



**Success story**

# CONELA: cooling solutions for seed storage

Improved reliability and efficiency  
with CAREL solutions

Integrating the high efficiency modulating technology (BLDC, Power+ inverter and EXV) into CAREL's programmable controller, combined with the remote monitoring and plant optimization services, improved the reliability of the systems, enabling the possibility to extend the warranty period from 12 to 24 months.



### Where

Brazil – Dois Marcos Sementes: quality and technology in Cristalina, Brazil, with 40,000 m<sup>2</sup> of air-conditioned warehouses.

### What

DEMETRA, the new product line of cooling units adopting CAREL programmable controllers and tools, easily integrating the high efficiency BLDC and ExV technology.

### Why

Conela Refrigeração was looking for reliable technology to improve the energy efficiency of the units, combined with the possibility of providing advanced support from remote

## Application and context: Challenges in climate-controlled storage to maximize seed productivity

Brazilian market is making large investments in technology for agricultural solutions and machineries, supporting the innovation on the processes for planting, irrigation, harvesting and storage of crops and seeds.

Particularly for seeds, adopting equipment for controlling the temperature and humidity of the storage environment is essential for preserving the genetic characteristics of soybean and corn seeds, ensuring that they maintain their vigor and germination power until sowing. In addition, the precise control of the storage conditions helps in preventing contamination by fungi and the proliferation of microorganisms.

Several studies indicate that the initial quality of vigor and germination can be maintained for at least 200 days (Carvalho, 1992) whether the seeds are conserved at 10°C (Bordignon, 2009) with a limited variation of relative humidity in a range between 50% and 60%.

Therefore, optimizing the storage conditions results in a more productive harvest, leading to the possibility of harvesting more with the same planted area. Moreover, the climate-controlled storage offers the advantage of maintaining the dry mass of seeds, allowing to maximize the income for those who sell them by weight.

## The DEMETRA project: smart cooling for agriculture

Conela Refrigeração improved its offer of cooling units for cold storage by designing the new line DEMETRA.

The new line offers different options for the installation, with both plugin and split models to fit the different mounting needs.

The new line DEMETRA is designed to serve a wide range of cooling capacities through different models which can be provided either with a single compressor or in a tandem or trio configuration.

Aiming to maximize the efficiency of the units, Conela Refrigeração adopted the variable speed capacity modulation with BLDC compressors, driven by CAREL Power+ inverter, in combination with the modulating CAREL electronic expansion valve (ExV). Considering that the inverter can allow the compressor to operate in a wider zone of power supply, the adoption of BLDC technology helped also in adapting the installation of these units to heavy duty conditions.



Focused on developing and integrating product and service solutions for air-conditioned warehouses, Conela Refrigeração is considered a reference in its field of activity and is nationally recognized in Brazil for its ability to innovate and offer excellent service throughout the entire sales and after-sales process.

Conela Refrigeração equipment is suitable for large storage environments that require strict control of temperature, relative humidity and gas concentration.



Fig. 1.a - DEMETRA Unit

Through the installation of several sensors the system continuously collects data of both working and ambient conditions, allowing the unit to dynamically adapt its operation.

Through the installation of a local supervisor of CAREL Boss family the plant is continuously monitored and the operational condition of the system can be constantly controlled from remote. The remote access allows the technicians to fine tune the unit settings even after the commissioning and it lets the store manager modify the ambient conditions according to the products to store.

The adoption of the BLDC technology combined with the remote access to the units has permitted to significantly improve the reliability of the systems, allowing to extend the warranty period up to 24 months when the Boss supervisory system is installed.

## Easy integration and advanced customized control logic

Conela Refrigeração selected CAREL c.pCO programmable controller as platform for the development for its new DEMETRA units.

Starting from a consolidated software base provided by CAREL, Conela Refrigeração developed autonomously its own software, easily integrating the management of BLDC and the ExV technology.

The CAREL proprietary development tools of the c.pCO platform allowed Conela Refrigeração to completely customize the control logics of the system, with advanced algorithms which permit to maximize the efficiency of the unit while keeping the optimal storage conditions of the produce.

Through the installation of the SENVA CO2 sensor the system can monitor the CO2 level in the air, activating the procedures to introduce fresh and expelling the exhausted air when required. To increase the efficiency of the whole system in some cases heat exchangers can be installed, thus helping to refresh the indoor air without affecting too much the stability of the ambient conditions.

The possibility of customizing the database of variables exposed to the supervisory system allowed also to select significant information to collect, thus enabling further analysis for predictive maintenance and for continuous algorithm optimization.



Fig. 1.b - DEMETRA unit switch board panel integrating CAREL c.pCO controller and Power+ inverters



Fig. 1.c - Dois Marcos Sementes installation



Fig. 1.d - DEMETRA Plug-in

Fernanda Rodrigues Batista and Nelson Millani stated:

*"Partnering with CAREL has allowed us to take a decisive step forward in innovation. Their technology perfectly matched our needs for reliability, efficiency, and smart integration. The flexibility of their solutions, combined with robust remote management, has been key to delivering superior storage conditions for our customers. We are extremely satisfied with the outcome and see CAREL as a valuable long-term partner in our development journey."*

## Conclusions

The collaboration between Conela Refrigeração and CAREL proved highly successful, resulting in the development of the DEMETRA line, a cutting edge solution for climate-controlled storage of seeds and crops.

The use of CAREL's c.pCO programmable controller enabled an easy integration of the high efficiency technology together with the implementation of advanced control logic for the optimized control of the ambient temperature, humidity and CO2 concentration level.

By adopting CAREL's high efficiency technology, Conela Refrigeração achieved a significant boost in energy efficiency and system reliability.

Moreover, thanks to continuous data monitoring and remote access via CAREL's Boss supervisory system the optimal preservation of the goods stored can be guaranteed, ensuring the ideal operating condition of the units.

This solution meets the highest standards required for preserving the genetic integrity and vigor of seed, supporting the innovation and sustainability in the growing agri-tech sector.



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