Güntner heat exchangers for Swiss logistics distribution centre and wholesale bakery

Swiss retail merchant Coop's largest logistics site in the Swiss canton of Aargau contributes significantly to the company's vision to become CO_2-neutral by 2023 in areas on which Coop can exert a direct influence. Efficient Güntner heat exchangers support this ambitious goal: They are used to cool storage and logistics areas and dissipate non-usable heat from the plant rooms.

Overview

Business line:	Industrial Refrigeration
Application:	Food
Country/Region:	Switzerland/Schafisheim
Fluid:	NH_3 or propylene glycol 38 %
Product:	AGVH-type FLAT Vario condenser
	GFH-type FLAT Vario fluid cooler
	GIK-type THERMOSTORE Application direct evaporator
	AGHN-type CUBIC Vario NH_3 direct evaporator
	ADHN-type DUAL Vario NH_3 direct evaporator
	DGN-type DUAL Vario air cooler
	GHF-type CUBIC Vario air cooler
	GGHN-type CUBIC Vario air cooler
	GGDF-type CUBIC Vario air cooler
	GGHF-type CUBIC Vario air cooler
	GGDF-type SLIM Compact air cooler

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▲ 27 AGVH-type Güntner FLAT Vario condensers are used to dissipate the heat that cannot be used in production from four central ammonia refrigeration circuits in the combined bakery/ deep-freeze storage building.

Coop's logistics site in Schafisheim, which was originally designed solely for regional supply, today houses the largest bakery and confectionery in Switzerland, the new frozen goods distribution centre for all of Switzerland and a regional distribution centre for the Zurich area as well as north-west and central Switzerland. The imposing buildings have been in operation since the summer of 2016.

With a spatial volume of approximately one million m^3/35,314,666,719 ft^3 and extending over up to six floors below ground level and eight above, the complex has a workforce of around 1,900 employees. The new building for the bakery and the deep-freeze storage room alone measures 186 m/610.23 ft in length, 102 m/334.65 ft in width and 50 m/164.04 ft in height (including a depth of 25 m/82.02 ft). A gross floor area of 164,000 m^2/1,765,281.3 ft^2 is spread over nine floors.

Largest bakery in Switzerland

Some 600 employees at the bakery are involved in the production of up to 60,000 tons/66,138 short tons of bread and baked goods annually from 40,000 tons/44,092 short tons of flour. The range of goods includes fresh bread, cakes and pies as well as more than 70 types of dough, which is baked in the outlets for consumption. There are 23 production lines in total: six for pies and pastries, two for tarts and flans, cakes, slices and dough rolls, three for commercial doughs and twelve for the bread assortment.

Europe's largest wood-burning oven is installed in the bakery, allowing traditional bread specialities to be produced on an industrial scale. According to company information, the bakery is the largest in Switzerland and one of the most modern in Europe.

The production and warehouse complex in Schafisheim combines the new bakery in Schafisheim and the national frozen goods distribution centre in one building. While baking production and the storage as well as order picking of frozen goods were formerly carried out at a minimum of six different locations, these are combined today at a single location.

All 1,200 Coop sales outlets in Switzerland are supplied with frozen goods from the deep-freeze storage room. The complete food assortment is distributed from Schafisheim to some 360 sales outlets – corresponding to approx. 40 percent of all Coop stores.

Fully automatic high bay storage

The fully automatic frozen high bay storage (-23°C/-9.4°F) is 39 m/127.95 ft in height and has space for more than 17,000 pallets. From storage and removal of pallets, depalletising and order picking through to provision of roller containers for output, all steps are performed fully automatically. Oxygen concentration is reduced in the unmanned store for fire safety reasons.

There is space for up to 336,000 containers on 17 levels in the likewise fully automatic cold store for dairy products, fresh meat, etc. 119 transport robots load up to 6,500 containers onto roller containers every hour and provide them for delivery.

Owing to the size of the rooms to be cooled, two independently operating cooling systems are used to cool the logistics wing of the regional distribution centre. Finally then, the normal refrigeration circuit extends to approx. 16,000 m^2/172,222.6 ft^2 at 3°C/37.4 °F to 5 °C/41 °F, while the normal temperature zone (13 °C/55.4 °F to 15°C/59 °F) measures around 13,500 m^2/145,312.8 ft^2.

Ammonia is used in both refrigerating plants as an environmentally-friendly and efficient refrigerant. The waste heat from the central cooling facility is used to heat the administration wing. Secondary propylene glycol circuits are used in turn to distribute the cold to the individual cooling points (38 %/62 %).

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▲ Four direct evaporating insulated unit coolers ensure constant minus temperatures in the deep-freeze high bay storage room. These coolers operate close to the ceiling in ammonia pump mode, each with an output of 200 kW/682,428 BTU/h.

▲ Güntner ADHN-type DUAL Vario direct evaporators are the preferred choice for installation in areas where a high cooling capacity is likewise required but where staff need protection from draughts.

Machine room for a cooling level of 8 MW/27,297,133 BTU/h

Four likewise independent ammonia cooling systems are installed in the significantly larger central cooling facility for the bakery and the national deep-freeze storage room, which together provide a cooling capacity of 8 MW/27,297,133 BTU/h at different temperature levels. The refrigerating capacity can be increased to a total of 10 MW/ 34,121,416 BTU/h by means of three redundant compressors.

A two-stage freezer is supplied by three screw compressors for the low pressure stage as well as three piston compressors for the high pressure stage. The refrigerating capacity for the two-stage freezer amounts to 1.8 MW/6,141,855 BTU/h for an evaporating temperature of -41 °C/-41.8 °F. A two-stage booster supplies refrigerating capacity of 1.7 MW/5,800,641 BTU/h for deep-freezing with an evaporating temperature of -35 °C/-31 °F. Both systems are fitted with an ammonia pump system, since the central cooling facility is located around 30 m/164.04 ft above the lowest cooling point. The excess liquid in the pump system therefore has to be pumped back into the central cooling facility.

Three piston compressors and two evaporators generate chilled water with a refrigerating capacity of 3.5 MW/11,942,496 BTU/h at an evaporating temperature of 4 °C/ 39.2 °F. The chilled water is used for air conditioning the production premises and the remainder of the building.

Three additional piston compressors and two evaporators cool a water-glycol mixture with a refrigerating capacity of 1 MW/3,412,142 BTU/h (evaporating temperature of -9 °C/15.8 °F). The connected glycol coolant network in this normal temperature store supplies all air coolers in production and additionally cools the iced water for the dough production.

Güntner ammonia condenser

25 AGVH-type Güntner FLAT Vario condensers are used to dissipate the heat that cannot be used in production from the four central ammonia refrigeration circuits, with eight units assigned in each case to the cold water system and freezer system. Three ammonia condensers are required for the normal temperature system and six for the freezing facilities. The total cooling capacity of all of the axial ammonia condensers installed on the roof collectively amounts to 10,840 kW/36,987,615 BTU/h.

The speed of the EC fans in the condensers is regulated with the aid of the Güntner GMM Motor Management system. A free-standing steel construction and extended feet for floor mounting prevent heat pockets from forming under the flat bed coolers that are installed side by side, or warm exhaust air from being sucked under the cooler because of a short-circuiting of air. The Güntner AGVH-type FLAT Vario condensers are installed on vibration dampers for sound insulation.

Four axial Güntner GFH-type FLAT Vario fluid coolers are likewise installed on the roof, which dissipate the heat from the oxygen reduction system and the waste heat from the NH3 compressor oil cooler into the environment. A total dry cooling capacity of 1,830 kW/6,244,219 BTU/h is installed here. A 38 percent propylene glycol mixture serves as a cooling medium, which uses EC fans for energy-efficient cooling down from 60 °C/140 °F to 40 °C/104 °F. The Güntner GMM Motor Management system regulates the optimum working point in each case. The Güntner GFH-type FLAT Vario fluid coolers are also installed on vibration dampers for sound insulation. The fans have a sound pressure level of 55 dB(A)/10 m.

Güntner air coolers for plant rooms

The machine and plant rooms have a very high thermal load and therefore have to be cooled. To ensure that this is handled as efficiently as possible, Güntner air coolers with speed-controlled fans were the preferred choice for installation in Schafisheim.

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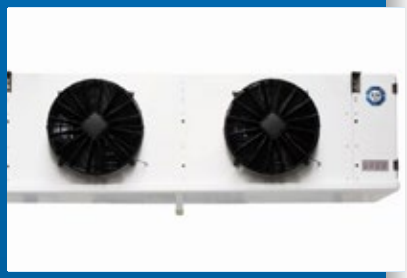

▲ Güntner GGHF-type CUBIC Vario air coolers are installed in storage rooms for flans and tarts, raw materials and bread remnants and in daily stores with and without yeast.

▲ Güntner Streamers are used to improve the air throw with a large room depth, allowing optimal penetration of the room.

Three GGHN-type CUBIC Vario EC fans are used to cool the machine room. Güntner GGDF-type and GGHF-type CUBIC Vario fans maintain the temperature in the blower room. A total of 15 speed-controlled Güntner GGDF-type SLIM Compact air coolers are needed in order to dissipate the heat from the power distribution and the electrical room (8°C/46.4°F or 18°C/64.4°F). The air compressors are also cooled with the aid of two Güntner DGN-type DUAL Vario air coolers.

Flooded Güntner evaporators in unmanned areas

Güntner AGHN-type CUBIC Vario direct evaporators are used especially in areas that require both a high cooling capacity and a high air throw. The flooded Güntner evaporators are installed, for example, in incoming and outgoing goods, in automated palletisation and order picking, in the daily store, as a blow-down version for a spiral conveyor and in the transportation aisles. They are also installed, however, in production areas with temperatures above zero that are not permanently manned by employees, such as in the storage room for opened packaging units, in the confectionery, the trainee bakery and in the storage room for bread remnants to be processed for current dough production.

If the Güntner AGHN-type CUBIC Vario direct evaporators are used to supply temperatures below zero, they are each fitted with additional hot gas piping for defrosting the coil and (double) defrost tray and an additional defrost flap with heated frame as well as an electrical ring heater for the fan. Güntner Streamers are used to improve the air throw with a large room depth, allowing optimal penetration of the room. The EC fans in the air cooler operate primarily in speed-controlled mode with an on-site control signal of 0 – 10 V or 4 – 20 mA.

Güntner ADHN-type DUAL Vario direct evaporators are in turn the preferred choice for installation in areas where a high cooling capacity is likewise required but where staff need protection from draughts. These areas include pre-zones and order picking. The air coolers that are installed here are also designed as flooded ammonia evaporators. They have a hot gas defrost facility with control valve for the coil, an insulated double tray and EC fans.

Güntner THERMOSTORE Application

Four direct evaporating insulated unit coolers ensure constant minus temperatures in the deep-freeze high bay storage room. These coolers operate close to the ceiling in ammonia pump mode, each with an output of 200 kW/682,428 BTU/h. The Güntner GIK-type THERMOSTORE Application units suck in the warm air from the high bay storage room in a horizontal orientation from the ceiling and dissipate it downwards back into the storage area after it has been cooled, so that it can fall downwards and form a cold-air pool on the floor.

The air coolers consist of a completely insulated air cooler housing in a sandwich design, which is fully foam-filled with PUR and impermeable. The entire floor is designed as a defrost tray. The axial fans are speed-controlled. The coolers are installed with height-adjustable vibration components for protecting against structure-borne noise.

Hot gas is used for defrosting the Güntner THERMOSTORE Application direct evaporator. If a defrost process is pending, the fan suction and discharge side is sealed with respect to the cold room by means of a torsion-resistant insulated rotating flap. The motorised valve has an all-round seal with frame heating and is actuated by means of a servo-motor. Excess defrost heat is therefore prevented from entering the deep-freeze area as a result. A door with all essential components (frame heating, emergency opening, etc.) is installed for inspecting the insulated casing.

Güntner CUBIC Vario air cooler

Additional Güntner CUBIC Vario air coolers, each supplied with cold via propylene glycol circuits (38/62 %), are installed in areas where employees work or pass or drive

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through. Güntner GHF-type CUBIC Vario air coolers, some with Güntner Streamers, are installed in corridors. Güntner GGHN-type CUBIC Vario air coolers are used in the cold room in the confectionery, while Güntner GGHF-type CUBIC Vario air coolers are installed in storage rooms for tarts and flans, raw materials and bread remnants and in daily stores with and without yeast. Güntner GGDF-type CUBIC Vario air coolers in turn cool the processed and raw fruit.

Güntner DGN-type DUAL Vario air coolers are installed in incoming and outgoing goods as well as in the 5 °C/41 °F zone and in order picking, where they ensure uniform and yet draught-reduced temperature distribution.
A Güntner GGDF-type SLIM Compact ensures the proper ambient temperature in the relatively small trainee bakery.

Outstanding location: Swiss Minergie standard

Coop's production and logistics site in Schafisheim is the first industrial site of its kind to bear the Minergie certification. Apart from using efficient refrigeration and heat technology, Coop relies on renewable energy sources in Schafisheim (95 % biomass for providing hot water and heating/solar energy for generating electricity) and is focusing increasingly on rail freight transport and alternative fuels for trucks in the area of logistics.

Coop Schafisheim has its own rail connection in a railway hall. Thanks to two additional railway lines, CO_2-reducing unaccompanied combined transport (UCT) is possible by train or truck. Frozen goods for Coop sales outlets that are located more than 90 km/56 miles from Schafisheim are usually delivered via UCT. This corresponds to some 100 swap bodies on eight rail connections every day.

Minergie…

… is a Swiss environmental construction standard for new and modernised buildings. The standard is supported as a trademark by industry, the cantons and the national government and is protected against misuse. Minergie buildings are characterised both by very low energy consumption and use of the highest possible proportion of renewable energies and also by a high level of living and working comfort for the user.

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