Optimize your cold storage

In cold storage, refrigeration accounts for 54 % of the total energy bill. Optimizing refrigeration efficiency is key to reducing energy costs and supporting more sustainable operations. Backed by more than 80 years of experience in the global refrigeration business, Danfoss develops and supplies the right products for advanced, environmentally friendly cooling installations.

Optimization toolbox for energy efficiency

Minimize Energy Waste, Maximize Performance

Challenge: Air and non-condensable gases (NCGs) can infiltrate refrigeration systems, pushing condensing pressure up and forcing compressors to work harder than needed.

Solution: By automatically removing unwanted air and NCGs only when needed, the system runs at optimal efficiency — with less energy waste and lower compressor load.

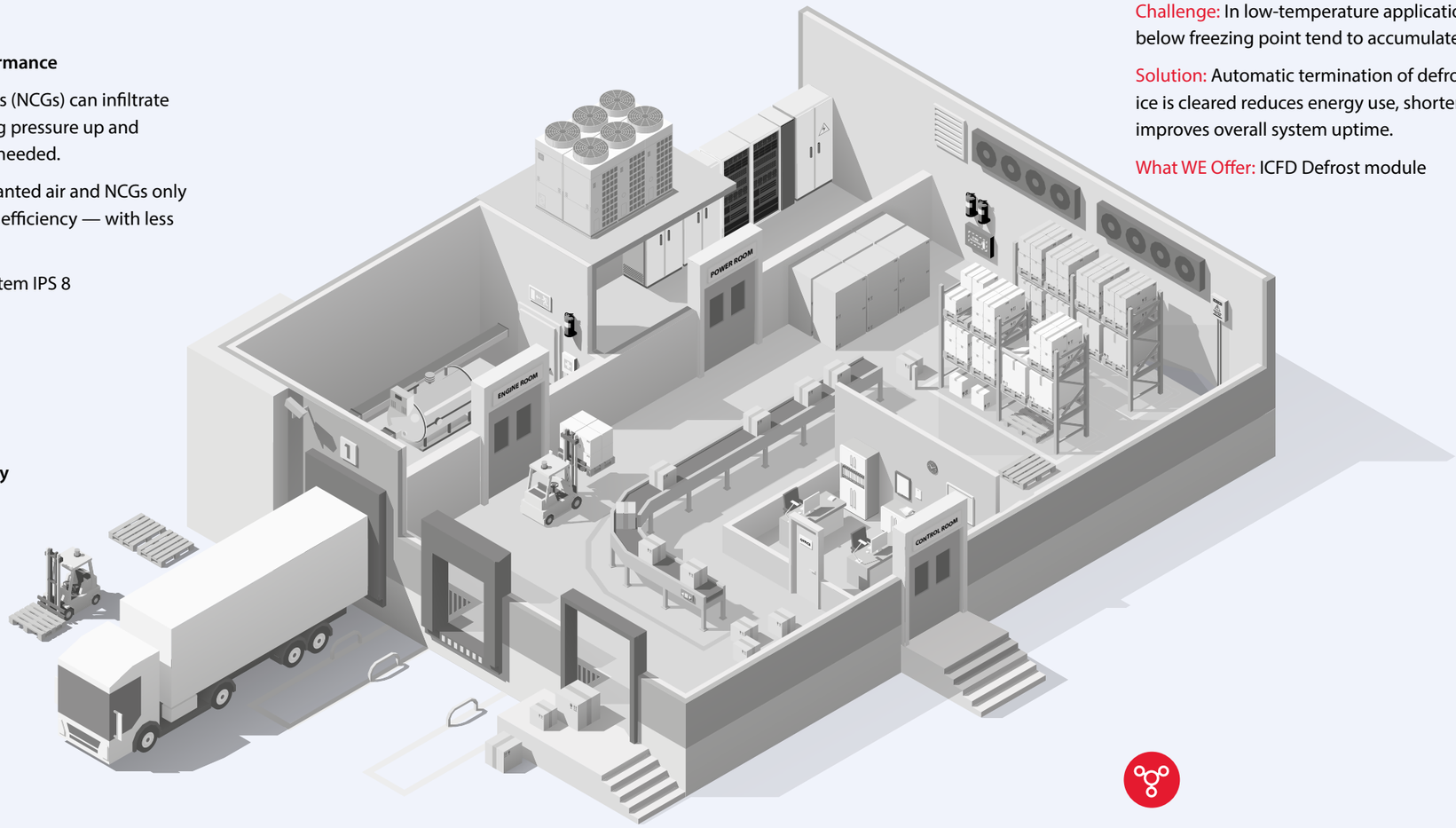
What WE Offer: Intelligent Air Purging System IPS 8

Reduce Pressure Drop, Increase Efficiency

Challenge: To keep your refrigeration system efficient, the compressor's suction pressure must adapt to changing conditions. Traditional servo-operated valves make this harder—they need a specific pressure difference to work. This creates extra pressure drop in the suction line, forcing the compressor to work harder and consume more energy.

Solution: A smarter valve design minimizes pressure loss, reduces compressor workload, and lowers energy use — without compromising control.

What WE Offer: ICM motorized valve



Modulated Liquid Level Control – Stable Operation, Lower Energy Bills

Challenge: Most refrigeration systems don't run at full capacity. They usually operate at 40–80% load. Traditional On/Off control struggles here—it causes pressure swings, vibrations, and even liquid hammer. This wastes energy and makes the system less stable.

Solution: A precise and steady liquid feed keeps your system stable, efficient, and cost-effective at all times.

What WE Offer: Modulated liquid level pump separator

Smarter Defrosting, Less Energy Use

Challenge: In low-temperature applications, air coolers operating below freezing point tend to accumulate ice on their surfaces.

Solution: Automatic termination of defrosting as soon as the ice is cleared reduces energy use, shortens defrost cycles, and improves overall system uptime.

What WE Offer: ICFD Defrost module

Maximum Efficiency, Minimum Refrigerant Charge

Challenge: Even modern refrigeration systems waste energy preparing refrigerant for the compressor—a process called "superheat." This not only increases energy consumption but often requires extra refrigerant charge, which can raise safety concerns and regulatory challenges.

Solution: Precise flow control eliminates superheat, reduces refrigerant charge, and increases overall system efficiency.

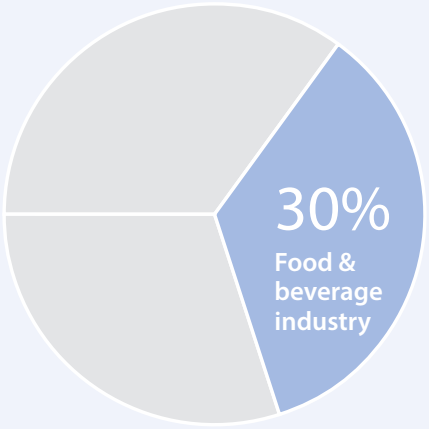
What WE Offer: NeoCharge®

Enabling more sustainable and energy efficient cooling systems across the food & beverage cold chain

Refrigeration systems are often overlooked but offer significant potential for cost and carbon footprint optimization. Energy efficiency aims at reducing the amount of energy required to provide products and services. It's all about doing more with less. It is the quickest and most affordable way to decarbonize our economy and ensure reliable and sustainable energy for everyone on the planet. The solutions are already there, and they can be implemented right away. And most have short payback time.

As your technology partner in the green transition, we empower you to meet increasing energy challenges with innovative, reliable solutions. Danfoss offers a wide portfolio of industrial refrigeration valves, controls, and subsystem solutions to enable improved and more efficient cooling in the food & beverage processing industries. Our cold storage solutions help you meet increasing energy challenges and reduce food loss by improving cooling and efficiency across the cold chain.

Global electricity consumption



Refrigeration energy consumption

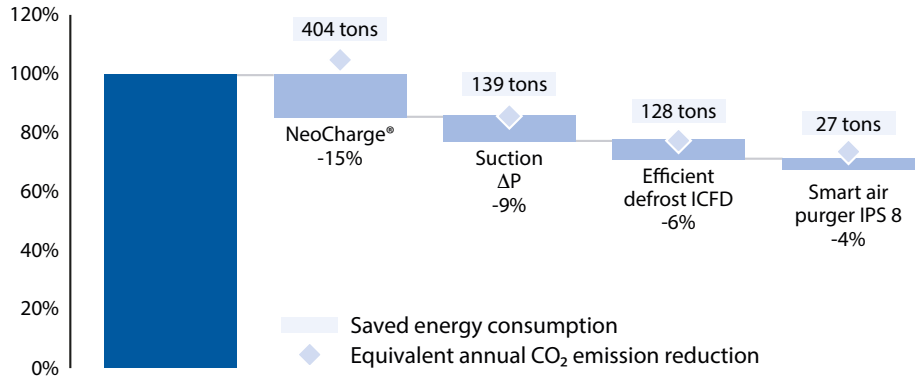
Food processing
35%
of energy bill [1,2]

Cold storage
54%
of energy bill [1,2]

1. Specific energy consumption values for various refrigerated food cold stores, I.A. Evans et.
2. Cold storage facilities energy savings guide, EnergyTrust of Oregon.

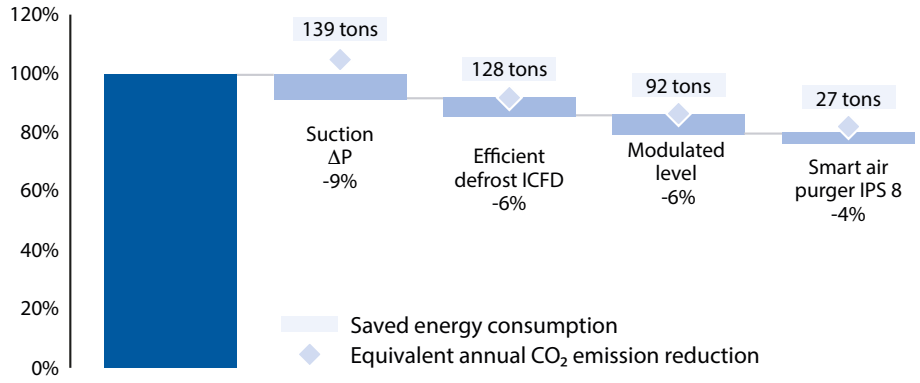
Clear pathway to energy-saving and decarbonization

Saving DX system energy with Danfoss solutions



Up to
35%
reduction in energy consumption

Saving recirculated system energy with Danfoss solutions



Up to
700
metric ton of annual equivalent CO_2 emission reduction

Intelligent Air Purging System Danfoss IPS 8

About air purger

The Danfoss Intelligent Purging System (IPS) is an automatic, self-contained operating unit that helps remove non-condensable gases in a safe and energy efficient way. This helps maintain an optimum refrigeration capacity and system efficiency, allowing professionals to achieve maximum system performance.

Easy installation and maintenance

- Cost-effective design with few mechanical and electrical connection interfaces
- Minimizes the risk of leakage thanks to the hermetic internal cooling system
- Plug and play, stand-alone unit eases installation and commissioning – low risk of potential error
- No need for any advanced settings
- Easy to handle with its compact design
- Fast and easy pump down before service

Improve operational safety

- Electronic smart purging helps reduce the risk of refrigerant release to the environment
- No need for oil management from the ammonia system
- Self-contained operating unit functions independently from the main plant
- Easy monitoring of past purging cycles data with operation log
- Self-diagnostics for unit and system operation to shut down in case of malfunction of Air Purger components
- Advance Bubbler support functions included
- LLS 4000 support increase system protection level

Maximize system performance

- Automatic purging response to non-condensable gases in the refrigeration system
- Continuous monitoring of differential pressure between system refrigerant and purger refrigerant
- Reduction of plant power consumption
- 8 point purging functionality
- Built-in Modbus communication enables easy sharing of essential data

The air purger removes non condensable gasses (air) from the cooling system

Example:

- Two stage NH_3 system in a Cold room application
- Capacity 300kW on LT and 900kW on MT
- Annual Power consumption: 2500MWh
- Electricity cost €/kWh: 0.1€

Danfoss IPS8 reduces the content of non condensables to decrease Tc with 1K:

Savings per year 7,500€

Savings over 20 years 150,000€

LT=Low Temperature, MT=Middle Temperature, Tc=Condensor Temperature

ICFD
Defrost module

Energy efficient hot gas defrost

The ICFD defrost module for CO_2 and Ammonia is a compact liquid-based drain module packaged into our ICF valve station. It unites the well-known benefits of the Danfoss ICF technology with the most efficient defrost method known into one state-of-the-art defrost solution for industrial refrigeration applications.

The ICFD Defrost Module comes in one size and two versions, ICFD 20 – Ammonia and ICFD 20 – CO_2 and is fully compatible with ICF 15-4, ICF 20-4, and ICF 20-6.

Improve defrost performance and reduce energy consumption

- The solution makes it possible to equip an evaporator with ICF Valve Stations across the wet suction, liquid, hot gas, and defrost drain lines. It provides an impressive range of benefits in respect of improved operational efficiency, easy installation, and energy savings.

Features and benefits

- Reduced energy consumption
- Improved defrost performance
- Improved job site efficiency
- Broad application range
- Easy system design

Fact: Defrosting is a necessity

Example:

- Two stage NH3 system in a Cold room application
- Numbers of evaporator 12
- Evaporator capacity 80kW
- Defrost duration 45 min
- Number of defrost cycles per day 1
- Number of days in a year with defrost 365
- Electricity cost €/kWh: 0.1€

Measured savings on float controlled hot gas defrost vs. pressure controlled:

Savings per year 14,000€

Savings over 20 years 285,000€

Reduction of total cost of ownership of a cold room with 12 evaporators

Modulated liquid level pump separator

Precisely modulated liquid feed translating into improved energy efficiency and reliability

On/Off liquid feed control in recirculated system is simple but causes energy waste and reliability issues due to instability. The target is to have steady and accurate liquid feed to prevent the return of liquid refrigerant to the compressor.

Systems rarely run at 100% design capacity—most of the time, they operate at 40–80% load, where On/Off control creates pressure fluctuations, vibration, liquid hammer, and surplus flash gas. This not only increases power consumption but also reduces system stability.

The Modulated Liquid Level solution changes this. By combining a ICM Motorized valve, a precise level sensor (AKS 4100), and a dedicated controller (EKE 347), it ensures steady and accurate liquid feed under all operating conditions.

The result:

- Higher energy efficiency – continuous modulation avoids flash gas formation, lowering temperatures by 2–3 °K and cutting power consumption 6-15%
- Improved reliability – stable liquid feed reduces vibration, liquid hammer, and electrical inrush
- Optimized process stability – stable liquid supply ensures smoother production and improved quality
- Flexibility & digital monitoring – wide setting range and smart digital oversight enable precise adjustments and full visibility

Conclusion:

With Modulated Liquid Level control, operators gain a modern, energy-saving, and reliable solution that delivers stability and efficiency exactly where it matters most—under real-world operating conditions.

Smart, stable, and energy-efficient liquid feed control

Example:

- 1,000 kW NH_3 system at –30 °C
- Separator Ø 1.8 m × 3 m, liquid level at 30%
- Operation 10 hours/day, 365 days/year

With On/Off control, compressors must remove surplus flash gas, increasing power demand.

Power demand:

- On/Off control: 338 kW
- Continuous control: 319 kW

Savings per year ~69,000 kWh ≈ €7,000 (at €0.1/kWh)

Savings over 20 years ~€140,000

ICM motorized valve

Boosting energy efficiency with zero-pressure loss motorized valve

The ICM motor operated valves from Danfoss ICV Flexline™ series are quick and simple to handle, install and service due to their low weight and compact design. The valve is designed to regulate the expansion process in liquid lines and to control pressure or temperature in dry and wet suction lines and hot gas lines.

Compressor suction pressure must be carefully regulated to adapt to changing operating conditions. Conventional servo control valves require a specific pressure differential to function, which leads to unnecessary compressor energy consumption.

The Danfoss ICM motorized valve provides a smarter and more efficient alternative. With an ultra-low pressure drop, it minimizes compressor workload and reduces energy use. Installation is simplified through electronic control, eliminating extra gas piping and cutting complexity. A fully hermetic coupling ensures leak-free reliability, while digital connectivity enhances monitoring and serviceability.

- Enhanced reliability with fully hermetic coupling, reduced leak risks
- Enhanced connectivity and serviceability
- High resolution of 20 micron/step, accurate flow control
- Wide capacity range, up to 6" size. Transcritical CO2 application ready
- Modular design with drop-in features. Easily install
- Low center-of-gravity body, reduced vibration and improved reliability

A modern, energy-efficient solution for precise and reliable suction pressure control

Example:

- Ammonia system with screw compressor
- Evaporation temperature: –40 to –20 °C
- Condensing temperature: +30 °C
- 0.07 bar pressure drop with servo valve

Result:

Even a small suction line pressure drop significantly increases compressor energy consumption in low-temperature applications. By eliminating this extra loss, motorized valves provide measurable and long-term savings.

Savings potential:

- Up to 9% Energy reduction by eliminating unnecessary pressure loss
- Ultra low pressure drop in suction line

NeoCharge®

NeoCharge® – a complete solution

NeoCharge is a complete solution to optimize industrial refrigeration systems. It includes sensors, control valves, and electronic controller. This unique yet simple technology reduces the charge in both new and existing systems.

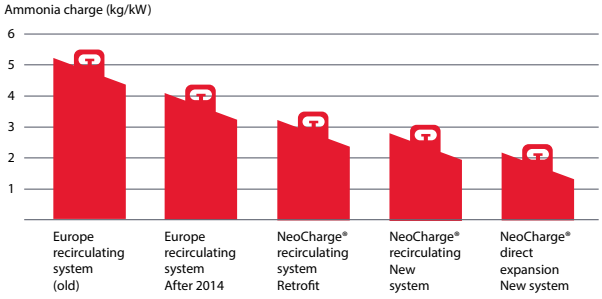
Cut energy costs and increase capacity with the same charge

NeoCharge enables Direct Expansion (DX) systems to run without superheat. In traditional flooded systems, the solution reduces recirculation to the lowest possible rate while maintaining high system performance. In short, NeoCharge is a complete solution that turns the tables when it comes to low-charge:

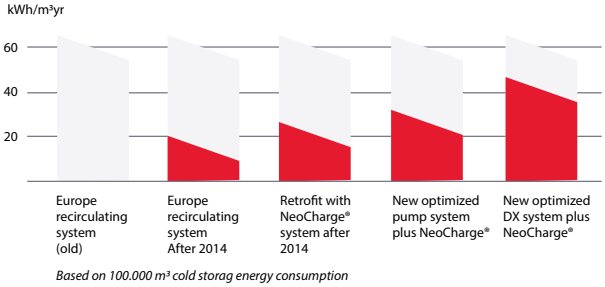
- → Reduce energy costs by up to 20%
- → Increase cold room capacity by up to 40 % using the same refrigerant charge
- → Easy to install in any shape of air cooler: traditionally over-feed or in direct expansion System
- → Fully plug-and-play and self-adaptive technology
- → Smaller system footprint, liquid separator, and piping

The NeoCharge® solution feeds each evaporator with the right charge required in any condition

Ammonia charge
with NeoCharge® technology



Energy savings potential
with NeoCharge® technology



Based on 100.000 m³ cold storag energy consumption

Latest in refrigeration technology

With more than 90 years of experience in the global refrigeration industry, Danfoss is your reliable partner in innovative refrigeration technology. We are offering you support in finding sustainable refrigerant solutions. With our wide range of components for industrial refrigeration, Danfoss reduces complexity and optimizes project deliveries. Our global know-how is always available to you – just contact your local Danfoss representative for more information.

Support tools for professionals

Coolselector®2:
Easy selection and calculation software

3D CAD symbols:
Download symbols and illustrations

Ref–Tools:
Complete overview of spare parts, Product-finder and more relevant HVACR tools.

IR Application Tool:
How a two-stage ammonia plant works.

Application Handbook:
How to select control methods for different refrigeration systems.

Training for professionals

Danfoss Learning:
Your personal learning portal is fast, easy and always accessible.

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