



Energy Efficiency

#2 FRUIT PRODUCTION - COLD ROOMS

This farm grows avocados and vine fruits in the warm temperate climate of the Toowoomba region in southeast Queensland.

This business is a complex operation featuring grading lines, packing operations and supporting facilities (office, lunchroom).

This case study will concentrate on its refrigeration facilities. The on-farm cold rooms and packing operation also receive produce for contract packaging from other growers, putting extra pressure on the cold room facilities to store the additional produce.

The total packing shed area is 1,440m², housing the grading and packing lines as well as the cold storage. The business includes 3 separate cold rooms varying in volume between 144 and 240m³, and with compressors ranging between 3 and 31kW. The three cold rooms use three different refrigerants (R22, R134A and R404A).

The compressor motors are the major energy users in the cold rooms, contributing to between 80 and 95 per cent of the total energy use. Internal lighting is the smallest contributor (less than 2 per cent), while the evaporator fans and condensers contribute between 2 and 12 per cent of consumption. The compressor motors vary in age; one is 5 years old, one is 10 years old, and one is new having just replaced another 10 year old motor.

All up, the cold rooms consume 52,666kWh per year. That's a bit over half (55 per cent) of the electrical energy consumed in the packing shed and about 52 per cent of the farm's total electricity consumption.

Clearly, there is scope for significant savings through maximising the energy efficiency of the cold rooms.

System maintenance

A well maintained system will run more efficiently, be more reliable and have a longer lifespan. Regular maintenance can, on average, save you 5 per cent of the energy costs and can ensure longer service life of the equipment, reduce service costs and lower the risks of breakdowns.

Regular maintenance should include:

- following recommended defrost procedures
- checking door seals and insulation
- ensuring temperature thermostats are operating correctly by doing regular calibration
- checking insulation on pipes and repair damages
- cleaning the condenser and check the fan, fan guard and pump
- cleaning the evaporator
- checking the operation of the defrost system, condition of fans and safety equipment
- checking for undue noise and vibrations
- checking the operation of all safety controls.

Cool room design

To lower electricity costs for refrigeration, it is important to have a well-insulated cool room without air-leaks and to minimise the temperature of produce before it goes into cool storage. Up to 30 per cent of heat load in cool rooms can come from air exchanges when cold air escapes through poorly sealed doors.

Plastic strip curtains are a cheap and efficient method to keep the cool air inside when shifting produce to and from the cool room. Automatic doors may be an option for larger enterprises.

The orientation of packing sheds, cool rooms, docking facilities, standing tarmac, pre-coolers, offices and the surrounding area will have the greatest efficiency impact. Packing shed doors and openings should preferably face south, and cool rooms should be placed in the southern end of the shed. If your packing shed doesn't meet these requirements, it will be worth considering additional shade provided by structures or vegetation.

Disclaimer: The examples in this fact sheet are provided for general information and do not constitute financial advice. We encourage growers to seek specialist financial advice before making significant investments.

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Equipment upgrades

Modern refrigeration plant can be much more energy efficient than older designs, incorporating newer technologies such as energy efficient motors and variable speed compressor drives. However, these kinds of upgrades require significant outlays and are probably best considered for new facilities or when existing equipment must be upgraded.

Management

Ensuring the cool room is full but not overloaded

- keeping heat sources away from the cool room
- ensuring that doors are kept shut
- installing strip curtains and/or rapid doors.

Action

The farm owners have taken the opportunity to replace an aging compressor motor with a more modern and efficient unit. No further action has been taken so far in regards to energy efficiency in the cold rooms.

More information

Further details are contained in Growcom Energy Efficiency factsheets, available from the Growcom website.