

Energy Savers Plus Program

targets significant energy savings for
Central Queensland aquaculture farm

PROPOSED SOLUTION 

Potential energy savings

12%

Key facts

Farm / Industry

Aquaculture

Product

Prawns

Location

Central Queensland

Key Energy Use Onsite

Pumps (intake and recirculation)
Pond aeration (excluded from audit)
Hatchery
Water treatment
Boilers
Processing facility

Solution

Proposed:
Heating tank covers,
heat recovery system

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



Farm profile

Located near Ilbilbie in Central Queensland, this prawn farm operates 33 saltwater ponds with a total pond area of approximately 33 hectares and a volume of 495,000m³. Development is currently underway for the introduction of new ponds to bring the total to 47. The site produces an average of approximately 450 tonnes of whole fresh prawns each year and includes its own hatchery containing approximately 135 open tanks.

Current energy demand

Energy consumption on the farms consists of:

- intake pumps and recirculation pumps
- main pond aeration heating elements
- workshop and feed shed
- hatchery with open heated tanks
- water treatment plant
- diesel boilers
- processing facility.

Action

An audit of site energy consumption focussed primarily on hatchery tank heating, heat recovery and recycled water evaluated:

- solar covers over hatchery ponds
- covers over heated tanks in the hatchery
- water recycling and heat recovery
- additional power factor correction.

Aeration of the main ponds was excluded from the audit.

Results

Of the energy-saving opportunities evaluated, two initiatives were identified for the Ilbilbie farm with potential savings of 12% and a payback period of 4 years (approx). The initiatives included installing covers to the heated hatchery tanks to reduce heat losses, and implementing a water recycling and heat recovery system to the hatchery.

The tanks are generally heated with resistive electrical heaters to maintain a constant

water temperature of 28–30°C 24hrs per day. Due to the winter operation, night time temperatures can drop to as low 13°C during July. Hence tank heating was a major portion of energy consumed within the hatchery. The recommendation aimed at reducing overnight tank heating costs for the Maturation and Spawning Tanks due to the cool night time ambient conditions experience in Ilbilbie. By installing plastic covers on top of the tanks after hours (6pm–6am) convective heat transfer from the exposed water surfaces can be stopped reducing the load on the electric heating to each tank.


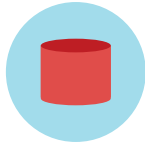
The implementation of a high efficiency filtration system to enable warm hatchery water to be recycled was investigated. Due to the high volume of water and high cost of a filtration unit the viability of mechanical filtration was not deemed feasible. Further investigation was conducted into a heat reclaim system which would recover the energy from the hatchery waste water and transfer it into the storage ponds through a plate heat exchanger. This resulted in both maintenance and opex savings for the hatchery with an estimated payback of 3.7 years.

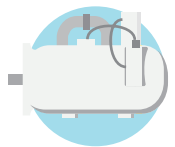
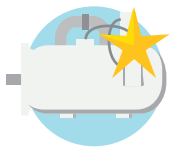

Solar blankets were also considered but ruled out with the payback being 6.7 years.



Recommendations

The energy audit recommendations are summarised below:

Solutions	 Hatchery Tank Heating Covers	 Hatchery Heat Recovery
Estimated energy savings (kWh/annum)	25,346	43,050
Estimated operating cost saving (p.a.)	\$4,461	\$8,500
Estimated cost to implement	\$13,650	\$24,000
Payback period (years)	3.4	3.7
Combined initiative estimated energy savings for hatchery	12%	

Forecast savings in pump operating costs	 Existing system	 Upgraded system	 Reduction in operating costs
Annual operating cost	\$608,324	\$598,863	-
Cost to implement	-	\$37,650	-
Operating costs for first 5 years	\$3,041,620	\$3,031,965	\$9,655
Annual operating cost for years 6 to 10	\$608,324	\$598,863	\$9,461
Total pumping costs for 10 years	\$6,083,240	\$6,026,280	\$56,960

Farmer feedback

The energy audit was very insightful and since the audit was completed we have implemented a range of energy savings initiatives including:

- pump refurbishment
- pump VSDs
- VSD to evaporator fans
- heat reflective coating
- tariff changes.