



Cold Store Application

COOL-FIT® ABS Plus



Modern Cold Store Logistics

The international logistics services company Gartner KG, headquartered in Lambach, Austria, has recently begun operating a modern distribution center for fruits and vegetables in Kehl, Germany.

The cold store has been designed according to state-of-the-art technology using only natural refrigerants.

A long-lasting and dependable refrigeration plant with low energy consumption and environmentally friendly with a sustainable refrigeration concept were the key specification requirements.

The Refrigeration System

The system uses the natural refrigerant Ammonia (NH₃) R717 in the chillers, Ammonia has a GWP 0 and ODP 0 (GWP = Global Warming Potential ODP = Ozone Depleting Potential).

NH₃ (R717) therefore does not fall under the EU F-Gas Regulation (EC No.842/2006) and complies with the requirement of the customer for a long-term environmentally friendly refrigeration concept. As well as being completely environmentally friendly, Ammonia also has a high energy efficiency and has been used in refrigeration systems for more than 120 years. The high efficiency of Ammonia ensures a high COP, thus lower electricity consumption, reducing the carbon footprint of the plant and saving money for the end-user.

The system uses a secondary loop to distribute energy to the cooling points; the food-safe coolant propylene glycol is the secondary refrigerant fluid. The operator of this large-scale refrigeration plant attached great importance to the fact that an inert coolant be used in the food storage areas.

In line with the HACCP (Hazard Analysis and Critical Control Points), the risk potential must be kept to a minimum by avoiding use of a noxious coolant.

Refrigeration Plant Technical Details

The chillers generate cold using two separate liquid cooling units:

- 2 NH₃ (R717) 220kW (295 hp) reciprocating compressors
- 2 NH₃ (R717) 640kW (858 hp) reciprocating compressors in flooded operation

Heat is removed via an evaporative condenser that is situated directly above the chiller units.

Secondary coolant: propylene glycol 38%, food-safe.

Secondary piping system: COOL-FIT ABS Plus (pre-insulated plastic pipe)

Temperatures: supply 18°F (-8°C), return 25°F (-4°C)

In designing the plant, special consideration was given to the very low partial loads which can occur in a food storage facility.

In the storage area, a gangway suspended from the ceiling is ideal for servicing the air cooler; this is essential especially in fruit and vegetable distribution warehouses, where the air coolers can become quite soiled.

Refrigerated Storage Area

Area 44,400 ft² (4,125 m²), temperature 43°F (+6°C)

5 separate cold rooms with a total surface area of approximately 26,900 ft² (2,500 m²), temperatures 31°F (-0.5°C) and 36°F (+2°C)

The air coolers used in the stock area are speed-controlled and can be regulated individually. The plant designers ensured that air distribution was constant and with no blockages, even though high humidity is possible. It is also possible to retrofit additional partitions, if, for example, different temperature zones are required in the storage areas. The speed-controlled air coolers are run at a low rpm to reduce the noise level for the comfort of employees working in the storage area.





Secondary Piping System Specification

In selecting a suitable piping system for the secondary coolant, several criteria were decisive: long lifetime, efficiency, light weight and ease of installation.

Lifetime and Efficiency

The “traditional” piping system used would be welded steel, post-insulated on-site. The quality of a such a solution is extremely difficult to control. The quality of the insulation in terms of energy efficiency is difficult to evaluate; damaged or incorrectly installed insulation allows condensation and moisture penetration. This in turn leads to further costly

energy losses, dripping, and corrosion of the metal, thus compromising the efficiency and operation of the whole plant.

Furthermore, condensation may drip onto the food stored below; this is highly undesirable and can cause contamination, leading to scrapping of stock or loss of food quality.

COOL-FIT ABS Plus, the pre-insulated plastic piping system from **Georg Fischer** was chosen due to its excellent price/performance ratio. The system consists of fittings and pipes, pre-insulated by the manufacturer, which can be installed easily with a simple reliable pipe joining technique.



The medium pipe is ABS (Acrylonitrile Butadiene Styrene), corrosion resistant to propylene glycol as well as all other standard cooling fluids found on the market. Food-safe cooling mediums can in certain circumstances be very aggressive, causing damage to metal pipe systems, for example if the cooling fluid comes into contact with the metal system during filling or ventilation or in the event of an accident.

The outer jacket pipe in the COOL-FIT system is made of impermeable and UV-resistant PE-HD (high density polyethylene), the system is vapor- and water-tight. PE-HD is impact-resistant and robust, so damage to the system is effectively prevented. The actual insulation is factory-manufactured high-density PUR foam, containing no CFCs, contributing not only to excellent insulation properties but also making the pipe more rigid with a robust impact resistant system.



The **PUR insulation** in the pre-insulated pipe and fittings has a Lambda value of **0.026 W/m.K** guaranteed, resulting in excellent money-saving insulating properties.

Pipe support is extremely cost effective: thanks to the hard nature of the insulation and outer jacket, all supports can be located directly onto the PE jacket, eliminating the need for any specialist pre-insulated pipe supports as well as also eliminating potential energy bridges.

The system is **corrosion-free**, with a plastic outer jacket and carrier pipe there is no danger of classic metal-like corrosion either externally or internally.

Weight Savings

Modern industrial architecture, especially larger industrial buildings, such as cold stores or production facilities, are very sensitive to weight loads that affect the static load of the building. Thanks to pre-insulated plastic pipe, COOL-FIT ABS Plus, which was selected for this application, the weight load was significantly reduced. In addition, the necessary pipe support system was kept very simple and cost effective.

The project plan for the cold store meant that the piping system had to be installed at a very early stage of the project. The pre-insulated plastic pipes were installed in the pre-mounted supports at a height of approximately 23 ft (7m) using a cherry-picker lift. The light weight of the plastic system compared to metal pipes allowed this to be undertaken simply and quickly, even at this height.

For construction reasons, the mid-section of the piping system was constructed first, followed by the piping connections to the air coolers.

Weight Example of 4" (DN 100) pipe

Steel (without insulation) pipe 328 ft (100m)	2039 lb (927 kg)
COOL-FIT ABS Plus pre-insulated pipe 328 ft (100m)	557 lb (253 kg)

Specialized Refrigeration Plant Contractor

Even for an experienced refrigeration contractor like the Schulz company, who specialize in building industrial refrigeration plants, the construction of such a large cold



store such as this presents a challenge. The installers were trained by GF in advance on how to work with a pre-insulated plastic pipe system. Well-trained professionals are the guarantee for a smooth installation process and top quality system. COOL-FIT ABS Plus installations are based on the time-tested and proven solvent cement joining method and are easy and safe to install with no expensive equipment required.

The ABS medium pipe has a pressure rating of 150 psi (10 bar); this offers sufficient safety reserves for the designed pump pressure of 60 psi (4 bar) specified here. The joint connections are designed to allow a gap to remain; this is to enable visual inspection during pressure testing. This gap is then sealed after pressure testing with a gap filler, a hot-melt adhesive strip, and a shrink sleeve. The joint is then **permanently vapor-tight and water-tight**.

Large building projects such as this have a very challenging construction time period. Pre-insulated pipes and fittings allow the secondary piping system to be installed in the shortest possible time period.

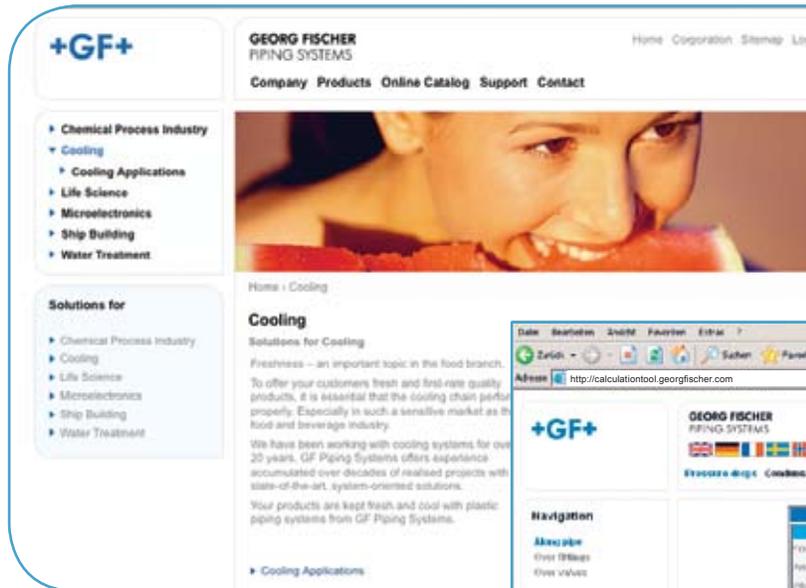
COOL-FIT ABS was installed in the mechanical equipment room without pre-insulation. These ABS fittings, pipes and valves (butterfly valves, filters, and compensators) were post-insulated using a rubber based insulation.

With this new distribution center, the Gartner company has constructed a state-of-the-art cold store with the lowest possible carbon foot-print cost effectively, allowing fresh and top quality fruits and vegetables from farm to store to consumer.

Companies involved in this project

Client:	Spedition Gartner KG
Architecture:	Shebl & Partner
Refrigeration planning:	KWN Engineering GmbH
Refrigeration installation:	Schulz Kältetechnik
Compressors:	Grasso
Evaporative condenser:	Evapco
Air coolers:	Güntner
Control Systems:	Wurm
Piping system:	Georg Fischer Piping Systems





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