New cold storage facility for poultry processing in South Africa

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Tydstroom Poultry's new cold storage facility outside Durbanville, Cape Town, South Africa, features mobile racking, which reduces the building footprint and associated energy consumption, while maximising the available pallet stacking slots.

Consisting of approximately 915m² of cold storage and 200m² of combined receiving and dispatch areas, the facility was designed as a stand-alone plant. It boasts a dedicated refrigeration system and plant room, forklift charging facilities, as well as an administrative office. A new truck switching yard was also constructed to tie into the existing traffic routes. The three adjacent insulated docking bays serve the dispatch and delivery areas.

GEA Project Solutions – leaders in the field of refrigeration related feasibility studies, planning, design, and project management – was contracted not only to facilitate design and planning but also to manage the overall project. GEA Refrigeration Africa carried out refrigeration design and installation, and supervised execution in accordance with the limits of the company budget.

The new cold store facilities at Tydstroom Poultry feature great energy efficiency, small footprint use of floor space, and large storage capacity.

Various design alternatives were investigated, including static and mobile racking layouts on various levels. Value engineering showed that the most cost effective solution would be a mobile racking solution for storing pallets on six levels. This approach enabled arriving at a design to utilise the smallest possible floor area, which as a result reduced the refrigeration capacity required to cool the building. Initial client requirements included 2,500 pallet storage positions, but the sophisticated design ultimately enabled storage capacity of 2,650 pallets.

The freezer facility operates at -20°C and the cooling requirement is met by three low temperature evaporator coils housed in pods. These insulated pods include hydraulically operated flaps and are designed to close during defrost cycles, which eliminates any heating of freezer storage during the hot-gas defrost cycle(s). The receiving and dispatch area is maintained at +10°C, with cooling duty provided by two direct-expansion evaporator coils. The refrigeration system utilises two GEA Grasso GSH III 57 TSOC (type used in the

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The advanced -20°C cold store has a pallet racking system installed on mobile bases. In this way, it was possible to increase the stipulated 2,500 pallet storage capacity to an actually achieved 2,650 pallets.

Two frequency-controlled Grasso GSH III 57 TSOC screw compressors with low-energy operation. They are characterised by efficient partload behaviour and low start-up current.

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South African market – equates to Berlin model H compressor which corresponds to a US model 110GM compressor package) screw compressor packages, complete with variable-frequency drives, thermo-syphon oil cooling, and economiser connections, with operation at suction temperature of -35°C. The high-stage loads are accommodated by the economiser and side-port capacity of the compressors.

The variable frequency drives (VFDs) not only assist in power savings under part-load conditions, but also enable substantial reduction in start-up current. Capacity control and compressor sequencing are managed by the GEA GForce micro-processor control system.

System design includes a high pressure float system to minimise the ammonia refrigerant charge. Refrigerant pumps installed below the -35°C accumulator vessel provide liquid refrigerant distribution to the low-temperature evaporator coils. This design solution supplies the receiving and dispatch area with high-pressure liquid refrigerant.

All possible measures were implemented to maximise energy efficiency and minimise energy consumption. Minimisation of footprint in the layout was the starting point. Energy efficient lighting together with mobile racking allows lights to be switched on only in the aisle currently being accessed. The receiving and dispatch area was designed with additional insulation and effective dock seals to minimize heat ingress and loss of cold during loading and dispatch activities. Insulation thicknesses were increased in key areas, and additional over-purlin insulation was added in roof areas.

Building regulations required the facility to be sprinkler-protected. This necessitated storage tanks with pumps with duty/standby configuration, ESFR sprinklers, and a VESDA detection system. Thanks to GEA Project Solutions, their professional team, GEA Refrigeration Africa, and the principle contractor, the project was completed on time and within budget, without compromising excellence or precision. ■

The condenser is provided on a roof terrace on the outside wall.

Ammonia as a refrigerant has no ozone depletion potential and no direct global warming potential. Its great energy efficiency also means that its contribution to indirect global warming is very slight.

Valve stations that control the evaporators are located in the pods.