

# AUSTRALIA GETS ITS FIRST AMMONIA/CO<sub>2</sub> NEWTON SYSTEMS

Five of the Mayekawa low-charge packaged systems were installed in July at a new cold storage center in Western Sydney.

— By Devin Yoshimoto and Caroline Rham



The NewTon machines.

**F**ive of Japanese OEM Mayekawa's "NewTon" ammonia/CO<sub>2</sub> industrial refrigeration systems were installed at a newly built cold storage and distribution center in Western Sydney, Australia, in July, by Tri Tech Refrigeration Australia, the installation contractor for the project.

These are the first NewTon systems to be installed in Australia.

The end user is a large multinational membership-based retailer that has been using third-party warehousing for refrigerated and non-refrigerated goods distributed to its retail outlets, explained Mack Hajjar, Projects Engineer for Tri Tech Refrigeration Australia. "Given the number of existing retail outlets that they have, with plans for more, the end user decided to build their own distribution center."

Basil McKinley Consulting prepared the project heat loads and specification while Mayekawa Japan managed the equipment selection and conceptual design. Tri Tech Refrigeration Australia

handled the detailed design, installation and commissioning.

Three medium temperature NewTon-C units supply 708kW (201.3TR) of cooling capacity at 2°C (35.6°F) for the chilled storage area of the facility, which measures around 28,975m<sup>3</sup> (1,023,242ft<sup>3</sup>). In addition, two low temperature NewTon R6000 units supply 198kW (56.3TR) of cooling capacity at -24°C (-11.2°F) for the frozen storage area of the facility, which measures around 15,119m<sup>3</sup> (533,922ft<sup>3</sup>).

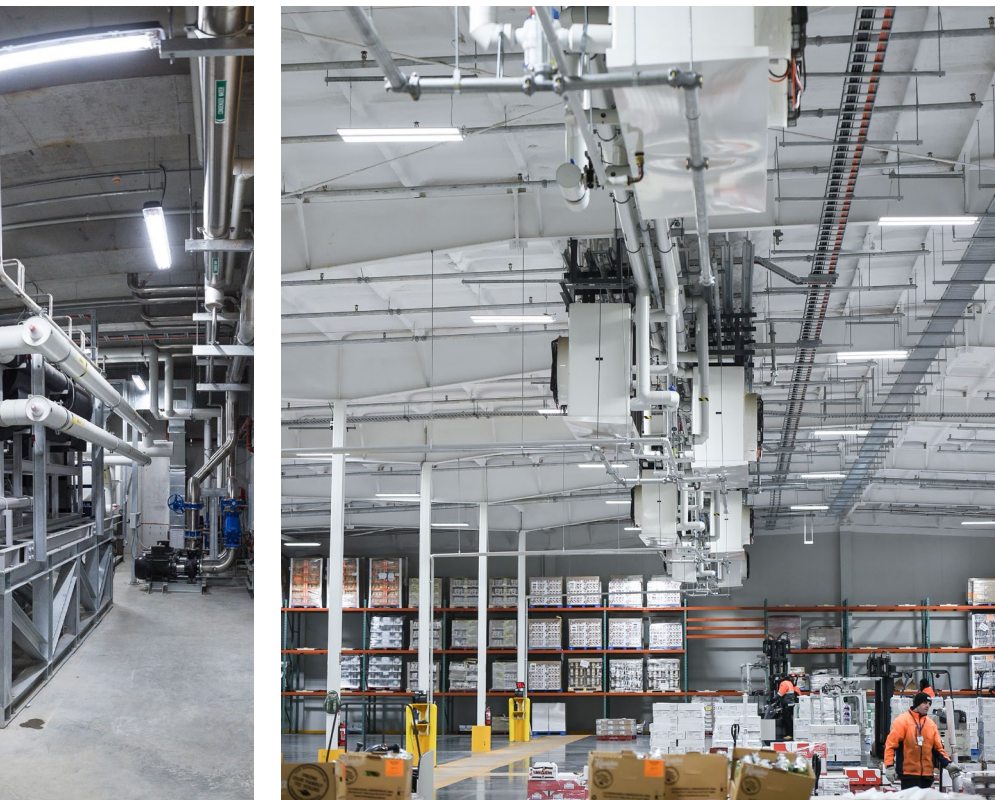
The decision to use the NewTons, Hajjar said, was motivated by the customer's requirements for safety and system redundancy.

One of the advantages of the NewTon system is that it employs CO<sub>2</sub> as a secondary refrigerant, reducing the overall ammonia charge and keeping it confined to the plant room. "The severity of an ammonia leak is further reduced because the total charge is distributed amongst several NewTon packages that in turn use semi-hermetic compressors which eliminates the risk of any shaft seal leaks," said Hajjar.

"These compressors are advanced; they have no shaft seal, no slide valve, are fully speed controlled, and use permanent magnet motors. It is good to see new technology like this come into the Australian market," he added.

There is a high level of redundancy built into the design as per the customer's requirements, explained Basil McKinley, the principal refrigeration consultant for the project. "One of the R6000 units provides 100% redundancy for the low-temperature system, as well as providing back-up for the medium-temperature system via a heat exchanger if required," he said.

"This also slows the CO<sub>2</sub> pressure rise in the medium-temperature system in the event of power failure by using the thermal mass of the freezer store," McKinley added. "The standby diesel generator only needs sufficient capacity to drive a low-temperature CO<sub>2</sub> pump and the fans of one freezer store evaporator to keep both CO<sub>2</sub> systems below design pressure during an extended power outage."



The newly built cold storage and distribution center in Western Sydney.

Compared to a traditional ammonia-pumped circulation system, the two NewTon R6000 units for the frozen storage area reduce the amount of ammonia from an estimated 1,900kg (4,189lbs) to 100kg (220lbs), according to Peter O'Neill, General Sales Manager for Mayekawa Australia, who spoke about the project during ATMOSphere Australia, held this past May in Melbourne. The CO<sub>2</sub> charge in this case is 1,300kg (2,866lbs).

First proposed over two years ago, the project entered its final installation stages in June and was commissioned in late July. Commissioning support was provided by Mayekawa Japan.

Regarding estimates on future energy performance, Hajjar said that "based on energy usage data obtained so far, overall typical compressor consumption is considerably lower than a conventional two-stage pumped ammonia plant servicing an industrial cold store of a similar size."

There were several challenges during installation and commissioning, Hajjar acknowledged, including providing elevation between the NewTon packages

and CO<sub>2</sub> pump stations; in this project that was done with structural steelwork. "Balancing water flows to optimize heat rejection/efficiency and maintaining adequate defrost temperatures were managed through commissioning and programming," Hajjar said.

Staging multiple NewTon units to maintain efficiency and part loading were also managed through commissioning and programming, added Hajjar.

Hajjar expects that, with regular preventative maintenance and ongoing manufacturer-recommended service, "the plant is expected to perform as designed for over 25 years, which is typical for industrial refrigeration plants."

Mayekawa expects to sell 330 sets of its NewTon ammonia/CO<sub>2</sub> cooling systems this fiscal year (April 2019 through March 2020), the company said in an interview conducted at its Moriya production facility in August. (The number of sets is equal to the number of compressors used; some NewTon units contain more than one compressor.) This would bring the total number of sets sold past 2,000 (95% in Japan) since the system was introduced in 2008. ■ DY & CR

## INSTALLATION AT A GLANCE

**Application:** Cold storage and distribution center

**Location:** Western Sydney, New South Wales, Australia

**Medium-temperature storage:**

**Temperature:** +2°C (35.6°F)

**Storage volume:** 28,975m<sup>3</sup> (1,023,242ft<sup>3</sup>)

**Cooling capacity load:** 708kW (201.3TR)

**Refrigeration equipment:** Three NewTon C units (plus one unit planned)

**CO<sub>2</sub> vessel and pumps:** One Mycom custom CO<sub>2</sub> vessel with two medium-temperature CO<sub>2</sub> pumps (duty and standby)

**Evaporators:** Eight 88.5kW (25.2TR) Thermofin CO<sub>2</sub> evaporators

**ICF valve station:** Danfoss

**Low temperature storage:**

**Temperature:** -24°C (-11.2°F)

**Storage volume:** 15,119m<sup>3</sup> (533,922ft<sup>3</sup>)

**Cooling capacity load:** 198kW (56.3TR)

**Refrigeration equipment:** Two NewTon R6000 units

**CO<sub>2</sub> vessel and pumps:** One Mycom custom CO<sub>2</sub> vessel with two low-temperature CO<sub>2</sub> pumps (duty and standby)

**Evaporators:** Eight 24.8kW (7.1TR) Thermofin CO<sub>2</sub> evaporators

**ICF valve station:** Danfoss

**Defrost:** Pumped warm glycol (all evaporators fitted with interlaced glycol circuits with heat for warm glycol recovered from cooling tower water)

**Condenser:** Water-cooled closed loop outdoor cooling tower