



Success story

Outstanding energy saving with iJF for VCC

A successful case of variable-
capacity compressor management

For its latest refrigerated cabinet designed for food storage applications, Hiron, a Chinese leader in the production of refrigerated equipment for the food service sector, has chosen CAREL's iJF, part of the iJ platform, due to its ability to fully manage variable-capacity compressors.



Where

China

What

Variable-speed technology applied to small plug-in units (vertical chest freezer).

Why

- Highly efficiency and energy saving
- Optimised maintenance management
- Food preservation and HACCP
- Excellent performance in terms of low noise and vibrations.

Hiron, Chinese leader in commercial refrigeration

Qingdao Hiron Commercial Cold Chain Co., Ltd. is a manufacturer specialising in commercial cold chain equipment, serving various applications such as cold drinks, cold food, beer, beverages, dairy, supermarket chains, convenience stores, and more. Its core products include freezing display cabinets and commercial refrigerating display cabinets, with a portfolio of over 100 products. With a strong commitment to innovation, quality, and sustainability, Hiron is a leading player in the professional commercial refrigeration cabinets.

Market demand for high efficiency

In today's rapidly developing business environment, the field of light commercial refrigeration is facing unprecedented challenges and opportunities. With increasing global attention to energy efficiency and environmental sustainability, high efficiency refrigeration solutions have become a key driving force in the light commercial segment.

The primary advantage of efficient refrigeration solutions is energy-saving. Energy consumption and operating costs can be significantly reduced by adopting advanced refrigeration technology and equipment. These savings can be converted into considerable economic benefits over the long term, bringing direct economic benefits to the enterprise.

High-efficiency refrigeration solutions also can help reduce the impact on the environment. These solutions support businesses in achieving their sustainable development goals and responding to global calls for environmental protection by reducing energy consumption and emissions.

As governments around the world increasingly demand stricter energy efficiency standards, efficient refrigeration solutions help businesses easily adapt to regulatory changes and avoid potential legal and financial risks arising from non-compliance with standards.

CAREL's solution

To meet market requirements on energy consumption and environmental sustainability, a commercial equipment manufacturer customer from Shandong China planned to develop a new generation display case equipped with variable-speed compressors and using R290 refrigerant.

The customer then chose the iJ, with a VCC serial port as the control solution, due to the excellent energy performance and compliance with flammable refrigerants.

Below are the main benefits that iJ with VCC serial mode can bring to the solution:

Highly efficiency and energy saving



iJ with VCC serial port can maximise the performance of variable-capacity compressors, as it continuously determines the operating speed of the compressor based on the actual operating temperature.

Optimised maintenance management



iJ with VCC serial port can enable the VCC compressor to send operating data. The embedded BMS port connects to the IOT platform, which facilitates service and maintenance management.

Food preservation and HACCP



PID control helps minimise temperature fluctuations. Integrated HACCP function prevents food damage and record logs in the event of power outages. Embedded BMS port for connection to Boss using the Modbus protocol.

Excellent performance in terms of low noise and vibrations



Thanks to the soft start and advanced PID logic, iJ reduces compressor vibration at start-up and in low load conditions, giving the cabinet higher performance in terms of noise reduction.

VCC serial mode management

The controller, based on cooling demand, sends the speed request to the inverter via a serial communication protocol. Communication is two-way: the controller sends the speed control signal to the inverter and can also get feedback (i.e. alarms). The iJ, thanks to the embedded VCC serial port, features an advanced algorithm to manage this function.



Tests

Information

Case specifications:

- vertical chest freezer application;
- stored products: ice cream;
- volume: 480 l;
- dimensions: 180cm x 100cm x 50cm;
- temperature range: L1;
- defrost interval: 6 h;
- defrost method: hot gas;
- refrigerant: R290;
- light: LED.

Test target and conditions

The aim of the tests was to prove the benefits that VCC serial management can provide.

To do this, the tests compared three different types of compressor management:

- Fixed speed (ON/OFF);
- Drop-in;
- VCC (variable-capacity compressor) in serial mode.

The tests followed the ISO 23953-2 standard, and in particular the following parameters were applied:

- package temperature: class L1 (-15 to -18 °C);
- climatic chamber conditions: temperature= 25 °C, humidity= 60%;
- test: steady packages, 12 h door openings (3 min at the beginning + 10 s every 10 m) + 12 h door closed.

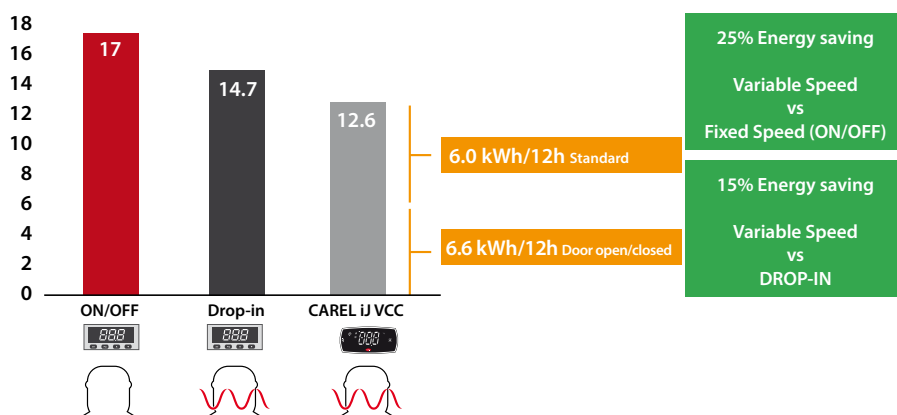
Results

After the real-life tests, keeping the same product storage quality, VCC serial mode management compared against fixed-speed and drop-in compressors operation showed the following improvements:

+25%
Energy
saving

Noise
reduction
-2db

Energy consumption kWh/24h



The temperature fluctuation of the cabinet is less than 2°C, meaning the set point can be ensured while saving energy and preserving the same food quality.

Conclusions

CAREL, in collaboration with Hiron, has once again demonstrated expertise and a spirit of innovation in the commercial refrigeration cabinet market, through the adoption of the most innovative technologies, standing out for the high reliability of its products, so as to best support customers, and proving to be a strategic partner for the technological proposals offered. The collaboration with Hiron has been a success, thanks to the commitment of both engineering teams, making the products even more effective and reliable.

Finally, the possibility of offering the solution to multiple markets, thanks to the wide range of certifications available, was also decisive in choosing iJF.



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