

New World Install First NZ CO₂ Solution

FOREWORD



NEW WORLD

The first transcritical carbon dioxide refrigeration system in New Zealand has been installed in a supermarket at Devonport, Auckland. It is equipped with control and monitoring systems

by Resource Data Management (RDM), ensuring the smooth running of the plant and optimising energy use across the store's advanced integrated cooling and heating system.

THE CHALLENGE

The New Zealand government is introducing tough controls on the use of synthetic hydrofluorocarbons (HFC) refrigerants. This takes the form of a levy on sales of refrigerants with a high Global Warming Potential (GWP) under the country's Emission Trading Scheme. Cooling technologies based on high GWP HFC refrigerants will be subject to sharp rises in costs, with users facing significant additional

expense in the event of a major leak. As a result, end users are searching for safe and efficient alternatives in order to reduce potential emissions and future-proof their businesses. New World supermarket, based on Auckland's North Shore, is owned and operated by John Ashton, a businessman with an enlightened view of environmental issues with a willingness to explore innovative

solutions. As part of a planned refurbishment of the 26-year-old supermarket, Mr Ashton was seeking to replace the existing refrigeration system and cabinets throughout the store. The challenge was to design a safe, efficient and reliable system that was not reliant on HFC refrigerants. John Ashton worked closely with EcoChill on a fresh approach to meet these requirements.

THE SOLUTION

The solution, designed, built and installed by EcoChill, is based on a transcritical CO₂ refrigeration pack with a linked heat recovery system. This harnesses waste heat from the high temperature condensing side of the refrigeration system to generate hot water for use in-store heating and the domestic water supply. At the heart of the system are two newly designed and constructed CO₂ packs: a booster system provides cooling to the Low Temperature (LT) and some Medium Temperature (MT) equipment, with the remainder of the MT load being cooled by the second CO₂ pack. The heat recovery circuit draws energy from both packs to heat the retail area of the store, as well as providing hot water to meet the store's entire hot water requirements. The air conditioning system, also upgraded as part of the project, has been integrated into the store's refrigeration and heating system, to create "a single store energy system".

The installer removed the standard control system supplied with the

packaged air conditioning unit, replacing it with an RDM Intuitive TDB Controller, in order to provide a comprehensive overview of the entire mechanical and refrigeration system in operation. Matthew Darby, Managing Director of EcoChill, says: "The key to delivering an energy efficient solution is, first, to ensure effective control of the transcritical refrigeration system; then, second, to fully integrate this with the heat recovery, heating and air conditioning systems – to manage it as one seamless, integrated system." RDM plant equipment was chosen to deliver this, controlling and managing all aspects of the system's operation. It is based on RDM's Data Manager, with Mercury case controllers for the refrigerated display cases, an RDM Intuitive Controller for the control of the Transcritical CO₂ Pack, and hubs for remote pressure control. Programming was carried out by a Technical Engineer within EcoChill.

The RDM system manages and optimises energy use across the

store for:

- Refrigeration
- Heat Recovery
- Air Conditioning
- Store Heating
- Energy Optimisation
- Hot Water

The RDM system brings together full oversight of all these, maximising the use of free heating in winter and initiating and controlling recirculation of cool air for free cooling in summer. "We harnessed the ability of the RDM system to enable suction and gas cooler pressures to float, resulting in a reduction in system compression ratios, thereby optimising performance," says Mr Darby. "We are also using RDM systems to monitor store conditions, including temperature and humidity, to ensure we provide the ideal climate for overall efficiency and performance of the store." The company is collecting energy and performance data to evaluate the efficiency of the plant.

THE BENEFITS

The new plant has only been up and running for a relatively short period, however early indications are that the system is delivering "a double-digit percentage reduction in energy use" compared with conventional systems. Mr Darby says: "The store is very energy-efficient. Although the total amount of refrigeration in the supermarket has been increased, the power required to run the system has been reduced. In addition, the

new system provides the store with free hot water and free store heating in winter." John Ashton, owner of the store, said: "I am delighted with the new plant and the benefits in terms of improved control and monitoring. The previous system was proving costly to maintain and operate. As a result of a forward-thinking approach, we have been able to modernise and increase use of refrigeration at the same time, while reducing energy use

– and benefiting from free heating. It is a win-win for the store, our customers and the environment." As a result of learning on the project and subsequent analysis of data provided by the RDM system, EcoChill has already identified improvements that will help to make the system even more efficient and reduce power consumption further in future.

