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Case Study: Energy Efficiency Best Practice Industrial Refrigeration

Mushroom Exchange Mernda Mushroom Production Plant

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Improving performance and saving energy in industrial refrigeration

By making simple changes to their refrigeration systems, Mushroom Exchange reduced their overall site energy consumption by 307,000 kWh per year, abating around 455 tonnes of carbon per annum.

The opportunity: save money and energy

Mushroom Exchange is the largest producer, packer and marketer of fresh mushrooms in the southern hemisphere, producing around 230 tonnes of mushrooms each week and supplying in excess of 30% of the Australian market.

The cooling system at its Mernda plant, made up of Trane reciprocating refrigeration compressors, serviced six mushroom spawn running rooms. This technology was operating at below optimum levels, with significant opportunities for efficiency and cost improvements. As well as improving the energy efficiency of the plant, Mushroom Exchange wanted to improve the refrigeration capacity of the rooms and productivity of the plant.

The solution: review and upgrade the current system

The solution involved upgrading the technology and improving the efficiency of the cooling system.

Step 1: After reviewing several options, Mushroom Exchange decided to replace the old compressors with high-efficiency Turbocor compressors from Airmaster Australia. The Turbocor compressor typically uses 40% less power for the same cooling output when compared to other, similar-sized compressors. The units are half the size and one fifth the weight of the same capacity reciprocating compressor, are extremely quiet and use ozone and greenhouse gas friendly refrigerants. The compressors have in-built soft starters and variable-frequency drives, meaning the compressor operates to match the load.

Step 2: Air handling units servicing the spawning rooms were converted from direct expansion units to chilled water type.

Step 3: Cooling capacity for the rooms was increased by 50% to cope with the higher loads imposed on the spawning rooms due to higher throughput. Through improved temperature control throughout the process cycle, yield increased from each room by approximately 10%. The system was designed to maximise efficiency. Two 900 kW PowerPax chillers, utilising a total of six Turbocor type compressors and feeding a common chilled water circuit, were installed to all 12 air handling units.

The benefits: leaner, greener production

The cost of purchase and installation of the new system was $365,500 – the Turbocor compressors being over 50% more expensive than a similar capacity reciprocating compressor. However, the total expected annual cost savings compared to the alternative option of purchasing two 900 kW screw compressor equipped chillers (at an estimated cost of $233,300) was $31,743. Therefore, the payback period on the additional investment was 4.2 years.

The Department of Innovation, Industry and Regional Development provided funding of $66,100 to assist the upgrade. The funding also helped the company accept the potential risk associated with the new application of the technology and to demonstrate its application for future installations.

The new refrigeration system saves about 407 tonnes of carbon per annum and around 48 tonnes per annum from the alternative refrigerant. Total carbon abatement was 455 tonnes per annum.

As well as the energy savings, the compressors operate at less than 70 dBA, reducing noise levels significantly and improving the work environment. The new, oil-free compressor also means Mushroom Exchange no longer has to dispose of 80 litres of oil per annum.

With over 6000 kW of cooling in service throughout their Victorian operations, Mushroom Exchange will consider installing the new technology in its other facilities.

For more advice

The **Energy Efficiency Best Practice Guide to Industrial Refrigeration** is a step-by-step guide to gaining maximum efficiency from your refrigeration system.

The ResourceSmart Business program helps businesses across Victoria improve resource efficiency and manage the risks and opportunities presented by climate change. For further information on making your business ResourceSmart, visit www.resourcesmart.vic.gov.au or call 1300 363 744.

"We have been really happy with the outcome of this project. These types of projects help us think 'outside the square' and challenge the way we do things. We intend to continue to refine our processes to improve energy efficiency and reduce our carbon footprint. This program has helped us realise just what can be done."

Peter Verbyla, Engineering Projects Director

"The new compressor installation and commissioning was hassle free. Since we installed the units, we have found that we can run the mushroom spawn rooms at much tighter temperature profiles because the new plant can more than handle high temperature variations over the total cycle, improving yield by about 10%. The energy and greenhouse gas savings have been fantastic, but this yield improvement was something we just didn't expect – it was a great bonus."

Andrew Ronalds, Maintenance Manager