

Unique service: Saving energy in fruit and vegetable refrigeration



Line of Business:	Industrial Refrigeration
Application:	Fruit and Vegetable Cooling
Country / City:	Germany / Wülfrath
Fluid:	R507, R507A, R134a
Product:	Ceiling unit cooler DHN, Wall/ceiling unit cooler GHN, Condenser GVH

In two recent large projects for fruit and vegetable refrigeration, the companies Frigotechnik Handels GmbH, Wülfrath, in co-operation with Kälte-Klima Peters from Meerbusch and Guntner, Fürstenfeldbruck, yet again brought proof of their competence in the refrigeration of foodstuffs. In both cases, the buildings were fitted with Guntner evaporators and condensers. After commissioning of the systems, as a special, additional service, the wholesaler, together with ISS Krefeld (Engineering Office Sven Schulte) offers his customers individual energy-consumption analyses, thus promoting energy- and cost-saving operation of the systems. The refrigeration of fruit and vegetables

in the import-export business is one of the most demanding areas in foodstuff refrigeration, because the quality of the most sensitive fresh goods must be reliably maintained throughout all transit stations. For the equipment of one completely new storage shed each for Rosenland Fruit Import in Mönchengladbach, Germany, and for the Günaydin fruit and vegetable export company in Alasehir, Turkey (see separate reference project "Günaydin - Fit for Europe-wide export"), however, it was not the value of the goods alone that made the highest demands. The high volume of goods in transit required special energy- and cost-saving equipment.

85 tonnes throughput daily

For the fruit importer Rosenland in Mönchengladbach, the architectural office of Vouille fitted out a completely new warehouse with a total of 3,760 m² of refrigerated floor space and around 800 m² of office space in only eight months' construction time, starting in May 2002. Rosenland's main product is tropical fruit, so the quality of the very perishable goods must be assured both in storage and in further transport. As a rule, the goods are delivered at a temperature of 25 to 28 °C, making gentle cooling down to +2 to +4 °C over a period of 10 to 12 hours necessary. And at Rosenland, these requirements apply to a throughput of 85 tonnes a day.

Steady storage temperature

When choosing the refrigeration equipment, the planning team decided on Güntner components throughout, supplied by interconnected Bitzer semi-hermetic screw compressors. This has the advantage that each compressor can be controlled individually in four stages via the system's PLC controls. The only refrigerant used is R507. A total of 700 kg of it are needed for the whole system.



New warehouse for fruit importers Rosenland in Mönchengladbach, Germany

So for the main store alone, eight dual discharge unit coolers type DHN 066D/37, exhausting to both sides, were selected. Optimised for a total power of 403.2 kW, this version ensures a continuous optimum room temperature, especially in large refrigerated rooms. Refrigeration expert Christoph Peters explains: "The compact construction of the units favours optimum utilisation of the storage space. Storage of fruit and vegetables also requires extremely high humidity, so these components have a large heat exchanger surface, and cause little draught. This means that little moisture is extracted from the air and the refrigerated goods, so that the latter stays fresh longer. Further decisive advantages are the hygienic design and the high resistance to corrosion."

Efficient hot-gas defrosting

To achieve time-saving defrosting processes under operating conditions, Kälte-Klima Peters used the DHN standard connections for energy-saving hot-gas defrosting, which is programmed in the controls as defrosting as necessary. Rosenland Fruit Import requires smooth-running logistics, so, in consultation with the architect's office of Vouille in Mönchengladbach, separate refrigeration areas were created for delivery, consignment and contingency.



Güntner aircooled condenser (axial) GVH:
Powerful, with a total capacity of 1,050 kW

In the contingency area, the Peters company mounted four GHN unit coolers, version 051C/27, with hot-gas defrosting. In the delivery area, four type S-DHN 066C/27 dual discharge unit coolers ensure the quality of the produce. These units were specially adapted for processing rooms, where they provide quiet, draught-free air flow. Their hygienic design favours operation free of drips and corrosion, and easy, quick cleaning. In the working areas, an upstream pump and water heater ensure energy- and cost-saving air-conditioning.

The aircooled condenser (axial) Type GVH 092B/2x6n (D), which is mounted outside, provides a total condensing capacity of 1,050 kW.

Optimum regulation

The core of the system is the controls. These have been fitted with a Siemens S7 PLC, and with an individual program from the ISS company of engineer Sven Schulte in Krefeld. The control system is designed for the entire refrigeration plant, and registers suction, air pressure and condensing pressure as analogue values. If a sensor should fail, the system switches over to a redundant sensor. The analogue temperatures registered are those of all rooms, switch cabinets and suction gas. The temperatures are gathered via ELREHA MiniMEP data loggers – devices that conform to the legal requirements on the archiving of temperatures in foodstuff storage and processing. Depending on the ambient temperature, the defrosting of the evaporator is carried out with circulated air or hot gas. In the latter case, the hot-gas defrosting is stored for 30 days with date and time. The triggering of the condenser is con-

trolled by pressure, and the speed of the fans is regulated. Should the speed regulator fail, the fans are regulated in stages directly, dependent on the pressure. The system stores both the compressor run times and the switching pulses for 30 days, allowing optimal savings in energy costs to be achieved.

Secure online controls

Fitting the control system with a password-protected modem provides additional service. This makes it easy to implement parameter security, adjustment of the set-points and program alteration online. Faults in the plant are displayed in text messages at a user-friendly touch screen. Every fault message is sent as an SMS to a registered mobile-phone number. The control system automatically distinguishes relevant and irrelevant faults. A list of the last 100 fault messages with timestamp can be viewed on site at the operator panel, or online. All system states can be reconstructed very quickly at the display or online. Important plant parameters (pressures, machine run times per day, etc.) are also stored for a selected period of time.

Quick amortisation through energy evaluation

As a special service ISS and Frigotechnik offer their customers, on request, an evaluation of the actual energy consumption in operation. Ten plant operators at present benefit from this service, including Rosenland and the fruit and vegetable exporter Günaydin. The operating parameters suction pressure, oil temperature, room temperature, room humidity, condenser pressure and intake and outlet temperature are registered at regular intervals, and evaluated with regard to optimum control. "This service is unique in the sector," Frigotechnik Branch Office Manager Penno confirms. "Experience has shown that it is possible to keep below the original cost-efficiency calculation when the controls are optimised on this basis. So plant operators can significantly speed up amortisation of their investment."



Main cold store at Rosenland: 8 DHN 066D/37 dual discharge unit coolers, total capacity 403.2 kW
Special feature: Large heat exchanger surface, i.e. low dehumidification

Source: C.-Dieter Penno, Frigotechnik Handels GmbH, Wülfrath, Germany

Europe-wide: Wholesale and system planning for refrigeration and air-conditioning equipment

Frigotechnik Handels GmbH is one of the leading wholesale companies in Germany and Europe in the refrigeration and air-conditioning sector. The company combines trading and service functions on top of a solid, established company structure. Frigotechnik's range of products combines tried products from national and international manufacturers for the entire refrigeration and air-conditioning sector. In addition to sustained high, innovative product quality, the wholesaler's quality standards include long-term availability of the solutions, including accessories and replacement parts. Where necessary, the supplier manufactures complete system solutions in his own workshops. Co-operation with experienced partners in manufacturing and allied trades ensures that the solutions are professional and state-of-the-art. The offering of Frigotechnik is rounded off by a comprehensive range of services, from personal consulting through storekeeping, delivery and collection services, to construction-site services.

This is important for fruit and vegetable refrigeration:

- Right temperature level between +1 and +4 °C with a relative humidity of 95 %
- Cooling speed of items to be refrigerated
- Heat to be removed per tonne of goods stored, e.g. apples:
 - cooling phase 235 W
 - storage phase 8 W
 - heat removal per tonne 0,9 %
- Temperature-stable storage
- Maintenance of quality through reduced transpiration
- Use of modern technologies, e.g.:
 - Güntner evaporators
 - mech./electrical injection valves
 - Siemens SPC controls
 - optimised energy consumption