WINERY ENERGY SAVER TOOLKIT – SUPPLIER CHECKLIST

COMPRESSED AIR

Supplier Checklist

The following checklist provides guidance on which information to collect from within the winery and from the equipment supplier, in order to assess the winery's compressed air systems for potential improvements in energy efficiency.

Important to note:

- Some of the information suggested below may be difficult or impractical for SME wineries to collect. We do not expect you to be an expert in compressed air – instead, the intention of this checklist is to give you a snapshot of what may be required to properly assess the opportunity, and to then have an informed discussion with the supplier to explore what may be possible.
- This checklist can be given directly to the supplier to assist them with providing the winery with an appropriate energy efficiency solution.
- An editable (Microsoft Word) and print-version of this checklist is available via the WEST Online Portal, accessible via www.winesa.asn.au.

Other tools

To further assist with evaluating opportunities to improve Compressed Air energy efficiency, the Winery Energy Saver Toolkit provides the following tools (available via the Online Portal, www.winesa.asn.au):

- **Energy efficiency opportunities modelling tool,** which can be used to test potential savings resulting from key energy efficiency improvements outlined in the Winery Energy Saver Toolkit
- **Energy Resource Use Data tool**, which can be used by businesses to collect and analyse their own baseline electricity, gas and fuel consumption data.

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Department of Industry

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
1. Determine the end-uses of your compressed air systems *Check the following end-uses:*		
Receiving	☐	
Presses	☐	
Winery	☐	
Cellars/barrel rooms	☐	
Bottling	☐	
Cleaning	☐	
Other:	☐	
2. Compile a compressed air system inventory *Compile a list of the following equipment:*		
Compressor: number, make, model, type, power rating (kW), flow rate (l/s), speed (rpm), operating pressure (kPa), number of compressor stages, and time in use (h/y)	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Motor (if it is a separate unit): number, make, model, type, power rating (kW), efficiency (%), speed (rpm), and time in use (h/y)	☐	
Dryer: number, make, model, type, power rating (kW), flow rate (l/s), purge flow rate (l/s), pressure dew point (°C), pressure drop (kPa)	☐	
Pipes: diameter (m)	☐	
Hoses: diameter (m)	☐	
Valves: number, make, model, type	☐	
Other:	☐	
Choose an approach to estimate time in use:		
Record readings on the hour-run meter (h) at regular intervals	☐	
Divide the hour-run meter reading (h) by the total time (h) that the air compressor has been installed	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Compare the energy (kWh) and power readings (kW) (if the system has an electricity meter)	☐	
Examine electricity meter load profiles (kW)	☐	
Use existing control systems and manual procedures	☐	
Check control settings (if the system has controls)	☐	
3. Estimate the compressed air requirements *Compile a list of the following information for each end-use:*		
Air: quality—pressure dew point (moisture) (°C), and dirt and oil concentration	☐	
Average flow rates (l/s) and maximum pressure (kPa) required now	☐	
Location of end-use	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Operating times or events that require compressed air	☐	
Reason the end-use requires compressed air	☐	
Average flow rates (l/s) and maximum pressure (kPa) required in the future	☐	
Choose and approach:		
1. For an initial estimate of compressed air requirements of major end-uses, record the time of day and length of time (h) that the major end-uses need compressed air over a production cycle. This approach is convenient for end-uses with short demand cycles.	☐	
2. For an initial estimate of total the compressed air requirement, record the readings of the outlet pressure gauge (kPa) at regular intervals over a production cycle. Use these readings with the 'pressure vs. flow' curve for the compressor (available from the manufacturer) to determine the corresponding flow rates (l/s).	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
3. For an initial estimate of the total compressed air requirement, install power demand analysers or power meters on the compressor and dryer to measure the power use (kW) over a production cycle. This data indicates times of peak and low load (kW).	☐	
4. If budget and time allow for a more-accurate estimate of compressed air requirements, install metering and monitoring equipment, such as: flow meters on the main compressed air branch lines, electronic pressure meters on the main lines, power meters on the compressor and dryer, and data-loggers. This approach also provides data about other aspect of performance and assists in the diagnosis of problems.	☐	

This list enables you to:

- Identify the end-uses that dominate the compressed air requirements;
- Identify wasteful and unnecessary uses of compressed air;
- Estimate the base and peak compressed air requirements, and the variation in compressed air, now and in the future; and
- Compare the current operating points of the compressor and dryer with the peak-efficiency points (rpm).

4. Estimate the energy use of your existing compressed air systems

Choose an approach:

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
1. Install a power demand analyser or a suitable meter to measure the average power (kW) of, or the energy (kWh) used by, the system over a test period.	☐	
2. Install a clip-on ammeter to measure the instantaneous currents (A) of each of the three phases with the compressor running at the most common load. Calculate the average phase current (A). Repeat this process with the compressor at no load and at full load. Multiply the average phase currents (A) by the time (h) that the compressor runs at each load (kW).	☐	
3. For compressors with control systems, record energy use (kWh) readings weekly to determine annual energy use (kWh).	☐	
5. Determine the business parameters of the compressed air system *Quantify or qualify the following values:*		
Energy price(s) ($/kWh; $/l)	☐	
Capital budget ($)	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Targets for running costs ($/y)	☐	
Required level of redundancy in the system	☐	
Acceptable level of risk for new technologies	☐	
Equipment constraints, such as: specific brands of motors, compressors, or dryers; specifications for electrical wiring; compatibility with existing infrastructure or floor space; and adaptability to future upgrades	☐	
Scope of energy efficiency opportunities to consider: If the existing equipment need to be replaced, then calculate the payback period (y) based on the extra (rather than total) costs ($) (if any) of the efficient equipment	☐	
6. Confirm compressor system performance *Check the following conditions:*		
The compressor meets the peak compressed air load (kW)	☐	
The compressor is optimised for the most common compressed air loads (kW)	☐	
The pipe/hose network has a pressure drop (kPa) of less than 10% of the compressor discharge pressure (kPa)	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
The air filter, oil filter, and oil separator are easily accessible	☐	
7. Select a service provider *Select an air compressor service provider that can provide the combination of services that you seek:*		
Measurement and analysis of the compressed air requirements profile; and power (kW) of compressors, dryers, and end-uses	☐	
Reporting on equipment and process performance	☐	
Optimisation of the pumping system, including: optimisation of the control system, flow rates (l/s), and pressure levels (kPa); management of air leaks; minimisation of the compressed air requirements at end-uses; appropriate treatment of air; and assessment of heat recovery potential	☐	
Design of a compressed air system that aims to minimise losses from the end-use to the compressor	☐	
Supply, service, installation of compressed air system equipment (e.g. compressors, filters, drains, and pipes) for optimal energy efficiency (%)	☐	
Supply of spare parts, including shipping	☐	
Guarantee of minimum efficiency (%) of the proposed system	☐	
Guarantee of maximum running costs ($/y) of the proposed system	☐	
Technical support and after sales service	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
In-house repairs and onsite service	☐	
Emergency service	☐	
Emergency rental compressors	☐	
Remote monitoring	☐	
Other:	☐	
8. Negotiate a contract *Determine your preferred type of contract:*		
• Service contract: supplier performs certain actions for a fixed price ($).	☐	
• Energy performance contract: the supplier performs certain actions that meet certain levels of energy reduction (kWh) for a lower upfront price ($) and a share of the cost savings ($/y).	☐	

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WINERY ENERGY SAVER TOOLKIT – SUPPLIER CHECKLIST

HOT WATER & STEAM

Supplier Checklist

The following checklist provides guidance on which information to collect from within the winery and from the equipment supplier, in order to assess the winery's hot water system for potential improvements in energy efficiency.

Important to note:

- Some of the information suggested below may be difficult or impractical for SME wineries to collect. We do not expect you to be an expert in boiler systems – instead, the intention of this checklist is to give you a snapshot of what may be required to properly assess the opportunity, and to then have an informed discussion with the supplier to explore what may be possible.
- This checklist can be given directly to the supplier to assist them with providing the winery with an appropriate energy efficiency solution.
- An editable (Microsoft Word) and print-version of this checklist is available via the WEST Online Portal, accessible via www.winesa.asn.au.

Other tools

To further assist with evaluating opportunities to improve Hot Water & Steam energy efficiency, the Winery Energy Saver Toolkit provides the following tools (available via the Online Portal, www.winesa.asn.au):

- **Energy efficiency opportunities modelling tool,** which can be used to test potential savings resulting from key energy efficiency improvements outlined in the Winery Energy Saver Toolkit
- **Energy Resource Use Data tool**, which can be used by businesses to collect and analyse their own baseline electricity, gas and fuel consumption data.

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
1. Determine the end-uses of your boiler *Check the following end-uses:*		
Cleaning	☐	
Heating tanks for malolactic fermentation	☐	
Preheating wine before bottling	☐	
Preheating wine after cold-stabilisation	☐	
Other:	☐	
2. Compile a boiler inventory *Compile a list of the following equipment:*		
Boilers: number, make, model, type(water tube or fire tube, condensing),fuel, power rating (kW), efficiency, flow rate (kg/s), pressure (kPa), and time in use (h/y)	☐	
Pipes: diameter (m)	☐	
Valves: number, make, model, type	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Other:	☐	
Choose an approach to estimate time in use:		
Divide the total fuel use (kWh) by the total time (h) that the boiler has been installed	☐	
Use existing control systems and manual procedures	☐	
Check control settings (if the system has controls)	☐	
3. Estimate the hot water load *Compile a list of the following information:*		
Flow rates (kg/s) required now	☐	
Location of end-use	☐	
Operating times or events that require hot water	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Reason the end-use requires hot water	☐	
Flow rates required in the future	☐	

This list enables you to:

- Estimate the hot water load (kW), including the base load (kW) and peak load (kW);
- Identify the end-uses that dominate the hot water load (kW);
- Identify the end-uses that can be rescheduled from peak times to off-peak times; and
- Group together end-uses that require similar heating temperatures (°C).

4. Estimate the efficiency of your existing boiler systems

Measure indicators of refrigerator performance

For an initial estimate, measure the following parameters, and compare them to their design values:

Flow rate (kg/s)	☐	
Pressure (kPa)	☐	
Fuel energy use (l/kg)	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
5. Determine the business parameters of the boiler system *Quantify or qualify the following values:*		
Energy price(s) ($/kWh; $/l)	☐	
Capital budget ($)	☐	
Targets for running costs ($/y)	☐	
Required level of redundancy in the system	☐	
Acceptable level of risk for new technologies	☐	
Equipment constraints, such as: specific brands of equipment; specifications for electrical wiring; compatibility with existing infrastructure or floor space; and adaptability to future upgrades	☐	
Scope of energy efficiency opportunities to consider: If the existing equipment need to be replaced, then calculate the payback period (y) based on the extra (rather than total) costs ($) (if any) of the efficient equipment	☐	
6. Confirm boiler system performance *Check the following conditions:*		

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
The boiler meets the peak hot water load (kW)	☐	
The boiler is optimised for the most common hot water loads (kW)	☐	
7. Select a service provider *Select a boiler service provider that can provide the combination of services that you seek:*		
Measurement and analysis of the hot water load profile (kW), and power (kW) of the boiler and end-uses	☐	
Reporting on equipment and process performance	☐	
Optimisation of the boiler system, including: optimisation of the control system, flow rates (kg/s), and pressure levels (kPa); management of hot water leaks; assessment of heat recovery potential; location of the boiler; and compatibility of the boiler with the existing heating system	☐	
Design of a boiler system that aims to minimise losses from the end-use to the boiler, including the selection of the most appropriate fuel	☐	
Supply, service, and installation of hot water equipment (e.g. boilers, pipes, and valves) for optimal energy efficiency	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Supply of spare parts, including shipping	☐	
Guarantee of minimum efficiency (%) of the proposed system	☐	
Guarantee of maximum running costs ($/y) of the proposed system	☐	
Technical support and after sales service	☐	
In-house repairs and onsite service	☐	
Emergency service	☐	
Other:	☐	
8. Negotiate a contract *Determine your preferred type of contract:*		
• Service contract: supplier performs certain actions for a fixed price ($).	☐	
• Energy performance contract: the supplier performs certain actions that meet certain levels of energy reduction (kWh) for a lower upfront price ($) and a share of the cost savings ($/y).	☐	

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WINERY ENERGY SAVER TOOLKIT – SUPPLIER CHECKLIST

HEATING, VENTILATION & AIR CONDITIONING (HVAC)

Supplier Checklist

The following checklist provides guidance on which information to collect from within the winery and from the equipment supplier, in order to assess the winery's HVAC system for potential improvements in energy efficiency.

Important to note:

- Some of the information suggested below may be difficult or impractical for SME wineries to collect. We do not expect you to be an expert in air conditioning – instead, the intention of this checklist is to give you a snapshot of what may be required to properly assess the opportunity, and to then have an informed discussion with the supplier to explore what may be possible.
- This checklist can be given directly to the supplier to assist them with providing the winery with an appropriate energy efficiency solution.
- An editable (Microsoft Word) and print-version of this checklist is available via the WEST Online Portal, accessible via www.winesa.asn.au.

Other tools

To further assist with evaluating opportunities to improve HVAC energy efficiency, the Winery Energy Saver Toolkit provides the following tools (available via the Online Portal, www.winesa.asn.au):

- **Energy efficiency opportunities modelling tool,** which can be used to test potential savings resulting from key energy efficiency improvements outlined in the Winery Energy Saver Toolkit
- **Energy Resource Use Data tool**, which can be used by businesses to collect and analyse their own baseline electricity, gas and fuel consumption data.

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
1. Determine the end-uses of your HVAC system *Check the following end-uses:*		
Offices	☐	
Factory floor	☐	
Warehouses	☐	
Store rooms	☐	
Plant rooms	☐	
Other:	☐	

2. Compile a HVAC inventory *Compile a list of the following equipment:*		
Compressors: number, make, model, type(screw or reciprocating), power rating (kW), efficiency (%), flow rate (l/s), speed (rpm), and number of pump stages	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Condensers: number, make, model, type (air cooled, water cooled or evaporative), and age (y)	☐	
Pumps: number, make, model, type, power rating (kW), efficiency (%), flow rate (l/s), speed (rpm), and number of pump stages	☐	
Fans: number, make, model, type, power rating (kW), efficiency (%), flow rate (l/s), speed (rpm), and number of pump stages	☐	
Ducts: diameter of main high-pressure refrigerant liquid line (m)	☐	
HVAC unit: time in use (h/y)	☐	
Electric heaters: number, make, model, type, power rating (kW), efficiency (%), time in use (h/y)	☐	
Other:	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Choose an approach to estimate time in use:		
Record readings on the hour-run meter (h) at regular intervals	☐	
Divide the hour-run meter reading (h) by the total time (h) that the HVAC unit has been installed	☐	
Compare the energy (kWh) and power readings (kW) (if the system has an electricity meter)	☐	
Examine electricity meter load profiles (kW)	☐	
Use existing control systems and manual procedures	☐	
Check control settings (if the system has controls)	☐	
Determine variation in cooling, heating, and ventilation loads under the following conditions:		
Seasonal variation in ambient temperatures (°C)	☐	
Variation in occupancy	☐	
Variation in vehicle movement	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
3. Estimate the cooling and heating loads *Compile a list of the following information:*		
Major end-uses (which comprise at least 70% of the total cooling and heating loads (kW))	☐	
Specific cooling and heating requirements (temperature (°C), and cooling and heating times (h)) for each end-use	☐	
Choose an approach:		
a. For an initial estimate of theoretical cooling requirements (kW), review equipment manuals and process specifications.	☐	
b. If budget and time allow for a more-accurate estimate of actual cooling and heating requirements (kW), which include undesirable heat gains and losses (kW), then install metering and monitoring equipment, such as data-loggers.	☐	
This list enables you to: • Estimate the cooling and heating loads (kW), including the base load (kW)and peak load (kW); • Identify the spaces that dominate the cooling and heating loads (kW); and • Identify the conditioning of spaces that can be rescheduled from peak times to off-peak times.		

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
4. Estimate the HVAC unit performance Measure indicators of HVAC unit performance		
Choose an approach:		
a. For an initial estimate, measure the following parameters, and compare them to their design values:		
Condensing temperature (°C) at the inlet	☐	
Condensing temperature (°C) at the outlet	☐	
Evaporator temperature (°C) at the inlet	☐	
Evaporator temperature (°C) at the outlet	☐	
Compressor pressure (kPa) and temperature (°C) at the inlet	☐	
Compressor pressure (kPa) and temperature (°C) at the outlet	☐	
Power to the compressor (kW)	☐	
Ambient temperature (°C)	☐	
b. For a more-accurate estimate, perform an energy consumption assessment. For this procedure, log the energy use of the HVAC unit and/or specific components against the ambient temperature (°C), and cooling and heating loads (kW); and then compare these graphs to the design values.		
Equipment:	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
HVAC unit	☐	
Compressors	☐	
Pumps	☐	
Fans	☐	
Other:	☐	

These indicators enable you to:

- Identify inefficient equipment and processes;
- Assess the effectiveness of the energy efficiency measure implemented; and
- Monitor for unexpected changes in the performance of equipment and processes.

5. Determine the business parameters of the HVAC system

Quantify or qualify the following values:

Energy price(s) ($/kWh; $/l)	☐	
Capital budget ($)	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Targets for running costs ($/y)	☐	
Required level of redundancy in the system	☐	
Acceptable level of risk for new technologies	☐	
Equipment constraints, such as: specific brands of equipment; specifications for electrical wiring; compatibility with existing infrastructure or floor space; and adaptability to future upgrades	☐	
Scope of energy efficiency opportunities to consider: If the existing equipment need to be replaced, then calculate the payback period (y) based on the extra (rather than total) costs ($) (if any) of the efficient equipment	☐	

6. Confirm refrigerator performance *Check the following conditions:*		
The HVAC unit meets the peak cooling and heating loads (kW)	☐	
The HVAC unit is optimised for the most common cooling and heating loads (kW)	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
7. Select a service provider *Select a refrigeration service provider that can provide the combination of services that you seek:*		
Measurement and analysis of the cooling and heating load profiles (kW), and power (kW) of the HVAC unit and end-uses	☐	
Reporting on equipment and process performance	☐	
Optimisation of the HVAC system, including: optimisation of the control system, temperature levels (°C), and flows (l/s); management of air leaks; assessment of heat recovery potential; and minimisation of the cooling and heating requirements (kW)	☐	
Supply, service, and installation of HVAC components (e.g. compressors, evaporators, filters, and ducts) for optimal energy efficiency (%)	☐	
Supply of spare parts, including shipping	☐	
Guarantee of minimum efficiency (%) of the proposed system	☐	
Guarantee of maximum running costs ($/y) of the proposed system	☐	
Technical support and after sales service	☐	
In-house repairs and onsite service	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Emergency service	☐	
Remote monitoring	☐	
Other:	☐	

8. Negotiate a contract *Determine your preferred type of contract:*		
• Service contract: the supplier performs certain actions for a fixed price ($).	☐	
• Energy performance contract: the supplier performs certain actions that meet certain levels of energy reduction (kWh) for a lower upfront price ($) and a share of the cost savings ($/y).	☐	

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WINERY ENERGY SAVER TOOLKIT – SUPPLIER CHECKLIST

LIGHTING

Supplier Checklist

The following checklist provides guidance on which information to collect from within the winery and from the equipment supplier, in order to assess the winery's lighting systems for potential improvements in energy efficiency.

Important to note:

- Some of the information suggested below may be difficult or impractical for SME wineries to collect. We do not expect you to be an expert in lighting – instead, the intention of this checklist is to give you a snapshot of what may be required to properly assess the opportunity, and to then have an informed discussion with the supplier to explore what may be possible.
- This checklist can be given directly to the supplier to assist them with providing the winery with an appropriate energy efficiency solution.
- An editable (Microsoft Word) and print-version of this checklist is available via the WEST Online Portal, accessible via www.winesa.asn.au.

Other tools

To further assist with evaluating opportunities to improve Lighting energy efficiency, the Winery Energy Saver Toolkit provides the following tools (available via the Online Portal, www.winesa.asn.au):

- **Energy efficiency opportunities modelling tool,** which can be used to test potential savings resulting from key energy efficiency improvements outlined in the Winery Energy Saver Toolkit
- **Energy Resource Use Data tool**, which can be used by businesses to collect and analyse their own baseline electricity, gas and fuel consumption data.

Australian Government
Department of Industry

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
1. Compile a lighting inventory *Compile a list of the following lamps, luminaires, and controls:*		
Incandescent	☐	
Compact fluorescent	☐	
Dichroic halogen	☐	
LED	☐	
T12 fluorescent	☐	
T8 fluorescent	☐	
T5 fluorescent	☐	
Linear LED	☐	
Mercury vapour	☐	
Metal halide	☐	
High pressure sodium	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Incandescent Exit signs	☐	
Fluorescent Exit signs	☐	
LED Exit signs	☐	
Other:	☐	
Choose an approach to estimate time in use:		
Use existing lighting timer settings	☐	
Examine logs	☐	
Consult staff	☐	

2. Compose a map of your lights *Specifying the following characteristics of each light:*		
Type	☐	
Power rating (kW)	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Time in use (h/y)	☐	
Location	☐	
Illumination in spaces: use a calibrated light meter	☐	

3. Determine the business parameters of the lighting system *Quantify or qualify the following values:*		
Energy price(s) ($/kWh; $/l)	☐	
Capital budget ($)	☐	
Targets for running costs ($/y)	☐	
Required level of redundancy in the system	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Acceptable payback period or Internal Rate of Return (IRR)	☐	
Acceptable level of risk for new technologies	☐	
Equipment constraints, such as: specifications for electrical wiring; compatibility with existing infrastructure or floor space; and adaptability to future upgrades	☐	
Scope of energy efficiency opportunities to consider: if the existing equipment need to be replaced, then calculate the payback period (y) based on the extra (rather than total) costs ($) (if any) of the efficient equipment	☐	
4. Determine the lighting requirements *Quantify or qualify the following values:*		
Financial: lifetime (h), efficacy (lm/W)	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Physical environment: surrounding, users, glare, ambient temperature (°C), fire safety, time of day	☐	
Ecological: disposal, emissions (kg), embodied energy (J)	☐	
Operational: colour rendering, colour preference (°C), illumination (lx), spectrum	☐	
Purpose: ambient, task, accent, decorative	☐	

5. Account for non-energy benefits *Quantify or qualify the following values:*		
Employees: higher productivity, better mood, lower absenteeism, fewer errors	☐	
Higher safety	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Improved colour rendering	☐	
Improved aesthetics / ambience	☐	
Smaller cooling load (kW) for the HVAC and refrigerator systems	☐	

6. Manage the commissioning process *Once the space is occupied, adjust the following features of the system to efficiently meet actual use patterns:*		
Switching times	☐	
Time delays	☐	
Sensor placement	☐	
Zoning	☐	

7. Confirm lighting system performance *Check the following conditions:*		
Light quality and quantity (lx) is meets the requirements of AS1680.1: use a calibrated light meter	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Daylight does not cause discomfort or make tasks difficult	☐	

8. Select a service provider *Select a lighting service provider that can provide the combination of services that you seek:*		
Measurement and analysis of the lighting requirements	☐	
Reporting on equipment and process performance	☐	
Optimisation of the lighting system, including: reduction in lighting requirements; and optimisation of the control system and illumination levels (lx)	☐	
Supply, service, and installation of lighting components (e.g. skylights, lamps, ballasts, and controls) for optimal energy efficiency (%)	☐	
Guarantee of minimum efficiency (%) of the proposed system	☐	
Guarantee of maximum running costs ($/y) of the proposed system	☐	
Technical support and after sales service	☐	
Emergency service	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Work done by lighting professionals who are registered with the Illumination Engineering Society of Australia and New Zealand	☐	
Other:	☐	

9. Negotiate a contract *Determine your preferred type of contract:*		
• Service contract: the supplier performs certain actions for a fixed price ($).	☐	
• Energy performance contract: the supplier performs certain actions that meet certain levels of energy reduction (kWh) for a lower upfront price ($) and a share of the cost savings ($/y).	☐	

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WINERY ENERGY SAVER TOOLKIT – SUPPLIER CHECKLIST

PUMPING

Supplier Checklist

The following checklist provides guidance on which information to collect from within the winery and from the equipment supplier, in order to assess the winery's pumping systems for potential improvements in energy efficiency.

Important to note:

- Some of the information suggested below may be difficult or impractical for SME wineries to collect. We do not expect you to be an expert in pumping – instead, the intention of this checklist is to give you a snapshot of what may be required to properly assess the opportunity, and to then have an informed discussion with the supplier to explore what may be possible.
- This checklist can be given directly to the supplier to assist them with providing the winery with an appropriate energy efficiency solution.
- An editable (Microsoft Word) and print-version of this checklist is available via the WEST Online Portal, accessible via www.winesa.asn.au.

Other tools

To further assist with evaluating opportunities to improve Pumping energy efficiency, the Winery Energy Saver Toolkit provides the following tools (available via the Online Portal, www.winesa.asn.au):

- **Energy efficiency opportunities modelling tool,** which can be used to test potential savings resulting from key energy efficiency improvements outlined in the Winery Energy Saver Toolkit
- **Energy Resource Use Data tool**, which can be used by businesses to collect and analyse their own baseline electricity, gas and fuel consumption data.

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
1. Determine the end-uses of your pumping systems *Check the following end-uses:*		
Receiving	☐	
Presses	☐	
Must pump	☐	
Winery pumps	☐	
Mobile pumps	☐	
Cellars/barrel rooms	☐	
Refrigeration/cooling circulation	☐	
Bottling	☐	
Hot water	☐	
Wastewater (if water is treated onsite)	☐	
Other:	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
2. Compile a pump system inventory *Compile a list of the following equipment:*		
Pumps: number, make, model, type, power rating (kW), flow rate (l/s), speed (rpm), head (m; kPa), number of pump stages, and time in use (h/y)	☐	
Motor (if it is a separate unit): number, make, model, type, power rating (kW), efficiency (%), speed (rpm), and time in use (h/y)	☐	
Pipes: diameter (m)	☐	
Valves: number, make, model, type	☐	
Other:	☐	
Choose an approach to estimate time in use:		
Record readings on the hour-run meter (h) at regular intervals	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Divide the hour-run meter reading (h) by the total time (h) that the pump has been installed	☐	
Compare the energy (kWh) and power readings (kW) (if the system has an electricity meter)	☐	
Examine electricity meter load profiles (kW)	☐	
Use existing control systems and manual procedures	☐	
Check control settings (if the system has controls)	☐	
3. Estimate the pumping requirements *Compile a list of the following information for each end-use:*		

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Fluid: name, temperature (°C), viscosity (Pa.s), solids concentration (%) and particle size (m), and density (kg/m^3) or specific gravity	☐	
Flow rates (l/s) and head (m; kPa) required now	☐	
Location of end-use	☐	
Operating times or events that require pumped fluid	☐	
Reason the end-use requires pumped fluid	☐	
Flow rates (l/s) and head (m; kPa) required in the future	☐	

This list enables you to:

- Identify the end-uses that dominate the pumping requirements (kW);

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
• identify wasteful and unnecessary uses of pumped fluid; and • estimate the base and peak pumping requirements (kW), and the variation in pumping requirements (kW), now and in the future.		
4. Estimate the efficiency of your existing pump systems *Measure the following parameters:*		
Flow rate (l/s)	☐	
Head (m; kPa)	☐	
Electrical energy use (kWh)	☐	
Choose an approach:		
1. Traditional approach: For permanent monitoring, install pressure tappings on either side of the pump, away from regions where pipe components disturb the fluid flow. For critical pumps, consider continuous monitoring by installing: ammeters on the motor, pressure gauges on the pump inlet and outlet, energy meters on large pumps, and a flow meter. Also, consider electronic data-logging.	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
2. Thermodynamic approach (pump): Install temporary pressure probes and sensitive temperature probes at the pump inlet and outlet to determine the energy losses (energy not converted to flow and pressure) (kWh). Calculate the flow rate (l/s) by also measuring the power (kW) used by the pump.	☐	
3. Thermodynamic approach (single pump system): Install meters to measure the motor input power (kW). Install a flow meter at the pipe outlet to determine the flow rate (l/s). Install a pressure probe at the pipe outlet to determine the fluid pressure (kPa). Calculate the fluid power (kW) using the pressure (kPa), flow rate (l/s), and specific weight (kN/m^3). Calculate pump efficiency (%) by taking the ratio of the fluid power (kW) and the motor input power (kW).	☐	
5. Determine the business parameters of the pumping system *Quantify or qualify the following values:*		
Energy price(s) ($/kWh; $/l)	☐	
Capital budget ($)	☐	
Targets for running costs ($/y)	☐	
Required level of redundancy in the system	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Acceptable level of risk for new technologies	☐	
Equipment constraints, such as: specific brands of motors or pumps; specifications for electrical wiring; compatibility with existing infrastructure or floor space; and adaptability to future upgrades	☐	
Scope of energy efficiency opportunities to consider: If the existing equipment need to be replaced, then calculate the payback period (y) based on the extra (rather than total) costs ($) (if any) of the efficient equipment	☐	
6. Develop a model of the pumping system Use data about the fluid, and pumping system components and configuration to calculate friction losses (kW), resistance curves of the system, and running costs ($/y). *Choose an approach:*		
1. Software (most common): requires pump system design software, which provides a list of suitable pumps and is usually linked to a particular pump manufacturer	☐	
2. Manual: requires calculations and graphs	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
This process enables you to: • compare the current operating points of the pump with the peak-efficiency point (rpm).		
7. Review manufacturer data *Review the following data:*		
Pumps: Pump manufacturers supply graphs of 'pressure versus flow rate', at various speeds (rpm), that include efficiency curves. Pump efficiency (%) varies widely with speed (rpm). It usually peaks near the middle of the range of speeds (rpm).	☐	
Variable speed drives: VSD manufacturers supply information about the load characteristics for which their VSDs are designed. VSDs are most effective when installed on a pump that is designed for the same load characteristic. Most pumps are designed for a specific quadratic load.	☐	
8. Confirm pump system performance *Check the following conditions:*		
The pump meets the peak pumping load (kW)	☐	
The pump is optimised for the most common pumping loads (kW)	☐	
9. Select a service provider		

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Select a pump service provider that can provide the combination of services that you seek:		
Measurement and analysis of the pumping requirements profile, and power (kW) of pumps and end-uses	☐	
Reporting on equipment and process performance	☐	
Optimisation of the pumping system, including: optimisation of the control system, flow rates (l/s), and head levels (m; kPa); management of fluid leaks; and minimisation of the pumping requirements at end-uses	☐	
Design of a pumping system that aims to minimise losses from the end-use to the pump	☐	
Supply, service, and installation of pumping system equipment (e.g. pumps, pipes, and valves) for optimal energy efficiency (%)	☐	
Supply of spare parts, including shipping	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Guarantee of minimum efficiency (%) of the proposed system	☐	
Guarantee of maximum running costs ($/y) of the proposed system	☐	
Technical support and after sales service	☐	
In-house repairs and onsite service	☐	
Emergency service	☐	
Other:	☐	
10. Negotiate a contract *Determine your preferred type of contract:*		
• Service contract: the supplier performs certain actions for a fixed price ($).	☐	
• Energy performance contract: the supplier performs certain actions that meet certain levels of energy reduction (kWh) for a lower upfront price ($) and a share of the cost savings ($/y).	☐	

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WINERY ENERGY SAVER TOOLKIT – SUPPLIER CHECKLIST

REFRIGERATION & TANK STORAGE

Supplier Checklist

The following checklist provides guidance on which information to collect from within the winery and from the equipment supplier, in order to assess the winery's refrigeration system for potential improvements in energy efficiency.

Important to note:

- Some of the information suggested below may be difficult or impractical for SME wineries to collect. We do not expect you to be an expert in refrigeration – instead, the intention of this checklist is to give you a snapshot of what may be required to properly assess the opportunity, and to then have an informed discussion with the supplier to explore what may be possible.
- This checklist can be given directly to the supplier to assist them with providing the winery with an appropriate energy efficiency solution.
- An editable (Microsoft Word) and print-version of this checklist is available via the WEST Online Portal, accessible via www.winesa.asn.au.

Other tools

To further assist with evaluating opportunities to improve Refrigeration and Tank Storage energy efficiency, the Winery Energy Saver Toolkit provides the following tools (available via the Online Portal, www.winesa.asn.au):

- **Energy efficiency opportunities modelling tool,** which can be used to test potential savings resulting from key energy efficiency improvements outlined in the Winery Energy Saver Toolkit
- **Energy Resource Use Data tool**, which can be used by businesses to collect and analyse their own baseline electricity, gas and fuel consumption data.

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
1. Determine the end-uses of your refrigerator *Check the following end-uses:*		
Fermentation	☐	
Cold stabilisation	☐	
Electrodialysis	☐	
Cold store (aging/barrel rooms)	☐	
Cooling water pumping/circulation	☐	
Cooling offices	☐	
Other:	☐	

2. Compile a refrigerator inventory *Compile a list of the following equipment:*		
Compressors: number, make, model, type (screw or reciprocating), power rating (kW), efficiency, flow rate (l/s), speed (rpm), and number of	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
pump stages		
Condensers: number, make, model, type (air cooled, water cooled or evaporative), and age (y)	☐	
Pumps: number, make, model, type, power rating (kW), efficiency, flow rate (l/s), speed (rpm), and number of pump stages	☐	
Fans: number, make, model, type, power rating (kW), efficiency, flow rate (l/s), speed (rpm), and number of pump stages	☐	
Pipes: diameter of main high-pressure refrigerant liquid line (m)	☐	
Refrigerator: time in use (h/y)	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Other:	☐	
Choose an approach to estimate time in use:		
Record readings on hour-run meter (h) at regular intervals	☐	
Divide the hour-run meter reading (h) by the total time (h) that the refrigerator has been installed	☐	
Compare the energy (kWh) and power readings (kW) (can be obtained visually if the system has an electricity meter)	☐	
Examine electricity meter load profiles (kW)	☐	
Use existing control systems and manual procedures	☐	
Check control settings (if the system has controls)	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES

3. Estimate the cooling load *Compile a list of the following information:*		
Major end-uses (which comprise at least 70% of the total cooling load (kW))	☐	
Specific cooling requirements (temperature (°C) and cooling time (h)) for each end-use	☐	
Choose an approach:		
a. For an initial estimate of theoretical cooling requirements (kW), review equipment manuals and process specifications.	☐	
b. If budget and time allow for a more-accurate estimate of actual cooling requirements (kW), which include undesirable heat gains (kW), install metering and monitoring equipment, such as data-loggers. For this procedure, collect the following data at the end-uses, for either the secondary refrigerant or the product, to calculate the heat removed:		

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Volumetric flow rate (m^3/s) (measure)	☐	
Temperature rise (°C) (measure)	☐	
Specific heat capacity (kJ/kg°C) (look up data sheet or estimate)	☐	
Fluid: refrigerant / product	☐	

This list enables you to:

- Estimate the cooling load (kW), including the base load (kW) and peak load (kW);
- Identify the end-uses that dominate the cooling load (kW);
- Identify the end-uses that can be rescheduled from peak times to off-peak times; and
- Group together end-uses that require similar cooling temperatures (°C).

4. Estimate the refrigerator performance

Measure indicators of refrigerator performance

Choose an approach:

a. For an initial estimate, measure the following parameters, and compare them to their design values:

Condensing temperature (°C) at the inlet	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Condensing temperature (°C) at the outlet	☐	
Evaporator temperature (°C) at the inlet	☐	
Evaporator temperature (°C) at the outlet	☐	
Compressor pressure (kPa) and temperature (°C) at the inlet	☐	
Compressor pressure (kPa) and temperature (°C) at the outlet	☐	
Power to the compressor (kW)	☐	
Ambient temperature (°C)	☐	
Brine temperature (°C)	☐	
b. For a more-accurate estimate, perform an energy consumption assessment. For this procedure, log the energy use of the refrigerator and/or specific components against the ambient temperature (°C) and cooling load (kW), and then compare these graphs to the design values.		
Equipment:	☐	
Refrigerator	☐	
Compressors	☐	
Pumps	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Fans	☐	
Other:	☐	

These indicators enable you to:

- Identify inefficient equipment and processes;
- Assess the effectiveness of the energy efficiency measure implemented; and
- Monitor for unexpected changes in the performance of equipment and processes.

5. Determine the business parameters of the refrigerator

Quantify or qualify the following values:

Energy price(s) ($/kWh; $/l)	☐	
Capital budget ($)	☐	
Targets for running costs ($/y)	☐	
Required level of redundancy in the system	☐	
Acceptable level of risk for new technologies	☐	
Equipment constraints, such as: specific brands of equipment;	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
specifications for electrical wiring; compatibility with existing infrastructure or floor space; and adaptability to future upgrades		
Scope of energy efficiency opportunities to consider: If the existing equipment needs to be replaced, then calculate the payback period (y) based on the extra (rather than total) costs ($) (if any) of the efficient equipment	☐	

6. Confirm refrigerator performance *Check the following conditions:*		
The refrigerator meets peak cooling load (kW)	☐	
The refrigerator is optimised for the most common cooling loads (kW)	☐	

7. Select a service provider *Select a refrigeration service provider that can provide the combination of services that you seek:*		
Measurement and analysis of the cooling load profile (kW), and power (kW) of the refrigerator and end-uses	☐	
Reporting on equipment and process performance	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
Optimisation of the refrigerator system, including: optimisation of the control system, pressure levels (kPa), temperature levels (°C), and flows (l/s); management of refrigerant leaks; and assessment of heat recovery potential	☐	
Supply, service, and installation of refrigerator components (e.g. compressors, evaporators, filters, and pipes) for optimal energy efficiency (%)	☐	
Supply of spare parts, including shipping	☐	
Guarantee of minimum efficiency (%) of the proposed system	☐	
Guarantee of maximum running costs ($/y) of the proposed system	☐	
Technical support and after sales service	☐	
In-house repairs and onsite service	☐	
Emergency service	☐	
Remote monitoring	☐	
Appropriate removal and disposal of old equipment	☐	
Other:	☐	

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DATA COLLECTION ITEM	COMPLETED? (TICK BOX)	NOTES
8. Negotiate a contract *Determine your preferred type of contract:*		
• Service contract: the supplier performs certain actions for a fixed price ($).	☐	
• Energy performance contract: the supplier performs certain actions that meet certain levels of energy reduction (kWh) for a lower upfront price ($) and a share of the cost savings ($/y).	☐	

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