Energy Management Guideline

Alan Brent, Nadia Sanetra and Cebo Silinga

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Wine Industry Network of Expertise and Technology
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ACKNOWLEDGEMENTS AND BACKGROUND

This energy management guideline was commissioned by Winetech, in collaboration with the Centre for Renewable and Sustainable Energy Studies (CRSES) at Stellenbosch University, with the aim to support the South African wine industry to improve energy performances and energy efficiencies, while supporting the goals of the Confronting Climate Change project.

The guideline is based on the principles of the ISO 50001 standard for Energy Management Systems and draws on energy guidelines from other wine industries; in Australia, the United States, the European Union, and England. The practical examples that are contained within the guideline are derived from energy audits that were conducted at various wineries in the Western Cape Province.

We would like to acknowledge the following authors and contributors: Bill Meffert and Liam Mclaughlin for UNIDO and the Industrial Energy Efficiency Project (IEEP) hosted by the National Cleaner Production of South Africa (NCPC-SA) as well as the CSIR. Also, we would like to acknowledge the contributions of Koos Bouwer and Barry Platt in their capacity as national experts in energy management systems and systems optimisation respectively.

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MANAGEMENT SUMMARY

Wineries are vulnerable to escalating electricity price increases and stricter energy regulations, as carbon emissions reduction targets have been set by the South African government through the National Development Plan. The purpose of this guideline is to empower winery management and staff, using the Plan-Do-Check-Act method of ISO50001 (Energy Management Systems), to identify and prioritise opportunities for the improvement of overall winery energy performance.

Although newer technologies can lead to better efficiencies, savings can often be achieved by low or no-cost interventions. Opportunities to save energy can be uncovered by working through this guideline in a systematic way and by focusing on the following actions:

- Understanding energy usage and how the winery is billed for energy.
- Identifying the significant energy users in the winery and better understanding the systems associated with these users.
- Listing and prioritising improvements based on the best return on investment.
- Setting targets and developing measurements to quantify improvements.
- Training staff and operators and increasing awareness of all end users.

PURPOSE OF THE DOCUMENT

The main objective of this document is to present the findings of the Energy management Guideline that has been developed. The guideline also highlights some of the potential energy cost-saving opportunities in the wine industry.

The guideline will help wineries to:

- Identify opportunities to save energy and money.
- Prioritise and evaluate the feasibility of energy saving projects.
- Understand energy bills.
- Set goals.
- Measure and improve energy performance in a systematic way.
- Make good choices for the future.
- Provide a framework for continuous improvement.

1. INTRODUCTION

The guideline aims to translate the best-practice principles of ISO50001 (Energy Management Systems) into a user-friendly format that is jargon free and action orientated. The guideline is for winemakers, assistant winemakers and senior cellar assistants who want to improve the energy performance of their wineries.

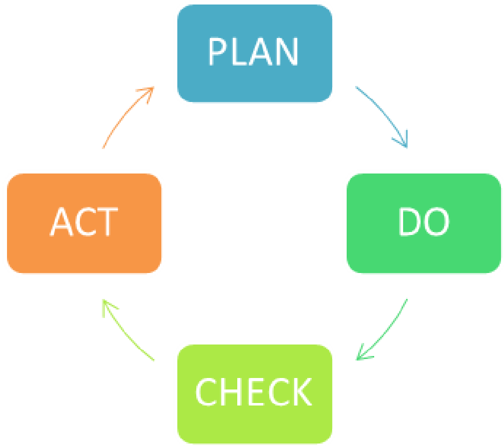


Figure1: The continuous improvement cycle of ISO 50001

Why is Energy Management Important?

- **Rising cost of electricity**
  Two factors influence the cost of energy in South Africa: the security of the electricity supply (capacity) and rising energy resource prices (mainly coal) due to limited availability.

- **Confronting climate change**
  South African electricity, generated mostly by coal-fired power stations, has high associated carbon emissions as compared to the rest of the world.

- **Political landscape**
  The South African government has set carbon emissions reduction targets that have led to stricter energy regulations as well as subsidies and rebates. The South African national treasury has released a “Carbon Tax policy” document for review. Carbon tax may have implications for the winemakers, so it needs to be considered, as businesses will be vulnerable due to carbon-intensive electricity.

- **Consumer awareness**
  Informed consumers are likely to give preference to a product produced by a company that is making an effort to use more sustainable production methods.

1.1 Best-Practice Energy Management

Better energy performance can be attained in two ways, typically:
- Behavioural change; and
- Technical interventions.

It is, however, often difficult to sustain improvement efforts over a period of time. Common pitfalls when attempting to improve energy performance include:
- Insufficient resources are allocated – there is not enough time to focus on energy savings, or limited finances are available for projects.
- Improvements are focused on technical interventions only – employees are not aware of energy usage or the influence they have as end-users.
- One person is responsible for energy in the winery – all knowledge resides with one person and that knowledge is not easily accessible to the rest of the winery.
- Improvements are not measured – there appears to be no change in the amount of energy consumed although energy savings projects have been implemented.

This Energy Management Guideline is based on the ISO50001 standard for an Energy Management System (EnMS), which addresses these and other challenges.

The benefits of implementing an EnMS include:
- It is a system designed to save you money.
- Based on world-class, best-practice, tried and tested methodology.
- Based on continuous improvement (Plan – Do – Check – Act) cycle.
- Allows focus on improving energy performance and not on developing a management system.
- It can be integrated into existing management systems (IPW, ISO14001).

1.2 Energy Management System Principles

This section presents an overview of a few guiding principles that can be extracted from ISO50001.

Principle # 1: Secure commitment from upper management

Upper management commitment lays the foundation for sustaining energy management efforts over the long term. What about resources? Communication, and updates on progress are key to ensuring that you keep the momentum going, which includes communication to upper management and staff.

Principle # 2: There's no 'I' in team

A team of people with different skills will help to maintain the momentum of implementation.

Principle # 3: You can't manage what you don't measure

Measurement will increase the understanding of energy use and trends, and will assist with the identification of energy saving projects that will yield the best return on investment.

Principle # 4: The 80/20 Pareto principle

The 80/20 principle states that 80 % of energy consumption is likely to come from 20 % of the operations or equipment. Focussing energy savings initiatives on the Significant Energy Uses (SEU's) in the winery is likely to result in more savings at a lower cost to the company.

Principle # 5: The whole is more than the sum of its parts

System optimisation means looking at a system holistically, from generation to distribution to end user. This is more effective than looking at components only.

2. ENERGY MANAGEMENT CHECKLIST:

See Appendix B for printable version.

Preparation

Step	Question	Example:	page #
1	Have management made the necessary resources (e.g. staff, time, money) available for energy management?	The assistant winemaker has allocated one half-day per week to work on energy management.	N/A
2	Is the Energy Management Systems (EnMS) part of the company policy and staff objectives?	The management should include the EnMS in the policy and on the list of the staff's objectives. By doing so, they can get the staff buy-in from the beginning.	N/A
3	Is everyone aware that improved energy management will be a focus going forward?	The winemaker made an announcement at the weekly staff meeting.	N/A

Plan

Step	Question	Example:	Page #
3	Which energy sources are used in the winery? When are they used? How much is being used?	Electricity, liquid petroleum gas, paraffin, diesel	See page 6 Basic self-assessment.
4	What are the biggest users of energy? (Significant Energy Users)	Cooling compressors, air compressors, centrifuge	See page 7 Identify the significant energy users
5	Do I understand the systems associated with significant energy users?	Cooling compressors are old and inefficient.	See page 7 Understand how systems work
6	What can be improved with these systems?	Accuracy on temperature settings.	See page 8 Identify and prioritise projects
7	Which interventions have the best return on investment?	Install a VSD on the circulation pump	See page 8 Financial Appraisal of projects
8	What is the savings target?	Save 5 % on cooling plant measured in kWh per litre of white wine made for the next financial year.	
9	How will savings be measured?	Install logger on distribution board in refrigeration-plant room.	See page 9 Measure before and after

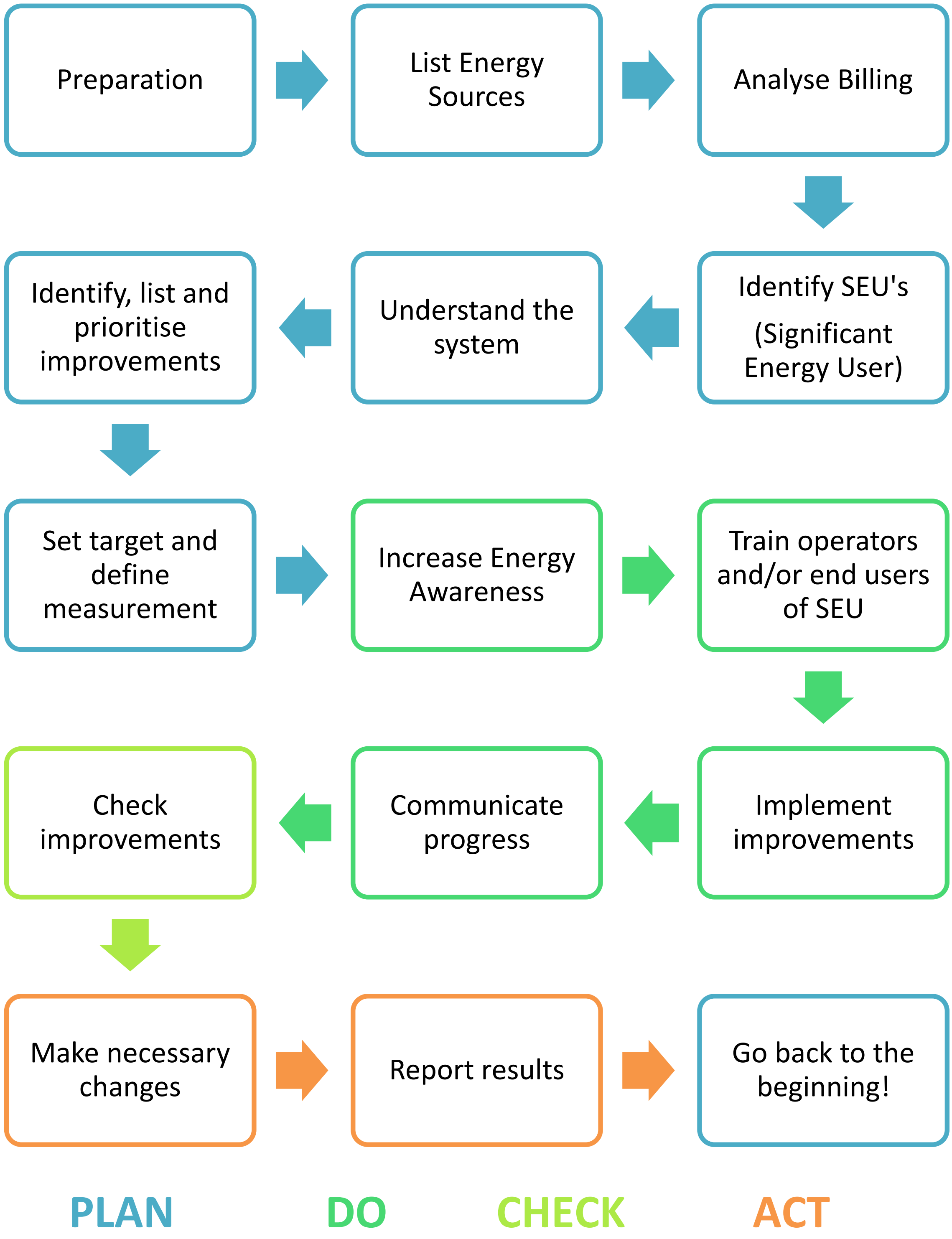
Do

Step	Question	Example:	Page #
10	Are all staff aware of how they can save energy at work and at home?	A workshop was held where staff were asked to identify savings.	
11	Have operators and users of significant energy users been properly trained?	A workshop was held with the refrigeration contractor for senior cellar staff to learn more about how the system works.	
12	Have listed improvements been implemented?	A VSD has been installed on circulation pumps on the refrigeration system.	
13	Have energy efficient procurement specifications been developed?	An email was sent to the refrigeration contractor to inform them that energy efficient technology should be considered going forward.	
14	Has progress been measured and communicated to staff & upper management?	kWh/L white wine has been reduced and this has been communicated in a management meeting.	

Check and Act

Step	Question	Example:	Page #
15	Have listed improvements been implemented?	Conduct an internal review of interventions. Is any intervention not working as planned? A list was made of what needs to be changed.	
16	Are all significant energy users being properly operated?	The contractor that is maintaining the refrigeration system was asked to provide evidence that the plant is running optimally.	
17	Are all significant energy users being properly maintained?	Maintenance records were requested and checked against maintenance requirements.	
18	Have predicted savings been achieved?	Overall kWh/L has been reduced.	
19	Have the results been reported to top management and staff?	The results have been communicated to upper management at the annual budget meeting. Staff were informed during a weekly meeting.	

Energy Management Steps



2.1 Basic Self-Assessment

Understand energy sources, usage patterns and charges

- Study energy bills and do a summary of total kWh used monthly.
- Plot this summary on an Excel graph.
- What is the tariff? What am I being charged for? Contact service provider if unclear.
- Can anything be changed to optimise the tariff? E.g. "Time of use" tariff charge is higher for peak periods, five hours per day – can I move any activities?

Example of "Time of Use" tariff:

A timer is installed on an aerator in a Water Treatment Plant. The aerator is switched off during peak times (five hours per day).

Peak time is the most expensive time to use electricity. The winery saves 50 % on the annual electricity cost for this aerator.

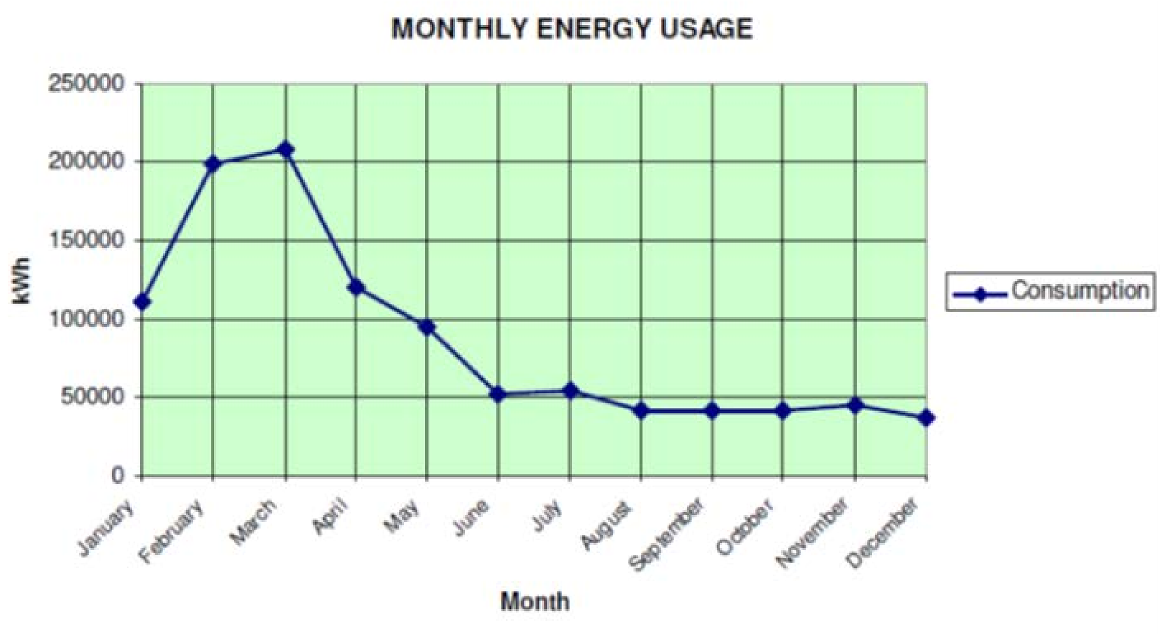


Figure: Typical Electricity Usage pattern in a winery.

Identify the significant energy users

Where are the large pieces of machinery? Which ones are consuming the most energy (kWh)? Which area or equipment is running 24/7?

This could be a:

- System, e.g: Refrigeration, compressed air, waste-water treatment.
- Physical area, e,g: Bottling hall, fermentation cellar, restaurant, tasting centre.
- Production function, e.g: Stabilisation, blending, fermentation.

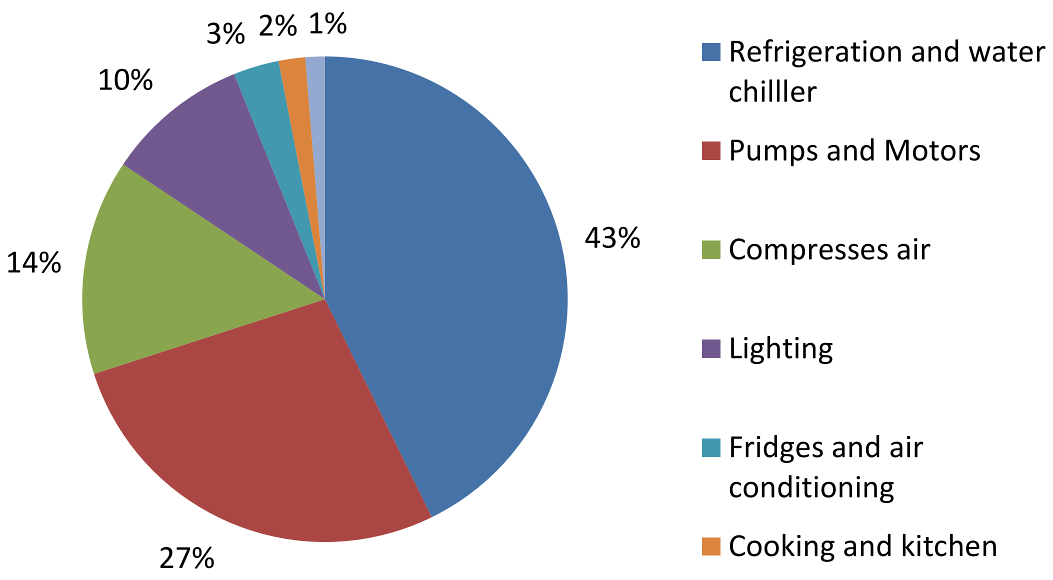


Figure: Typical significant energy users for a winery

Understand how systems work

To do:	Example:
Select a system e.g. cooling, lighting.	The cooling system has a compressor that runs 24/7 from end January until May.
Identify the components.	Compressors, circulation pumps, pipes, valves.
What is its function? What is it trying to achieve?	It supplies chilled water to the cellar for cooling tanks and to an air-handling unit for cooling the barrel room.
How much is the system supplying and when?	There are two chilled-water tanks of 5 000 L stored at 7 °C. This 10 000 L is available for five months of the year from January – May.
What is the requirement?	We are only using half of the winery's tank capacity. Once fermented, we store wine at 14 °C.
What are the opportunities?	After the peak fermentation period is over, chill only one 5 000 L tank at an increased temperature of 10 °C.

Identify and prioritise projects

To do:	Example:
Is there a mismatch between supply and demand? Is there any waste?	Air compressors supplying compressed air at a high pressure when a lower pressure is needed. Audible air leaks in the compressed air system.
Is the system effective? Is it delivering what it is supposed to, according to the requirement?	A chiller unit is set to cool the barrel room to 14 °C but in summer, the temperature of the room never goes below 19 °C.
Can the operating parameters be adjusted to save?	Increasing the temperature setting of the chiller unit in the barrel room from 14 °C to 18 °C.
Is there a cheaper source of energy that can achieve the same function? E.g. renewable energy	Solar water geysers are installed to replace electric geysers.
Is there new technology that could replace inefficient technology?	An old pump is replaced with a new pump with an energy efficient motor.
Prioritise projects according to the best return on investment	Projects are listed and categorised according to the payback period.

Financial appraisal of projects

Example

Life-Cycle Costing

Proposed project:
Decide between two pumps: **Pump A** is an energy efficient pump that costs R 80 000 and **Pump B** is a less efficient pump that costs R 50 000.

The annual cost of the electricity to run the energy efficient pump is R 42 000 versus R 60 000 for the less efficient pump. Which pump will be cheaper over the 15-year life span of the pump?

Pump A = R 80 000 (initial cost) + R 630 000 (R 42 000 x 15 years electricity cost)
= R 710 000
Pump B = R 50 000 (initial cost) + R 900 000 (R 60 000 x 15 years electricity cost)
= R 950 000

Example

Simple Payback = Cost/Savings per year

Proposed project:

Replace 80 Mercury Vapourhigh bay lights (400 W each) with 80 Induction lights (200 W each) at a cost of R 96 000 for the project. These lights are on for eight hours per day, five days per week for 50 weeks per year = 2000 hours per year. The cost of electricity is R 1.00/kWh.

Calculation:

Lights before: 400 W x 80 = 32 kW

Lights after: 200 W x 80 = 16 kW

Annual Saving of 16 kW x 2000 hours

= 32000 kWh x R 1.00

= R 32 000

Simple Payback

= R 96 000/R32 000

= 3 years

Measure before and after

Develop baseline and indicators

Before implementing an improvement project, know how the improvement will be measured. This is important, as management will want to know whether an improvement was made due to a project and how much was saved. The easiest way to do this is to ask the contractor, who is doing the work, to do it as part of the quote.

Sub-metering and smart-metering

Sub-metering and smart-metering help the organisation to obtain a more accurate picture of the current energy consumption patterns, what is spent on energy in various forms and the unit costs, what it is used for, which are essential and which are not.

The sub-metering and smart-metering system includes various methods, like metering of sub-systems. During the planning phase, it is important to measure and monitor the system and obtain results in order to ascertain the feasibility of the project. The results obtained from the improved process can then be compared to the initial measured results. If there are external operations linked to the winery – perhaps a restaurant, sub-metering and smart-metering can be used to obtain an accurate electricity bill.

Conclusion

Members of Winetech reviewed this Energy Management Guideline for Wineries. In contrast to other international energy efficiency guidelines for wineries, the document has attempted to explain the principles and steps of an Energy Management System (EnMS) as outlined in ISO50001, and illustrate how an EnMS may be applied to a winery situation. Furthermore, it has shown, by way of case studies from South African wineries, the typical energy savings opportunities that exist.

GLOSSARY

Note: Definitions from ISO50001

energy
electricity, fuels, steam, heat, compressed air, and other like media

energy baseline
quantitative reference(s) providing a basis for comparison of energy performance

energy consumption
quantity of energy used

energy efficiency
ratio or other quantitative relationship between an output of performance, service, goods or energy, and an input of energy

energy management system (EnMS)
set of interrelated or interacting elements to establish an energy policy and energy objectives, and processes and procedures to achieve those objectives

energy management team
person(s) responsible for effective implementation of the energy management system activities and for delivering energy performance improvements
NOTE The size and nature of the organization, and available resources, will determine the size of the team. The team may be one person, such as the management representative

energy objective
specified outcome or achievement set to meet the organization's energy policy related to improved energy performance

energy performance
measurable results related to energy efficiency, energy use and energy consumption

energy performance indicator (EnPI)
quantitative value or measure of energy performance, as defined by the organization

energy policy
statement by the organization of its overall intentions and direction of an organization related to its energy performance, as formally expressed by top management

energy review
determination of the organization's energy performance based on data and other information, leading to identification of opportunities for improvement

scope
extent of activities, facilities and decisions that the organization addresses through an EnMS, which can include several boundaries

significant energy use
energy use accounting for substantial energy consumption and/or offering considerable potential for energy performance improvement

upper management
person or group of people who directs and controls an organization at the highest level.

APPENDIX A: BASIC ENERGY SAVINGS TIPS

PLEASE NOTE: These are general tips. All projects should be evaluated on individual merit, based on the specific conditions of the winery.

Refrigeration

- Match the cooling load (temperature and quantity of chilled water) produced with what is required.
- Insulate buildings.
- Install VSD on circulation pumps.
- Minimise the number of bends and valves in the system as this increases friction, which means the circulation pumps have to work harder.
- Control cooling-tower fans based on leaving water temperatures.

Example

By increasing the temperature of a 10 000 L tank by 1 °C, cost savings can be calculated as follows:

Savings for each 10 000 L tank of chilled water with reducing cooling

by 1 °C = R 54 680.00

by 3 °C = R 164 040.00

The savings on this project, if practicable, can be realised as soon as it is implemented. It also only requires management commitment.

Space cooling

There are various ways of assessing the energy consumption for space cooling. In many cases, it is possible to examine the records of the electricity used. Energy cost reduction of space cooling is concerned with:

- Avoiding over cooling.
- Minimising the losses through the building.
- Maximising the usage of the cold space.

Example

A storage facility kept at 12 °C can potentially result in reduced energy costs if the set temperature is increased by 1 °C. The cooling requirement is calculated as follows:

The savings opportunity is, therefore, derived from increasing the room temperature set point until the maximum possible temperature is reached where the product can safely be stored.

If for example, the current room temperature is set at 12 °C, and this could safely be increased to 15 °C, then the cooling power reduction for this 3 °C increase would result in a R 300 000 saving for a 60 000 m² room.

The resulting savings from this project can be realised as soon as it is implemented. It only needs management commitment.

Insulation

Insulation is essential in thermal applications because it prevents heat gain and losses, thereby saving on fuel and energy costs. Insulation of hot surfaces and cold rooms is one of the simplest and most cost-effective ways of increasing energy efficiency. The payback time for insulating a pipe is generally less than one year. For piping, tanks and valves, and fittings, immediate savings can be realised from insulating where no insulation existed previously.

Apart from insulation, there are opportunities to reduce energy costs. Housekeeping opportunities provide options for costs savings. Typically, areas such as damaged insulation and damaged covering and finishes are identified. Retrofitting the existing system provides an opportunity. This can be done by upgrading the existing insulation levels or reviewing the thickness requirements.

Lighting

Lighting constitutes about 10 % of energy demand in wineries. If proper lighting products are installed, they can result in substantial savings. Employees can play a big role in the cost saving initiatives from lighting. This can be done by switching off all unnecessary lights or installing automatic lighting controls. Harvesting daylight through the installation of skylights may be considered where heat ingress is not a problem.

- Make staff aware of the cost associated with electricity.
- Replace inefficient old fittings with newer, more efficient technology – start with the highest wattage lights that are on for the longest hours.
- Install lighting controls e.g. day/night switches, timers, motion sensors.
- Daylighting – install skylights so that lights can be switched off during the day.

Replacing the existing lights with more efficient/low energy consuming lights may provide an opportunity for cost cutting. The savings are realised as soon as the new lights are installed. The most efficient commercial lighting sources may last longer than the existing inefficient lighting, which justifies the high capital expenditure. Take special care when deciding upon and selecting the efficient lighting sources. They need to comply with the OHS Act requirements concerning the light intensity levels in the work place. This is legislation for workers' safety. It is critical to do the lighting design upfront to ensure that the replacements comply with the regulations. If the new energy saving lights do not comply to light intensity legal limits, they will have to be replaced. This may negate any projected savings.

Compressed Air

Compressed air is used extensively in the wine industry and it is a very expensive service. It is generally accepted that about 5 % of the energy consumed by compressing air is available at the point of use. This makes it crucial to utilise compressed air effectively.

The performance of the compressed air system is heavily dependent on the level of air leakage. This can be best assessed during periods of low or no compressed air demand. The energy consumption can also be reduced by installing a more efficient compressor (e.g. VSD compressor) and it is possible to save 10-20 % of energy running costs. The operating pressure of the compressor also affects the energy consumption of the compressor, for example, a reduction of 1 bar of pressure generally results in a 7 % energy saving.

Example

An illustration of potential energy saving from the compressor is by maintaining the compressor pressure at the required level. For a compressor that has 2 x 75 kW capacity – typical size that is used at a winery, that operates for five days per week and 20 weeks per year, the energy costs are expressed as follows:

(2 x 75 kW) x 60 % load x 24 hours, five days/week x 20 weeks/year x Tariff (R 1/kWh) = R 180 000

If the set point was reduced from 8.5 bar to 7.5 bar the savings would be 7 % = R 12 600

Pumps and motors

Pumps are usually selected with safety margins in order to ensure sufficient capacity. The selected pump for an operation may be efficient however, there is usually wasted energy consumption.

Irrespective of the type of pump that is used for the operation, the following factors may assist in saving energy:

- Reducing excess flow rate – installing pumps that operate at flow rates close to the required system flow rate.
- Reducing the pipe resistance – reducing the number of bends, T's and fittings.
- Efficient motor control – installing VSDs.

Hot water supply

As with domestic geysers, when water is heated by electricity it can be very costly. Savings opportunities exist in matching the water heated with the required temperature and amount needed.

Example

There are various opportunities for cost saving in areas where water is heated by electricity. These opportunities can be realised by adopting other systems like heat pumps and excess steam from the boiler.

Typical 200 litre geyser electrical element = 4.00 kW

Typically, a heat pump uses 30 % of the required electricity of a heating element.

Replacement heat pump power = 4.0 x 30 % = 1.20 kW

This project will typically yield a 30 % saving.

Steam

The boiler is often the largest single consumer of energy in the winery. This makes it crucial to ensure that there is appropriate constant review of its performance. Boilers are classified according to their size and input fuel type.

The measure of the boiler performance is the specific boiler efficiency. This is the ratio between the useful heat production and the energy consumed – useful steam over fuel consumption. Boilers are complex energy systems and performance monitoring may be achieved by direct measurement of energy transfer to the working fluid or by indirect measurements – such as fluid temperatures, pressure and volume flow-rate measurements.

Electricity is consumed in the boiler system, typically for circulating pumps, combustion fans, etc. An electricity kWh meter can be installed to monitor the electricity consumption profile from these systems. Steam systems are the most important place to look for savings by insulating pipes and valves.

APPENDIX B: CHECKLIST

Preparation

	Question	To be actioned (person's name)	By (date)	Completed ✓
1	Have management made the necessary resources (e.g. staff, time, money) available for energy management?			
2	Is everyone aware that improved energy management will be a focus going forward?			

Plan

	Question	To be actioned (person's name)	By (date)	Completed ✓
3	Which energy sources are used in the winery? When is it used? How much is being used?			
4	What are the biggest users of energy? (Significant Energy Users)			
5	Do I understand the systems associated with significant energy users?			
6	What can be improved with these systems?			
7	Which interventions have the best return on investment?			
8	What is the savings target?			
9	How will savings be measured?			

Do

Step	Question	To be actioned (person's name)	By (date)	Completed ✓
10	Are all staff aware of how they can save energy at work and at home?			
11	Have operators and users of significant energy users been properly trained?			
12	Have listed improvements been implemented?			
13	Have energy efficient procurement specifications been developed?			
14	Has progress been measured and communicated to staff & top management?			

Notes:

Check & Act

Step	Question	To be actioned (person's name)	By (date)	Completed ✓
15	Have listed improvements been implemented?			
16	Are all significant energy users being correctly operated?			
17	Are all significant energy users being properly maintained?			
18	Have predicted savings been achieved?			
19	Have the results been reported to top management and staff?			

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APPENDIX C: SERVICE PROVIDER QUESTIONNAIRE

Energy efficiency plan	The winemaker should have a written energy efficiency plan that details the methods of energy consumption reduction on the wine farm. This should include an energy consumption reduction strategy, training of personnel to improve energy consumption, and monitoring programmes. A documented energy efficiency plan will assist the wine farm to achieve the energy efficiency and cost reduction in a formal manner. A plan will document how, when and where energy use will be monitored and how the results will be used to improve energy efficiency. The EnMS (including the energy efficiency plan) should be included in the company policy. The EnMS should also be included in staff objectives in order to get their buy-in. • Do you have an executive level commitment to a successful energy management programme? • Have you assigned an in-house energy manager to oversee management of energy at your winery? • Do you track the costs and benefits of energy management? • Have you developed an inherent system for continuous improvement of energy management?
Energy monitoring	Energy consumption data should be collected to enable detailed analysis of the winery energy usage. Real time data will allow the winemaker to identify peak demands and high energy usage processes that could be targeted for energy reduction. The energy consumption records could be in the form of monthly financial statement or in the form of: • Electricity usage (kWh). • Diesel usage (litres). • Petrol (litres). • Coal (tonnes). • Have you established a baseline using appropriate measures of performance for each system? • Have you quantified the current energy used and losses? • Do you shift electricity consumption into less expensive off-peak times? • Have you evaluated using alternative and/or renewable energy like wind, solar, biofuels, or others? • Do you incorporate carbon footprint information in all energy management evaluations?
Equipment servicing and optimisation	Energy efficiency should be a high priority when purchasing new equipment. The existing equipment should also be serviced regularly, and repaired whenever necessary to ensure optimum energy consumption.

Optimisation of refrigeration and cooling efficiencies	Refrigeration and cooling systems provide an opportunity for cost reduction and energy efficiency. This can simply be achieved by optimising the existing equipment. • Have you reduced suction pressure to reduce compressor power and save energy? • Do you variably adjust the condenser set-point temperature to optimise compressor pressure difference for varying ambient temperatures? • Have you reduced excess heat gain from: interior lights (replace with LED), inadequate defrosting, inadequate insulation, excessive air exchange, worn weather stripping, etc? • Have you insulated refrigeration lines? • Do you optimise tank volume? • Have you installed variable speed controls (where necessary) on the condenser and evaporator?
Are you using the most efficient lighting sources	Space lighting provides an opportunity for cost reduction and efficient energy use. This can be achieved by replacing the existing light bulbs with more energy efficient light bulbs. The existing energy equipment can also be optimised for better operation. • Have you established necessary light levels for specific areas when used and unused? • Have you reduced lighting levels where appropriate? • Do you utilise lighting controls (time clocks, by-pass/delay timers, motion detectors)? • Do you make use of natural lighting (daylighting – windows and skylights)?
Utilisation of programmes to maintain and operate all motors, belts, drives, fans, pumps and compressors for optimum energy use	Overall, there should be programmes in place for all the energy consuming equipment in the wine farm. Energy reduction and cost cutting will not occur homogenously, however, the combination of these programmes may result in breakthrough improvements. • Have you installed properly sized premium efficiency motors? • Have you installed timers and sensor controls to turn off during idle time? • Have you installed properly sized energy efficient pumps and fans? • Do you perform regular preventative maintenance?