Variable speed drives

Overview of options

This fact sheet is part of the Profitable Dairying series - *Good business management reduces greenhouse gas emissions*.

The Australian dairy industry has committed to reducing greenhouse gas emissions intensity by 30% by 2020.

Installation of variable speed drives for vacuum pumps can reduce energy costs.

Energy savings potential

Energy to power pressurized irrigation systems can be the most significant use of energy on dairy farms.

In the dairy shed approximately 80% of energy use is associated with hot water, milk cooling and milk harvesting[1].

Using variable speed drive (VSD) irrigation pumps can reduce power consumption by up to 75%[2].

Energy savings of 40-63% can be made when a VSD is fitted to the vacuum pump[2].

Further savings can be made when VSDs are fitted to the milk pump as they can improve the efficiency of heat exchange through the plate cooler.

How does a VSD work?

In many dairies vacuum and milk pumps operate at a constant speed, which is required to create a desired vacuum or flow rate. A similar situation is found in irrigation systems.

A VSD uses a sensor in the vacuum line to detect changes in pressure and then adjusts the speed of the pump motor to match the demand for vacuum or flow rate.

Factors to consider before installing VSD for milk and/or vacuum pumps:

- **Existing pump** – blower vacuum pumps are generally more efficient than a vane pump. The working condition of the pump can influence potential savings, particularly on older pumps.
- **Running times** – the greatest gains are made on longer running times.
- **Pump size** – the size of the pump is relative to the size of the shed. A small pump in a large shed provides opportunity to save money by upgrading the pump and installing a VSD.
- **Landform** – installing a VSD when irrigating undulating or hilly country is more likely to generate power savings in comparison to level country.
- **Installation** – a VSD needs to be correctly installed by a qualified technician. The full energy savings are often not achieved if the VSD is installed without filter protections and if it is not tested to ensure it is operating efficiently.

Advantages and disadvantages of VSDs[2]

VSD on vacuum pumps

Advantages	Disadvantages
- The longer the milking time, the better the savings.	- Capital expense.
- Only uses energy needed to meet the load on the milking system.	- Not everyone can repair them. Requires yearly servicing.
- Reduces noise in the dairy	- Typical payback time range from 4 to 7 years depending on how many hours per day they are used.
- Reduces wear on the motor and pump, prolonging their lives.	

VSD on milk pumps

Advantages	Disadvantages
- Can give better milk cooling due to more constant rate of milk flow.	- Capital expense.
- Enables better matching of pre-cooled water to dairy milk volume, which can save water.	- Not everyone can repair them. Requires yearly servicing.
- Reduces the need for a 'choke' on the milk line, which may have an impact on milk quality.	- Typical payback time range from 2.5 to 5 years, depending on how many hours per day they are used.

VSD on irrigation pumps

Advantages	Disadvantages
- Can reduce energy usage by up to 75%.	- Capital expense.
- Enables a fixed irrigation pressure when irrigating hilly or undulating country.	- Not everyone can repair them. Requires yearly servicing.
- Removes the need to use a throttle to manage flow rate reducing wear on the motor and pump.	

Cost

Cost will vary depending on the made, country of manufacture and whether the VSD is pre-programmed for the model and type of vacuum. Depending on the size of the pump costs can range from $3,000 to $10,000.

The decision of what size VSD to install comes down to the effective lifetime of the unit, payback period for the investment and ongoing running costs. Every farm is different and it is important to seek advice from a pump technician or other appropriate service provider.

Further resources:

Dairying for Tomorrow

Dairy Climate Toolkit

References:

[1]Independent analysis of national energy assessment data (2015)

[2]Saving energy on dairy farms – resource booklet

Published by Dairy Australia Limited with support from the Australian Government.

Dairy Australia Limited ABN 60 105 227 987
Level 5, IBM Centre
60 City Road, Southbank VIC 3006 Australia
T + 61 3 9694 3777 F + 61 3 9694 3701
E enquiries@dairyaustralia.com.au
dairyaustralia.com.au

Dairy Australia
Your Levy at Work