

# Plenty in store at Oxford

Oxford Cold Storage recently completed yet another extension of its North Laverton cold store just outside of Melbourne. The facility is now the largest of its kind in Australia - **Adam Carey** sheds some light on why the company has been such a remarkable success.

Who would have thought the business of keeping things cold could be so complex?

Oxford Cold Storage, one of Australia's largest privately owned cold store operators, must meet the high expectations of its customers, and comply with numerous domestic and international regulations on the storing of perishables, in its day-to-day business.

This means having a tightly controlled cold storage facility that can keep chilled and frozen goods at the right temperatures constantly, while running the store at an optimum level of energy efficiency to save on operating costs.

It also requires sophisticated information and communication technology systems so that both Oxford and its customers can stay informed about the quantity, condition and location of their stored perishable goods. Meeting all of these demands is a delicate balancing act.

In the past 12 years, Oxford's major cold store in North Laverton, Victoria, has increased its storage capacity more than fivefold, from 20,000 pallets to 110,000 pallets.

**“Last August the company completed yet another extension, in what is now the largest single site cold storage facility in Australia.”**

Last August the company completed yet another extension, creating space for an extra 15,500 pallets in what is now the largest single site cold storage facility in Australia.

Oxford's engineering manager, Gabor Hilton, says the company has achieved such high growth because it is able to deliver its customers what they need – secure cold storage and full traceability for their products and seamless access to information.

Additionally, its proximity to the Port of Melbourne makes it a natural storage point for imports, exports and quarantined goods.

Today the cold store counts Nestlé, McCains, Frontera, Simplot, Don Smallgoods and CSL Pharmaceuticals among its major clients, some of the largest commercial users of cold storage in the country.

Many of the smaller players in cold storage have folded in recent times, squeezed out by a combination of increased energy costs, the enormous cost of food safety compliance and moves by the bigger food manufacturers and distributors to consolidate their stock at one venue.



*Insulated ammonia lines*

## Standards, standards everywhere

Hilton lists Australian quarantine standards (AQIS), Food Safety Standards Australia New Zealand, EU standards, and halal as just some of the regulatory requirements cold storage companies must comply with to stay in business.

There is also the maintenance and treatment of 14 cooling towers to attend to.

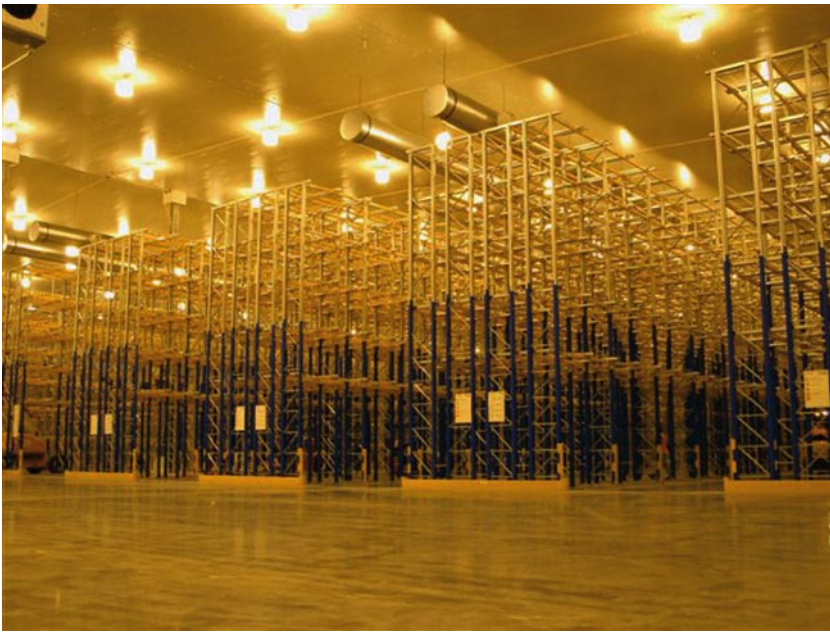
The company keeps on top of this long list of requirements through a daily inspection regime, undertaken by its engineering staff.

Plant and equipment is physically checked, and vital signs such as chamber temperatures and plant operating parameters are measured and recorded by a SCADA (system control and data acquisition) system.

The system triggers an alarm if there is ever a problem, notifying engineering staff.



*Air distribution ducts*



Cold store interior (top) and loading dock seals

“Checking that the facility is running smoothly is one thing, but designing it to perform well in the first place is an elaborate engineering challenge.”

SCADA also controls and monitors power consumption throughout the facility, automatically triggering load shedding when appropriate.

Electricity costs are further reduced through a rebate as part of a commercial contract for demand side management with Melbourne company Energy Response.

Hilton says the SCADA system can be accessed remotely, so checks and adjustments can be made during the night and on weekends (which is great for the facility, but perhaps not for him!)

### Design challenges

Checking that the facility is running smoothly is one thing, but designing it to perform well in the first place is an elaborate engineering challenge.

Key engineering challenges include designing the site for safety, maximising storage capacity, building a cost-effective and energy efficient refrigeration system, fire prevention and detection, floor heating, and minimising heat infiltration.

Fire detection is provided by aspiration-type very early smoke detection systems, which detects smoke rather than heat, chosen because it had the fastest response

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Curiously, floor heating is one of the most crucial features for any cold store, because frost can cause huge damage.

"If you've got a freezer floor that gets colder than the surrounding temperature then all the moisture tends to migrate there... and crack the floor. If it gets cold enough that water will freeze and expand. Ice will lift up your floor and destroy it over two or three years," Hilton says.

He says that there are several methods available to prevent this.

Underfloor pipes filled with ethylene glycol, an antifreeze agent, can be installed, or, for rooms in climates that do not reach subzero temperatures, pipes that circulate outdoor air can be used.

He says that smaller rooms are best served by electric heating mats, but they increase power consumption.

At the new chamber in North Laverton, plastic glycol pipes have been laid under the floor, beneath the bottom layer of concrete.

They are connected to a circulating pump and plate heat exchanger in the plant room, and heated with recycled heat from the refrigeration compressors.

The plate heat exchanger acts as an extra condenser and helps to lower the plant room's discharge pressure.

"It's free heat, the cheapest to install, and being all plastic parts, they usually last forever," Hilton says.

A centralised, two-stage ammonia refrigeration plant is used, as Hilton says it increases plant efficiency and reduces the maintenance costs associated with single stage economised compressors.

In the latest facility, which for the time being is being run as a +4°C chiller room, the evaporators have aluminium fins and stainless steel tubes.

As the chiller is some 500 metres from the plant room, should it be run as a freezer at a later stage, there are plans to build a two-stage plant close to the chamber and to run the evaporators at -40° C.

This will be done by installing a small plant room that will use carbon dioxide as the primary refrigerant, and ammonia as the secondary refrigerant. Hilton says this will save on running costs, and make for a more environmentally friendly plant operation.

Heat infiltration has been minimised in many ways. 250mm of expanded polystyrene lines the ceilings, and 200mm of lining is in the walls.

All of the cold store's delivery docks are also fully sealed with airlocks. When a vehicle arrives, an airbag interlocks with the vehicle and the door, preventing any outside air from entering.

The building's external walls and roof have been designed to minimise solar heat gain via ventilation, with the portal frame containing the building fully clad to shade the insulation panels.

Ground level louvres channel air through the walls and up into the attic space, where wind cowls and a ventilated ridge reduce the air temperature.

### IT solutions

The final key component of Oxford's operation, at least as important as building design and engineering, is the IT systems.

The company was an early adopter of radio frequency



Air defrost doors

technology for stock control, embracing it in 1994 to aids full traceability and very high accuracy of stock.

Today it manufactures and sells the technology to other cold stores, through its technology arm, Radio Terminal Systems. The company owns the intellectual property of all of its computer hardware and software.

Hilton says the company was effectively forced into buying the source code after a series of upgrades by its commercial suppliers left it without the technical support it needed to run its systems smoothly. Now, Oxford's warehouse management system can be accessed online by its customers.

"We don't need to send faxes, e-mails, (or make) telephone calls. (Clients) just send an order, it gets dispatched electronically and we can raise a big order seamlessly, in real time," Hilton says. ■



High stage screw compressor