

Retailers Ensure Sustainable Technology Uptake

KIWI case Norway and transcritical technology fitting Asia

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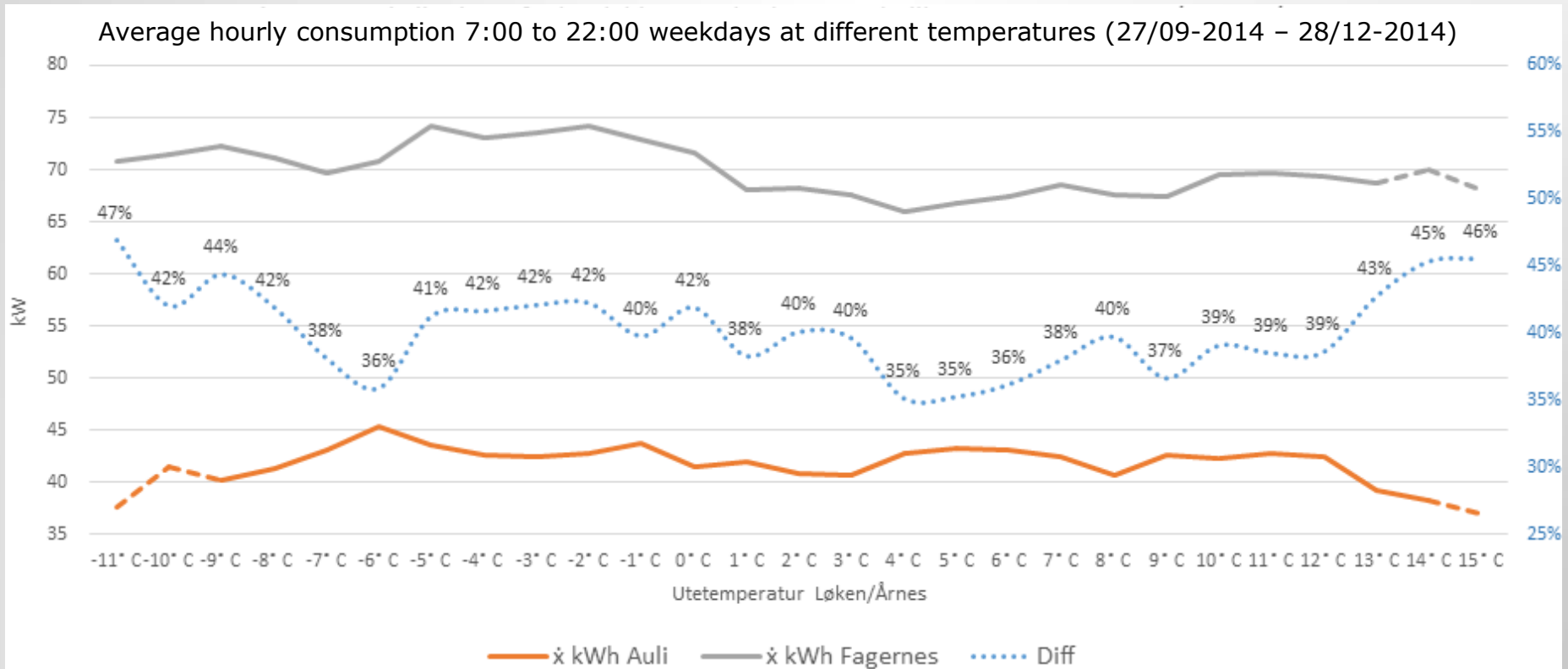
Transcritical CO₂

Goes global with support of retailers and technology



The KIWI case - Deploying & proving

- **40% energy savings** since September 2014 in KIWI's 1300m² pilot store.
 - Transcritical Booster (Auli) vs. R507A (Fagernes)
- Expectations to perform even better after optimizing the system settings end December 2014.



The KIWI case - Deploying & proving

Total store approach

- State of the art heat reclaim
- Heat pump functionality (with refrigeration priority at any time for food safety)
- 200 meter deep energy wells supporting during summer and winter
- Doors on all cabinets
- Solar panels on the roof
- Passive house – additional insulation
- Shine through isolated panels to save on light
- LED light
- Excessive heat to melt snow
- Excessive electricity to grid and electric car charger

The KIWI case - Final stage of commissioning



The KIWI case - Solar panel installation



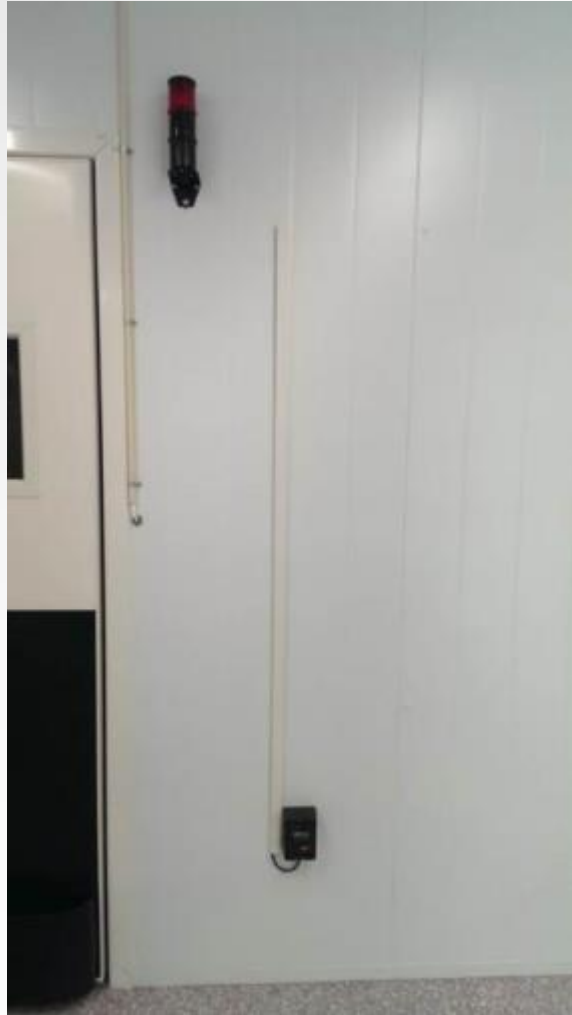
The KIWI case – Example of electrical cabinet



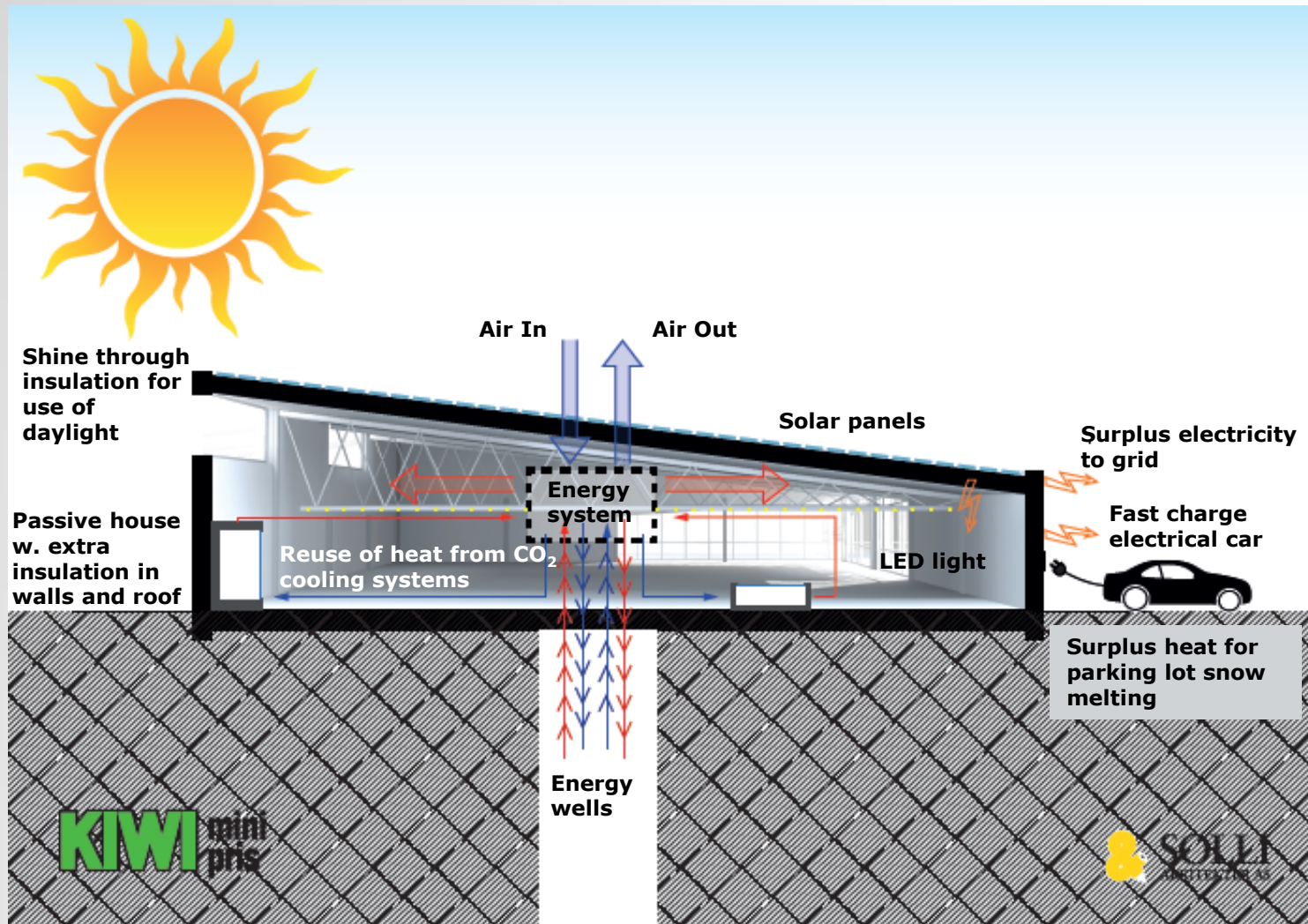
The KIWI case - Pack/rack room



The KIWI case - Safety first



The KIWI case - Deploying & proving



Adapted from Kiwi and translation made by Danfoss

The link to and benefits for Asia

Among many retailers KIWI are pulling sustainable technology to the market

- In warmer climates retailers trust the capabilities of CO₂ to have energy advantages in these climates. Different both proven and future technologies enable this confidence.

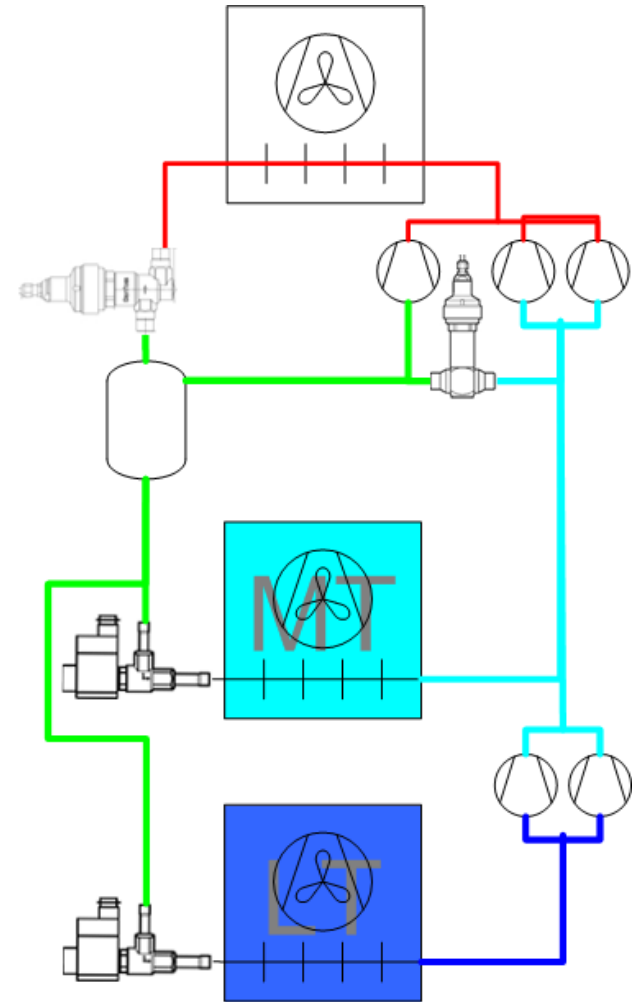
What are these technologies?

- Important to remember the traditional CO₂ cascade systems. As they have advantages that are obvious still in different scenarios.
- The more traditional ways are mechanical sub cooling and adiabatic condensers
- New to the game is parallel compression
- Ejectors to join the game soon

The most recent technologies

Parallel compression

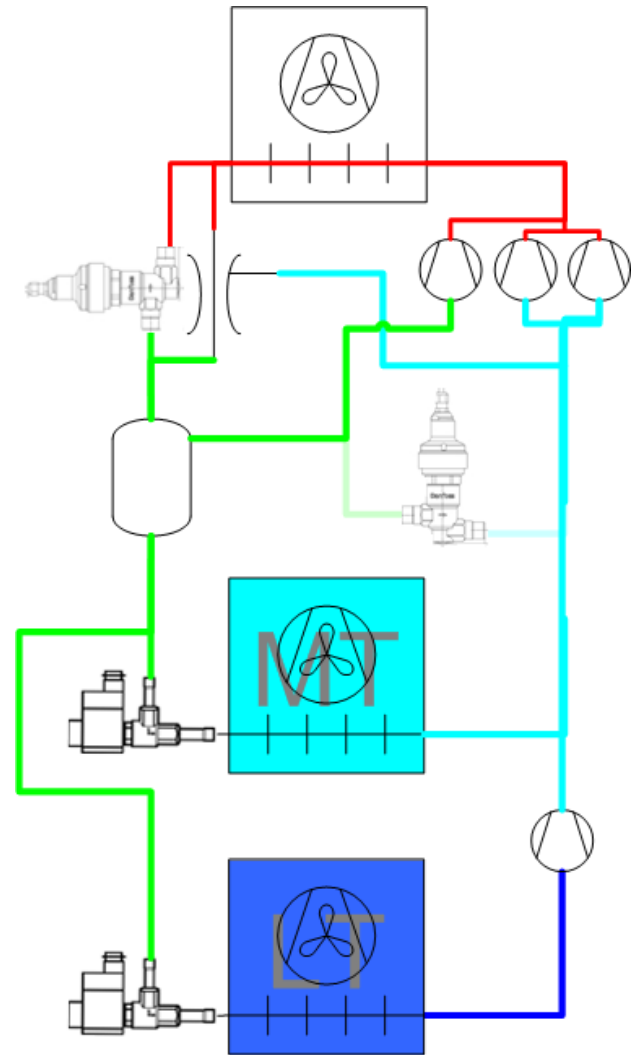
- The solution is ready
- 5-10% energy improvement in warm climates
- Approximately 25% savings on installed capacity
- The challenge is on small systems where the parallel compressor is often too big
- Can be combined with other features to enhance the system



The most recent technologies

Ejectors

- An ejector works as a pre-compressor for the parallel compressor
- Can be combined with other features
- Lab applications and initial field test performance data logged:
 - Conservative energy performance improvement over traditional R404 plant is in the area of 20%



Different type of ejectors, Pros and cons.

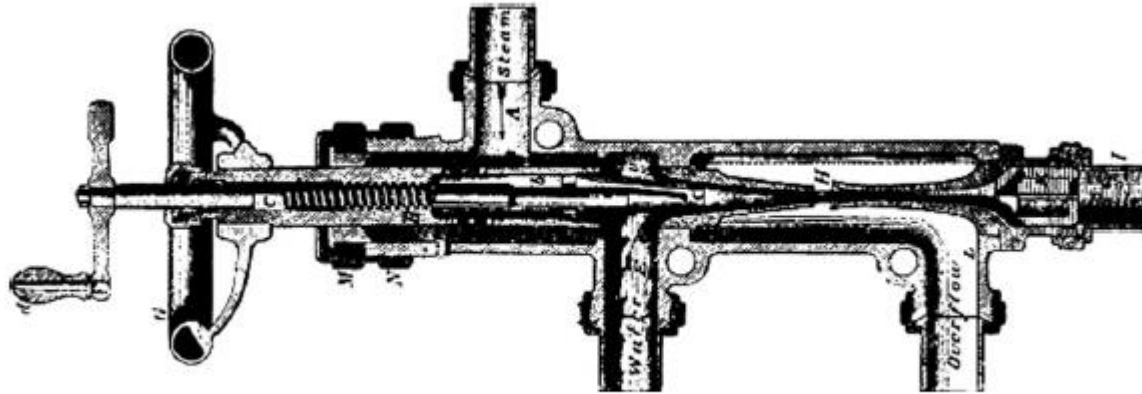


Fig. 1 – Henri Giffard's ejector from 1864 with integrated spindle valve for control of motive flow rate (Kranakis, 1982).

- There are two different main directions of ejectors, Variable and fixed ejector
- Variable ejectors can vary the capacity with a needle in the nozzle
- Fixed ejectors vary the capacity by taking in and out ejectors (multiple ejectors and staging of them)

What do the future hold?

- Market trends indicate that the timing is right to center developments within retail refrigeration around natural refrigerants and improve within these refrigerants instead of waiting for the next refrigerant in line.
 - The industry is ready for the challenge
 - The retailers are keen on adopting as long as it comes with a reasonable price tag
 - The first cost vs. total cost battle still exist
- Keep engineering and keep innovating!

Thank you for your attention!

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