



# Options to reduce your electricity usage

## 1. Introduction

Modern dairy farms are very dependent on electrical power. This Quick Note is designed to briefly look at a few of the options for reducing a farm's dependence on main's electricity.

## 2. Interpretation and relevance to Australian conditions

Electrical power is the energy of choice for our modern dairies. However the cost of electricity is significant and the supply in some farming areas may not always be able to meet the demand. The reduction of electricity usage by farms in many areas will also reduce greenhouse emissions from coal powered power stations.

## 3. Relationship to CowTime goals

Electricity accounts for a significant proportion of the farm's shed costs. The use of any of the technologies discussed will reduce the amount of electricity needed to operate the dairy. This can result in reduced running costs and longer operating life for some components, improving milking productivity.

## 4. Some options for reducing dependence on main's electricity.

### Solar energy

Solar energy can be used to pre-heat water for use in the dairy. This heated water is then stored and used as feedstock for the water heater. Solar water heaters have the potential to significantly reduce the amount of electrical energy used to heat hot water for the dairy. The amount of water heated and the temperature achieved will depend on the location, the particular installation and size of the system you use, but commonly water is heated to just over twice the maximum ambient temperature on any given day. The newer systems are relatively maintenance free. Government (federal and some States) schemes currently reduce the cost of purchasing new systems – retailers usually organise this for you as an up-front reduction in the purchase price.

Advantages	Disadvantages
Free energy from the sun	Capital expense
Reduces dependence on external supply	Medium to long pay back time
Simple system to operate	Replaces a process mainly done using off-peak power
May attract a government rebate	Roof mounted models may need structural support
	Difficult to generate enough water to a temperature that is suitable for dairy use (without LPG or electric boosting)

### Heat recovery systems

A large amount of waste heat is generated at milking which can be harvested and used. Potential sources include the plate cooler, refrigeration systems and some vacuum pumps (roots blower). Commercial systems are available that reclaim heat from the refrigeration system. These systems can potentially heat small volumes of water to over 75°C, although more commonly are used to heat a larger volume to around 60°C. The water that is heated from the recovered heat is usually stored and used as feedstock for the hot water system. Using water to remove heat from the refrigeration system is more efficient than using air, so improves the efficiency (and life) of the refrigeration compressor.

Advantages	Disadvantages
Free energy from the refrigeration system	Capital expense
Can reduce milk refrigeration energy costs in properly designed systems	Poorly designed systems (where the water gets too hot) can reduce the overall efficiency of the refrigeration
Can prolong the life of the compressor	Difficult to recover heat from the large volume of warm water generated from the plate cooler (without insulated storage).
In some cases possible to get water to greater than 75 °C	

## Variable speed drives (VSD)

Variable speed drives can be used on pumps to significantly reduce the power used. The vacuum and milk pumps in many milking installations are designed to run flat out. The vacuum is controlled by the regulator letting more or less air in to the system, whilst the milk pump output is regulated by a valve or choke.

A variable speed drive adjusts the speed of the motor controlling the milk or vacuum pump to allow the pump to run only at the speed required to create a desired vacuum or flow rate. By adjusting motor speeds, variable speed drives reduce energy use and prolong the life of equipment. A VSD on the milk pump can also improve the efficiency of heat exchange through a plate cooler, resulting in further cost savings in milk cooling. Although VSD technology is commonly used in large dairies overseas (that have long milking periods) they are not yet common here. Most equipment suppliers can supply variable speeds drives.

### *On vacuum pump*

Advantages	Disadvantages
Uses only the energy needed to meet the load on the milking system	Capital expense
The longer the milking time the better the savings	Not everyone can repair them (complicated technology)
Reduces noise in the dairy	Typical pay back times for VSDs on vacuum pumps range from 4 to 7 years, depending on how many hours each day they are used for
Reduces wear on the motor and pump and prolongs life, as they do not need to work so hard	

### *On milk pump*

Advantages	Disadvantages
Can give better milk cooling due to more constant rate of milk flow	Capital expense
Enables better matching of pre-cooled water volume to daily milk volume, which can save water	Typical pay back times for VSDs on milk pumps range from 2.5 to 5 years, depending on daily milk volume and the expected improvement in milk cooling efficiency
Reduces the need for a "choke" on the milk line which may have an impact on the milk quality	Not everyone can repair them (complicated technology)

## 5. Potential issues with implementation

The uptake of energy efficient technology is frequently hampered by a higher initial cost and a perceived greater maintenance requirement than that experienced with conventional options. Furthermore, purchase decisions are frequently made in response to a sudden breakdown rather than a planned and coordinated effort to reduce operating costs over the longer term. Payback times can be longer on items that are retro-fitted compared to totally new installations.

## 6. Robustness of this information

CowTime has consulted with a range of people in the industry as well as with members of Sustainability Victoria. Extensive review of past work done in Australia and information applicable to Australia from overseas sources has also been incorporated into this Quick Note.

## 7. References and further reading

Genesis Automation. Steps to reducing energy costs on your farm. Based on a comprehensive study completed in 1997 of energy requirements on dairy farms in North-East Victoria, for the Upper Murray Development Board.

[http://www.genesisauto.com.au/html/dairy.htm#cheapest\\_energy](http://www.genesisauto.com.au/html/dairy.htm#cheapest_energy)

"AC Variable Speed Drives" [http://www.seav.sustainability.vic.gov.au/ftp/advice/business/info\\_sheets/ACVSDInfosheet\\_0\\_a.pdf](http://www.seav.sustainability.vic.gov.au/ftp/advice/business/info_sheets/ACVSDInfosheet_0_a.pdf)

"Heat Recovery" [http://www.seav.sustainability.vic.gov.au/advice/business/infosheets/heat\\_recovery.asp](http://www.seav.sustainability.vic.gov.au/advice/business/infosheets/heat_recovery.asp)

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