

ENGINEERING
TOMORROW

Danfoss

Refrigeration solutions for Dairy Industry

Precise Temperature Control And **Zero Corrosion**

Danfoss offers a wide range of valves and controls that can help improve energy efficiency, productivity & sustainability.

All

the valves and
controls you need
for your refrigeration
system in the Dairy
Industry.



Fresh milk and dairy products throughout the processing chain: **Reliable refrigeration solutions for the dairy industry**

Modern dairy industry is highly technological and the demands for temperature control are rigid. In dairy production end products such as milk, yoghurt and ice cream require precise temperature management to achieve a consistent quality in the end product in a safe and efficient manner.

Danfoss refrigeration valves (including stainless steel series) and sub-system solutions help you to maintain high hygiene and enables reliable, efficient and safe refrigeration for across the various cooling applications and needs, regardless of production

scale and geographical location. Our products and solutions play an active role in several of the critical cooling and production processes and help producers of milk, yoghurt, ice cream,

and other dairy product to obtain consistently high product quality through meticulous temperature control and options to save energy with more efficient solutions.

Dairy product cooling

- ▶ Raw milk cooling: Raw milk needs to be kept cold after collection
- ▶ Milk collection: Raw milk filtering and purification
- ▶ Raw milk storage: Raw milk must be stored at a temperature of +4° C to +6° C
- ▶ Temperature storage: After pasteurization, the milk is stored and cooled temporarily for post UHT or packaging process
- ▶ Sterile storage: Both pasteurized milk and high-temperature sterilized milk must be stored in a sterile and low-temperature environment

Cooling: Ammonia, CO₂ or ice water

Pasteurization

Pasteurization is a vital step in the handling of dairy products. After pasteurization, the hot milk must be cooled quickly to a temperature below +4 °C in order to keep enzymes active.

Cooling: Ice water is used for cooling, which can be achieved with ammonia or CO₂ heat exchanger

Congelation

The ice cream mix is frozen by agitation and air to form some ice crystals and to expand volume.

Cooling: Congealing machine is used for cooling at -6 °C to -9 °C

Fermentation, cooling and maturation

Fermentation is a key step in the production and processing of yoghurt. The taste of the yoghurt is decided by the lactic acid culture, which is affected by the fermentation temperature; the cooling process can reduce microorganism and enzyme activity. To avoid over-produced acid, the maturation process may further improve the flavor.

Set yoghurt: The set yoghurt must be stored at 0 °C to +4 °C immediately after fermentation for 24 hours before sale, during which the acidity will increase

Churned yoghurt: After fermentation, stirred yoghurt must be cooled to +10 °C to +20 °C before storage, and maturation and storage must take place at 0 °C to +7 °C.

Cooling: Ice water is used for cooling, which can be achieved with ammonia or CO₂ plate heat exchanger

Refrigeration storage

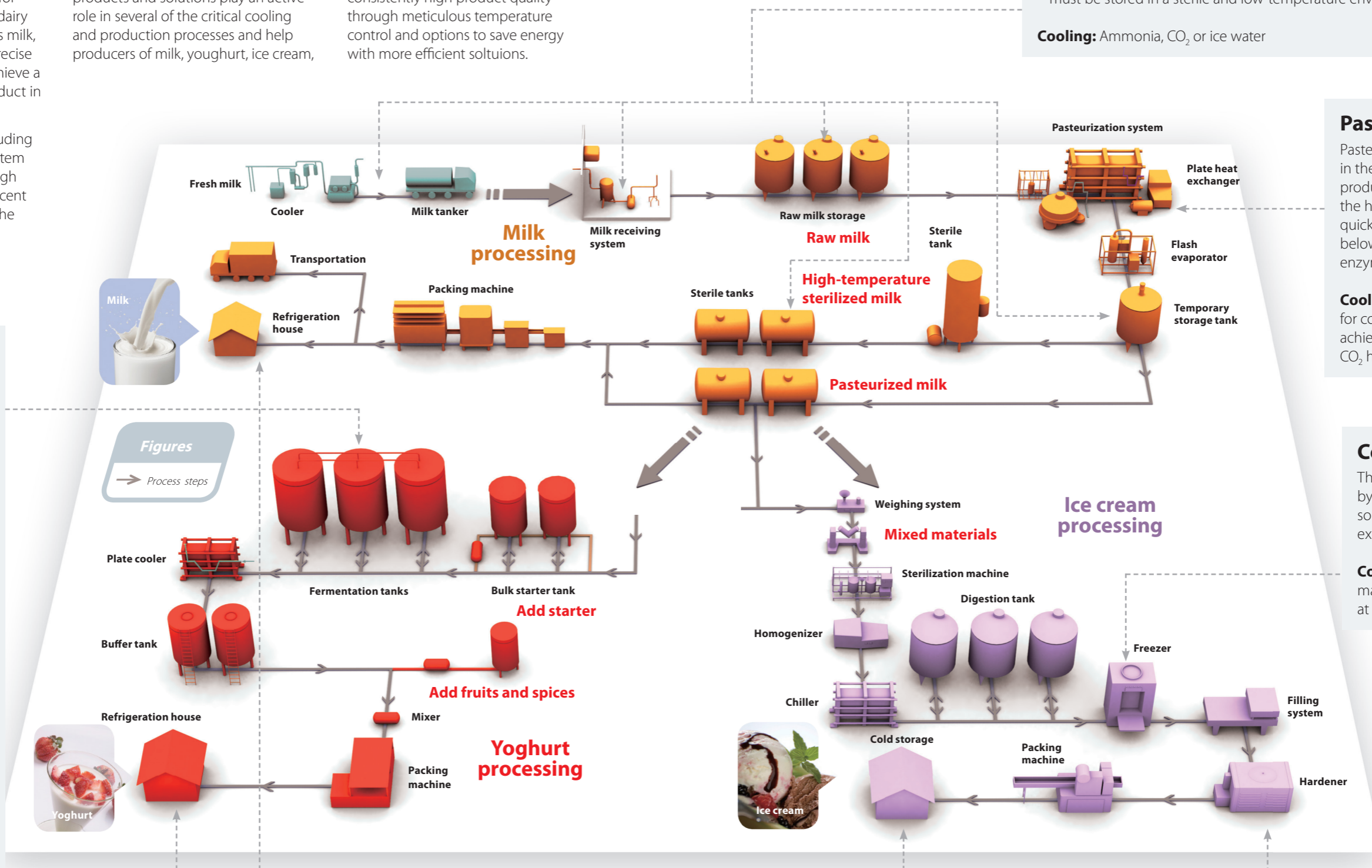
- ▶ After packaging, pasteurized milk needs to be stored in the refrigeration house at +4 °C to ensure the quality of the milk.
- ▶ Finished yoghurt products need to be kept at 0 °C to +4 °C in order to maintain appropriate acidity and avoid deterioration

- ▶ Finished ice cream products need to be stored at -24 °C to -28 °C in order to maintain the desired product hardness and inhibit bacterial growth
- Cooling:** The majority of storage in refrigeration house using ammonia or CO₂

Hardening

After filling and packaging, the frozen ice cream must be kept at freezing temperatures to fix shape and hardness.

Cooling: Ammonia or CO₂ instant freezer



Note: the illustration shows only one of the many possible process setups.



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



High performing products and solutions
for industrial refrigeration systems

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 sub-system 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.

Intelligent Air Purging System

Danfoss IPS8



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.

✓ 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

✓ 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

The **Air purger** removes Non Condensable Gasses (Air) from the cooling system



Example:

- ▶ Two stage NH3 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:

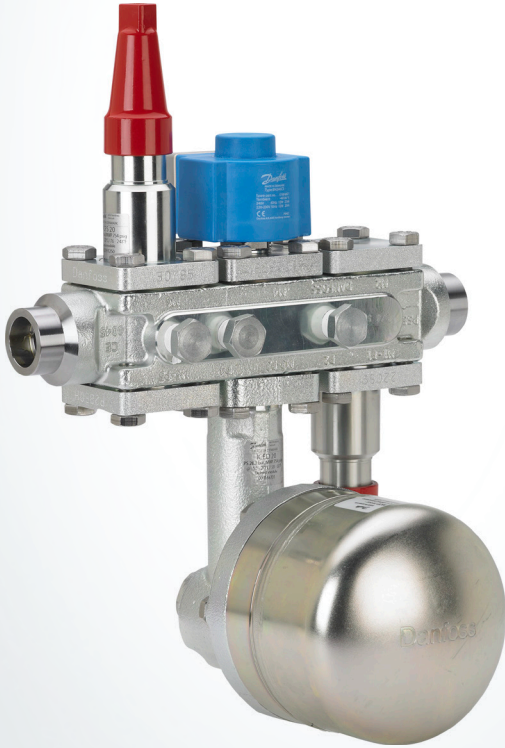
Savings per year **7,500€**

Savings over 20 Year **150,000€**

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

ICFD

Defrost module



Energy Efficient Hot Gas Defrost

The **ICFD defrost module** for CO₂ 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 – CO₂ 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:**

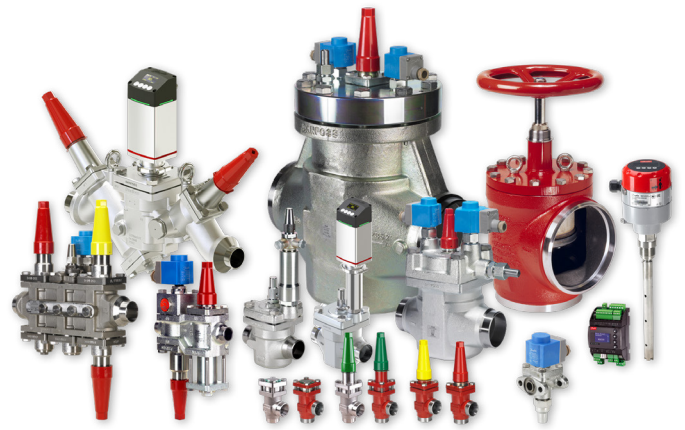
Savings per year **14,000€**

Savings over 20 Year **285,000€**

Reduction of Total Cost of Ownership of a Cold room with 12 evaporators

Flexline™ valve portfolio

Consists of three major valve groups offering solutions ranging from basic to advanced, high level industrial refrigeration systems concepts.



Flexibility

- › Smart solutions based upon a complete common modular platform.
- › Reduce system complexity and increase reliability.



Innovation

- › Innovative design ensures increased system safety and efficiency.
- › Improve food safety and quality.

Automatic, regulated valves

ICV Flexline™

- › ICM Motor valve, ICS pressure controlled valve and ICLX 2-step solenoid valve in steel



Semi-welded plate heat exchangers

- › Excellent heat transfer capabilities, reliable design, operational safety



Manual valves

SVL Flexline™

- › Stop valves, filters, regulating valves, check valves, and stop valves in stainless steel and steel



Danfoss AIM System control*

- › Embedded Microprocessor Controls (EMC)
- › PLC Supervisory control systems
- › Power products: Motor Starters and VFDs
- › Combination products utilizing power products and PLC or EMC controls



Advanced system solutions

ICF Multi-functional valve station

- › ICF multi-functional valve
- › Motor valves ICM, stepper motor
- › ICAD, Liquid level control AKS4100
- › Advanced evaporator controller
- › Digital gas detection
- › Intelligent Air purging system



*Only offered in USA and China

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
<https://www.danfoss.com/en/service-and-support/downloads/dcs/coolselector-2/>



3D CAD symbols:

Download symbols and illustrations



Ref-Tools:

Complete overview of spare parts, Product-finder and more relevant HVACR tools.
<https://www.danfoss.com/en/service-and-support/downloads/dcs/ref-tools/>



IR Application Tool:

How a two-stage ammonia plant works.
<https://www.danfoss.com/en/service-and-support/downloads/dcs/industrial-refrigeration-application-tool/>



Application Handbook:

How to select control methods for different refrigeration systems.
<https://www.danfoss.com/en/markets/refrigeration-and-air-conditioning/dcs/industrial-refrigeration/industrial-refrigeration-application-handbook/>

Training for Professionals



Danfoss Learning:

Your personal learning portal is fast, easy and always accessible.
<https://www.danfoss.com/en/service-and-support/learning/>



LinkedIn:

<https://www.linkedin.com/company/danfossclimate>



YouTube:

<https://www.youtube.com/DanfossClimate>



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<https://www.instagram.com/DanfossInstallerLife/>



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<https://www.facebook.com/danfossclimate/>