



Solstice® N40

Supermarket innovation:

**SOLSTICE N40 (R-448A)
RETROFITTED IN A MAKRO STORE
FOR BETTER SUSTAINABILITY
AND REDUCED CARBON**



Member of
METRO GROUP



“N40 (R-448A) performance is good; and set points were achieved immediately after retrofit. We will continue to monitor and measure energy consumption for a long period to have reliable data about savings and consider them for future plans.”

José María de Santos – Refrigeration Manager Makro

“It was a real challenge to make the conversion in the planned time, working shifts and with up to 60 technicians in the plant. The easy handling of R-448A, the fact that it is a direct replacement and the excellent operational strategy defined for the job together with Makro, helped in minimizing the time.”

Rafael Matarranz – Manager Catri

Summary: direct retrofit, quick, problem-free and safe for better sustainability and carbon footprint

Makro, a subsidiary of the Metro Group, is the leader in wholesale retailer in Spain, with 37 business centers, over 2,700 employees and close to one million registered users. Makro's customers are mainly independent companies from HORECA sector.

To reduce their climate impact – considering that the cost of energy is increasing worldwide – and to lower operational costs, Makro performs efficient practices to ensure their business is a central pillar in their commitment to improving sustainability. To help meet their targets, several measures are currently being implemented to reduce energy needs. These include the installation of best-in-class technologies, as well as programs of training and empowerment of employees. Makro is in continuous renovation and adaptation to ensure the use of latest technologies that help to reduce carbon footprint.

Catri is a major contractor in Spain which has more than 40 years of success in refrigeration services, providing their customers with integrated solutions in industrial refrigeration, service, maintenance, and turn-key projects.

The retrofit from R-404A to R-448A in the Leganés store provided many benefits, including:

- R-448A shows improved performance to R-404A.
- Lower energy consumption in both low and medium temperature systems.
- A reduced GWP – 66% lower than R-404A, giving lower emissions as well as lower maintenance costs due to the lower GWP tax in Spain.
- Retrofit was completed without any incidents, thanks to being a direct replacement of R-404A, making the change safe, easy and more efficient for the technicians.

Description of the installation

- Makro Leganés (Madrid), opened in 2004
- Surface: 12,000m² in total, 4,000m² refrigerated area
- 3 packs: 2 medium temperature (MT), 1 low temperature (LT)
- Cooling capacity 370kW
- Bitzer compressors; LT have head fans
- Charge ~1,200 kg of R-404A, replaced with R-448A

Implementation: a perfect execution of a well-designed plan

In their search for a reduction of carbon footprint, Makro achieved two great goals in the past in this same store:

- Installation of doors and lids in MT and LT cabinets. This allowed for the de-commissioning of one out of the four original central racks, as consumption was reduced; maintenance costs were also reduced.
- A strong focus on refrigerant leaks at the store resulted in a significant reduction to a level of only 6%.

The refrigeration system has now been converted to achieve higher efficiency and further reduced carbon footprint:

- Original oil management system, based on Venturi effect, has been replaced by active systems with oil separators and receivers with individual control of oil through compressor.
- Microchannel technology introduced through V-shaped condensers with higher efficiency and a 15% lower refrigerant charge.
- Introduction of floating condensing and evaporating control.
- Inverter technology introduced for each rack's master compressor.

The refurbishment project took place from 23rd to 27th March, 2016, and involved a total crew of 60 people working on all aspects relating to works, refrigeration and electrics. Catri worked shifts continuously during those days.

Refrigerated stock from the medium temperature cabinets and cold rooms, were moved to a nearby Makro logistics center, whilst the products from the low temperature cabinets and walk-in freezers were kept in 2 x 13m long refrigerated trucks.

Simple adjustment of all refrigeration controls saw the expansion valves closed by one turn, with superheat settings adjusted to meet the demands of the system.

Even though the discharge temperature of R-448A is very close to that of R-404A, due to the extreme peak temperatures in summer Makro decided to add extra mitigation in both low and medium temperature with ChillBooster in both condensers.

Next steps

Makro and Catri continue to work during the coming months on system optimization. Evaporating temperature is continuously monitored to keep it as high as possible and achieve the lowest possible energy use, with an expected level of 2-3% savings per degree Celsius.

After the success of this store in Leganés, the Makro store in Santander (North of Spain) has now also been retrofitted from R-404A to the HFO blend R-448A in May 2016.

Key results:

- Simple retrofit, quick, problems-free and safe thanks to the similar characteristics of R-448A versus R-404A.
- Temperature set points were achieved very quickly, after the re-start of the installation.
- After conversion, a lower energy consumption was observed in both low and medium temperature systems.
- R-448A (Solstice N40) has a GWP 66% lower than R-404A, resulting in reduced emissions and lower cost of maintenance (lowest possible tax/GWP than any other A1 alternative to R-404A).





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Literature

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