



Nursery & Garden Industry
Queensland

Case Study



Aspley Nursery Energy efficiency

*“Regular
monitoring has
delivered real and
tangible benefits
to the business”.*

*Noel Percy
Aspley Nursery*

Aspley Nursery is a landscape supply nursery to the north of Brisbane. The nursery operates from two independent sites at Hunt Road and Roth Park Burpengary and has been owned and operated by the Percy Family since 1951.

Aspley Nursery supplies quality plants for residential and commercial developments from an extensive and diverse range of production stock along with the production of selected plant material for specific projects. The in-house planning service designs projects to development application (DA) standards and assists in ensuring these projects run efficiently. The nursery has achieved a reputation forged over 64 years for the supply of quality product to the landscape industry and prides itself in delivering the finest quality stock.

Aspley Nursery operates under the Nursery Production Farm Management System and is accredited under the industry BMP program NIASA and EcoHort certified under the industry Environmental Management System.

In 2015 Aspley Nursery made a serious commitment to the environment and sustainability by becoming more energy efficient. An on-site energy audit was commissioned to identify opportunities to minimise energy consumption and reduce costs.



Improving irrigation management
for a profitable and sustainable future



Aspley Nursery Energy efficiency



Aspley Nursery's participation in the EcoHort program under the Nursery Production Farm Management System requires the nursery to undertake regular monitoring of fuel and energy use. Regular routine monitoring identified a significant trend of increasing monthly electricity usage at the Hunt Road site.

AGL and Energex, the retail and bulk energy suppliers to Aspley Nursery, acknowledged the yearly electricity consumption was projected to exceed 100 megawatts (MW), requiring a change of metering and a shift in energy tariff and billing.

As at July 1 2015, new demand pricing was introduced in Queensland meaning charges are based on power supplied (kVA) rather than power used (kWh) for larger businesses. This charge is based on a business's highest recorded demand during a billing period, which is the maximum amount of electricity supplied in any 30 minute interval. These new network charges are designed to meet the cost of the network construction as required to meet this demand. Larger businesses operating pumps and equipment that might start and operate together in any 30 minute period may experience a significant increase in energy charges.

Aspley Nursery's commitment to improving their energy efficiency began by commissioning an energy audit to provide a breakdown of electricity consumption at the Hunt Road site.

ASPLEY NURSERY ELECTRICITY USE

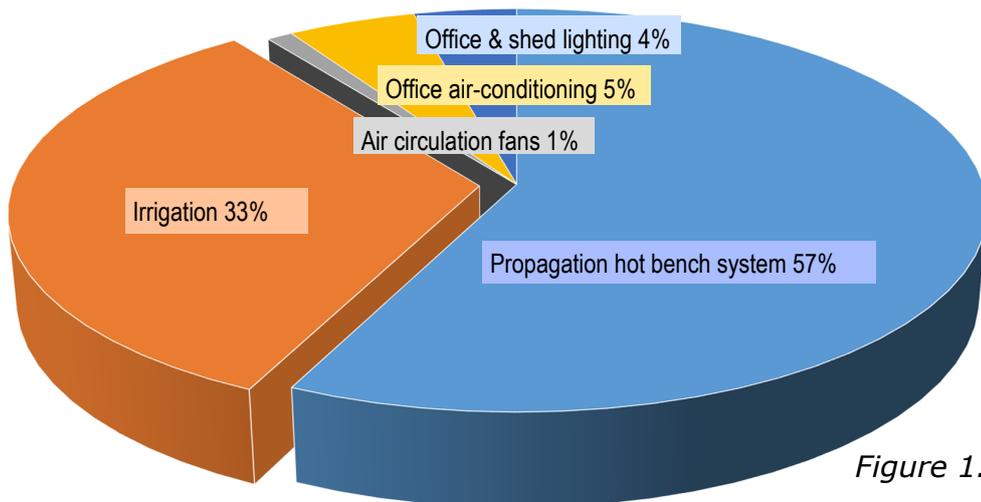


Figure 1.

Ergon Energy's Network Demand Management (NDM) Project had successfully reduced electricity demand and subsequent greenhouse gas emissions in businesses across Queensland.

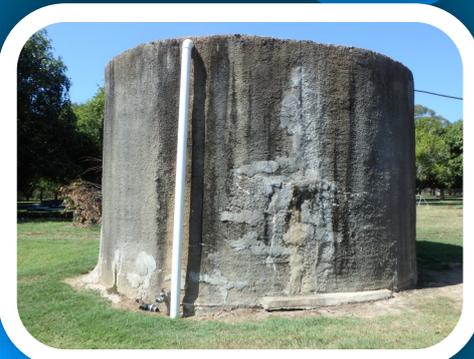
Through the Nursery & Garden Industry Queensland's Rural Water Use Efficiency - Irrigation Futures initiative, Aspley Nursery was provided with an opportunity to participate in the 'Queensland Farmers Federation Irrigation Energy Savers - Stage 2 Network Demand Management (NDM)' project that proposes onsite energy saving upgrades and identifies their potential costs and benefits.

Note: 1 megawatt (MW) of power equals 1,000 kilowatts (kW)

Aspley Nursery Energy efficiency



“The new pump is quiet, efficient and provides the degree of flexibility required by the nursery”
Robert Percy 2015



Ergon Energy’s Network Demand Management (NDM) Project identified that 33% of Aspley Nursery’s electricity usage came from irrigation related activities (*see figure 1*).

Aspley Nursery’s irrigation system consisted of an aerator pump, a transfer pump and a 3kW pressure system supported by a 7.5kW main irrigation supply pump. The original ‘Regent’ 7.5kW centrifugal irrigation pump contributed 5% to the site electricity usage and was upgraded to a ‘Grundfos CRIE 15’ 5.5kW vertical, multi-stage, variable frequency drive (VFD) centrifugal pump, to deliver the pressurised irrigation throughout the Hunt Road nursery site. (*see table 1.*)

Robert Percy said “The new pump system is quiet, efficient and provides the degree of flexibility required by the nursery. The Grundfos system costs considerably less to operate. It simply does a better job than the old pump”.

Note: The frequency converter on the Grundfos CRIE 15 pump allows continuously variable control of the motor speed, making it possible to set the pump operation duty point to a given pressure requirement.

The new Grundfos centrifugal pump has replaced both the 3kW and 7.5kW irrigation pumps and will operate at a much higher efficiency, providing energy savings and resulting in lower power costs.

The new pump system, by virtue of its variable frequency drive, adapts the pump motor speed to the varying pressure and flow requirements of the different sized production areas leading to improved water use efficiency. The versatility of the new pumping system has allowed a reduction in operating pressure from 700kpa to 550kpa. This reduced pressure, along with the VFD pump’s soft start, has all but eliminated distribution pipework emergency repairs and significantly reduced maintenance activities and costs.

Pump investment (Grundfos CRIE 15 5.5kW)	\$9,394.13
Pump installation costs	\$500.00
Yearly energy savings	11,880 kWh
Yearly operational cost savings (@26c kWh)	\$3,088.80
Payback time	Approx. 3 years
Accumulated savings over 10 years (calculated at 26 cents per kWh)	\$30,888.00

Table 1

Aspley Nursery Energy efficiency

The installation of the new pumping system at Aspley Nursery has not only reduced energy consumption but improved the water use efficiency (WUE) through improved scheduling and irrigation application uniformity.

Noel Percy identified some of the benefits of the pump upgrade as:

- one single pump replacing two older inefficient pumps
- reduction in energy consumption (28% saving in energy)
- payback on investment in three years
- flexibility in the scheduling of irrigation
- reduction in system operating pressure
- constant and consistent pressure across the nursery
- more efficient irrigation application uniformity
- soft start and stop reduces stress on the aging distribution pipework
- reduced downtime due to repairs and maintenance
- improved water use efficiency due to improved application uniformity

The pump upgrade has exceeded benefit projections and is on track to deliver a yearly reduction in power consumption of 11.8 MW saving the business approximately \$3,068.00 per year. (calculated at 26 cents per kWh).

*Note: A kilowatt (kW) is a unit of power (1kW = 1,000watts)
eg. a 10 kW pump will use 10 kW of power regardless of the duration it is operated.
kW denotes the rate at which a pump uses energy, the pump's load or demand.
To calculate the energy used by a 10kW pump it is necessary to multiply the power (kW)
by the duration of operation (hours): energy (kWh) = power (kW) x time (hours).*

Forty-four twin and single fluorescent light fittings in the office and sheds at Aspley Nursery were responsible for 4% of the energy consumption at the Hunt Road site. (see figure 1).

The fluorescent lights operate for forty hours each week, fifty weeks of the year, with each fluorescent tube drawing 36W and each ballast drawing 18W. The fluorescent tubes in each light fitting were replaced with energy efficient Light Emitting Diode (LED) tubes and the ballast in each fitting replaced. Total cost of replacing the fluorescent tubes and ballast was \$880.00 and is tracking to deliver savings of 2.75 MW equating to \$715.00 per year. The LED tubes can be expected to last up to twice the life of a fluorescent tube, approximately 16 years.

Fluorescent lighting operation	4,125 kW	\$1072.50
LED lighting operation (upgrade cost \$880.00)	1,375 kW	\$375.50
Lighting upgrade savings in energy & dollars per year	2,750 kW	\$715.00
Payback time (calculated at 26 cents per kWh)	<1.3 years	

Table 2.

Noel Percy said "The lighting upgrade was a simple easy task to complete after conducting some basic research into the technology. The upgrade immediately provided the benefits of reduced energy consumption and improved lighting".

Aspley Nursery Energy efficiency



“Monitoring of the propagation heating system upgrade has made it possible to reduce storage temperatures and save thousands of dollars.”

Noel Percy



The energy audit identified that in 2015 the propagation hot water system accounted for 57% of the electricity consumed at Aspley Nursery Hunt Road site (see figure 1).

The propagation bench heating system was designed to maintain the surface temperature of the benches at 24.7°C, providing an environment conducive to cutting root formation and seed germination.

Historically, hot water was supplied from a 2,000 litre concrete storage tank heated using an 18kW electric circulation element utilising off peak ‘time of day’ tariff. Hot water was drawn from the tank to maintain the constant temperature required at the benches. Water in the storage tank was maintained at 60-70°C depending on the seasonal demand. These high temperatures regularly led to issues of tank and under bench pipe and fixture failure causing down time and a loss of productivity.

Aspley Nursery installed a solar hot water system consisting of three banks of evacuated tube collectors and a 400litre storage tank. The evacuated tubes have a vacuum between two layers of glass allowing them to retain up to 95% of the energy captured.

The upgraded system now operates by using the solar collectors to heat the 400litre solar tank. The hot water from the solar storage tank is then used to preheat the 2,000litre concrete propagation storage tank which in turn heats the propagation benches utilising the existing heating infrastructure. Temperature data loggers are used to monitor the performance of the upgraded system with sensors located at the propagation hot water storage tank as well as both the bench surface and propagation media.

Monitoring has enabled the propagation hot water storage tank temperature to be reduced from 60-70°C to 45-55°C greatly reducing the electricity consumption from the 18kW in-line heater particularly during the high demand winter period. The efficiency of the solar hot water system is increasing further through summer allowing the temperature set points to be reduced even further providing greater energy savings. A fourth bank of evacuated tube solar collectors was added mid year (2015) to further improve the overall system efficiency.

Noel Percy noted “Monitoring of the propagation heating system upgrade has made it possible to reduce storage temperatures and save thousands of dollars. For less than a hundred dollars, two data loggers have provided the information required to allow us to make informed decisions”.

Aspley Nursery Energy efficiency

Electricity usage at Aspley Nursery is currently tracking at 87.5MW per year, down from the projected 124MW (see figure 2).

This current power consumption of 87.5MW per year provides an energy saving of 36.5MW which equates to yearly cost savings of approximately \$9490.00 (calculated at 26c per kWh) and a payback period of less than 2 years on the onsite upgrade installations (see Table 3).

Projected yearly power consumption prior to upgrades	124MW
Current projected yearly power consumption	87.5MW
Yearly energy savings (different between projected and current power usage)	36.5MW
Yearly cost savings (calculated at 26 cents per kWh)	\$9,490.00
Payback period (calculations based on 26 cents per kWh)	<2 years
Accumulated cost savings over 10 years (calculated at 26 cents per kWh)	\$94,900.00

Table 3.

Energy costs would also have been significantly higher had the on-site infrastructure upgrades not occurred and the electricity consumption not been reduced, therefore forcing the nursery to move to a demand tariff pricing.

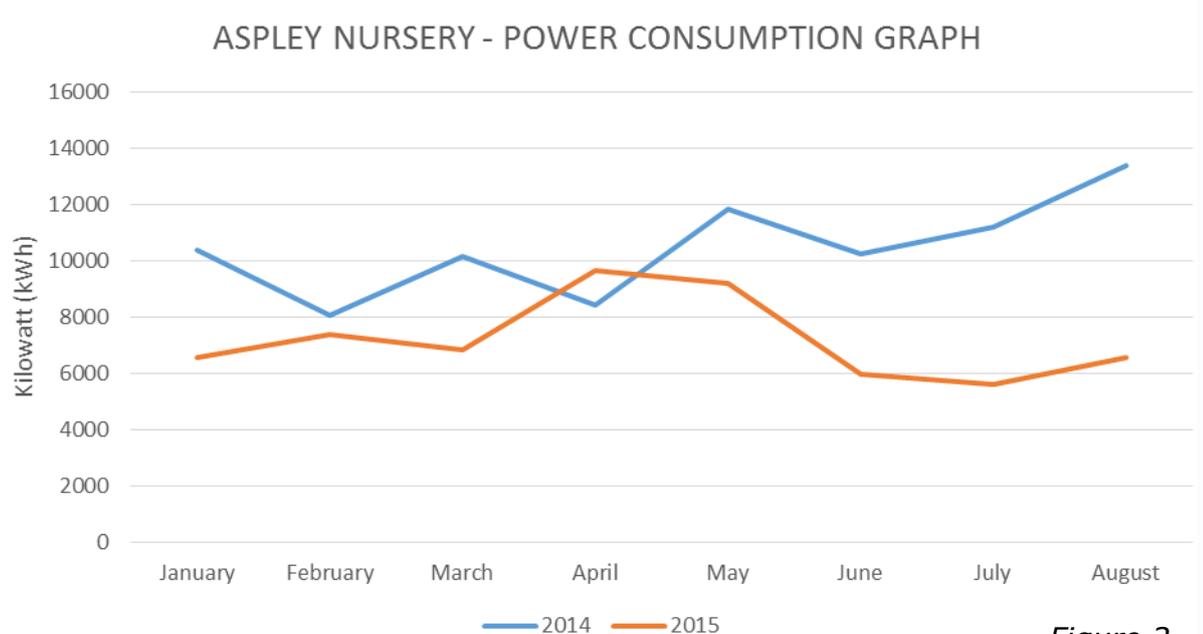


Figure 2.

Robert and Noel Percy have identified that as the solar heating system for propagation becomes more efficient during the longer days of summer, some of the energy saving gains are offset by the increased irrigation demands through the warmer weather.

Aspley Nursery—energy efficiency



With environmental sustainability in mind the next energy saving project for Aspley Nursery Hunt Road site will be the installation of a solar photovoltaic (PV) system. Solar PV systems convert light directly into DC electrical current which is then directed through an inverter to produce the required AC electrical current. Solar PV systems can be combined with solar tracking to enhance their overall performance.

Aspley Nursery is investigating a 5kW solar PV system for the nursery, costing approximately seven thousand dollars plus GST. The solar PV system will require an available roof area of 32m² and utilise around twenty 1.6m x 1m solar panels to produce, on average, 8212kW of electricity each year. Calculating the generated electricity at \$0.26 per kW the system will deliver \$2135.00 worth of electrical power each year. The \$7,000.00 capital outlay should provide a 30% return on the business investment in the first 2.5 years.

Energy saving upgrades are also occurring at Aspley Nursery's second site, Roth Park. A new multistage Grundfos VFD irrigation pump costing \$14,227.40 has been installed to replace the existing system. The installation will improve water use efficiency, provide flexibility and reduce operating costs.

Noel Percy remarked "The energy saving initiatives have saved the nursery thousands of dollars in reducing the nursery electricity usage and therefore maintaining the current electricity metering, energy tariff and billing.

For more information contact:
Nursery & Garden Industry Queensland (NGIQ)
Ph. 07 3277 7900
Email. info@ngiq.asn.au

NGIQ - Farm Management System Officer
Steve Hart mobile. 0407 644 707
NGIQ - Farm Management System Officer
Lex McMullin mobile. 0400 005 236



Nursery & Garden Industry
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"With the increasing costs of energy, solar photovoltaic systems are becoming more attractive. A 5kW system has the potential to produce \$2135.00 worth of power each year. This is quite an attractive investment"

*Noel Percy
August 2015*



Improving irrigation management
for a profitable and sustainable future



Queensland Government The RWUE-IF initiative helps irrigators make better use of their on-farm water supplies, through efficient irrigation system design and management. It also helps irrigators to reduce energy consumption associated with their pumping applications. RWUE-IF is a partnership between the Queensland Government and major rural industries, where the government provides financial support to assist industry groups in providing services to irrigators.

Rural Water Use Efficiency—Irrigation Futures (RWUE-IF)