

# Energy Savers Plus Program

targets significant energy savings for  
Queensland meat processors

Proposed  
Solution



Potential  
site energy  
savings

13%

## Key facts

### Q Farm / Industry

Beef Cattle, Sheep & Pigs

### Product

Meat processing

### Production Metric:

Hot Standard Carcass  
Weight (HSCW)

### Location

Southern Queensland

### Case Study Focus

Refrigeration Systems

### Solution

**Proposed:** Evaporator fan  
speed control

## Site profiles

Energy audits were completed for several meat processors in Southern Queensland that process mainly beef cattle as well as sheep and pigs. Refrigeration accounts for between 46% and 55% of energy consumption at each site with multiple cold rooms and refrigerators in operation.

Cold rooms operate at different temperatures to accommodate meat in various stages of processing and storage prior to transport. Refrigerated cases are also used for display of processed meat for retail sale on site.

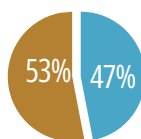
## Typical energy demand

### Typical Site Energy Consumption Breakdown

Refrigeration = 47%

Other (including air  
compressors and lighting) = 53%

\*Hot water is gas (excluded from  
% calculation)



Total = 421 MWh p.a.

Post implementation total usage  
would reduce to 373MWh p.a. after  
evaporator speed fan controls  
introduced.

Refrigeration electricity consumption at the  
processing facilities typically consists of:

- Condensing units servicing cool rooms  
and freezer rooms
- Refrigerators and display cases
- Refrigerated containers

## Action

Audits of site energy consumption  
evaluated:

- Evaporator fan speed control by variable  
speed drive
- New evaporator installation with  
electronically commutated fans

Long-term consolidation of refrigeration  
systems, or change to (Centralised 407F  
Rack) Transcritical CO2 system a common  
recommendation with paybacks averaging  
6.2 years.

## Results

Many evaporator fans at the meat processing  
facilities are typically not speed controlled  
and either operate at full speed or cycle off  
as required. The heat from the fan motors is  
continuously introduced into the cold rooms  
which reflects as a load on the refrigeration  
system.

The savings available by reducing fan speed  
are significant as its electricity consumption  
or the fans power requirement is directly  
proportional to the cube of its speed. So,  
reducing the fan speed by 20%, for example,  
would reduce the fan power requirement by  
approximately 50% but only reduce flow  
rate by 20%. In this way, reducing the fan  
speed leads to energy cost savings due to the  
increased fan efficiency at lower speeds as  
well as reducing the heat load introduced to  
the room.

A common energy conservation measure  
recommended across several meat processing  
facilities is the implementation of variable  
speed controls on evaporator fans with  
temperature control logic allowing the fans  
to operate at a lower speed with significant  
electricity savings.

In cases where replacement of the entire  
evaporator assembly is required and for  
new installations, new evaporators with  
electronically commutated fans should be  
considered.

The Energy Savers Plus  
Program was funded by the  
Queensland Department of  
Energy and Water Supply



# Recommendations

The energy audit recommendations are summarised below:

## Solution



Evaporator fan speed control by variable speed drive installation

Site	Site A	Site B
Est. energy savings (kWh/annum)	89,997	6,215
Est. operating cost saving	\$19,331	\$1,392
Est. cost to implement	\$76,000	\$5,000
Payback period (years)	3.9	3.6
Est. energy savings	25%	37%

Two other sites were estimated to achieve payback in just over five years by implementing evaporator fan speed controls.

## Forecast savings in production costs

	Site A	Site B
Baseline Electricity consumption (kWh / tonne)	110	200
Electricity savings (kWh / tonne)	16 (14.5%)	22 (11%)

The audits have also recommended over the long-term, that the businesses consider consolidating multiple independent refrigeration units to a centralised rack system with a single air-cooled condenser or Glycol/Ammonia CO2 systems. These projects had a high capital cost, with payback period ranging between 5.7 and 9.8 years depending on the age and condition of the existing systems.

### Quick Wins from audits for refrigeration systems:

- Increase air flow to condenser units – ideal location is south facing wall or a sheltered area and separating the units from each other and the wall by at least a condenser fan diameter
- Providing insulation to suction lines for condensing units
- Relocation of liquid line solenoid valves close to evaporator units

### Update

Recommendations for improvements to evaporator speed controls as well as the quick wins recommendations are being implemented at one site already.

**This case study was originally developed in 2017 as part of the Queensland Government funded Energy Savers Plus Program, delivered by the Queensland Farmers' Federation.**