

Electricity Use in the Dairy

Practical Guide



Our Practical Guides cover five useful topics:

1. Use energy and fuels efficiently
2. Renewable energy
3. Lock carbon into soils and vegetation
4. Making the best use of nutrients
5. Optimise livestock management

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Websites

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ahdb.org.uk/dairy

www.ipcc.ch

www.soilassociation.org

www.energysavingtrust.org.uk

www.carbontrust.co.uk

www.agrecalc.com

www.fas.scot/energy/

We are all facing the challenge of reducing greenhouse gas (GHG) emissions and the Climate Change Act 2019 commits Scotland to net-zero emissions of all greenhouse gases by 2045. Current estimates suggest that agriculture and related land use contribute to around 20% of Scotland's emissions.

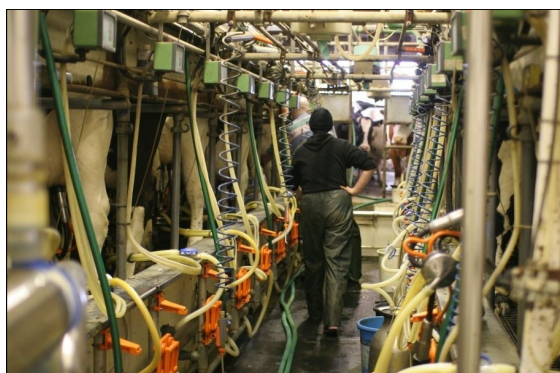
One way to help reduce the release of GHG emissions is by examining how electricity and fuel is used on the farm. Reducing fuel use will lower bills and energy demand, especially if coupled with on-farm renewables. Reducing fossil fuel use means less GHG emissions are released.

Dairy farms have noticeably changed over the past 20 years, with smaller farms declining and a move towards farms with larger herds. This has increased the opportunity to improve energy efficiency within the dairy. Investing in new technology and even applying small changes to current management practices can bring about substantial savings and a reduction in emissions.

This Practical Guide highlights how technology can improve energy use during milking and lead to improved farm efficiency.

Insulating water tanks/pipes

Within the milking parlour and tank room it is important to ensure that water pipes and tanks are fitted with the correct insulation. All tanks should be fitted with a minimum 80mm thick insulation jacket, which can be bought for roughly £20. This layer can offer significant savings annually, especially with increasing costs of energy bills and result in less energy use and therefore fewer emissions.



Key facts:

- Around 30% of energy use on a farm dairy is consumed by the vacuum pump.
- Using a VSD can save 40-50% of energy previously used.
- Heat drawn from milk can be utilised for pre-heating wash water.
- Seek advice so that the most beneficial options for your situation can be identified.



Electricity Use in the Dairy



Utilising heat from milk cooling

Instead of heat removed from fresh milk being released to atmosphere by the condenser coils of the refrigeration plant, this heat can be used to pre-heat water or supply drinking troughs through a heat recovery unit (HRU).

There are two types of HRU:

- Flow based HRU
- Storage based HRU

In a flow based HRU, warm refrigerant runs in a heat exchanger against cooler water, the refrigerant pre-heats the water, which is then used for parlour washing or fed to a conventional water heater.

In a storage based HRU system, heat exchange takes place within an insulated tank. This system allows hot water to be stored and used at a later date and often heated further using a conventional heat source.

These systems can result in substantial savings as less fuel is needed to heat the water up to the required temperature. Note it is important to ensure that any existing plate cooler is operating at its maximum potential before investing in further equipment.

Variable Speed Drives (VSD) for vacuum pumps

Around 30% of dairy farm energy consumption can be due to vacuum pumps working to full capacity for long periods of time. When vacuum demand is low, air is admitted to the system by a regulator valve.

Introducing VSD into the milking machinery can dramatically reduce wasted energy, in some cases by 40-50%.

The VSD works by altering the speed of the motor driving the pump to match the demand for vacuum, meaning the machine is only at full capacity when required. The benefits of VSD include:

- Energy savings
- Longer pump life due to the pump not always working to full capacity, therefore, less deterioration
- Reduced overall noise levels as pumps not always running
- The system offers a stable vacuum as the VSD can change rapidly with fluctuations in pressure

Some routine maintenance is required with these systems, for example the filter needs to be clean, pump oil levels need regular checks and any chemical residues need to be removed.

Plate Coolers

Plate coolers are installed between the parlour and the bulk tank. Fresh milk needs to be cooled down to 2-4°C within 30 minutes of milking, which is an expensive and energy demanding process. One way to help reduce the expense of the cooling process is by using plate coolers as a pre-cooling option.

Metal plates run parallel to each other, with cold water running in alternate spaces and in the opposite direction to the milk. An efficient plate cooler can cool the milk by 10-20°C before it reaches the bulk tank.

Using a plate cooler has been found to reduce the energy required for refrigeration by 30-40%.

Pre-cooling milk results in less energy being required by the bulk tank at the end of the process. This can lead to significant savings on energy bills.

Utilising plate coolers:

- Try to maximise water to milk ratio.
- Re-use cooler water to avoid waste.
- Install a time delay solenoid valve which will stop water flow shortly after milk flow stops.
- Ensure cooler size matches herd size requirements.
- Use the coldest water you have at your disposal.
- Ensure water and milk flow in the opposite direction from each other.
- Consider installing a variable speed milk pump to maximize cooling effect.