

CAREL

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CAREL'S SOLUTIONS FOR TRANSCRITICAL CO₂ SYSTEM INSTALLED IN CARREFOUR IN ITALY

— CASE STUDY

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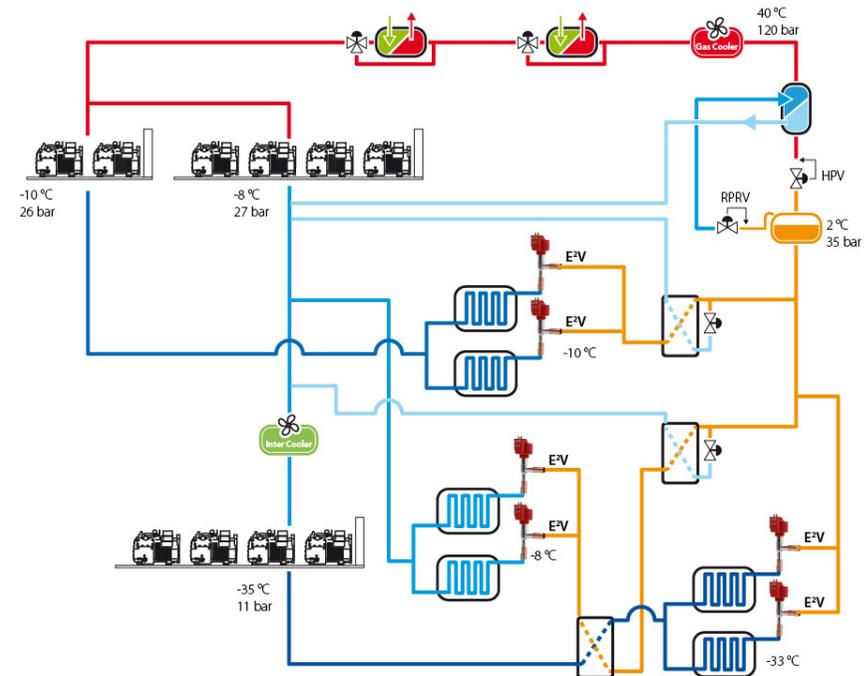
Carel's solutions for transcritical CO₂ system installed in Carrefour in Italy

INTRODUCTION

Thanks to the partnership among Carel, Carrefour and Enex, a new supermarket in Aosta has become fully green. Installed in September 2013, the refrigeration system now uses carbon dioxide as the sole refrigerant for cold food storage.

Carrefour, committed to replacing its HFC systems, first with hybrid CO₂/ R134a solutions, and then with refrigeration systems that only use CO₂, inaugurates this new hypermarket that stands out for its size and the specific configuration with three suction lines - MT1, MT2 and LT.

ABOUT THE SYSTEM



CAREL

Carel
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ABOUT THE COMPANY

CAREL has been working in the field of refrigeration, air conditioning and humidity control since 1973. CAREL solutions are specifically tailored for the management of chillers, compressor packs, showcases, multiplexed cabinets, cold storage rooms, seasoning rooms, retarders, air handling units, roof-top units and air-conditioning units. These solutions are used world-wide, both by the most well-known OEMs and by the most demanding installers in the HVAC&R market.

The compressor rack is a transcritical CO₂ booster system. The pRack controller manages three suction lines, comprised of four compressors (LT), four compressors (MT1) and four compressors (MT2).

Specifically, the low temperature (-35°C) compressor discharge is first cooled by an intercooler featuring two ON/OFF fans and is then delivered to the first medium temperature suction line (-8°C). Independently from the booster system, a second medium temperature suction line provides a third level of evaporation (-10°C). The compressor discharge on the two medium temperature lines flows into the condenser line, where a system of three heat exchangers provides for heat recovery in two stages, firstly for domestic hot water and secondly as for room heating. Both are managed directly by the Carel pRack board and the Carel IR33 universal controllers. The third heat exchanger is placed in series with the first two, and can be used manually for system safety.

pRack provides temperature control of the gas cooler, featuring EC fans, based directly on the heat exchanger outlet temperature, with the possibility to adjust the control set point based on variation in outside temperature (floating condensing pressure function). Between the gas cooler and the HPV valve is a subcooler, which exploits the colder fluid from the flash valve to further cool the CO₂ at the high pressure valve inlet.

The HP valve is controlled by pressure; the set point is calculated based on the saturated temperature at the gas cooler, with the aim of ensuring the optimum pressure for compressor rack COP in transcritical conditions or the ideal level of subcooling in subcritical conditions.

Liquid refrigerant is delivered from the receiver directly to the low temperature units, where it is expanded to cool the cabinets and cold rooms, while the medium temperature units receive superheated refrigerant via a series of heat exchangers controlled based on superheat using the Carel EVD DRIVER controllers. From the three temperature levels at the refrigeration units, the CO₂ is then injected into the three separate suction lines and the flash valve.

CONTROL SYSTEM

pRack pR300T

The compact CAREL solution for complete control and management of CO₂ refrigerant systems is ideal to meet the considerable market demand for the following:

- » integrated management of low and medium temperature compressors (two suction lines) and transcritical valves;
- » innovative energy saving management algorithms;
- » algorithms dedicated to the management of CO₂ systems;
- » management of heat recovery in two separate stages (domestic hot water and room heating)
- » ample possibility for integration/supervision



PlantVisor PRO

Complete and reliable solution for the management, monitoring and optimisation of refrigeration and air-conditioning systems with up to 300 units:

- » management of large and complex systems using an intuitive web interface;
- » HVAC-ECO optimisation package;
- » fast installation onsite;
- » alarm management using a powerful engine of rules, conditions and notification channels;
- » complete series of reports and documents, such as HACCP and SYSTEM REPORT.



RESULTS

Safety: Following the CO₂ refrigerant thermo-physical properties, Carel integrated a control system for an easy management and operation with the complete control logic and safety features being the same as for traditional refrigerant systems.

Performance: With the best monitoring platform and reliable design, customers are able to manage the system more intuitively and effectively.

Energy Efficiency & Environment: The Carrefour CO₂ refrigeration system achieves about 30% energy reduction due to an efficient heat exchanger with CO₂ and the specific configuration with a three suction lines design.

SUMMARY

Carel has implemented the new CO₂ refrigeration system control for both low temperature cabinets (frozen food) and fresh produce. Because the project is centred around environmental sustainability, the system relies on a completely natural refrigeration technology.

The CAREL pRack PRK300T electronic controller, by adopting innovative control algorithms to manage at the same time the compressor, heat recovery and the transcritical section, can achieve maximum efficiency and savings in energy consumption. Carel has once again proven to be a sustainable innovator, applying its technology to provide cooling using carbon dioxide, while ensuring the lowest possible energy consumption.

High
Efficiency
Solutions.

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Get in touch with shecco's Market Development team to learn more about the market for natural refrigerants in China or find out how we can help you in gathering market intelligence and proactively building your business with our tailored market development services, to get your technology faster to market.

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