



Deep-freezing at external temperatures of above 50 °C

More than 5 million inhabitants live in the ever-growing Saudi Arabian megacity of Riyadh. The city is surrounded by the desert, the climate is sub-tropical. The technical requirements placed on a cold store for food are accordingly stringent. Güntner supplied 23 THERMOSTORE insulated unit coolers, 22 GGHN air coolers as well as two AGVH 090 ammonia condensers for the new cold storage of the Shahini Group. Two thermowave TL 250 plate heat exchangers form the hydraulic interface between refrigerant and fluid.

The thermometer in Riyadh – situated amidst the Arabian peninsula – often indicates temperatures of above 50 °C in strong sunlight between May and September; at night, it still is very warm at temperatures ranging between 25 and 29 °C in average. However, thanks to innovative and efficient technology, the population can be supplied with fresh and chilled foodstuffs throughout the year.

With regard to its new cold storage, the Saudi Arabian Shahini Holding Group puts particular emphasis on sustainable, environmentally friendly refrigeration engineering and on high economic efficiency. This is why ammonia (R717) is used as refrigerant. The German engineering office „Brunnenkant“ from Wiesloch prepared the specialist planning for the refrigeration engineering of the cold storage for foodstuffs.



Overview

| | |
|-----------------|---|
| Business line: | Industrial Refrigeration |
| Application: | Food Cooling |
| Country/Region: | Saudi Arabia/Riyadh |
| Fluid: | NH ₃ / water/glycol mixture |
| Product: | Güntner GGHN Güntner AGVH 090 thermowave TL 250 |

Güntner GmbH & Co. KG
Hans-Güntner-Straße 2 – 6
82256 FÜRSTENFELDBRUCK
GERMANY
www.guentner.eu

Member of Güntner Group

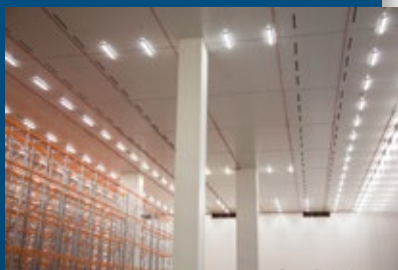




▲ With regard to its new cold storage, the Saudi Arabian Shahini Holding Group put particular emphasis on sustainable, environmentally friendly refrigeration engineering and on high economic efficiency.



▲ 23 Güntner THERMOSTORE insulated unit coolers (flooded evaporators) registered for patent are installed above the picking area; they cool the storage rooms and the logistics facilities.



▲ The insulated unit coolers are installed above the picking area at the front side of the storage rooms. From there, they blow the air via insulated ducts from above into the normal- and low-temperature rooms and the logistics area respectively.

All the components of the cold air supply are outside the cold rooms (a widespread trend in warehouse logistics) so that the operator has the freedom to easily change over to another racking system and logistics concept respectively.

Cold store for foodstuffs

The modern Al Shahini cold store for foodstuffs comprises a deep-freeze area (-24 °C) of about 3,500 m² with air lock and an area which is double the size with its 7,950 m² used as normal temperature store (+4 °C). As the latter is equipped with the according technology, it could also be used entirely for deep-freeze applications whenever necessary. Crosswise in front of the storage rooms, there is a 3,000 m² logistics area (+6 °C).

Several foodstuffs such as dairy products, fruits and vegetables are stored in the cold rooms at +4 °C. The low-temperature area with its own logistics area directly in front of it is located approximately in the middle of the building; deep-frozen foodstuffs are stored here. Warehousing and removal is carried out via air lock.

Ammonia as refrigerant

The cold store's machine room is equipped with a two-stage ammonia refrigerating installation with screw compressors. All the insulated unit coolers are directly supplied with NH₃ by the refrigerating installation via pump operation. The rest of the air coolers, used for cooling the machine rooms and technical premises, is connected with the central cooling facility via a secondary glycol circuit.

Three screw compressors produce the cold for the low pressure stage (-37 °C) and four of them for the high pressure stage (-10 °C). Yet another screw compressor is designed in such a way it can switch between the low and high pressure stage operating modes. This particular design was required as the operator, Al Shahini, wanted to be flexible regarding the use of individual cold rooms as normal- or low-temperature storage rooms. The insulated unit coolers for the normal-temperature rooms and their piping and fittings are designed both for normal- and low-temperature operation.

The low-pressure cycle provides 1,560 kW of refrigerating capacity whereas the high-pressure cycle provides 1,250 kW. 23 flooded evaporators operate in the ammonia cycle as „terminal units“ cooling the storage and logistics rooms. For this purpose, Al Shahini went for the Güntner THERMOSTORE insulated unit coolers registered for patent.

Güntner THERMOSTORE insulated unit coolers

Four of the Güntner THERMOSTORE insulated unit coolers are designed exclusively for low-temperature operation. Another nine can be used for normal- and low-temperature operation. And then there are ten Güntner THERMOSTORE insulated unit coolers designed only for the normal temperature range; those supply cold for the incoming and outgoing goods section.

Every insulated unit cooler is installed in the technical premises above the picking area. The units for the cold rooms and low-temperature storage rooms are placed at the front side of the storage rooms. From there, they blow the air via insulated ducts from above into the normal- and low-temperature rooms and the logistics area respectively. Every cooler circulates up to 90,000 m³ of air per hour and thus provides an ideal air distribution in the storage.

Low-maintenance and efficient

Thanks to their design and the installation site, the Güntner THERMOSTORE air coolers of the latest generation hardly produce any noise and they provide draught-reduced

Güntner GmbH & Co. KG
Hans-Güntner-Straße 2 – 6
82256 FÜRSTENFELDBRUCK
GERMANY
www.guentner.eu

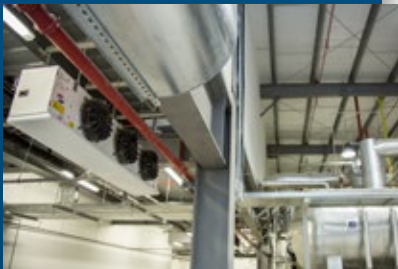
Member of Güntner Group 



▲ Every cooler circulates up to 90,000 m³ of air per hour and thus provides an ideal air distribution in the storage.



▲ Two thermowave TL 250 plate heat exchangers form the hydraulic interface between refrigerant and fluid.



▲ The high external temperatures also require the air conditioning of technical premises and machine and staff rooms. The air coolers are supplied via the secondary water/glycol circuit (+8 °C/+16 °C).

air distribution. They feature directly driven centrifugal fans without V-belt, placed directly behind the heat exchanger coil. The speed-controlled EC motors of the fans ensure low energy consumption without peak loads during the start-up operation. All the components can easily be reached via the accessible casing; this and the above-mentioned characteristics keep the effort for service and maintenance of the insulated unit coolers at a minimum.

In the low-temperature storage rooms, the PU insulation of the Güntner THERMOSTORE air coolers is 200 mm thick and thus designed for a temperature difference of 70 K; in the logistics area where the temperature difference is lower, the thickness is 170 mm.

Hot gas is used for defrosting the insulated unit coolers. During the defrost phase, the flap of the unit is closed and hot gas is passed to the heat exchanger coil through a separate piping network. The fans now run at reduced speeds and circulate in the casing the air heating up until all components are defrosted. The bottom of the cooler, designed as tray, drains the ice water without it being necessary to separately heat the tray for this purpose.

Customised control

The insulated unit coolers are equipped with an advanced control adjusted to the particular demands of this project by a master-master principle. This means that the central building management system as well as the individual insulated unit coolers act as master and interact with one another.

The insulated unit coolers measure the temperature difference between ambient air and evaporating temperature and, based on a characteristic curve, communicate the state of frost formation and the defrost readiness to the customer system. The customer, in turn, releases the defrost process of individual insulated unit coolers provided there is a sufficient number of other cooling units in operation.

Subsequently, the insulated unit cooler reports the performed defrost process to the building management system. This ensures defrosting cycles in line with demand, based on transparent data. Thanks to redundant manual modules, it is possible (e.g. for maintenance works) to manually override the defrost phase.

Güntner condensers and air coolers

Two air-cooled Güntner AGVH 090 ammonia condensers and three hybrid evaporative condensers are operated, depending on the climatic conditions outside. At low external temperatures and/or the corresponding partial load operation, the air-cooled condensers from Güntner are used. Only if their capacity is no longer sufficient at rising temperatures, the central plant control switches the operation to the evaporative condensers. Combining both systems saves water – a scarce and expensive resource in arid climate.

The high external temperatures also require the air conditioning of technical premises and machine and staff rooms. These rooms are air-conditioned to a consistent room temperature of 25 °C by 22 Güntner GGHN air coolers. The air coolers are supplied via the secondary water/glycol circuit (+8 °C/+16 °C).

Al Shahini is fully satisfied with the entire project management and with the cold air supply in its new storage.

Güntner GmbH & Co. KG
Hans-Güntner-Straße 2 – 6
82256 FÜRSTENFELDBRUCK
GERMANY
www.guentner.eu

Member of Güntner Group 