Water for Profit

WHAT'S THAT (ELECTRIC) PUMP COSTING YOU?

WATERFORPROFIT

Pumping efficiency tests completed as part of system auditing within the Rural Water Use Efficiency Initiative found that many systems are operating inefficiently and costing growers more than is required.

Introduction

There are a number of reasons for inefficient operating:

- Worn pumps
- Poor pump selection
- Improper motor size
- Changes in application systems (big gun – drip tape).

This Water for Profit sheet provides information enabling you to determine pump costs. By repeatedly checking the system over a period of time you will be able to develop maintenance programs and determine replacement recovery costs.

When the irrigation system was originally designed, a pump would have been chosen to provide sufficient head pressure, including friction losses, so that the sprinkler located at the highest point in the irrigation block operated efficiently.

Invariably you would not have been provided with a projected operational cost for the life of the pump. Figures show that initial purchase price is only 5 per cent of the total cost over a ten year period (electrical driven units).

Over time farming practices may have changed, new irrigation systems may have been purchased, water supply may have varied and/or the pumping unit has become worn. All these factors can contribute to an increase in costs that will directly affect your profit margin.

How to determine pumping costs

The elements required to calculate costs are:

- Electricity consumption per hour (kW/hr)
- Discharge rate per hour (l/sec)
- Pump operating pressure
- Tariff rate – on your electricity account

What does this all cost?

Current benchmark recommendations are: 35 cents / psi / ML.

Based on:

- Pump efficiency – 70 per cent
- Electricity cost of 10 cents/kW.

Using the information that has been collected for determining pump efficiency and your tariff rate, the following calculations can be made to determine the cost of running your pump and a comparison with the benchmark figure.

- To calculate kWh / ML = kW ÷ (Q x 0.0036). Note: 0.0036 converts kW secs / litre into kWh / ML).
- Pump pressure measured in psi (A)
- Day Rate (cents/kWh), Night Rate (cents/kWh)
- To calculate c/psi/ML = ($/ML x 100) ÷ A

For example: kW used = 30, Q = 20, kWh/ML = 416.67, A = 79.8 psi, day rate 18.8, night rate 6.6.

	c/kWh	$/ML	c/psi/ML
Day rate	18.8	78.33	98.15
Night rate	6.6	27.50	34.46
Benchmark	10	41.66	52.20

As well as calculating the actual cost in relationship to the tariff rates we can also use a constant (10 cents/kW) to gauge how cost effectively the pumping unit is operating in relation to others. This pumping unit measured in direct comparison to the benchmark figure is operating inefficiently at 52.20 c/psi/ML.

Measuring and recording kW usage

OPTION 1

R - No. of revs counted:	t - time taken in seconds:	c - meter constant:

kW/hr = (R ÷ t) x (3600 ÷ c)

kW/hr = (÷   ) x (3600 ÷   ) = _____

If multiplier is present on the face of the meter then multiply it with kW used to determine full usage per hour.

OPTION 2

	Start	Finish	TOTAL
Meter 1			
Meter 2			
Meter 3			
		SUM OF TOTAL:	

Time between readings _____ minutes

Sum of total ÷ minutes x 60 = _____ = _____ kW/hr

Water meter

Type of meter _____

Start	Finish	TOTAL

Time between readings _____ seconds

Discharge rate (Q) = TOTAL litres _____ ÷ seconds _____ = _____

Pumping unit

PRESSURE AT PUMP measured in PSI (A):

Calculating cost

From the data collected you are now able to calculate pumping costs

kW used per hour:	
Q (litres per second):	
kWh / ML	kW ÷ (Q x 0.0036):
Pump pressure measured in psi	(A):
Day Rate	(cents/kWh):
Night Rate	(cents/kWh):

NOTE: 0.0036 converts kW seconds / litre into kWh / ML

To calculate $/ML - kWh / ML x cents / kWh (as a decimal)

	kWh/ML	cents / kWh	$/ML
Day Rate			
Night Rate			
Benchmark Rate			

To calculate c/psi/ML - ($/ML x 100) ÷ Pressure at Pump (A)

	$/ML		A	c/psi/ML
Day Rate		x 100	÷	c/psi/ML
Night Rate		x 100	÷	c/psi/ML
Benchmark Rate		x 100	÷	c/psi/ML

For more details contact Growcom on 07 3620 3844.