

Energy Savers Plus Program

targets significant energy savings for a
Queensland sugar cane farm

PROPOSED SOLUTION 

Potential energy savings

19%

Key facts

Farm / Industry

Sugar cane

Location

Mareeba

Irrigation

Centre Pivot

Pumps

Centrifugal

Solution

Proposed:
Optimise pump operation

Site profile

The farm near Mareeba produces sugar cane with irrigation provided predominantly by centre pivots. Water is supplied from the Tinaroo scheme channel and is pumped to a holding pond at the farm via a 6.8km pipeline with a 10m increase in elevation from the channel. A large centrifugal pump is used for the water transfer and this pump station was the subject of an energy audit to identify opportunities for energy and cost optimisation.

Current energy demand

The pump station is comprised of:

- One Hidrostral end suction screw single stage centrifugal pump, powered by a direct coupled 160kW high efficiency motor. The centrifugal screw impeller is a unique feature on the Hidrostral range of pumps.
- The pump is controlled by a variable speed drive that is manually switched and controlled at a static speed.

Action

An audit of site energy consumption evaluated the best efficiency point for pump operation and the overall systems best efficiency.

At the time of the audit pump speed was selected based on water requirements throughout the year. The pump is typically operated at ~40Hz during periods of high demand or operates at random lower speeds and is turned off when not required.

Professional flow testing of the pump system was undertaken to determine the best efficiency point of the pump and the energy and cost saving opportunity by running the pump in the most efficient manner. The pump was tested at sequential speeds by varying the frequency of the variable speed drive from 30Hz through to 45Hz.

Results

The pump testing identified that 45Hz is the practical operating limit of the pump as above this value the pump begins to induce air into the suction system, fortunately lower speeds were found to be preferable upon analysis.

Due to the long pipe run and significant friction losses at higher flow rates the most efficient system operating point was found to be 30Hz delivering 550kL/h at approximately 48kWh/ML as opposed to 68kWh/ML average baseline efficiency.

However, historical data suggests that the amount of water required per annum would exceed what is able to be delivered by the pump at this reduced speed and flow. Therefore an operating strategy was proposed whereby the pump would be run at 37.5Hz during periods of high demand to ensure irrigation requirements are met. The pump would then be operated at the more efficient 30Hz whenever practicable when 550kL/h is sufficient.

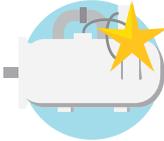
Estimated energy savings of 19% and cost saving in the order of \$9,500 per annum are available by implementing the above pump operating strategy. This is an attractive opportunity as these potential savings can be achieved with no further investment.

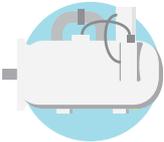
The Energy Savers Plus Program is funded by the Queensland Department of Energy and Water Supply



Recommendations

The energy audit recommendations are summarised below:

Solution	 Optimise pump operation
Est. energy savings (kWh/annum)	52,590
Est. operating cost saving	\$9,532
Est. energy savings	19%

Forecast savings in operating costs	 Existing system	 Upgraded system	 Reduction in operating costs
Annual operating cost	\$67,895	\$58,363	\$9,532
Total energy costs for 10 years	\$678,950	\$583,630	\$95,320

Farmer feedback

This was the ideal case study for us: a possible 19% energy savings for no capital cost!?
Big thank you to the Energy Savers team.