Simplot Australia is a wholly owned subsidiary of US-based J.R. Simplot Company, a privately held food and agri-business corporation based in Boise, Idaho. It has manufacturing facilities in the Australian states of Tasmania, Victoria and New South Wales.

This case study focuses on Simplot’s plant in Devonport, Tasmania, which produces frozen vegetables under the Birds Eye and Edgell brands. The electrical energy use of the site is over 18,000 MWh each year, about 70% of which is used in the refrigeration and freezer tunnels. The natural gas use is about 40,000 GJ per year.

**Business Benefits Achieved**

Changes to the plant’s refrigeration control system, including the installation of variable speed drives (VSDs) and variable head pressure control (VHPC), may have reduced refrigeration energy use by up to 10%.

The installation of the VHPC allowed the Devonport plant to continue operating despite an electrical failure that caused the loss of two compressors during a peak harvest period in 2011. This avoided the potential loss of up to one third of the season’s pea production.

The plant still often operates without the need for two of the compressors during the summer peak processing season. The energy savings continue to accrue from optimal control, however the major benefit of improved control is the reduction of risk due to the improved flexibility and redundancy available to cope with any production situation.
Global Energy Management System Implementation: Case Study

Business case for systems optimisation

Simplot has been actively pursuing savings in energy use through increased energy management for many years. Around 2008 Simplot decided to invest in a more dynamic data collection and monitoring system to improve energy management at its Devonport facility. This was driven by several converging factors:

- the introduction of the Australian Government’s EEO Program
- an unprecedented increase in energy prices
- Simplot head office introduced its global ‘25 in 10’ program – a target to reduce energy intensity (energy use per tonne of production) by 25% over a 10 year period from base year 2008.

A key area for development was energy metering and monitoring to measure, plan, carry out and assess energy saving activities. This was followed by an optimisation project for the refrigeration system.

Implementation of systems optimisation

Improved metering

Prior to 2008 the only energy use data being collected was from meters on incoming energy and a couple of the main switchboards. These meters were read and manually recorded each month. There was very little analysis of the data, which was primarily used as an input to financial reports.

Simplot decided to invest in a metering system that would improve their ability to understand and improve energy performance. Electricity and flow meters were installed and integrated into the plant’s Supervisory Control and Data Acquisition (SCADA) system.

Integration of data into the SCADA system

The SCADA system (see a screen shot in Figure 2) consists of a user interface and programmable logic controllers (PLCs) for data collection and control. All processes are controlled by a local PLC, which is supervised by a central computer system. Data is stored on a historian, which is programmed to store data for long periods of time and to create reports for production and energy use.

The SCADA system was improved by programming the PLCs to collect energy use information, and with optimal control algorithms for the refrigeration systems to minimise energy use. Energy use trends were configured to allow operators to view real time energy use, and the historian was programmed to collect daily energy and production data to create energy performance indicators for all key processes.

What is systems optimisation?

Industrial processes are subject to numerous variables, which have traditionally required skilled and experienced operators to maintain optimal operating conditions.

Modern systems optimisation technology allows for this experience and judgment to be understood, modelled and automated. It sits above existing process control systems (Figure 1).

Figure 1: Systems optimisation sits above the existing process control system
Optimising the refrigeration system

Refrigeration has been a focus for energy efficiency at Simplot’s Devonport plant due to the high cost of electricity and the need to have high equipment and process availability during vegetable processing seasons.

Previously the compressors often worked at only part-load, which resulted in unnecessary energy consumption. The key projects that have led to improved energy performance are the installation of a variable speed drive (VSD) on a key compressor to improve efficiency at part-load, and the introduction of variable head pressure control (VHPC) to take advantage of ambient conditions. To equip the logic controllers to recognise ambient conditions, temperature and humidity sensors were installed throughout the plant.

The logic controllers have also been programmed to stage the operation of the compressors based on plant load. Compressor selection is optimised to maximise energy performance while operating with the variable loads of between one and four freezer tunnels.

Results

Energy savings

The new refrigeration control system was implemented in 2009-10. The power savings range from a few percentages to over 10%, depending on the ambient conditions. The largest percentage savings are generally made during the cooler months when the condensing pressure or head pressure can be reduced further than in summer conditions.

Improved flexibility and productivity

VHPC allowed the facility to continue operating despite an electrical failure that caused the loss of two compressors in 2011. This occurred during peak production of frozen peas. Without two of the compressors there was insufficient freezing capacity to process the peas at planned production throughputs. There was a need to immediately find extra capacity in the refrigeration system to ensure that all of the peas could be processed.

The site engineers decided to review the control systems to see if the controls strategies could be adjusted to achieve the desired refrigeration capacity without the use of the two compressors. After a series of adjustments, the refrigeration capacity was found to ensure uninterrupted processing. A key factor in the ability to increase capacity was the implementation of VHPC, which allowed the condenser fans to be run at high loads to lower discharge pressures and thus increase refrigeration capacity.
Lessons Learned

Monitor energy use in real time to maintain and improve efficiencies

The SCADA system at Simplot’s Devonport site allows operators to view data on real time energy use. Daily, weekly and monthly energy reports are utilised in site meetings to track and identify energy use issues. The ability to see plant energy performance at key production process and energy system levels allows for quicker identification of energy waste and opportunities for improving energy use.

Ensure you have access to the right skills

External contractors were used to implement the software and hardware changes required. However, Simplot found that they only started to achieve the full benefits of optimisation after they employed an experienced process engineer. This brought more of the required knowledge and expertise in-house and helped to build ownership of the new system.

Next steps

Driven by the benefits already achieved from improved data collection systems, the next stage of development is to provide online energy performance indicators by combining production and energy use information in real time in the SCADA system. The transition from a static data collection system to a more dynamic optimisation model at Simplot’s Devonport site is illustrated in Figure 3.

This will allow operators to see directly how each production line is performing from an energy intensity point of view. It will also enable forecast modelling to be undertaken based on typical plant operations over a 7-day period, rather than maximum demand. Operators will be able to monitor actual energy use compared to forecast energy use, and to take action immediately if there are any discrepancies.

“You don’t want to know next month when your bill comes in that you’re not using energy efficiently. You want to know right now so that you can do something about it.”

Graham Bryant, National Environment Manager, Simplot Australia

Figure 3: The transition to a more dynamic data collection and analysis system at Simplot Australia

The Global Superior Energy Performance (GSEP) initiative was launched in 2010 by the Clean Energy Ministerial (CEM) and International Partnership for Energy Efficiency Cooperation (IPEEC). Through GSEP’s Energy Management Working Group (EMWG), government officials worldwide share best practices and leverage their collective knowledge and experience to create high-impact national programs that accelerate the use of energy management systems in industry and commercial buildings.

For more information, please visit www.cleanenergyministerial.org/EnergyManagement.

Further information about how Australian industry has improved energy management can be found at http://energyefficiencyopportunities.gov.au/templates-and-tools/case-studies/.