

COMMERCIAL COOLING

Performax™ LT / CO₂: first supermarket in France

The Intermarché supermarket in Tréguéux is taking a big step forward by choosing a new cascade refrigeration system that combines energy efficiency and sustainability.

Now more than ever, Performax™ LT is the right refrigerant to meet the needs of large- and medium-size stores whose managers are looking to save energy. Mr. Piermé, the manager of the Intermarché store in Tréguéux, agrees: «Every month we pay close attention to our energy consumption and do all we can to lower its substantial impact on our budget.»

Located near to St Brieuc in the department of Côtes-d'Armor, France, the 2,225 m² Intermarché decided to increase its sales floor by more than 30% (to 3000 m²). Central Froid was consulted to replace the old cooling equipment that ran on R-22, R-408A, and R-404A.

The company's geographic proximity and the recommendations regarding new technologies made by Mickael Rouxel, Director of Central Froid since 1 August 2008, attracted attention, and so work began in late 2011.

The solution is centred on a Performax™ LT / CO₂ cascade installation for the environmental benefit of refrigerants and the energy savings of R-407F.

As the supermarket was not going to be closed during the expansion, technical solutions were needed to ensure constant refrigeration.

The operation therefore proceeded in several phases over 4 months, with 4 to 7 technicians working to ensure the smooth-functioning of operations.

The refrigeration installer recommended that a CO₂ / R-404A system came first, in order to be able to continue working with the existing linear compressors that used R-404A, and to



From left to right: Sébastien Corre, refrigeration technician – Mickael Rouxel, Central Froid Director – Mr Piermé, store manager – Pierre-Emmanuel Danet, Climallife technical support manager

add the new refrigeration equipment planned as part of the expansion.

An optimized refrigeration system

Designed following a detailed study of needs, the system is made up of two central HK Refrigeration units, each equipped with variable speed drives in order to limit energy consumption and short-cycle starts, and to manage the compressors' operation in order to best meet the needs of the various cold units. The Danfoss electronic expansion system is equipped with AKOC 550 and AKOC 750 controllers.

The CO₂ low-temperature central unit is made up of three Bitzer 2EHC-3K-40S compressors which supply four linear compressors and two -25°C frozen chambers. The medium-temperature central unit, loaded with 500 kg

of Performax™ LT supplied by the distributor Rolesco (Rennes office), includes four Bitzer compressors (3 x 6H25-2Y / 1 x 6H35-2Y) and a floating HP, and generates cooling for 14 work rooms, the air-conditioned premises, and 18 linear compressors. In the condensation section, a EXL 14A 50S SR plate heat exchanger with power of 150kW is installed to retrieve heat for the supermarket air heaters.

Until April 2012, when construction was complete, the installation ran on R-404A.

Afterwards, R-404A / Performax™ LT retrofit was carried out at night, and completed in 8 hours. The installation was fully drained, the R-404A was retrieved in accordance with regulatory requirements, and then the Performax™ LT was injected by the installation's liquid line. In order to avoid emptying the display cases, the installer recommended using dry ice. This measure also made it possible to avoid temperature increases and a resultant risk of CO₂ leaks, due to the very high pressure of the fluid.

Overheating adjustments were performed. Direct cooperation between Mr. Rouxel and the companies Honeywell, Danfoss, and Climallife proved necessary in order to configure the electronic control system initially designed for R-404A to work with R-407F. This case study enabled the control system's manufacturer, Danfoss, to integrate this new refrigerant into their equipment. The same was true for Siemens, which was contacted for its Polycool expansion valve, which is installed on the CO₂ evaporative condenser.



Diagram of the HK Refrigeration medium-temperature central unit running on Performax™ LT

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Characteristics of the Performax™ LT / CO₂ installation

	Unit	Low-temperature central unit	Medium-temperature central unit	
		HK eCO ₂ Gen 40/3	Performax™ LT	HK MOPSH 213 4P
		CO ₂		R-404A
Evaporating pressure	Bar gauge	10.5	2.9	3.6
Evaporating temperature	°C	-36	-8	-8
Condensing pressure	Bar	29.2	20.5	19.5
Condensing temperature	°C	-5	45	45
Cooling capacity (SC=10K / SR=3K)	kW	37.8	-	234.7
Compressor power	kW	11.1	-	110
Compressor type/product code		Bitzer 2EHC-3K-40S	Bitzer (3 x 6H25-2Y / 1 x 6H35-2Y)	
Number of compressors		3	4	
Refrigerant load	kg	90	500	-
Type of oil		BSE60K	BSE32	

10% energy savings compared to R-404A

On-site operating readings were taken on 16 August, 2012. Three months after service began, the results speak for themselves.

With more cooling units (12 m more medium-temperature display case linear compressors, 10 m freezer linear compressors, three air-conditioned laboratories added: pastry, fish and a cheese counter), and a 30% expansion of the store, Performax™ LT has reduced the electrical bill for cooling, as it does not cause power consumption to increase.

The absorbed current as measured with the Performax™ LT is 10% less on average than with the R-404A. In practical terms, these energy savings match the theoretical estimated values.

Absorbed current measured

on the medium-temperature central unit's compressors

	T° Outside	Date of readings	Compressor N°2	Compressor N°3	Compressor N°4
Centrale unit R-404A	+ 19°C	April 2012	I1= 35.9 I2= 36 I3= 36.2	I1= 35.8 I2= 36 I3= 36	I1= 36 I2= 35.9 I3= 36.1
Centrale unit Performax™ LT	+ 18,5°C	Retrofit	I1= 32.8 I2= 33 I3= 32.9	I1=33.3 I2= 33.1 I3= 33	I1= 33 I2= 32.7 I3= 33
Centrale unit Performax™ LT	+ 22,8°C	16 August, 2012	I1= 33.2 I2= 32.8 I3= 33.2	I1= 33 I2= 32.6 I3= 32.4	Compressor off – not in service

Note: Compressor n°1 does not appear in this table, as the reading is insignificant. This compressor constantly operates with a power regulator

Overall satisfaction

Already convinced of the Performax™ LT's performance from installations performed earlier, Mickaël Rouxel was pleased with the results achieved using this new system. «This refrigerant is a reliable product that shows promise for the future. Since April 2011, we have been using it regularly and have had no negative feedback for the systems in service. No leaks have been found and there is no need to change the seals on the solenoid valves.» This installer feels it is his duty to remind his end customers every day of the benefit of putting lower-GWP fluids to use in order to preserve the environment and offer more energy-efficient solutions. «I'm 31, and after my years working in Switzerland, I know that we need to take care of the environment and make it an important part of our lives.»

Medium-temperature central unit	T _{evap} = -10,3°C
	T _{cond} = 37,1°C
	Machine : 71%
	Condensator : 83%
Low-temperature central unit	T _{evap} = -32,8°C
	T _{cond} = -7,1°C
	Machine : 71%
	Condensator : 0%



Company: Sarl Central Froid
Business: Commercial cooling, air conditioning, and commissioning or repairing heat pumps
Location: St Brieuc, France
Date of creation: 1982
Employees: 12 people