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Fact Sheet

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Pump and energy fast facts for irrigators

Water coming out of irrigation pipes, indicates your pump is working – but how do you know if the pump is inefficient and costing you more money than it should?

Studies on broadacre irrigation farms have found the vast majority of pumps are inefficient and not operating on their correct duty point. The motor may be oversized, or the pump may be going too fast! This fast fact sheet offers a guide and first step to evaluating a ballpark measure for an efficient pump, and if its operating near its duty point.

1. On average, irrigation energy metrics are broadly;

I. 1 Mega Litre (ML) lifted 1 metre height uses 1.1 litres of diesel (at 70% pump efficiency)

II. 1 Mega Litre (ML) lifted 1 metre height uses approximately 4.55 kiloWatt-hours (kWh) of electricity (70% pump efficiency)

Therefore, comparing electricity and diesel, it costs approximately $1.10 /ML to lift water the same height when diesel is priced at $1.10/l and electricity at $0.24/kWh.

The following 3 steps can provide a simplified way to audit your pumping efficiency:

2. Measuring cost per ML

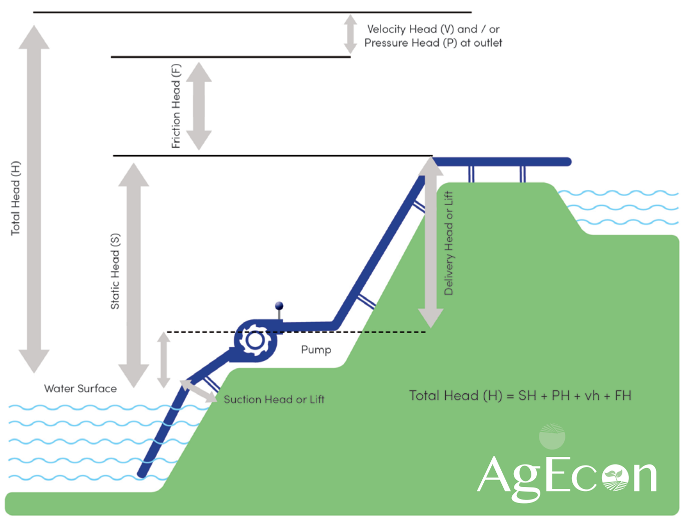
For grid-connected pumps;

- Record the water meter at the start / end of the Ergon Energy billing period (ML total)
- Identify the total kWh energy used over the pumping period which should match the line item on the energy bill.

3. Measure Total Head

Total head is a term given to the pressure that needs to be supplied for a specific pumping task. It is made up of four components all added together as per the below figure:

- Static Head
- Pressure Head
- Friction Head
- Velocity Head



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Example Total Head calculations for river extraction to high pressure or surface irrigation:

Total head examples	River/channel to high pressure	River/channel to surface (flood) irrigation
Static Head – suction lift	3.5m	nil (submersed inlet)
Static Head – delivery lift	5m	3m
Friction Head	8.5m	0.1m
Pressure outlet in metres (100kPa = 10m)	500kPa/10 = 50m	nil
Velocity Head	0.5m	0.4m
Irrigator Hose losses	100mx76mm poly@8L/s = 12.5m	nil
Total Head	3.5+5+8.5+50+0.5+12.5 = 80m	3+0.1+0.4 = 3.5m

4. Audit your own energy use

Applying the typical irrigation energy metrics to the above example, the cost to lift or push water under assumptions (1) and (3) is therefore:

Energy Source	River/channel to high pressure	River/channel to surface (flood) irrigation
Electricity @$0.24/kWh	80m hd x $1.10 = $88/ML	3.5m x $1.10 = $3.85
Diesel @ $1.10/l	80m hd x $1.10 = $88/ML	3.5m x $1.10 = $3.85
Friction Head	8.5m	0.1m

If your rough self-audit calculations are significantly different to your actual costs, call in an irrigation consultant. Automated and live pump energy monitoring can be done using telemetry systems. An example of such equipment can be found here: https://observant.net/pumps-irrigation

References and key Resources:

WaterPak (2012). A guide for irrigation management in cotton and grain farming systems. Section 1.8. pp. 113-135. https://www.cottoninfo.com.au/publications/waterpak

Foley (2015). Fundamentals of energy use in water pumping. Fact Sheet. https://cottoninfo.com.au/publications/energy-fundamentals-energy-use-water-pumping