

Options for reducing irrigation pumping costs

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Introduction

- Reducing pump head requirements
 - Hydraulic optimisation
 - Irrigation hardware
- Comparing energy sources
 - Electricity
 - Diesel
 - LPG
- Pump efficiency



In the last 15 years we have seen;

- An increase in adoption of drip irrigation
- An increase in energy cost

- clash / conflict of policy

- Increasing energy infrastructure costs
- Move to be efficient with energy as well as water



Pumping head vs energy costs



Pump efficiency 70% Derating 14%



Pumping head vs energy costs









CENTRIFUGAL PUMP PERFORMANCE DATA



Hydraulic optimisation

- Identify critical valves / pathways
- These determine the pump head
- Are there options available to drop the pressure required of critical blocks?



From Vellotti & Kalogernis, IAL Griffith 2013

- Upgrade drip line from 17 to 20mm as shown (17,000m of drip line)
- Supply & Install cost of approx. 50c/m = \$8,500
- Total pump saving from this upgrade = 3.0 Mhd



- Upgrade sub main from 50 to 80 PVC as shown (54m x 2 = 108m)
- Supply & install cost of approx. \$12/m = \$1,300
- Total pump saving from this upgrade = 1.0 Mhd



- Total cost of upgrade = \$9,800
 - \$8,500 for drip line upgrade
 - \$1,300 for sub main upgrade
- Total pump head savings = 4.0 Mhd
 - 3.0m for drip line upgrade
 - 1.0m for sub main upgrade
- Now lets looks at the annual pumping cost savings of this 644 ha almond development.....



Using the basic calculation we looked at previously:

- Power costs 12c/Kw-hr
- Pump flow of 885 Lps
- Annual pumping hours of 2426 hours
- A saving of 4.0 Mhd from the upgrades

At 70% P (Kw) =	$H \times Q =$	<u>4 x 885</u> =	49.58 Kw
	71.4	71.4	
			A444054

49.58 Kw x 12c/Kw-hr = \$5.95/hr x 2426 hrs = **\$14,435/year**

• The upgrade will be paid for within the first year!



Irrigation infrastructure

- New products / design approaches
 - 10 ha drip systems operating on 10-15 m supply in MIA
- Low pressure drip
 - large diameters (20 & 25 mm)
 - emitters operating as low as 50 kPa







DRIPNET PCTM

COMPACT INTEGRAL PRESSURE-COMPENSATING, CONTINUOUSLY SELF-CLEANING DRIPPER

16009 - 16010 - 16012 - 20010 - 20012 - 23009

TECHNICAL INFORMATION

- Pressure-compensating range: 0.25/0.40/0.60-2.5/3.0/3.5 bar (according to flow rate model).
- Recommended filtration: according to drippers flow rate.
- Filtration method is to be selected based on the kind and concentration of the dirt particles existing in the water. Wherever sand exceeding 2 ppm exists in the water, a Hydro-cyclone filter is to be installed before the main filter. When sand/silt/clay solids exceed 100 ppm, pre treatment will be applied according to Netafim[™] expert team's instructions.
- TurboNet[™] labyrinth with large water passage.
- To be "welded" into thick-walled dripperlines (0.9, 1.0, 1.2 mm).
- Injected dripper, very low CV.
- Injected silicon diaphragm.
- UV resistant. Resistant to standard nutrients used in agricultural.
- DripNet PC[™] drippers meet ISO 9261 Standards with production certified by the Israel Standards Institute (SII).

Netafim

Irrigation infrastructure

- New products / design approaches
 - 25 acre drip systems operating on 10m supply in MIA
- Low pressure drip
 - large diameters (20 & 25 mm)
 - emitters operating as low as 50kPa
- LEAF (low energy automation filtration)







Irrigation infrastructure

- Variable speed drives
 - Take advantage of lower pressure requirements
 - Variable shift sizes
 - Variable positive suction pressures
 - Multiple transducer set operating pressures

Provide the pressure as required, not at a constant higher duty all the time





Energy supply

Motor	Calculations	Extra charges	Annual operating cost
Diesel	15,000 × 30.3c = \$ 4,545	nil	\$ 4,545
LPG	15,000 × 39.9c = \$ 5,985	annual fee of \$300	\$ 6,285
Electricity (standard @ 27.3 c/kWh)	15,000 × 30.3c = \$ 4,545	Service availability charge \$ 1,387	\$ 5,932
Electricity (off-peak @ 15.9 c/kWh)	15,000 × 17.7c = \$ 2,649	Service availability charge \$ 1,387	\$ 4,036

Sunraysia prices 2012

Usage only



Future trends to energy costs





How efficient is your pump?

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Other aspects to consider

- Tariffs which reflect usage tariff providers
- Good irrigation management, proper irrigation scheduling
- Power factor
- Energy efficiency for small business grants
- Advice on overall recommendations, including solar power





Primary Industries



COVERNMENT Industries