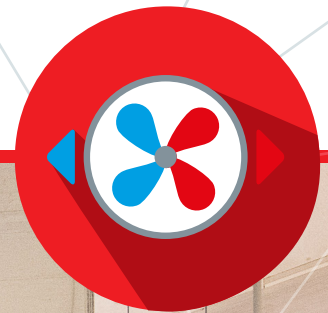


# Supermarket refrigeration, heating, air conditioning, and ventilation **work best** as an **integrated solution**. Here's why.

When you stop and think about it, it's a little strange that supermarkets usually pay to heat their premises and water while their refrigeration system works overtime to move heat energy outside.

Once, this might have seemed sensible: having discrete, isolated systems can give retailers' technical teams a sense of control. There's also less risk that a major fault might incapacitate the whole system.

Conventional HFC refrigerants also lacked the discharge temperature necessary to drive a heating system without several additional components. This added to installation costs and complexity and made payback relatively slow.



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Now, it's time to look again. Energy costs are rising, and margins are low. Retailers are fighting to reduce their carbon footprint—and to find energy savings wherever possible.

In that context, and with the growing popularity of CO<sub>2</sub> as a refrigerant, integrating HVAC and refrigeration systems has become a serious option supermarkets can no longer ignore.

## Integrating heating and AC into a CO<sub>2</sub> refrigeration system

For a supermarket with a parallel compressor CO<sub>2</sub> refrigeration system, incorporating heat recovery and air conditioning load is relatively straightforward—and extremely cost-effective. In the UK, a single Sainsbury's supermarket saved one million kWh in a year with heat recovery from its CO<sub>2</sub> refrigeration system.

Running refrigeration, freezing, air conditioning, hot water, and in-store heating from a single compressor pack improves efficiency and the store's carbon footprint, and can significantly reduce initial installation costs.

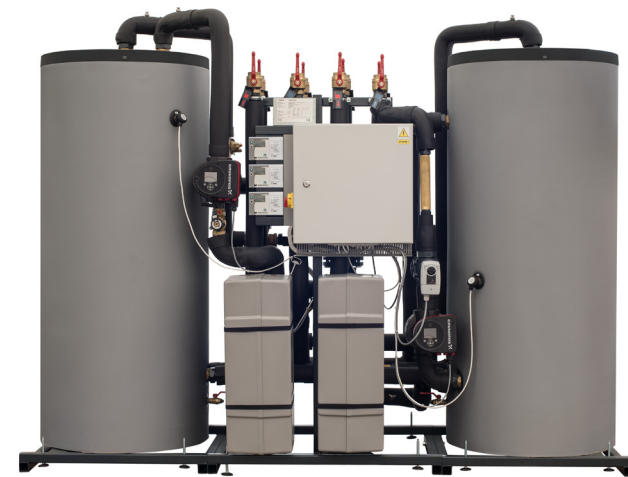
Space and water are heated by including one or more additional heat exchangers in front of the gas cooler, taking advantage of the high discharge temperature of CO<sub>2</sub>.

Meanwhile, an air conditioning evaporator or chilled water system can be fitted at the system's separator. Compared to the refrigeration load, this almost provides air conditioning for free.

As well as saving the running costs and carbon footprints of the separate systems, this approach can eliminate the need to install and maintain those components. For example, the store may not require a boiler or gas furnace at all.

It's also possible to go further and sell excess heat to neighboring buildings. This is easiest where a store has an adjacent fitness center or shopping mall, but there are other approaches. For example, a SuperBrugsen supermarket in Denmark is one of many to [supply their local district heating system](#).

## Unlocking the potential of supermarket heat recovery



At Danfoss, we wanted to prevent these kinds of problems, simplify the process, and bring supermarket heat recovery into the mainstream.

We've therefore combined our heating and refrigeration expertise to create a purpose-built Heat Recovery Unit (HRU), perfect for supermarkets. It's now proving its worth in supermarkets across Northern Europe, where CO<sub>2</sub> is well established, and we look forward to seeing it deliver results worldwide.

The HRU solves many of the traditional issues with heat recovery—notably by giving engineers a well-defined design, common components, and clear service requirements. It includes an extra heat exchanger set to prevent breakdowns and leakage and temperature buffer tanks to prevent stress in moments of peak demand.

The result is an easy, self-contained way for supermarkets to harness the heat recovery potential of CO<sub>2</sub> refrigeration systems, using a system built by one of Europe's leading manufacturers of heating systems.

It also opens the possibility of selling excess heat to neighbors in a controlled way, using approved heat meters—which can increase the benefit of using the store's compressors as a heat pump.

It adds up to a rapid cost savings. If you have a CO<sub>2</sub> system, payback is typically within 1-2 years—sometimes sooner.

While the theory is simple, supermarkets have historically faced a number of challenges with implementing heat recovery successfully.

Usually, systems were created, modified, or retrofitted on a bespoke basis. This limited servicing options. And in some systems, large temperature fluctuations in the heat exchanger led to CO<sub>2</sub> leakage into the water—creating carbolic acid that damaged water lines.

## Integrating other kinds of AC systems

It's also possible to integrate several approaches within a non-CO<sub>2</sub> air conditioning (AC) system to improve efficiency and reduce GWP.

For example, in large, hypermarket-scale applications—or where there's a large AC load—an oil-free centrifugal Danfoss Turbocor® compressor can run chillers in combination with air-handling units (AHUs).

This integrated solution makes both services extremely energy efficient and opens the possibility of using ultra-low GWP, HFO

refrigerants like R1234ze. In China, a Suguo hypermarket cut its AC energy costs by 50% by using exactly this solution.

Reacting to changing load conditions is also important. So, for standard rooftop chiller scenarios, using a variable-speed compressor gives an immediate way to improve year-round energy efficiency across every part of the system. This can be further integrated with an extra coil and rooftop ice bank to even out peaks in load and make the best use of cheap energy when it's available.

## Integrated solutions need smart controls

However, there is no such thing as a standard configuration. Each individual store faces different challenges.

An integrated solution may need to include measures to manage humidity, account for ambient temperature changes, or combat frosting and fogging. The system might incorporate a plug-in hydronic system with balancing valves, or fan speed control.

That means the central part of any integrated system must be a smart controller—with the right algorithms to make the best use of all the technology in your solution.

For example, the Danfoss MCX controller lets you take a modular approach, building in expansion and accessory modules to suit your system's exact needs. It also lets you program your system graphically through its own design app.

Connecting your controller to an in-store system manager like the Danfoss AK-SM800 makes it smarter still. Now, you can link in other building management systems and tune performance across the whole store through a single interface—so you can trade off different aspects to achieve the best energy profile overall.



## An integrated system is a better system

Ultimately, the closer you align your heating, ventilation, air conditioning, and refrigeration systems, the easier it will be to save money, safeguard stock, and reduce your environmental impact.

As an added benefit, an integrated solution reduces the chance of separate system suppliers disputing the cause of issues, delaying fixes, and jeopardizing food safety.

**90%**  
reduction in your  
heating costs.