

Solstice® N13 (R-450A)



**Innovative Refrigeration
System, Combining the
'Best of Both Worlds'**

Honeywell

Auchan

Creating a More Sustainable Approach to Refrigeration



“Our aim was to successfully trial the new HFO blend N13 in a flagship store and to prove it’s operational and energy saving credentials. The results speak for themselves.”

Jean-Michel Deroo, Groupe Auchan

When it comes to delivering on environmental promises, Groupe Auchan has an enviable record, having been rated among the greenest supermarket chains and openly publishing its ambitious annual carbon reduction targets.

Part of this eco-commitment involves finding greener ways of operating its stores – and this includes refrigeration – so when the company heard about the benefits of a new Honeywell HFO blend – Solstice N13 (R-450A) – they were keen to test its credentials. Solstice N13, recently awarded official ASHRAE R-450A, is an alternative to R-134a, offering similar performance but with a superior GWP of ~600 and is ideally suited to chillers and MT refrigeration (distributed, CO₂ cascade), offering the best non-flammable replacement for R-134a.

Approval was given to design a combined Solstice N13/CO₂ refrigeration system for a new large hypermarket opening in Epinay-sur-Seine (Paris), with measurement criteria focused on energy efficiency, equivalent CO₂ emissions reduction and refrigeration performance.

The test utilised a new design of low energy refrigeration unit and involved a team from Auchan, the company’s

refrigeration partners Axima Refrigeration and Honeywell. The test focused on assessing the merits of a system that incorporated an N13 liquefaction unit alongside a CO₂ refrigerated distribution circuit. The system was then compared with Auchan’s current standard set-up that uses R-134a and glycol water with CO₂.

The results to date have been encouraging, and include:

- Easy commissioning, with similar energy efficiency as R-134a
- A global saving of 90 tons CO₂eq / year compared with a secondary Glycol / R-134a / CO₂ system and savings of 960 tons CO₂eq / year compared with using a standard R-404A DX system

Background: Contributing to Groupe Auchan’s Environmental Goals

Groupe Auchan is at the leading edge of mitigating the ecological footprint generated by its different activities and constantly strives to innovate in order to lower energy consumption, contribute to the fight against global warming and promote biodiversity.

All of the group’s businesses control their energy consumption by setting ambitious annual reduction targets. The installation of smart meters helps chains to identify waste and to optimise consumption.

To help meet the European Union’s objective of 20% of all energy usage coming from renewable energy by 2020, Auchan has invested in solar and geothermal energy over recent years. All new buildings include autonomous energy production systems and, as a result, more than 55% of energy consumed by Auchan comes from renewable sources.

The refrigeration pilot project at Epinay-sur-Seine is, therefore, entirely in keeping with the context of building a greener operating environment.

From this start point, the company participated in a wider partnership, involving the end user plus Honeywell (and its Solstice ze technology), L’Ecole des Mines de Paris and Total – Ademe, to build a second prototype machine. The

aim was to develop a machine that was not only capable of delivering hot water at 97°C but could also immediately cool the product down to 2°C using chilled water. This second machine would be assessed against key criteria, including environmental performance, process effectiveness and pay-back linked to energy efficiency.

Field Test Implementation: Monitoring and Assessing Data

Groupe Auchan worked alongside its refrigeration partner Axima Refrigeration to develop a system for the Epinay-sur-Seine store that combined the low GWP and energy efficiency benefits of a new refrigeration HFO blend named Solstice N13 (R-450A) – and the proven performance of pumped CO₂.

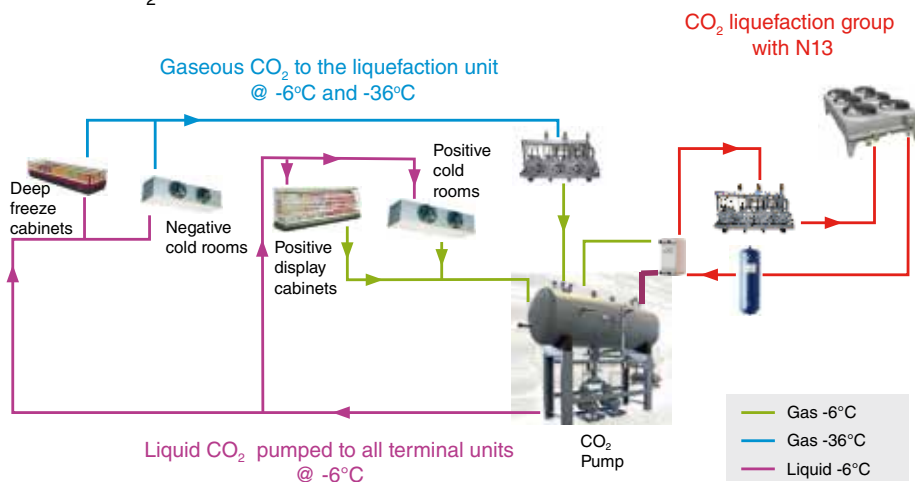
The system uses Solstice N13 in a liquefaction unit to convert gaseous CO₂ into a liquid that is then pumped to deep freeze containers, cold rooms and display cabinets. The CO₂ returns in a gaseous form to the Solstice N13 liquefaction unit ready for converting again to liquid.

MT Refrigeration	
Refrigerant	Solstice® N13 (R-450A)
Refrigerant charge	1,200 kg
Refrigeration power	800 kW
Consumption power	350 kW
Regime (evap. / condensing temp)	-11°C / +45°C
Compressor type and manufacturer	Screw / Bitzer
No. of compressors	6 (3 per pack)
Number	SCM Frigo / 2 packs

LT Refrigeration – CO ₂	
Refrigerant	CO ₂
Refrigerant charge	CO ₂ Secondary MT circuit = 2,000 kg CO ₂ LT Cascade circuit = 2,000 kg
Refrigeration power	105 kW
Consumption power	21 kW
Regime (evap. / condensing temp)	-45°C / +35°C
Compressor type and manufacturer	S / Hermetic Recip / Bitzer
No. of compressors	3
Number	1 pack

To support the yearly energy saving objectives of the project, the system includes a floating high pressure, a floating low pressure, as well as variable speed control on the compressors of the negative CO₂ rig, on the positive N13 compressor and on heat recovery units.

CO₂ distribution circuit in the store



Field Test Results: Proving the Value of Solstice N13 (R-450A)

Since the opening of the Auchan Epinay store in October 2013, a thorough evaluation of the results by the entire project team confirmed the energy efficiency benefits of the trial.

Energy Consumption

- The Solstice N13 / CO₂ system is on par with energy consumption of the standard Groupe Auchan R-134a / CO₂ system.

The new system was also measured against the following criteria to ensure the resulting performance was as good if not better than the current design

- Discharge temperature at compressor head 110°C (Below that of R-134a systems)
- Compressor Oil temperature 55°C (Below that of R-134a systems)

Feedback: A Greener Outcome for Groupe Auchan

“Groupe Auchan places environmental responsibility at the top of its business agenda and we are very supportive of innovations such as this new approach to refrigeration that delivers benefits to us as a business, to the customers we serve and to the wider community”.

Jean-Michel Deroo, Groupe Auchan.

“We are continuously looking to apply more sustainable and lower GWP solutions into Supermarkets such as Auchan. With the experience and results of this Solstice® N13 trial, we are now confident we can deliver even greater environmental benefits to the industry. The choice of refrigerant is a fundamental element in our strategy for the reduction of CO₂ equivalent emissions and for maintaining or improving energy efficiency.”

Cédric Leroy, Axima Refrigeration.

Sector Perspective: Rolling Out the Benefits of Solstice N13

The Field Test with Groupe Auchan confirms the energy efficiency benefits of using Solstice N13 (R-450A) alongside CO₂ in a cascade system, with additional advantages in terms of CO₂ equivalent emissions reduction and much lower GWP (-58%) over traditional refrigerants such as R-134a.

More information

Download the free software from Honeywell Genetron Properties Suite at:

<https://www.honeywell-refrigerants.com>

Download the **PT retrofit calculator applications for iOS and Android** free



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