

Energy Savers Plus Program

targets significant energy savings for a Queensland cotton farm

ImPLemented SoLution 

Actual energy savings

15%

Key facts

Farm / Industry

Cotton

Location

Brookstead

Irrigation

Flood

Pumps

Submersible

Solution

Implemented:

Pump modification

Site profile

The farm located in southern Queensland produces cotton utilising flood irrigation beginning with pre-watering in September / October and crop irrigation during January and February.

An audit of energy consumption assessed a bore pump that is used for irrigating 27Ha of the farm, from a depth of 50 metres into a head ditch for distribution to the crops.

Current energy demand

The existing pump was a seven stage turbine pump with direct drive from a 30kW electric motor.

Action

An audit of pump energy consumption evaluated:

- Pump and bore maintenance
- Pump replacement
- Solar PV implementation

Results

Of the opportunities evaluated, three energy saving initiatives were identified:

- Bore maintenance to investigate / address the presence of iron bacteria
- Pump replacement or modification
- Implementation of a 45kW solar PV system to power the bore pump.

On initial assessment, the bore appeared to contain iron bacteria with red / brown contaminant evident in the water on pump start-up. If left unchecked, iron bacteria build up can result in restriction or complete blockage of aquifer water into the bore. The audit report recommended removal of the pump to treat the bore for bacteria.

The seven stage, 30kW pump was assessed to be operating below optimal efficiency as the pump specifications did not match the required duty due to low total dynamic

head (TDH) and flow rate. The audit recommended either replacing the pump or simply removing stages from within the existing pump to better match the required duty.

Following the audit report the pump was removed to treat the suspected iron bacteria but on inspection the cause of discolouration was found to be corrosion. The farmer elected to re-install the existing pump with two of the stages removed. Changing the pump from seven stages to five stages results in a reduced flow rate with greater overall efficiency for the low TDH and flow rate duty.

Measurement and verification of the pump system following this modification identified that pumping time was increased by 24% each season due to the lower flow rate but overall energy consumption was reduced by 15% with an overall cost reduction of nearly \$1,200 per year.

The audit report also identified an initiative to install a 45kW solar PV system to power the pump and thereby achieve energy savings, which remains an option. A system larger than the 30kW pump capacity would allow the system to provide enough power for the pump for a longer period each day. The audit identified that while Solar PV would assist in reducing the operating cost of the pump, the pump is not used frequently enough to achieve a suitable payback period.

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



Outcomes

the pumping system efficiency has been significantly improved.

Savings in operating costs	Seven Stage Pump	After removing 2 stages	Improvement
Motor Rating	30kW	30kW	–
Pump Flow Rate ML/day	2.5	2.0	-0.5
Pumping Hours per year	1,056	1,321	–
kWh/ML/m head	6.09	4.59	25%
Combined efficiency	44.8%	59.3%	25%



Energy savings

A summary of the energy savings achieved is as follows:

Solution	Pump modification (Implemented)	45kW Solar PV System (not implemented)
Energy savings (kWh/annum)	5,864	12,918
Operating cost saving	\$1,194	\$2,630
Cost to implement	\$2,998	\$58,500
Payback period (years)	2.5	22
Demand reduction (kW)	11.8	–
energy savings	15%	33%

Savings in operating costs	existing system	upgraded system	Reduction in operating costs
Annual operating cost	\$7,889	\$6,695	–
Cost to implement	–	\$2,998	–
Operating costs for first 3 years	\$23,667	\$23,083	\$584
Annual operating cost for years 4 to 10	\$7,889	\$6,695	\$1,194
total energy costs for 10 years	\$78,890	\$69,948	\$8,942

Farmer feedback

Reduced energy consumption following pump modification is now delivering irrigation cost savings.

This case study was originally developed during 2018-19 as part of the Queensland Government funded Energy Savers Plus Program, delivered by the Queensland Farmers' Federation.