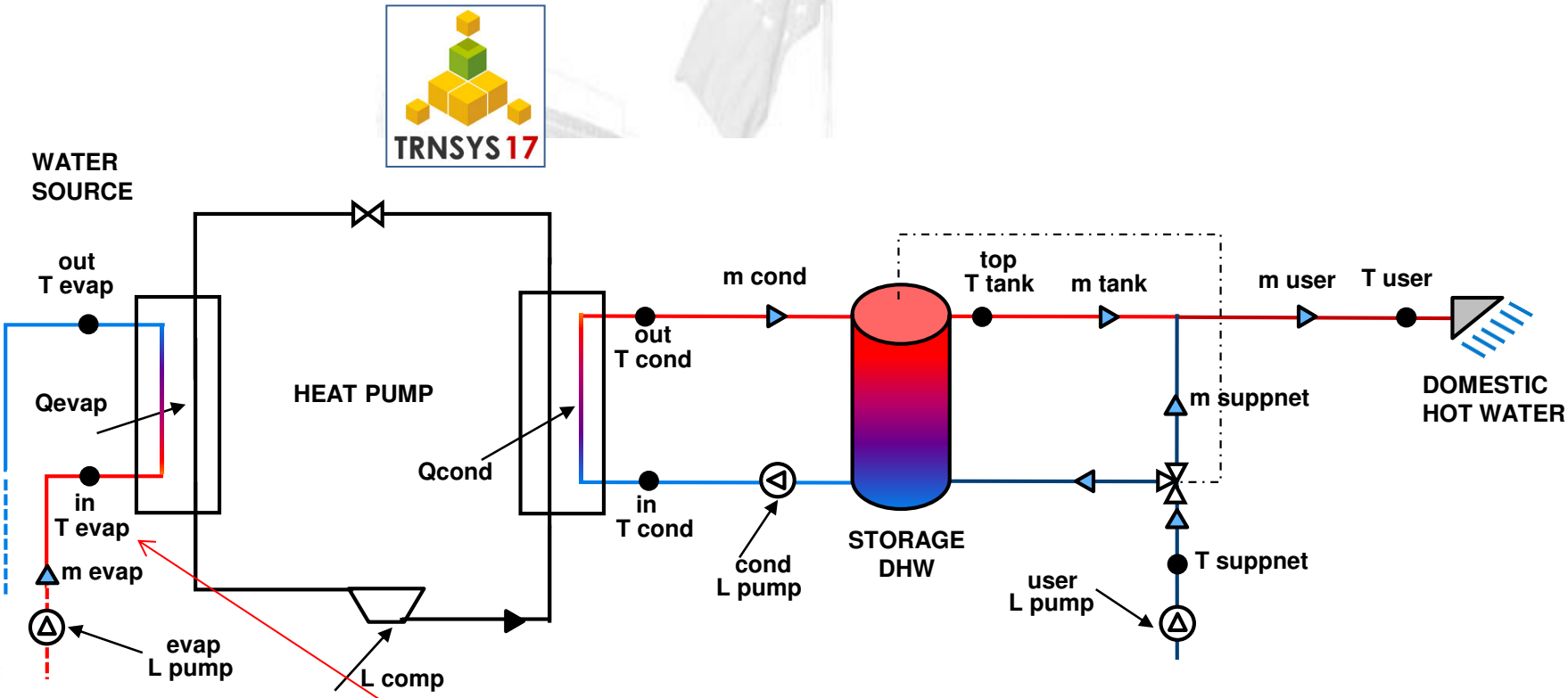


Optimized Subcooling





Yearly Performance Factor



- Twi_{evap}= 15 ºC → **YPF = 4.7**
- Twi_{evap}= 25 ºC → **YPF = 5.5**

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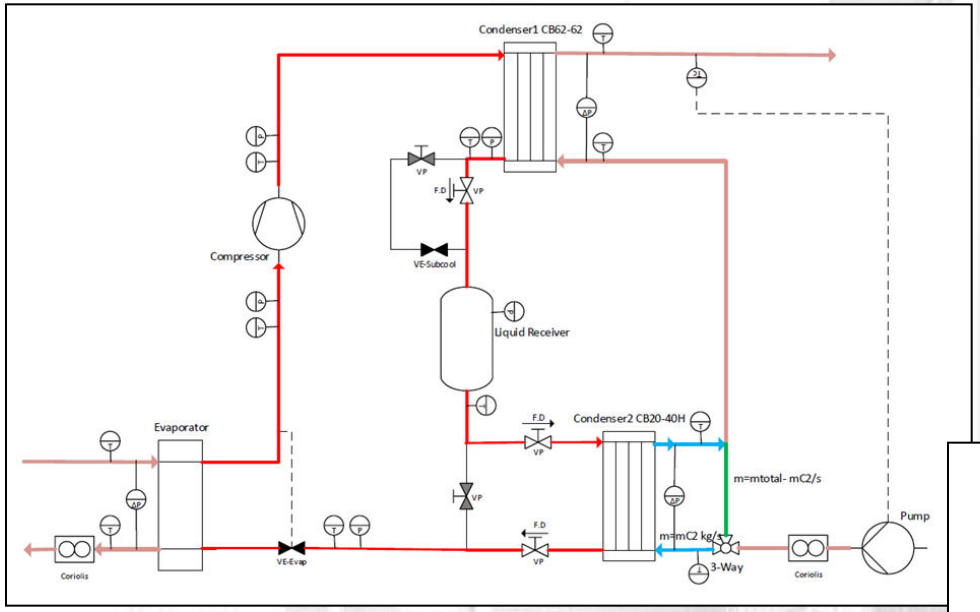
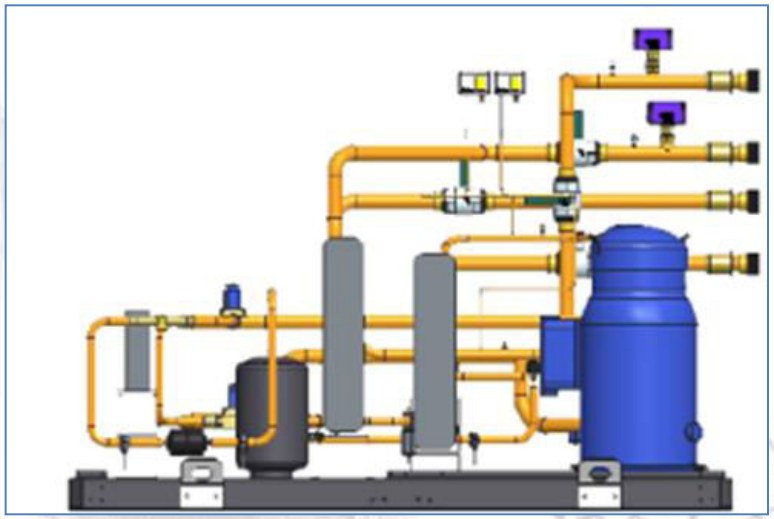
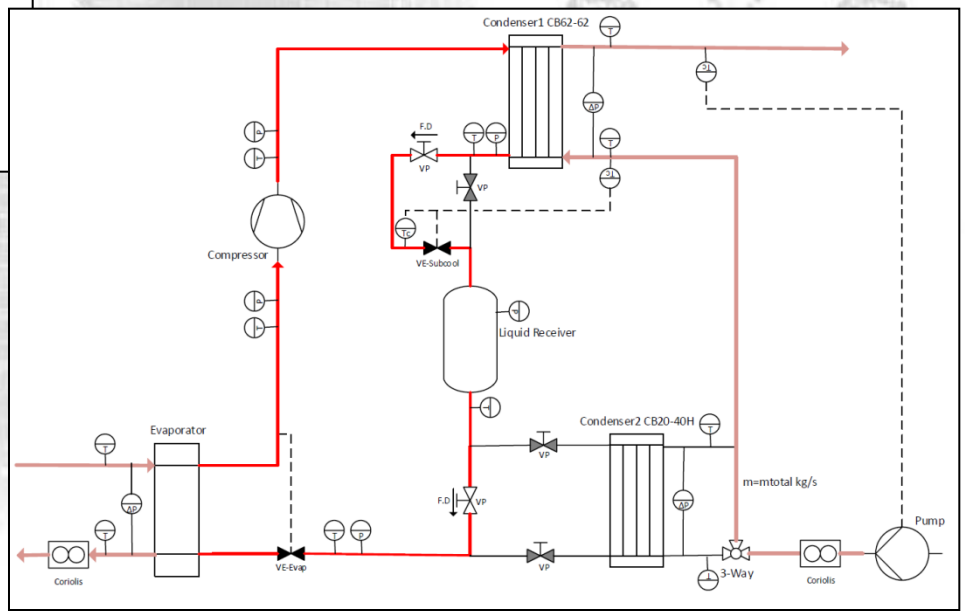
Experimental test rig

Layout A



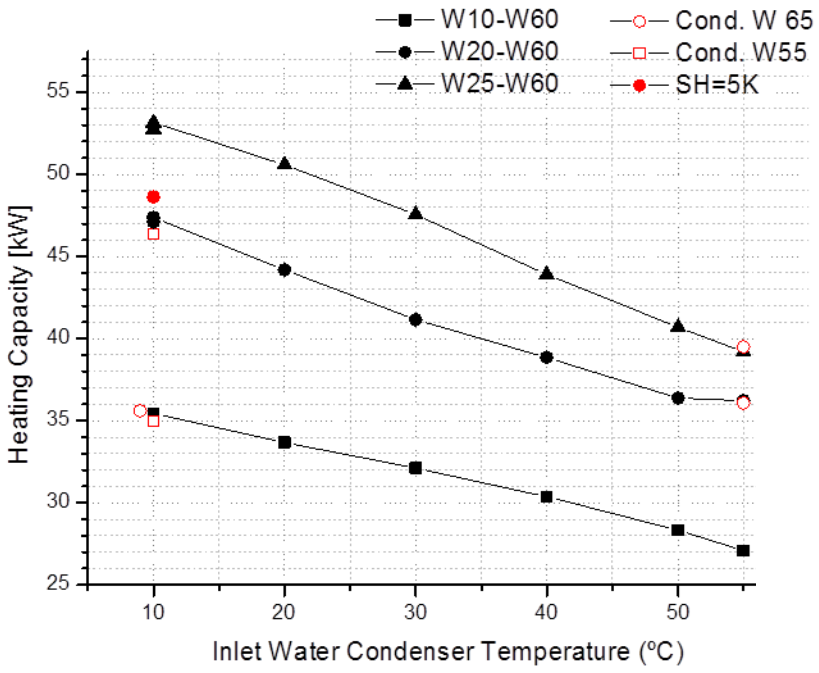


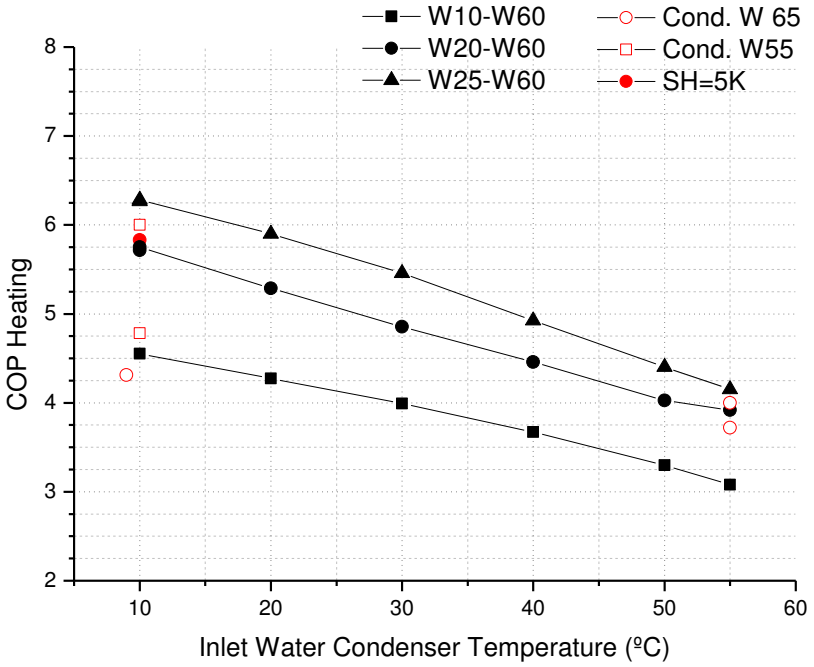
Layout B



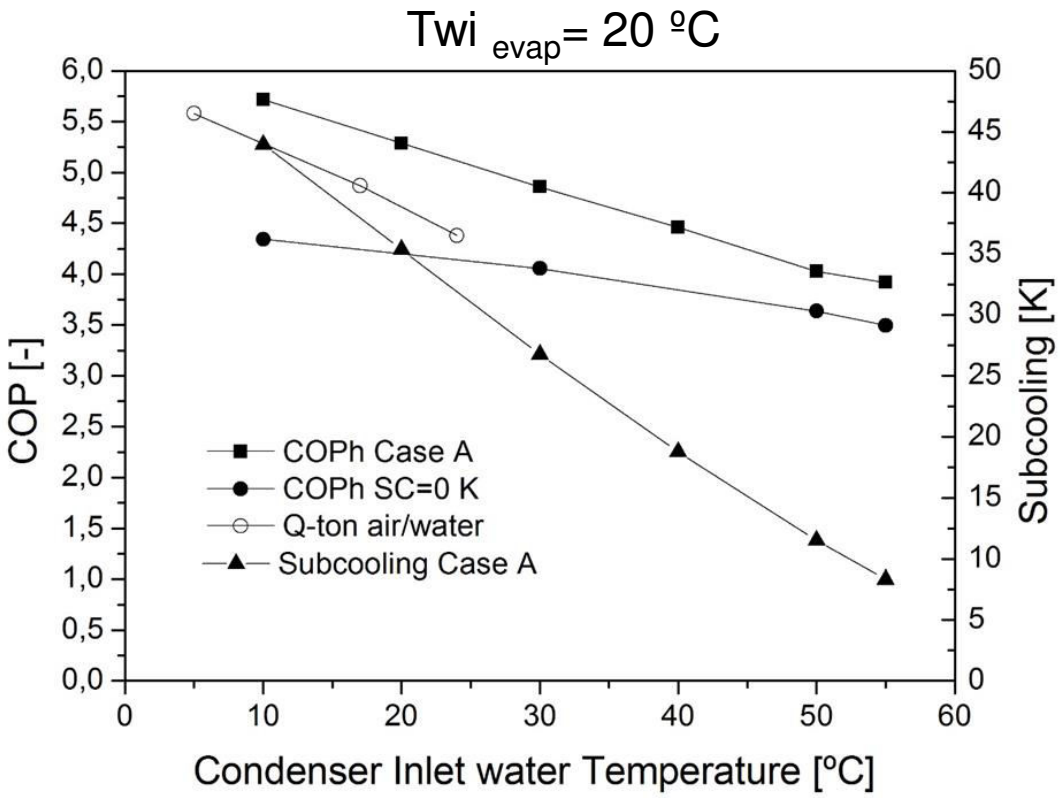
Experimental results

Layout A





Experimental results



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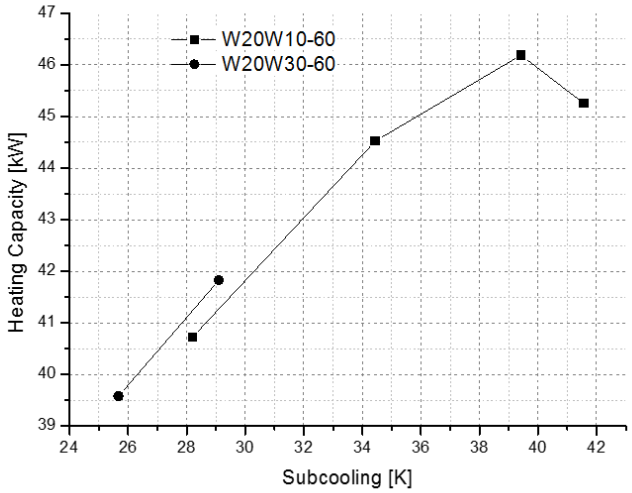
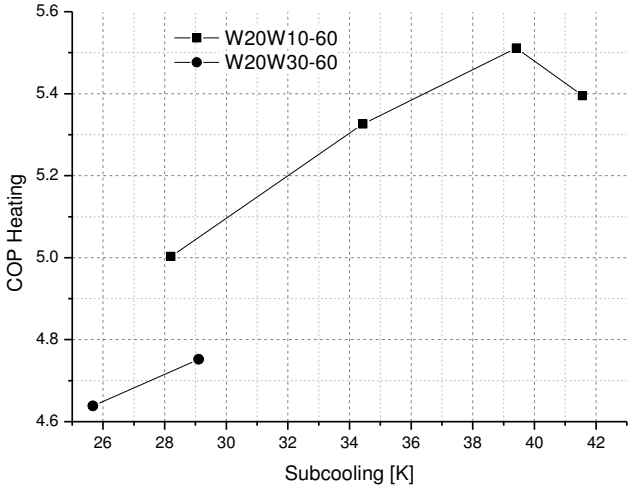
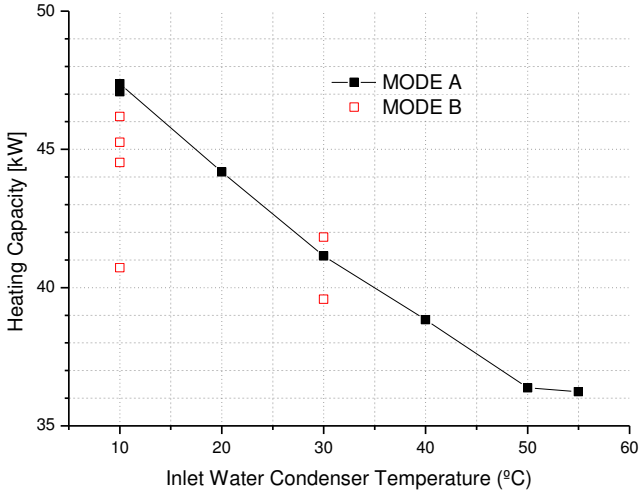
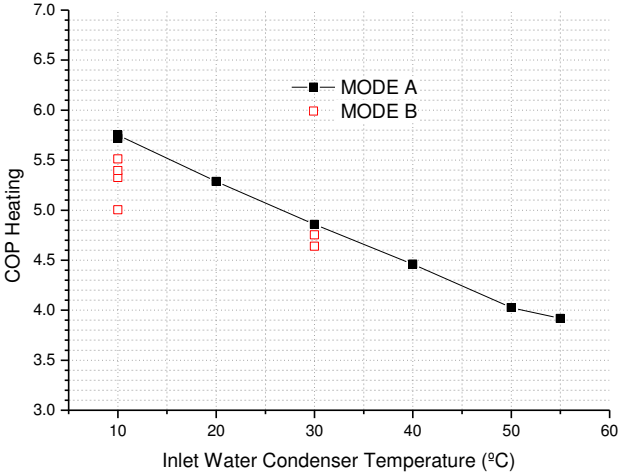
Experimental results

Layout B









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Conclusions and final remarks

- A propane **water-to-water heat pump booster** has been developed under the frame of the EU funded project NxtHPG. The development targets to take advantage of the subcooling produced by the low water temperature at the inlet of the HP for DHW
- The heat pump has been modelled in IMST-ART and assessed in Trnsys. The simulations indicate **YPF of 4.7 for waste heat at 15 ºC** and **5.5 for 25 ºC**
- SAFETY:
  - The unit is designed to be at open air or in a machinery room
  - Present prototype charge is 7kg but we expect to reduce it to lower than 5kg.
- **The experimental results show** the benefit of the generated subcooling and the expected **high value of the COP (>5 for Twi = 20)**
- **Potential market for low T heat recovery:** sewage water, low T process water in industry, condensation loop of refrigeration plants...

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Thank you very much for your attention!