

When the AFL extended its influence into the rugby league stronghold of south-east Queensland, it did so by importing the best player of his generation into a team of young talent. In many ways the refrigeration design of Metricon Stadium, home to the Gold Coast Suns, reflects a similar approach. Sean McGowan reports.

# REFRIGERATION KICKS GOALS



Built on the site of the former Carrara Stadium, the \$144 million Metricon Stadium project was jointly funded by the Queensland and Commonwealth governments, Gold Coast City Council, and the AFL.

Primarily designed to host AFL matches featuring main tenant the Gold Coast Suns, it is also capable of hosting ICC cricket matches, concerts, festivals, IAAF athletics events and FIFA World Cup soccer matches.

In 2018 the stadium will also be home to the opening and closing ceremonies, as well as the athletics competition, when the Gold Coast hosts the Commonwealth Games.

Designed to accommodate 25,000 spectators, with the capability of being extended to 40,000 seats in the future, it has been described as one of the most environmentally advanced facilities of its kind anywhere in the world.

The stadium boasts a “solar halo” – an elaborate photovoltaic array built into the stadium’s roof canopy, capable of generating up to 275mW/h of energy annually.

It also has a state-of-the-art refrigeration system designed to deliver substantial energy cost savings while meeting wild load swings.

The energy-efficient refrigeration system was designed by Brisbane-based Realcold Australia, a specialist refrigeration and air conditioning components wholesaler.

Of course, this took place amid the advent of the carbon price, and an environment of escalating electricity prices.

In consultation with its client, Realcold made the decision to embrace energy-efficient refrigeration equipment emerging from Europe, including compressors and variable speed drives.



*Inside the Metricon Stadium.*

"Catering for refrigeration requirements at major sporting venues can be challenging, due to the enormous swings in load," says Vaughn Strydom, M. AIRAH, who headed up the refrigeration design for Realcold.

These swings result from capacity crowds on match days, where demand on the refrigeration system skyrockets as bars and food catering facilities around the stadium aim to serve thousands of patrons within the space of just a few hours. This peak is followed by days or weeks of very low or no demand, until the stadium once again hosts a match.

"With energy efficiency being a key design requirement, self-contained integral refrigerators could not be used due to the additional load these would have placed on the air conditioning system," says Strydom.

"Fractional horsepower machines were also not practical due to the long pipe runs involved in this kind of application, and the sheer number of locations required. With the swings in demand, it would also have meant that the system would either be under capacity or short-cycling."

The solution was a system designed around high-performance condensing units and a refrigeration

load distributed as evenly as possible across each of the stadium's service areas. Local firm Coldwell Refrigeration handled the installation and commissioning.

The 14 condensing units, based on high-efficiency semi-hermetic reciprocating compressors from an Italian manufacturer, operate on HFC refrigerant blend R404A.

To meet the project's energy targets, eight compressors are equipped with German-built variable speed drives (VSDs) with a total cooling capacity of 140kW. This is thought to be a unique pairing of the two technologies, using up to 40 per cent less energy than a conventional system.

The condensing units serve some 72 different loads across the stadium, including cold rooms, freezer rooms, under-bar refrigerated counters, upright glass-door display cabinets, blast chillers and blast freezers. The eight condensing units equipped with VSDs cool all perishable food, as well as support in-bar bottle cooling equipment.

The six compressor-only systems are used on match day to augment beverage cooling.

Along with a 40 per cent saving in energy consumption, the solution has delivered a remarkably well-balanced system to the stadium's operators. The result? Energy usage closely following that of the load requirements.

"The key was to balance the cooling load across the system as far as possible, to ensure the equipment operates as efficiently as possible," says Strydom.



*Metricon Stadium is one of the most environmentally advanced facilities of its kind.*



Inside the plant room.

“The use of inverters ensures that output can be matched as closely as possible to the varying load, to cater for peaks and troughs that occur in the use of the stadium.”

Rod Holder of Coldwell Refrigeration worked closely with equipment supplier Stoddart Manufacturing and the stadium’s management during installation. This ensured each aspect of the project was completed to a high standard, and refrigeration performance was achieved.

## FURTHER LEARNING

To maximise plant energy efficiency and develop the design team’s sustainability credentials, members of Realcold completed the AIRAH Plant Optimisation course run by AIRAH in conjunction with Oxford Cold Storage and Andrew Pang, Ass.AIRAH.

Similarly, locally run CO<sub>2</sub> and hydrocarbon courses were also completed.

Strydom managed all elements of the design phase, including computer modelling using the compressor manufacturer’s own software. Strydom also researched the use of refrigerant-containment initiatives developed by Realskills Europe, with information about this subject being disseminated across the Australian industry.

These have been applied at Metricon Stadium as part of a company-wide commitment to promote comprehensive refrigerant-containment measures in Australia.

“In regards to the refrigerant-containment initiatives, it is our belief that by purely helping to educate the industry on the effects of refrigerant on the environment, common leaks and solutions, we can improve the everyday practices of every refrigeration technician,” says Strydom.

“With fewer leaks comes an extended equipment life, less cost to the end user and fewer ozone-

depleting particles entering our atmosphere, as well as less global warming potential caused by our industry.”

## KICKING GOALS

The “solar halo” delivers up to 20 per cent of the stadium’s total electricity needs, and a 650,000L rainwater harvesting and storage system saves a considerable amount of water. The refrigeration system’s small environmental footprint also contributes to Metricon Stadium’s status as a world leader in sustainability.

According to Giovanni Lo Nero, sales area manager for Italian compressor manufacturer Frascold in Australia, the refrigeration system design is a worthwhile investment.

“It’s a superb system and matches the strong environmental credentials of the outstanding facility as a whole,” he says. “Over time, it will deliver a huge reduction in energy consumption that will translate into serious savings for the operator.

“As energy costs continue to rise, and demand for environmentally responsible cooling grows, we believe energy-saving technologies such as this will grow significantly in popularity. Payback times are reducing as power costs increase. It is proven to be a worthwhile investment that pays for itself very quickly.” ▲

## PROJECT AT A GLANCE

### The professionals

**Developer:** Watpac

**Funding partners:** Queensland government (through Stadiums Queensland), Commonwealth government, Gold Coast City Council and the AFL

**Refrigeration contractor:** Coldwell Refrigeration

**Refrigeration designer:** Realcold Australia

**Stadium architects:** Populous

**Stadium operator:** Gold Coast Suns

### Equipment at a glance

**Compressors:** Frascold D and Q models

**Food service equipment:** Stoddart Manufacturing

**Variable speed drives (VSD):** Lenze



Setting up systems.