

High
Efficiency
Solutions.



CAREL

High efficiency in commercial refrigeration



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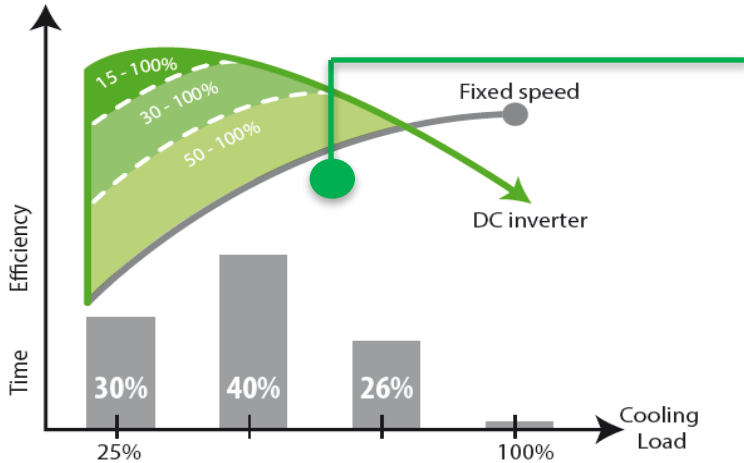
April 20th 2016

DC inverter technology



DC technology

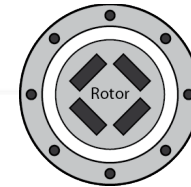
The compressor with DC motor allows considerable energy saving as operation is optimum at part loads.



The wide range of modulation means the best operating conditions can be achieved, guaranteeing greater stability and less starts/stops.



Technology	Saving
Inverter AC vs ON-OFF	Up to 9%
DC power+ vs ON-OFF	Up to 25%
DC power+ vs inverter AC	Up to 15%

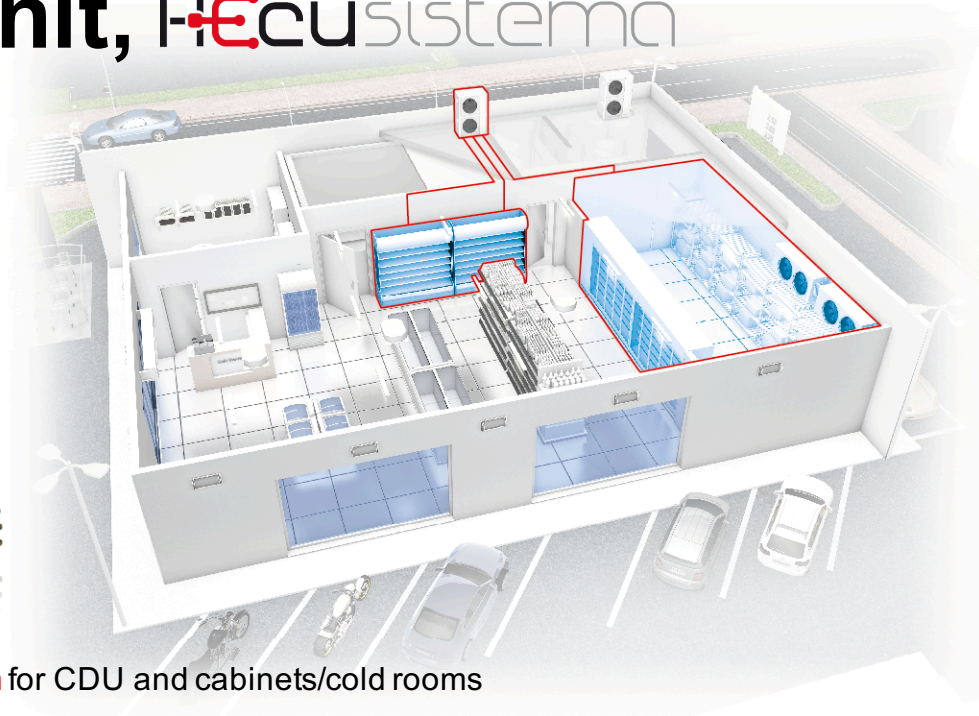


Electrical efficiency improvement

4-5%

BLDC vs AC Induction

DC condensing unit, HECU sistema



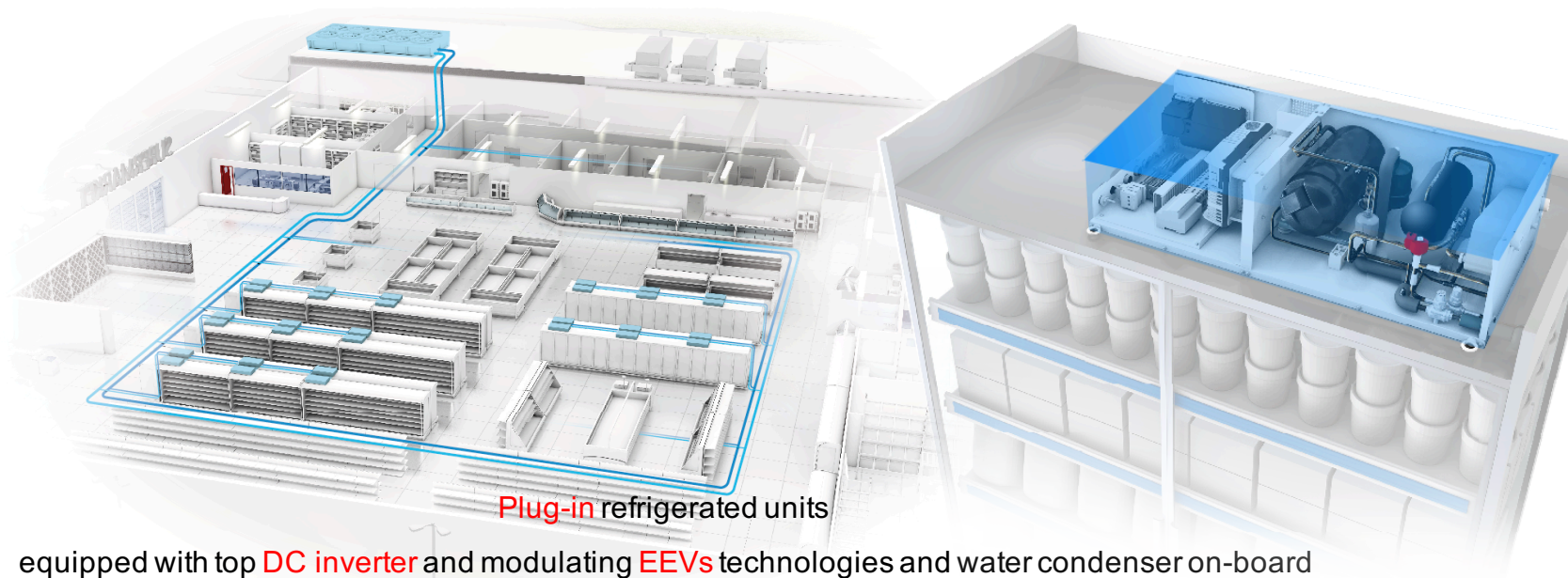
an **integrated refrigeration control system** for CDU and cabinets/cold rooms

equipped with top **DC inverter** and modulating **EEVs** technologies

providing **self-optimization** for energy saving and food quality

enabling high end remote **monitoring** and **benchmarking**

DC waterloop, Heosistema



equipped with top **DC inverter** and modulating **EEVs** technologies and water condenser on-board
connected with a **water loop system** for condenser heat management
providing **high flexibility** and **low ambient impact**

High Efficiency in commercial refrigeration



Convenience store

Supermarket

HEcusistema

Heosistema

HECU : Energy efficiency

30%
Energy savings

Excellent performance at part loads

- With DC technology and power+ inverter



Real time energy optimization

- Through continuous data exchange with showcases



Minimum energy wastage

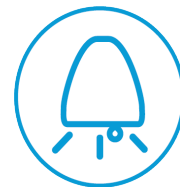
- With calibrated injection of oil and liquid using CAREL E2V



High temperature stability

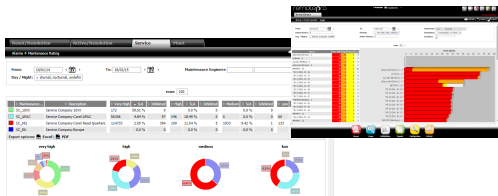
- Using CAREL E2V valves

HECU : Reliability and usability



Centralised alarm management with system network

- Preventive actions for optimal working conditions
- Safety procedures to strongly reduce installation down-time



Intuitive programming

- Different access profile for different user
- Simplified menu for a clear navigation
- PGD and pLD PRO terminal with full informations

Oil return and recovery procedures

- Advanced software functions such as speed boost and oil recovery washing
- Multisplit installation layout for an higher refrigerant speed in the suction line

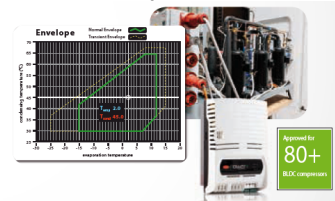


Easy set-up and optimisation

- Wizard start-up procedure for a simplified unit configuration
- Pre-setting of the main parameters and probes to reduce commissioning timing

Optimal compressor management with power+ inverter

- Detailed qualification process
- Perfect control of compressor envelope
- Safety procedures



Extremely fast commissioning

- Automatic preconfiguration of the system network (refrigerated cases and condensing unit)
- Optimised default parameters with extensive laboratory tests

Heos : Energy efficiency

25%
Energy savings

Heos controller

- DC compressor management and full envelope control
- EEV valve management
- Safety features and preventive actions



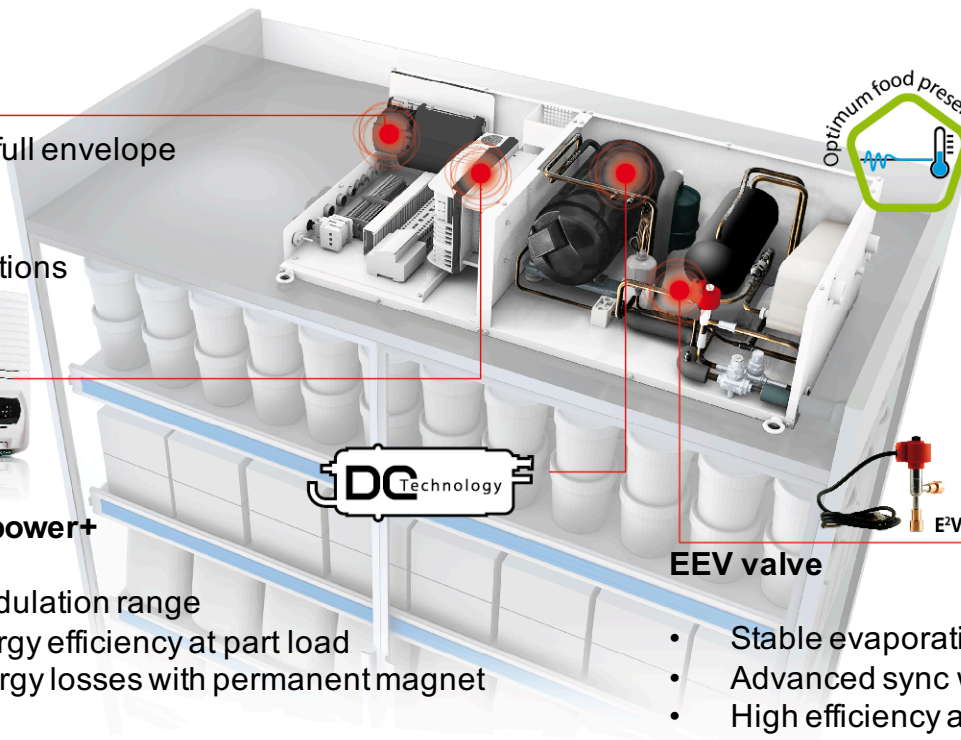
DC inverter power+

- Wide modulation range
- High energy efficiency at part load
- Less energy losses with permanent magnet



EEV valve

- Stable evaporation temperature
- Advanced sync with compressor
- High efficiency at variable flow rate



Heos : Environment respect and flexibility

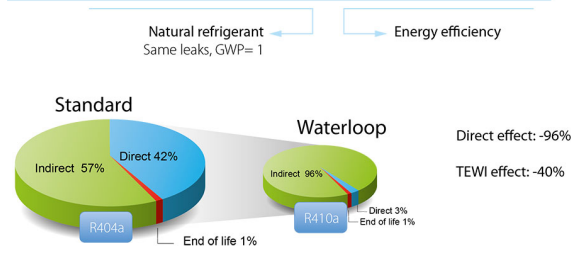


Refrigerant charge reduction compared with traditional system

- No long copper pipes
- No compressor rack
- No receivers

TEWI reduction

$$TEWI = GWP(\text{direct, refrigerant leaks}) + GWP(\text{indirect, emissions})$$



Refrigerant leaks reduction with ermetically sealed unit

- No welding on the field
- Factory tested units



Wider sales area

- No more need of compressor rack



Flexible sales area & easy layout change

- Easy installation or deinstallation of new/promotional cabinets
- Easily move of the cabinets inside the supermarket



High investment recovery

- Critical components fully contained into the cabinet



Natural refrigerants in high efficiency systems

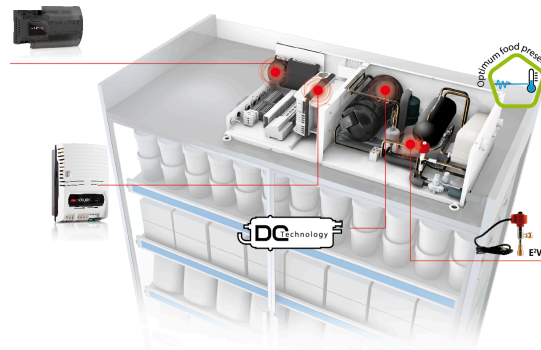
HECU : suitable for CO₂



R744

- Well accepted from the market
- Overcomed worries on pressures and usability
- Innovation trends ongoing

Heos : suitable for natural



R290

- High efficiency refrigerant
- Standard working pressures
- Ideal for small units

R744

- Well accepted from the market
- Overcomed worries on pressures and usability
- Innovation trends ongoing



Conclusions

- The **DC inverter technology is ready for the commercial refrigeration** and can cover a wide range of store format
- Considerable **energy saving** results can be achieved with **DC technology**
- DC technology together with **CAREL E2V valves and advanced control algorithms** increase further energy saving results
- This saving contributes to reach an **optimum food preservation** with more stable product temperature and to **reduce the ambient impact**
- Natural refrigerant inside the high efficiency solution is **CAREL** next step

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