



Energy data for Field Vegetable Production

Increasing energy prices, combined with consumer demand for crops with a low 'carbon footprint' mean that horticultural producers are facing increasing financial and social pressure to improve energy efficiency. By monitoring and tracking consumption against production and output levels, it is possible for growers to equate energy use to specific tasks and develop realistic reduction targets. Simple

energy reduction policies, such as turn it off / close it / turn it down, can help as can regular maintenance of refrigeration equipment, checking insulation seals and the use of simple automatic controls, such as occupancy sensors and thermostats. Below are some options which could help achieve a greater level of energy efficiency:

AMBIENT STORAGE OPTIONS - POTATOES, REDBEET, ONIONS.

The figures given below are based on the energy consumption of a reasonably economical potato store at 130 kWh to 160 kWh per tonne per annum. The figures are also broadly applicable to onions and redbet storage also.

Have you considered improving insulation? Yes No

Increasing insulation thickness by 25 mm can reduce fan hours and heat requirement for frost protection and condensation control. Potential savings of up to 10%.

Can you improve sealing of the store? Yes No

Improve store sealing at doors, eaves, vents etc. Potential savings of between 5-10%.

Do you check system efficiency and integrity? Yes No

Typical faults include undersized and restricted ducts, inlet and recirculation vents, floors. Duct leakage gives uncontrolled warm air recirculation. Potential savings between 2-10%.

Have you reviewed the suitability of the fan used? Yes No

A grain store specification fan could be replaced by low-pressure fan unit. Fan should operate 10-13% of the time. Save up to 60%.

Do you have automatic control for the system? Yes No

A good automatic control system compared to poor manual control could save up to 60%

Are the temperature sensors accurate? Yes No

Inaccuracies can result from poorly positioned and/or inaccurate sensors. Poor setting of controller can also cause problems. Saving up to 50%.

Onion drying and ambient storage: (as previous information but in addition)

Do you have a modulating burner with thermostat control? Yes No

Large amount of energy used during drying. Saving approx. 20%.

Do you have full automatic control of Stage two drying Yes No

Control of second stage with humidity sensors and air mixing. Saving 20%.

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REFRIGERATED BULK AND BOX STORAGE - POTATOES, WINTER CABBAGE, ONIONS.

The figures given below are based on the energy consumption of a reasonably economical potato store at 130 kWh to 160 kWh per tonne per annum and are broadly applicable to onions or winter cabbage storage

Have you improved insulation?

Yes No

E.g. from 0.55 to 0.25 W/m² °C requires application of an additional 50 mm polyurethane insulation. Potential savings of up to 27%.

Do you have sufficient store sealing?

Yes No

Can reduce infiltration by 50%. Improve store sealing at doors, vents, eaves etc. Use air curtains/flexible doors. Likely savings 10%.

Have you checked the efficiency of air circulation fans?

Yes No

Fan load etc. on refrigeration plant can amount to 25%. Where store is only partly loaded this can rise to 50%. Saving 6%.

Are temperature sensors accurate?

Yes No

Wasted energy is 15% for each 1°C lower than required due to inaccuracy.

Do you have a flexible store divider?

Yes No

Dividing store in half with flexible insulated divider when store half full. Saving 35%.

Do you pre-cool using ambient air ventilation?

Yes No

With some crops it is possible to reduce crop temperature by storing outside overnight, or use store ambient ventilation. Saving 10%+.

Is evaporator defrosting used in refrigeration?

Yes No

Reset time clock after 'pull-down' or install automatic defrost. Excess ice/heat to store. Save 2-25%.

Is an electronic expansion valve used in refrigeration?

Yes No

Improved efficiency over mechanical Thermostatic Expansion Valve (but TEV is low cost and simple). Saving 2-5%.

Is there capacity control of the compressor in refrigeration?

Yes No

Important reduction in energy when operating at reduced load. Saving up to 47%.

Can the Coefficient of Performance for the refrigeration system be improved?

Yes No

Compressor consumption is minimised by having the highest evaporation temperature and a large evaporation surface area to give the maximum heat transfer coefficient. Saving up to 15%.

Have you considered other heat recovery systems?

Yes No

Can only be used in very specific situations incorporated at design stage.

The savings are not cumulative as one option may affect the potential savings of another.

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PACK AREAS AND WORKSHOPS

Do you limit the space heated?

Yes No

Avoid unnecessarily heating of large areas that are sparsely staffed. Localised and radiant heating can save energy and provide better working conditions in large grading and washing operations. The use of partitioned enclosures increase staff comfort and retain heat. Savings up to 70%.

Do you avoid product heating?

Yes No

Unnecessary warming of produce as it passes through a warm pack house should be avoided, as energy will be required to re-cool the product. Saving up to 10%.

Do you only heat during occupancy?

Yes No

Space & water heating should be controlled to only operate during occupancy by staff (apart from frost protection). Saving up to 50%.

Is warm air recirculated?

Yes No

Warm air heating systems should be ducted with point outlet diffusers. These systems should always recirculate the air within the pack house area. Ventilation of the building should be controlled independently. Saving up to 50%.

Do you have temperature redistribution fans?

Yes No

Slow moving open paddle type fans mounted in the roof will even out distribution of rising warm air.

Are the boilers and warm air heaters regularly serviced?

Yes No

They should be serviced at regular intervals and combustion efficiency checked frequently. Up to 50%.

Do you have thermostats checked against a thermometer?

Yes No

Saving up to 7% per °C excess

Is equipment only operated when necessary?

Yes No

Avoid having all the product lines operating and running empty when only part of the system is required. Fit isolator switches to all individual components.

Is process/line speed optimal?

Yes No

Adjust the forward speed of grading lines to ensure that the product completely fills the line. Avoid bottlenecks in the process that results in part of the line running empty or at fractional capacity. Saving up to 10%.

Is the line switched off during breaks?

Yes No

During work break period's switch off as much of the equipment as possible. Saving up to 12%.

Are process requirements minimised?

Yes No

Analyse product requirement for any particular process. Review this regularly internally and with the customer.

Is waste production minimised?

Yes No

Avoid over processing which increases volume & waste content of effluent. Waste treatment and disposal consumes more power. Saving up to 50%.

Is process water recycled?

Yes No

Where heated or cooled water is used recycle this as much as possible. Allow adequate time for water to be drained from produce. Saving up to 50%.

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PACK AREAS AND WORKSHOPS *Continued*

Have you considered low tech processing?

Yes No

For example simple trimming tables with produce and waste collection bins are likely to be just as effective as stations on conveyor systems.

Are your buildings insulated?

Yes No

Important to insulate to minimise heat losses, particularly roofs.

Do doors have plastic strip curtains or heated air curtains?

Yes No

Saving up to 10%.

Is process heat recycled?

Yes No

For large heat consuming and heat rejecting processes e.g. frying or blast freezing consider using heat recovery or utilisation of rejected processed heat. Saving up to 70%.

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Data Source: Managing Energy and Carbon - The UK Carbon Trust www.thecarbontrust.co.uk