ATMO EU sphere
solutions for europe
natural refrigerants
15-16 October 2013, Brussels

Integrated CO_2 booster for high-efficiency cooling, heating and air-conditioning

By Jens Kallesøe, Advansor

COOP Maxi Mat Tocksfors Choosing SIGMA system from Advansor

∑ Sum of all levels of thermal energy.

Low temperature

Medium temperature

AC Temperature

Heat Recovery + HP function

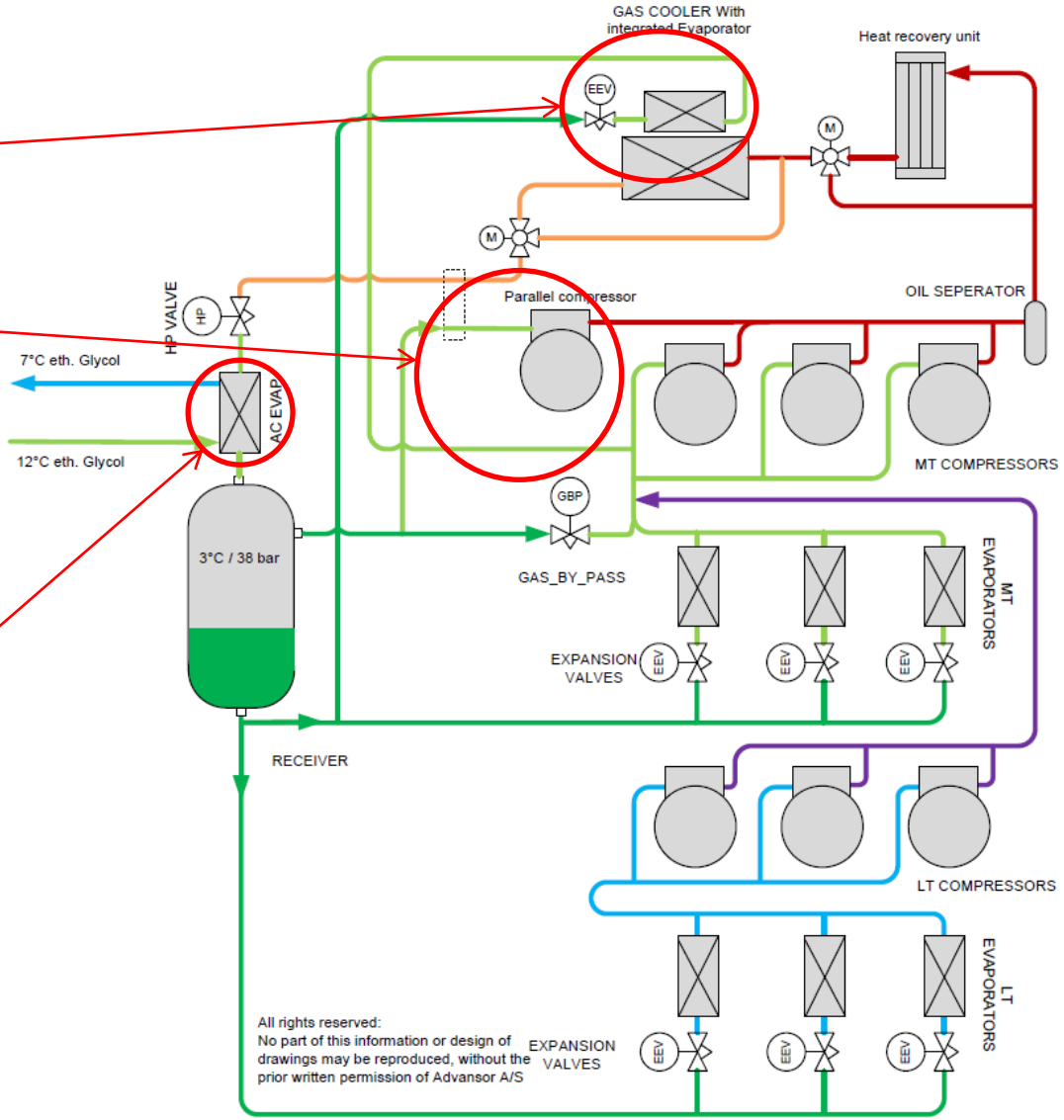
∑ Sum of BENEFITS

Detail of the systems installed

- 2 identical systems installed
- LT load: 2x28kW @ -35°C
- MT load: 2x80kW @ -10°C
- AC load: 2x50kW @ 12/7°C Eth. Glycol
- Heat Recovery: 2x134kW @ 40/70°C
- Artificial Load on gascooler evaporator: 2x25kW @ -10°C

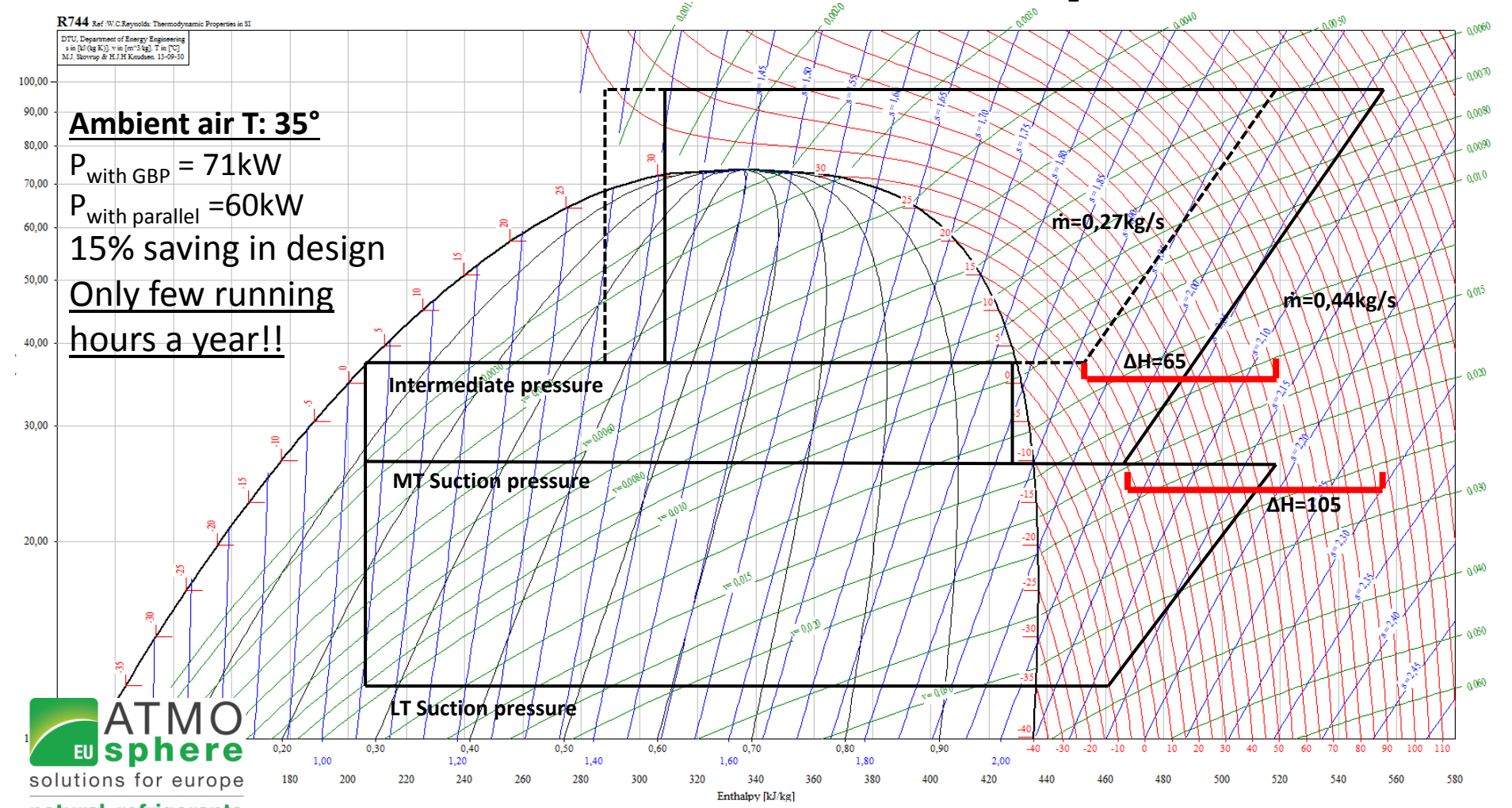
Schematic design of SIGMA Systems – PATENTED SOLUTIONS

- False load evaporator integrated in the gascooler for artificial load on MT compressors
- Parallel/AC compressors for optimized COP, When AC is needed
- Flooded AC evaporator



Energy performance with parallel compression

Without AC load and compared to Traditional CO_2 Booster



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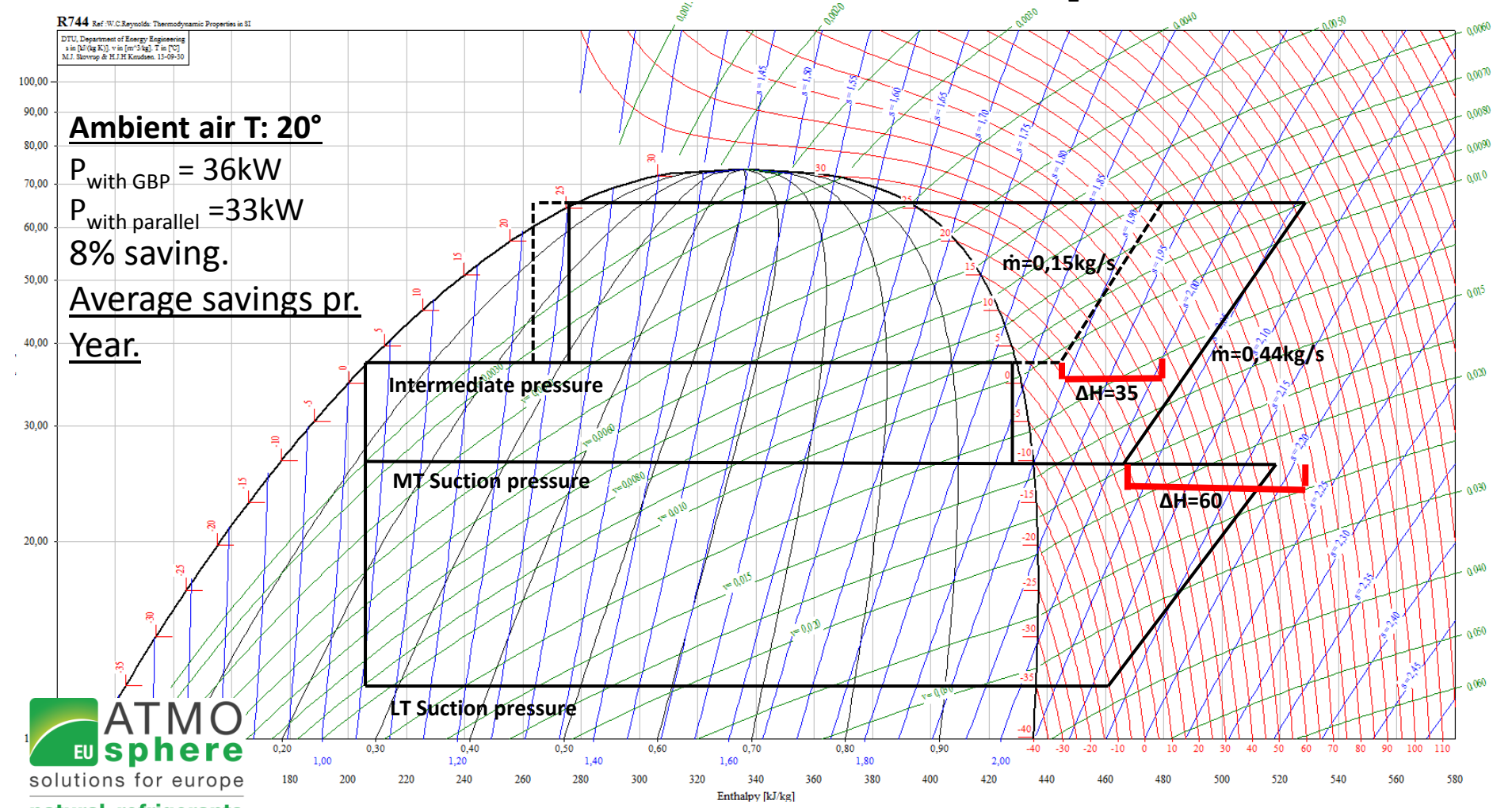

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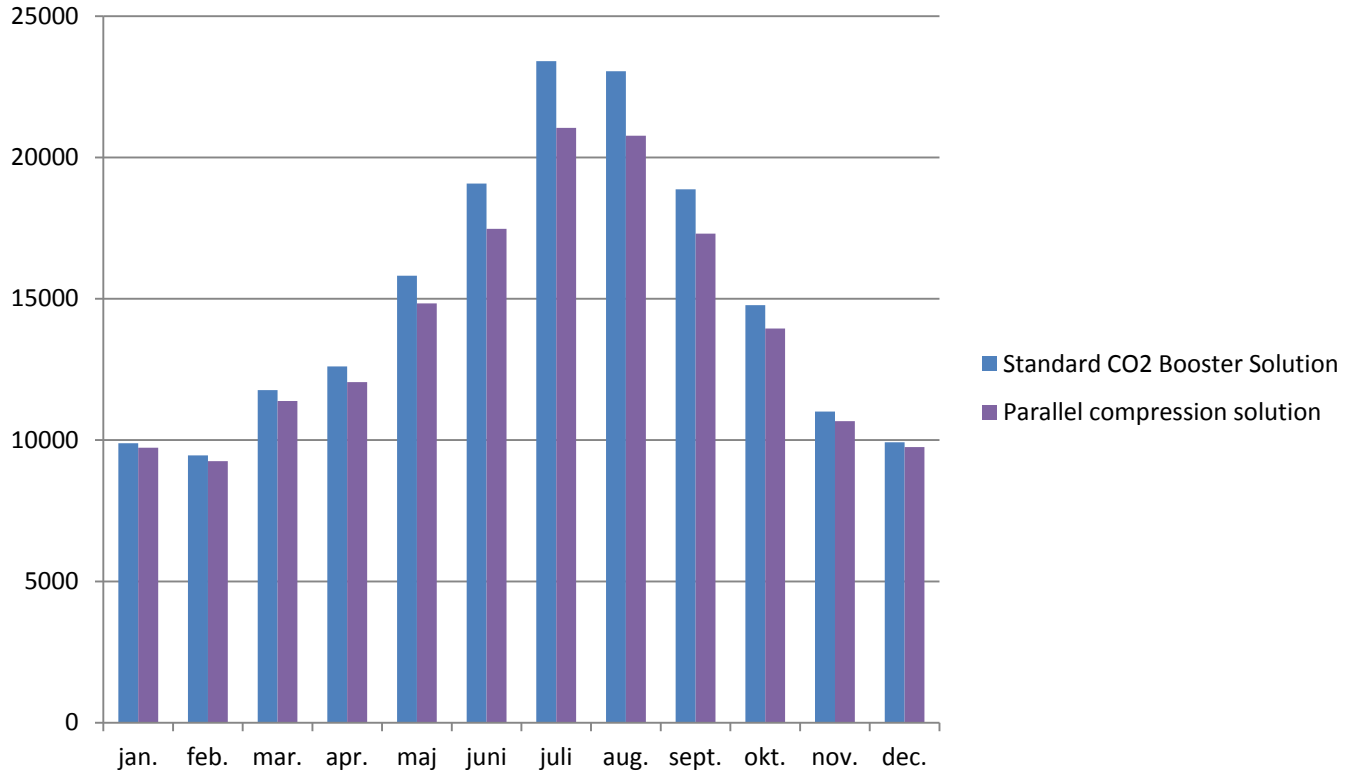
Energy savings throughout a year



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Total energy savings during a year:
Refrigeration purpose only : 6,3 %
Refrigeration & Heating purposes : approx 11 %

Data from Pack Calculation II ver. 3.07

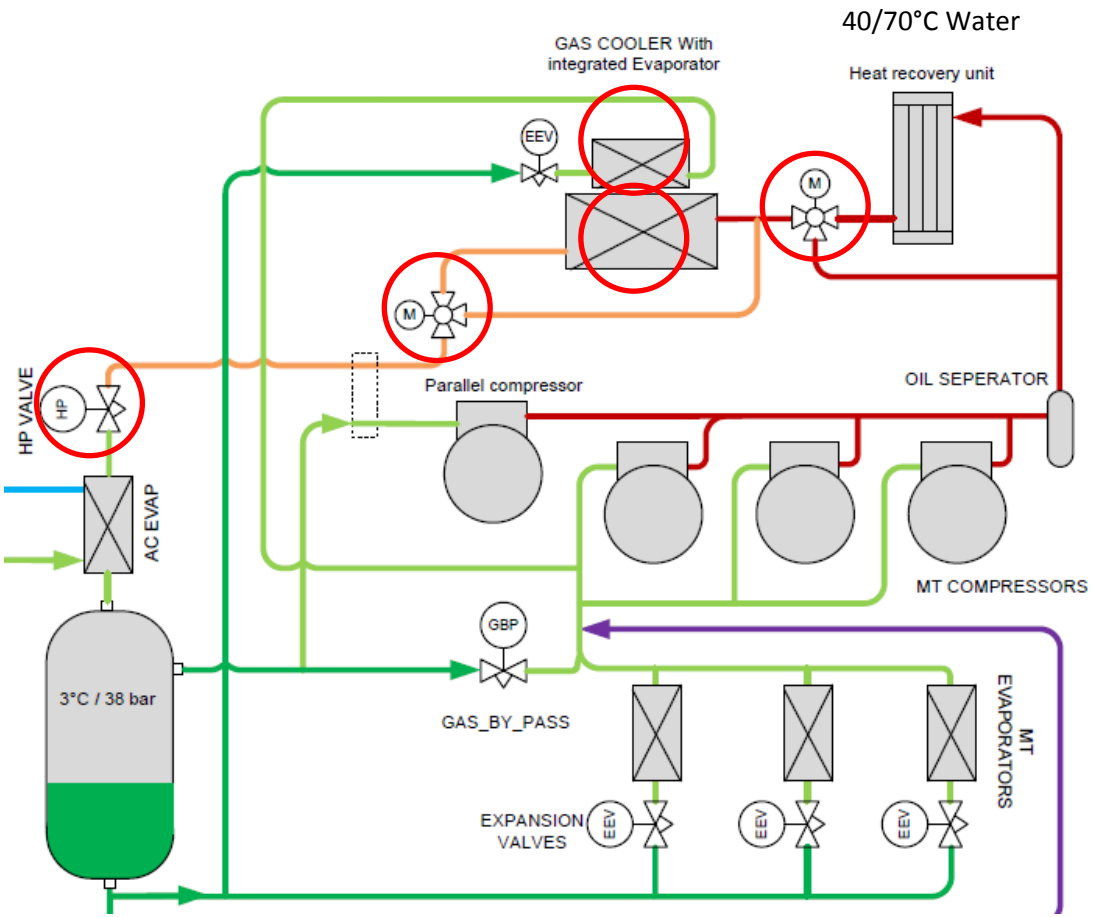
- WWW.IPU.DK

Heat Reclaim with Parallel compression and False load evaporator

Heat Reclaim with 5 stages

- Stage 1: Activate HR
- Stage 2: Raise Pressure
- Stage 3: Stop Fans
- Stage 4: by pass gascooler
- Stage 5: Start false load

When Stage 2 is activated Gas concentration will raise in the Receiver, which will activate parallel compressors



Heat Recovery with Parallel compression and False load evaporator

Heat_COP improves when Parallel compressors are activated.

Heat_COP from MT compressors: 2,3

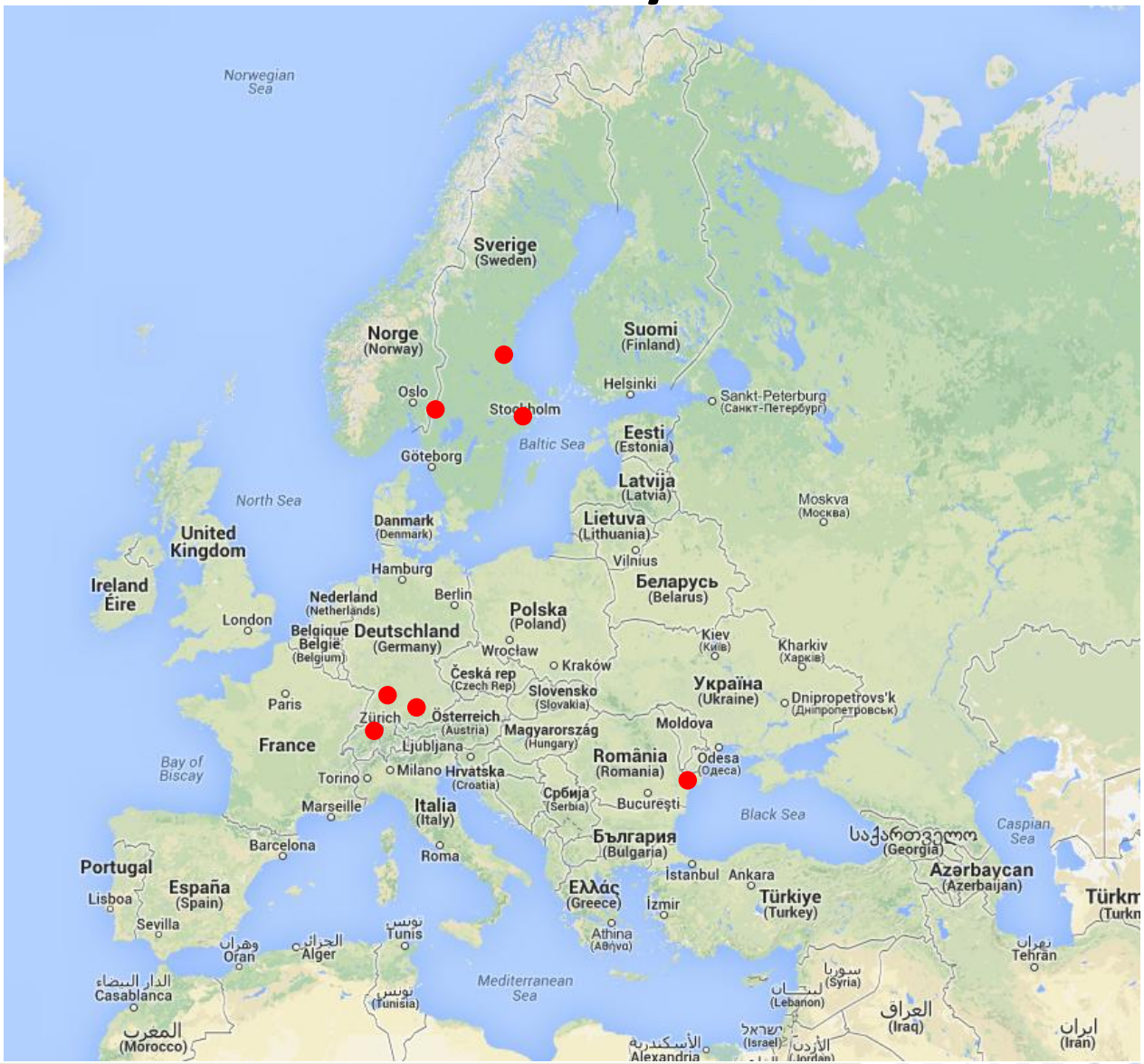
Heat_COP from PA compressors: 3,2

False load evaporator ensure artificial loads on MT compressors, when there is low loads from Cabinets and cold rooms.

COOP MAXI mat Tocksfors is able to produces more heat, than the store needs. Surplus Heat is deliver to district heating.

Sites with SIGMA System

- 9 system with SIGMA
- 7 of them with with LT, MT, AC and HR
- 2 of them with LT, MT and HR.



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Conclusion

- Combines all thermal demands in one system
- Easy to control AC Evaporator, Since the plate Heat Exchangers is flooded
  - No need of controlling Superheat or injection
  - CO_2 Temperature is controlled by Receiver pressure
  - Easy control of glycol or water
- Parallel compressors starts up automatically when enough gas concentration in receiver
- Lower energy consumption compare to traditional CO_2 Booster systems
- Better Heat_COP when using the parallel compressors during heat reclaim
- Only ONE plug&play technical unit fits all demands
  - No greyzones to HVAC mechanical and electrical contractors
- The low carbon footprint choice for supermarkets
- Ready for southern Europe