

Case story

How heating and cooling were integrated into one efficient and sustainable system using Danfoss ICFD



Re-thinking heating efficiency in flower bulb processing with ICFD

Introduction

In the flower bulb industry, maintaining precise climate conditions is essential to ensuring product quality. Traditionally, heating and cooling are handled as separate processes, often relying heavily on fossil fuels. This case demonstrates how heating and cooling were integrated into one efficient and sustainable system using Danfoss ICFD in a pilot project carried out by Dijkma Koudetechniek in the Netherlands.

Key Highlights

- Operation proven beyond original design limits (up to 50 °C)
- Elimination of gas boilers using recovered heat from the refrigeration cycle
- Minimal flash gas losses for higher system efficiency
- Fully mechanical solution with no need for adjustment



Challenge

Maintaining precise conditions for drying flower bulbs requires strict control of temperature, humidity, air circulation, and ethylene levels. Traditionally, this process relies on gas boilers for heating, while refrigeration systems operate separately.

Dijksma aimed to eliminate fossil fuels and instead use the refrigeration cycle to generate heat. However, applying the ICFD defrost module at temperatures above 20°C raised concerns. As Wim Kombrink, Engineer/R&D at Dijksma explains, “It was a pilot project because we did not know whether the floats would function properly at higher condensation temperatures.”

The concept was based on Dijksma’s prior experience with hot gas defrosting in CO₂ pump systems. From this experience, they had observed that compressor capacity could decrease significantly during defrost when using pressure-controlled solutions (IPV). This insight became a key factor in selecting the system design.



“It was a pilot project because we did not know whether the floats would function properly at higher condensation temperatures.”

Wim Kombrink, Dijksma Koudetechniek

Solution

In collaboration with Danfoss, Dijksma implemented the ICF Flexline™ valve station with ICFD in a heating application. By using the refrigeration system for heat recovery, hot gas is injected into evaporators, condensing at temperatures up to 40–50°C.

Originally designed for hot gas defrost applications, the ICFD ensures only fully condensed liquid returns to the separator, minimizing flash gas losses and maximizing efficiency. Dijksma deliberately chose a float-based solution using ICFD rather than a pressure-controlled concept. In previous installations, pressure-controlled systems led to a noticeable reduction in available compressor capacity during defrost.

Since the heating application requires significantly higher capacity than defrosting, maintaining compressor performance was a critical requirement. The float-

based ICFD solution ensured stable operation without compromising capacity.

The system operates mechanically without the need for adjustments and allows simultaneous heating and cooling.

According to Wim Kombrink, “Using the ICFD for this application creates a lot of possibilities for the future.” He further highlights: “The solution minimizes flash gas losses while reducing the load on the ECO separator floats, improving condensate handling during heating.”

Why ICFD?

- No system adjustments required
- High efficiency with minimal flash gas
- Reduced load on separator floats
- Robust and reliable performance
- Maintains compressor capacity during heating



Results

The ICFD successfully operated beyond its traditional limits, functioning reliably at up to 50°C condensation temperature.

This enabled the elimination of gas boilers and significantly improved system efficiency. The selected float-based approach also ensured sufficient compressor capacity during heating, addressing limitations typically seen with pressure-controlled systems.

The successful pilot led to expansion of the installation with additional cells using the same solution. Wim Kombrink concludes: "The robustness of the ICFD, the extended operating envelope and the professional collaboration with Danfoss really give us new opportunities in this field."

By transforming refrigeration into a combined heating and cooling solution, Dijkma has demonstrated how industrial systems can reduce reliance on fossil fuels while improving overall energy efficiency.

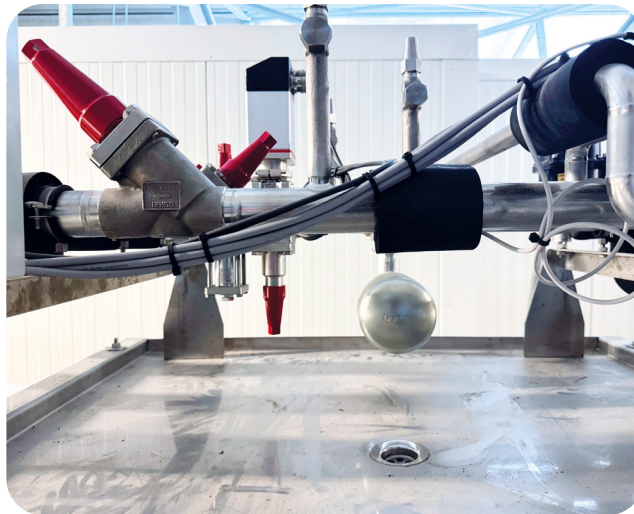
This approach opens new opportunities across agrofood and industrial refrigeration applications where integrated and sustainable thermal management is key.



"Minimal flash gas losses and the fact that we release the floats on the ECO separator ensures that condensate is handled in the most efficient way during heating.

This really gives us new opportunities to operate in this field."

Wim Kombrink, Dijkma Koudetechniek



Dijkma Koudetechniek is a specialist in refrigeration, climate control, and electrotechnical systems for the agricultural and industrial sectors, with over 40 years of experience in sustainable cooling solutions.

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