



Opteon™ XL20 (R-454C)

Efficiency, Safety and Ease
of use in Supermarkets



The EMI Supermarket

The EMI supermarket chain stands out for its concrete commitment to reducing its CO₂ footprint.

Part of the prestigious Selex and Unicom group, EMI Supermarket is deployed to 54 stores in the regions of central Italy. Thanks to significant investments in photovoltaic energy and the modernization of commercial refrigeration systems, the company is positioned as a benchmark for sustainable innovation in the sector.

During the visit to the "Umbertide" store, created with the collaboration of Umbria Frigo S.r.l., we had the opportunity to appreciate a modern, aesthetically pleasing and highly functional structure. With a sales area of 1,500 m², the store is not only well-stocked but also designed to ensure an optimal customer experience.

The implemented technological solution, derived from an advanced plant engineering approach proposed by the contractor/designer and backed by robust technical data, utilizes a cascade system based on R-454C and CO₂. This configuration represents a significant step forward in response to European regulatory evolution, in particular the F-Gas Regulation 2024/573.

This legislation requires food business operators to adopt technological solutions that reduce energy consumption, guarantee maximum safety in the use and maintenance of the systems and offer simplicity of management in the event of technical interventions. The adoption of such an innovative system underlines the commitment to a more sustainable and efficient future.



The choice of Opteon™ XL20 (R-454C): the contribution of the protagonists

Opteon™ XL20 (R-454C) has been developed to offer refrigeration solutions with high efficiency and reliability, responding to the needs of an increasingly sustainability-oriented industry. In the context of organized distribution, a commitment to more sustainable practices is an essential goal.

With a global warming potential (GWP) of less than 150, Opteon™ XL20 (R-454C) minimizes CO₂ equivalent direct emissions, ensuring full compliance with the F-Gas Regulation and supporting customers' sustainability goals.

Industry professionals are looking for solutions that combine high performance, operational simplicity, and cost control. Opteon™ XL20 (R-454C) addresses these needs, offering an easy transition from legacy HFC systems and ensuring cost-effective installation and maintenance, without sacrificing efficiency or quality of performance.

NEXA Group - Umbria Frigo

Umbria Frigo, the technological heart of Nexa Group, with over 40 years of experience, is a point of reference in the design and installation of refrigeration systems. The company stands out for its innovative solutions, designed to ensure maximum energy efficiency and operational reliability, offering added value to customers in every system.

Thanks to its consolidated experience and the use of advanced technologies, Umbria Frigo develops tailor-made systems that respond precisely to the specific needs of customers. These systems are designed to ensure optimal control of refrigeration processes, maximizing energy efficiency and performance. The commitment to environmental sustainability has allowed the company to collaborate with important supermarket chains, consolidating its presence especially in central Italy.

For EMI, Umbria Frigo has designed and built a complete MT (Mid-Temperature) + LT (Low Temperature) subcritical refrigeration system, based on an R-454C and R-744 cascade cycle. This advanced solution reflects the technical excellence and focus on sustainability that characterize every work of the company.

The growing need to reduce the global warming potential (GWP) of refrigerant gases, while maintaining high levels of energy efficiency, has led to the development of HFOs, which are designed to offer numerous benefits:

- **Safety:** High standards in construction, operation and maintenance.
- **Sustainability:** GWP < 150, with reduced environmental impact.
- **Compatibility:** Design suitable for existing systems, without the need for major modifications.
- **Charge Size Flexibility:** Compliant with EN378 standard, with the possibility of exceeding 57 kg charge through dedicated analyses.
- **Energy efficiency:** Optimal performance with reduced power consumption.
- **Reliability:** Low working pressures and moderate temperatures on compressors, for longer life and reliability.

Umbria Frigo, an expert in the supply of cascade systems with CO₂ (R-744), has in the past used refrigerants such as R-449A (with GWP < 1500) for the first stage. However, with the entrance into effect of the new F-Gas Regulation 2024/573, both the company and customers have recognized the need to update these solutions.

For the EMI Umbertide store, Opteon™ XL20 (R-454C) refrigerant was chosen for the first stage of the refrigeration process, confined to the condensing plant for CO₂ liquefaction. This decision reflects a commitment to more sustainable solutions that comply with future regulatory requirements.



System Essentials	
Total MT cooling capacity	80kW
Total LT cooling capacity	38kW
Condenser Capacity Power R-454C	245kW
Minimum overall COP per system	1.92
MT Temperature Set Point	-12°C
LT Temperature Set Point	-32°C
Set Point Condensing Temperature (cascade heat exchanger)	- 7 °C
PED Category	IV
Compliant	EN 378

Increased energy efficiency for a lower environmental impact

- The cascade system with R-744 ensures stable performance even during summer heat waves. This is possible because CO₂ remains in a liquid state before being distributed to refrigerated cabinets and cold rooms, both for Low Temperature (LT) and Medium Temperature (MT) applications.
- Thanks to its relatively low condensing pressures, the refrigerant Opteon™ XL20 (R-454C) ensures high thermodynamic efficiency even under thermal stress conditions.
- The condensing coil is precisely designed, maintaining a ΔT below 10 °C to optimize performance.

In addition, the plant integrates a "refrigerant-water" heat exchanger, which allows the production of domestic hot water, adding further value in terms of sustainability and efficiency.

Safe design with Opteon™ XL20 (R-454C)

The system complies with the EN378 safety standard. Both portions of the system, both with non-flammable A1 and low-flammability A2L refrigerant gas, have been sized and designed not to introduce additional safety risks.

The machine room and condensers are located outside, on the roof of the store, meet the necessary safety conditions and benefit from good air circulation.

Opteon™ XL20 (R-454C) refrigerant was supplied by General Gas to ensure superior quality and targeted services. Thanks to its team of experts, GeneralGas is able to identify refrigerants that allow you to:

- Optimize initial costs for renovation systems or new construction
- Safeguard plant safety in compliance with regulatory standards
- Maximize energy efficiency, particularly in hot climate areas and at times of increased power demand
- Facilitate maintenance and recovery of obsolete refrigerants

Innovative platforms such as Smart 378 and RAC Genius Pro, developed by General Gas, simplify processes and enable the adoption of HFO solutions with GWP<150, such as Opteon™ XL20 (R-454C), in a practical and efficient way.

Companies Involved

NEXA Group - Umbriafrigo s.r.l, Via Aldo Manna, 37, 06132 Perugia (PG)

GeneralGas s.r.l, Via Aosta 5, 20063 Cernusco Sul Naviglio (MI)

Chemours Italy s.r.l, Centro Direzionale Colleoni, 20864 Agrate Brianza (MB)



The performance today demands,
the future tomorrow deserves.

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