

Case Study – Canon Foods



Canon Foods is a Canning Vale based food business which manufactures three main product types:

- 1) heat and eat foods
- 2) cooked and diced meats and
- 3) value added meals

The business operates Monday to Friday and the occasional Saturday and uses both and natural gas for energy in its operations. It is a medium sized business employing approximately 40 staff and used 1,133MWh of electricity in 2007/08 and 1,175MWh of electricity in 2008/09. A typical production day is approximately 14 hours long.

In March 2009, it was selected as a demonstration site for food manufacturing businesses as part of Perth Region NRM's Development of Sector Specific Energy Management Action Plan (EMAP) Program, funded by the Government of Western Australia's Office of Energy.

A desktop and Level 2 Energy Audit of Canon Foods was conducted which identified ways in which the business could improve its energy use.

This involved collecting real-time as well as historical energy use data, the compilation of an equipment inventory, staff surveys and data analysis of this information.

Canon Foods is situated in a building insulated with 100mm polyurethane sandwich panelling and hollow bricks. The site serves as the production factory, main office and also houses a small retail store.

Sub-metering of various areas of the business combined with an equipment inventory, equipment monitoring and the completion of equipment use logs by staff resulted in electricity use in the business being categorised into the areas of:

- Chilling – 67.6%
- Cooking – 23.8%
- Office equipment – <1%
- Lighting <1%
- Heating, Ventilations & Air Conditioning – 1.5%
- Packaging – 1.2% and
- Other equipment – 4.4%

Chilling – The main user of energy in the business (780MWh a year), this includes all fridges, coolrooms, freezers, blast freezers and room chillers. These operated 24 hours a day, 7 days a week prior to the Energy Audit and Audit Report. The main storage compressor accounted for the largest share of the electricity use in this category (31%), followed by the ammonia system/spiral freezer (27%) four separate cooling systems and the remaining stand alone refrigerators.

Cooking – The second highest energy use area, this includes all equipment used to change products from raw to cooked or partially cooked products. Cooking equipment accounts for approximately 274MWh of electricity use every year. The majority of energy in this area was used to operate two large electric ovens (60%) with other major energy using cooking equipment including the grill, fryer, mincer and former. The operation of the bowl chopper, blender, crumbing machine, pre-dust machine, battering machine, shredder, massager mixer and flaker makes up the rest of the cooking equipment.

Office equipment – Includes all computers (69%), monitors, security recording equipment, printers and photocopiers.

Lighting – This was provided predominantly by T8 fluorescent tubes with some external mercury vapour spotlights and internal 12V dichroic halogen down-lights. Lighting costs per each area of the business was determined and indicated that most energy was used to illuminate the factory floor (69.5%). Other main lighting provisions covered external security lighting (12%), toilet and amenity areas (11%), the retail store and the office.

Heating, Ventilation & Air Conditioning (HVAC) – Consisting of a central air conditioner in the office, a split reverse cycle air conditioner and an evaporative ACU in the forming line, HVAC accounts for approximately 1.5% of overall electricity use in the business.

Packaging – This includes a vacuum packer (58%), packing machine (29%), taping machine and a printer.

Other equipment – Consisting of all other equipment not covered by the above categories, the majority of electricity use in this area went towards operating the air compressor (61%), hot water urn (15%) and fork lift battery charger (13%). Other items in this category included air curtains, vending machines, a television, microwave and exhaust fans in amenity areas.

Gas Use - Natural gas is used in Canon Foods to boil hot water in the gas cooker, provide hot water for cleaning and for general hot water supply. Natural gas accounted for 23% of energy use in Canon Foods and there was a 25% decrease in natural gas use in 2008/09 compared to 2007/08 due to the installation of new gas hot water heaters.

While natural gas accounted for 23% of Canon Food's overall energy use, it represented 13% of total energy costs compared to 87% for electricity. Natural gas is generally cheaper to use and has less greenhouse gas emissions associated with its use.

The following Audit Report recommendations were made upon completion of the Level 2 Energy Audit:

- Developing an Energy Policy and Energy Action Management Plan – No cost. Tracks energy use and develops a system for managing energy use. This includes tracking production outputs for benchmarking purposes.
- Staff education and engagement – No cost.
- Turning off or down appliances that are not in use - No cost. Work planning to reduce equipment stand-by time for unused machinery, turning lights and HVAC systems off in unoccupied areas and enabling energy saving modes on electronic equipment.
- Reducing equipment use – No to low cost. Turning off urns and boiling water units on weekends and when not in use (utilising the existing programmable timer on the urn) and the use of digital timers for vending machines and amenity extractor fans.
- Reducing air infiltration – No cost. Closing doors to air conditioned areas.
- Reducing wastage in and improving the refrigeration systems – Developing an in-house maintenance program, identifying and repairing leaks, replacing worn gasket seals, installing air curtains, using waste cold air emitted from the spiral chiller for cooling the forming line room, improving refrigerant pipe insulation, monitoring refrigerant filters and charge and cleaning and defrosting evaporative coils for the main freezer.
- Improving building design/performance – Ensuring that external doors are closed to reduce heat gain in summer, installing shading for the freezer, installing shading for the North facing refrigeration and freezer compressors, thermal modelling to determine insulation improvement potential, use of energy efficient lights and de-lamping excessively lit areas.

Following presentation of the Level 2 Energy Report findings to Canon Foods Management, staffs was engaged with energy saving actions in the business. Management at Canon Foods researched energy efficient options for existing equipment and many low and no cost actions were undertaken.

Management were keen to further progress the recommendations of the Energy Audit and Report and researched available external assistance in terms of funding and support. An application was submitted to the Commonwealth government's Re-tooling for Climate Change Fund in August 2009. This application is being considered by the Commonwealth to assist with the implementation of the key energy saving opportunities identified in the Audit Report.

The Re-tooling for Climate Change Application seeks to cover half the cost of purchasing and installing (dollar for dollar funding) more efficient plant and equipment specifically:

- Replacement of the two old electric ovens with one energy efficient gas oven. The existing ovens are responsible for 14.4% of Canon Foods' electricity consumption. Using an efficient gas oven has the potential to reduce oven energy use by 50% with a corresponding 90% reduction in GHG emissions due to the use of natural gas instead of electricity. Dollar savings would also be realised by the business.

This oven will also allow decommissioning of the gas boiler. While the gas saving as a result of decommissioning the boiler is hard to quantify, a further 6,000 Litres of water a week would be saved. Management have committed to the purchase of the new oven with or

without government funding.

- Replacement of the existing shock chiller with a more efficient blast chiller. The shock chiller currently operates for 24 hours a day, four days a week. A suitably sized blast chiller could provide the same level of cooling in 2 hours use a day. Electricity and GHG reductions of up to 60% could be achieved.

The blast chiller will also replace the existing water bath for cooling product and result in savings of 1,920 kilolitres of water every year. External funding will be required to help meet the cost of this upgrade.

- Waste heat recovery for pre-cooling cooked product. Engineering modifications will allow for waste air from the spiral freezer to be redirected to incoming product. This would reduce the load on the spiral freezer through less chilled air loss and lower incoming product temperature. This will be implemented and funded by Canon Food's management even if no external funding support is received.

Estimated Energy savings from these three actions – 179.34MWh/annum

Estimated GHG savings from these three actions – 147 t CO₂^e

Estimated cost saving - \$39,170/annum (based on Synergy's current P02 tariff rate)

The actions taken at Canon Foods to date as a result of the Energy Audit Report and Energy Management Action Planning are listed below.

- Development of an Energy Policy – including energy efficiency requirements for new equipment, whole of life costing for equipment acquisition.
- Staff training in energy awareness.
- Equipment is turned off after hours (urns, vending machine).
- HVAC is turned off in unused areas instead of only at the end of each shift.
- Consolidation of refrigeration systems allowing some coolrooms to be turned off every night and the shock chiller to be turned off on weekends.
- Lighting turned off after every shift and cleaners are only turning on lights in areas being cleaned.
- Energy saving modes have been enabled on office equipment which is now turned off every night.
- Staff are closing external doors and doors leading to cooking areas to minimise heat gain.
- An annual review of monitoring, calibration and maintenance program for the chillers has been put into place.
- The implementation of a maintenance program for equipment seals.
- The inclusion of an external refrigerant delivery system check in the annual maintenance program for chillers.
- A reduction in the use of inefficient display fridges.

Further actions being considered by Canon Foods include:

- Investigating the use of sensor operated defrost systems for freezers.
- Reviewing lighting provision and the suitability of LED or T5 fluorescent lighting systems to replace existing lights

Results:

While it is still too early to quantify energy savings (the Level 2 Energy Audit findings were presented to management in February 2010), there is some encouraging evidence of a reduction in energy use in the business when compared to production output.

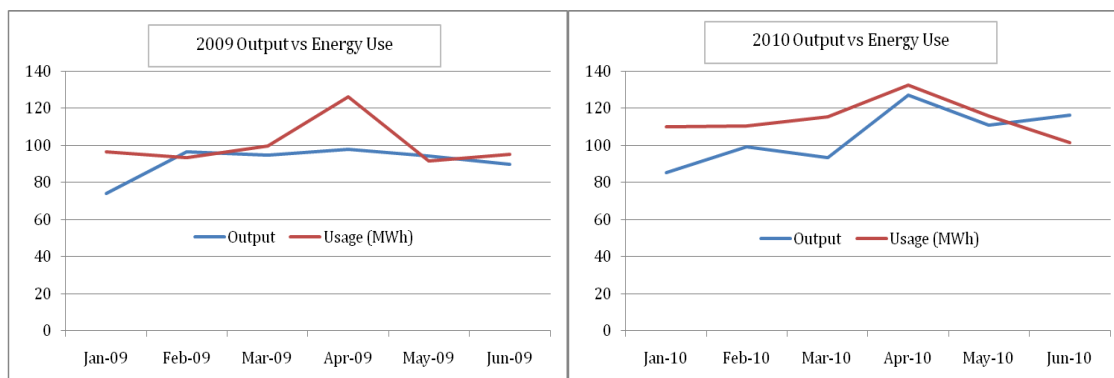
Canon Foods began tracking the tonnes of products produced as a result of the EMAP project at the start of 2009. 2010 has seen an increase in production at Canon Foods (up 15.65% in the first six months of the year from 2009) mostly in the area of “Heat and Eat” products.

In the same period, electricity use increased by 14.7% at Canon Foods.

While this may not seem like a large efficiency gain, the “Heat and Eat” production process at Canon Foods is the most energy intensive of their processes (more so than Value Added and Cooked and Diced Meats) as it involves the use of equipment in the forming line.

Examination of climate data from the Bureau of Meteorology also suggests that the summer of 2009/10 was on average, 1°C warmer than the mean monthly average for summer in 2008/09 which would place more heat load on chillers, Canon Food’s main energy use area.

The first four months of 2010 saw an overall increase in electricity use at the site. However, the ratio of electricity used per production tonne has decreased by 1.36% despite the production increase being predominantly in the energy intensive “Heat and Eat” line. This is shown in the following graphs.



This efficiency gain is conservative as no data has been kept on the increase across the three different product areas, only on final production output for the areas combined. It is estimated that the actual efficiency gain would be greater than 1.36% for the following reasons:

- Production increases have been in the most energy intensive area of “Heat and Eat” and not the lower energy intensive areas of “Diced Meats” and “Value Added” products.

- Level 2 Audit Recommendations were only provided to management in mid-February 2010 and hence, many actions were not implemented until after March 2010. In fact, when Production Output and Electricity use for the four month period March 2009 to June 2009 is compared to data from March 2010 to June 2010, an efficiency gain in electricity of 5.2% is realised.
- The Average Mean monthly temperature for summer 2009/10 was warmer than the Average Mean monthly temperature for summer 2008/09 by approximately 1°C.

It is estimated that a 5% gain in efficiency has been made in electricity use as a result of the implementation of the low to no-cost recommendations made in the Level 2 Audit Report.

Further gains are expected from replacement of the inefficient ovens and from the utilisation of waste air from the spiral freezer as well as, subject to Commonwealth funding, the replacement of the shock chiller.

A conservative 1.36% gain in efficiency would save 17.4MWh of electricity per annum. At the average unit cost (for 2009/10) of 18.53c/kWh, this would equate to a saving of \$3,200.

A 5% gain in efficiency would save 64MWh of electricity per annum. At the average unit cost (for 2009/10) of 18.53c/kWh, this would equate to a saving of \$11,850.