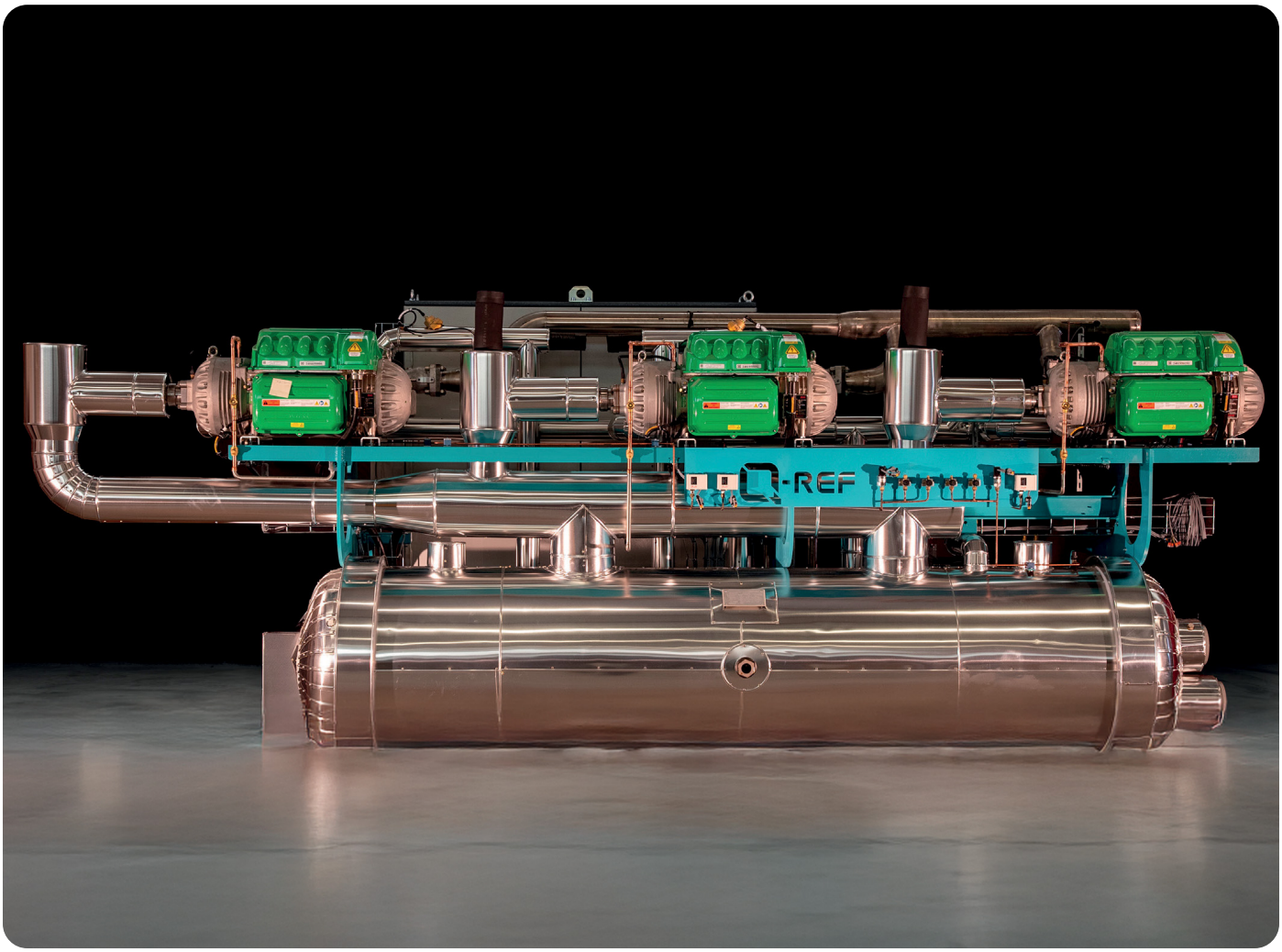
Solstice

THOUGHT FOR FOOD: SOLSTICE®'s EMPOWERS A GAME-CHANGER IN COLD STORAGE

CASE STUDY



Solstice refrigerants are at the heart of a revolutionary chiller technology cutting power bills in half and helping meet food producers' and retailers' environmental goals.

BACKGROUND

Q-REF is a new OEM entrant to refrigeration, launched to meet the industry's environmental challenges by reducing the carbon footprint of supply chains that help feed us all. With previously unheard-of efficiency, it reduces energy requirements for chilling by up to 50%.

While Q-REF is a new business, its founder Benoît Duparc also founded and heads Quercy Réfrigération, an industrial refrigeration specialist with decades of experience, eight patents and €60 million in revenue. The new company's first product is its KIBO® chiller, using Danfoss' state-of-the-art Turbocor® compression technology and Solstice HFO refrigerant to achieve massively improved performance compared to ammonia (NH_3, R-717) chillers.

With electricity accounting for up to 70% of cold storage and logistical operators' costs, KIBO is well placed to gain market share in a storage capacity market growing globally. It is also likely to persuade other OEMs to embrace Turbocor and HFO technology.

Cold storage in the food chain is a key driver of Scope 3 emissions, which account for 80% of a typical retailer's emissions. With regulatory and stakeholder pressure to reduce carbon footprints and meet net zero targets, there is a critical and urgent need for more efficient cooling technologies.

SOLUTION

With KIBO, Q-REF is pioneering a fresh direction by merging Solstice ze (R-1234ze) with Danfoss Turbocor compression technology, ushering in a new era of efficiency.

In a time of escalating environmental concerns, the combination of Danfoss Turbocor® technology along with an entire oil-free portfolio using Solstice R-1234ze offers high application safety (non-toxic, low pressure, nonflammable), reduced maintenance expenses, and unparalleled operational efficiency.



A PERFECT MATCH

Turbocor compressor technology has a long history of use in HVAC systems for comfort cooling. The world's first oil-free, magnetic bearing compressor, it offers users world-class efficiency, low noise, and frictionless operations without performance degradation over the compressor's life. More than 70,000 are installed across the globe.

KIBO combines this technology with Solstice ze (R-1234ze) to deliver lower temperatures for refrigeration at never-before-seen efficiency, with Coefficient of Performance (COP) levels double that of ammonia systems. With a refrigeration capacity between 200 kW and 900 kW (according to the customer's needs), KIBO produces glycol water at -10°C to maintain the temperature of cooling tunnels and cold rooms at temperatures between -3°C and +2°C.

Solstice HFOs are refrigerant solutions that are good for businesses and the planet. Without the toxicity of NH_3 (ammonia) or the limitations and pressure level requirements of CO_2 (R-744), they offer a safe long-term, future-proof technology for cold storage applications. Solstice ze (R-1234ze), used in the KIBO chiller, is a sustainable alternative to traditional refrigerants. It is used not just in energy-efficient chillers, but also in commercial air-conditioning and a range of other medium-temperature applications.

BENEFITS

KIBO is a game-changer in refrigeration, with potential applications for food and medicine manufacturers, food retailers, and temperature-controlled transport and storage operators. That has already been proven in use, with previously unrealized efficiency levels independently verified.

With Solstice and Danfoss Turbocor and oil-free portfolio including the OFC discharge valves and the ETS electric expansion valves, KIBO sets new standards for efficiency, reliability, and footprints:

- 50% better energy efficiency.
- 20% savings on maintenance.
- 30% reduction in size and weight compared to equivalent ammonia screw chillers.

VALIDATED PERFORMANCE

In specific customer installations, the KIBO chiller delivers up to 46% energy savings against ammonia chillers and does this constantly over the whole lifetime of the system.

Castang, an agricultural cooperative in Gardonne, France, has operated a KIBO chiller in parallel with three ammonia chillers of the same cooling capacity for over a year. Over the period, it has recorded total COP levels of 5 to 7 for the KIBO chiller against 2.7 to 3.5 for the ammonia chillers.

That performance was certified by the independent engineering firm Optienergie in August 2023, while Cemafroid, in October 2023, confirmed the savings by measurement and calculated that it delivered a 43% lower annual electricity consumption than ammonia chillers for the same cooling capacity.

Another user, Coccolo Group, replaced an ammonia chiller of the very latest generation at its Damazon facility in southwestern France. The chiller had developed a leak at a joint on the evaporator plate heat exchanger, and a KIBO chiller was brought in as an emergency replacement in October 2023.

Apart from the chiller, which produces cold brine for the cold rooms, there have been no other changes to the site. Nevertheless, from November 2023 until March 2024 included, electricity bills at the site were 20% lower than over the same period one year before. Seasonal temperatures during the months were comparable, and the tonnage and annual rotation of apples in the cold rooms and the fruit station were the same. Taking into account the share of the site's electricity consumption coming from the chillers, this corresponds to an improvement of the same order of magnitude as in the Castang case.



IMPROVED RELIABILITY, SAFETY AND MAINTENANCE

As well as a vastly improved COP, KIBO delivers other benefits:

Improved safety and environmental performance

with Solstice ze (R-1234ze) refrigerant, which is non-toxic and has a very low pressure, minimizing safety risks and installation costs.

Enhanced reliability

saving approximately 20% in preventive and corrective maintenance operations, with fewer callouts than traditional refrigeration systems. Castang has spent nothing on maintenance after 5,000 hours of operation. Even with the 43°C ambient temperature last summer, the KIBO chiller operated flawlessly while the ammonia chillers stopped due to the temperature of the cooling towers.

Quiet operation and minimal footprint,

with Turbocor compressor technology that uses magnetic bearings for a significant noise reduction and a 30% reduction in the refrigeration unit's weight and footprint vs. ammonia chillers.

KIBO has won several awards, including the French "Grand Prix des ETI" 2023 Innovation Award. With direct expansion options due to come soon, it is expected to go from strength to strength. The dramatic improvements in energy efficiency and performance are also likely to see many other OEMs invest in similar groundbreaking technology using HFO-based refrigeration in future.

For More Information Visit
https://www.solstice.com/us/en

Solstice Advanced Materials Inc.
115 Tabor Rd. | Morris Plains, NJ 07950

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