Capilano

Australia's favourite honey reduces energy cost

Background

Founded more than 60 years ago, Capilano is proudly Australian owned and has grown into one of the world's leading honey suppliers and enjoys a reputation of innovation, best practise procedures and high quality honey. Capilano has received national recognition for its packaging innovations, as well as its contribution to the Queensland's exports. The company subscribes to the most stringent Australian and international food quality standards. In association with its beekeeper network, Capilano adopt best practice processes, as well as maintaining Hazard Analysis and Critical Control Point (HACCP) accreditation. Furthermore, Capilano's SciTest laboratory is setting the standard in Australia. SciTest ensures accuracy and maintains best practise analytical testing for microbial and chemical residues.

Figure 1: Capilano's production line

Capilano has the capacity to produce more than 45,000 tonnes of honey each year, supplying to more than 30 countries across the globe. This is all possible through Capilano's network of more than 500 Australian beekeeping families across Australia. Whilst food safety and quality is paramount, National Operation Manager Luke Morrison, understands that keeping an eye

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on the bottom line is non-negotiable in the highly competitive food manufacturing market. As a progressive Australian manufacturer committed to both reducing bottom line cost and improving sustainability metrics, Luke is continuously looking at adopting energy cost savings measures.

Like all food manufacturing businesses, energy is a key production input. Capilano's facility in Richlands, Queensland uses electricity and natural gas as the primary energy source and input costs. Total energy consumption is 18,000GJ at a cost of $580,000 per annum. Twenty five percent of energy consumption is linked to thermal loads for pasteurisation and hot water generation. A breakdown of major energy end uses is provided in Figure 2. Under the AFGC empower program, Capilano was able to build on their energy and carbon achievements by utilising the AFGC empower tool and accessing the services of leading energy consulting firm, Energetics.

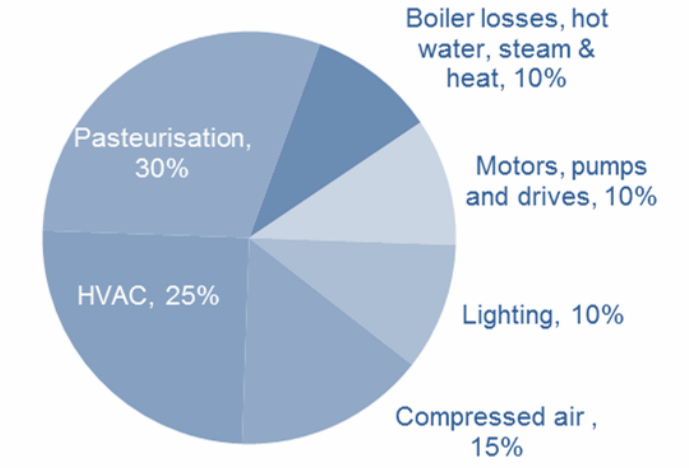

Figure 2: Major energy uses at Capilano

Opportunities

Capilano previously identified opportunities around improved pasteurisation and lighting. However, operational demands made it difficult for key resources to commit time to understanding how these projects might impact energy consumption. In addition, facility changes necessitated the use of a temporary raw honey handling plant. The implementation of energy efficiency opportunities were therefore delayed, in anticipation that it is best integrated into the design of the new plant under development.

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Whilst cognisant of the impending changes in the plant, the AFGC empower assessment expanded focus to pasteurisation (30%), compressed air (15%) and other thermal systems (10%). Given the important role these processes play in food safety and quality, Energetics ensured that the 'energy service' were not compromised. Rather, the focus was on opportunities to reduce wastage,

I.e. where a change in system operation could reduce energy demand, without altering the level of service provided. Identified opportunities in this category include qualification of improved pasteurisation, heat recovery from compressed air, better thermal insulation, improved lighting systems and optimal battery charging of forklifts.

These opportunities are discussed in more detail below.

Lighting opportunities

Figure 3: Metal halide low bay light fixtures in Capilano's packaging area

Warehousing, production and external areas all utilise High Intensity Discharge (HID) lighting technology such as metal halide and sodium vapour. In the last two to five years technology providers have rapidly improved lighting technology with 50% energy savings and double the life expectance commercially available through induction and Light Emitting Diode (LED) technology. These are very real options for Capilano and are currently under investigation.

Solar PV

Site electricity usage patterns and the prevailing government incentives were considered by Energetics before recommending the optimum size of the Solar PV system. The maximum return on investment is achieved when the PV system is offsetting grid electricity and not

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exporting to the Electricity Network. It is recommended that Capilano invest in a 100kW roof top solar PV system that will offset 5% of the grid purchased electricity and save around $22,000 annually. This sizing will maximise the return under the Small Scale Renewable Energy Certificates (SRECs) Scheme as renewable installations up to 100kW are able to deem the certificates at the commencement of the project, compared to larger projects where certificates are generated over the project lifetime. This would enable Capilano to use the SRECs to decrease the upfront capital cost of the solar PV system.

Thermal system insulation

Thermal systems, fuelled by natural gas represent 40% of total energy consumption and 25% of total energy cost. On a per unit energy basis the cost of delivered natural gas is $20 per GJ, compared to electricity which is almost double at $39 per GJ. While this is noticeably cheaper than electricity, Australian east coast natural gas costs have, and are expected to increase significantly. Hence better management of consumption of natural gas is prudent and remains a key focus. Consequently, it was recommended that Capilano review insulation of the external pipework and repair any leaks to reduce heat loss.

Insulation prevents up to 90% of potential heat loss. For example, installing insulation on a surface that has a temperature of more than 50°C can result in a saving of up to 13% of boiler energy use and at high fuel prices will generally provide a return on investment within 2 years. In the case of Capilano, assessment of thermal insulation proved to have a longer simple payback. This is due to lower temperature differential between warm honey (at 45°C) transported throughout the plant in stainless steel pipework and ambient temperatures. The lower temperature means less heat loss and potential energy savings. This should be considered carefully during the development of the business case development.

Thermal system heat recovery

Capilano uses a pasteurisation plant to kill any latent yeast cells and to slow down the granulation process providing a high quality, extended shelf-life and safe to eat product to consumers. In summary, the current system involves the raw honey being heated slightly before being removed from storage drums. It then passes through a filtering system to remove any wax and debris. Once filtered, it passes through a plate heat exchanger or pasteuriser using hot water to indirectly transfer heat to the product raising the temperature to around 72°C, before being cooling.

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Modification of this system was under investigation by Capilano and the pasteuriser manufacturer focusing on improved productivity. Through the AFGC empower program Energetics assisted Capilano in quantifying the potential energy benefits of an improved regeneration phase. Because of the simultaneous heating and cooling of product some energy can be recovered. The hot product exiting the pasteuriser at around 72°C has to cool down again before it is packaged. Some of this heat can be captured using an additional heat exchanger and used to pre-heat product entering the process at 45°C. The key benefit here is to reduce thermal load and save on natural gas. It's important to highlight that although the main driver for this project was general productivity gain, consideration of energy productivity in the design of the new process often result in improved financial performance of the total project. This should not be overlooked when developing the business case.

Compressed air heat recovery

Capliano has five compressed air units distributed throughout the plant that service several areas. During the AFGC empower workshop Energetics identified that one of these units is located right beside the boiler and therefore ideally placed for heat recovery. Specifically, there is an opportunity to capture waste heat coming off the air compressor and using it to pre-heat make up water for the boiler. This strategy is best deployed when a heat source is in close proximately to a heat generator, such as a boiler. In terms of energy flow the situation is ideal as compression of air is very inefficient. Only 20% to 30% of electrical energy converts to compressed air energy, the rest is lost to atmosphere as heat. Some of this heat can be captured by retrofitting a heat exchanger to the air compressor cooling circuit and using it to heat a medium, in this case water. Instead of the boiler feed water entering the make-up water tank at ambient temperature, it can be heated by the air compressor to 80°C. The boiler would therefore need to do less work and consume less gas.

Measures quantified and implemented

Most of the above opportunities appeared attractive to Capilano. However, capital limitations, resourcing and operational demands necessitate the prioritisation of opportunities. Capilano therefore commissioned business cases for the regeneration and compressed air heat recovery opportunities discussed above. The illustrative results from the businesses cases and high level assessment of other opportunities is presented in Figure 4, showing the analysis of

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the assessment of the relative effort vis-à-vis energy savings impact, developed using the AFGC empower tool.

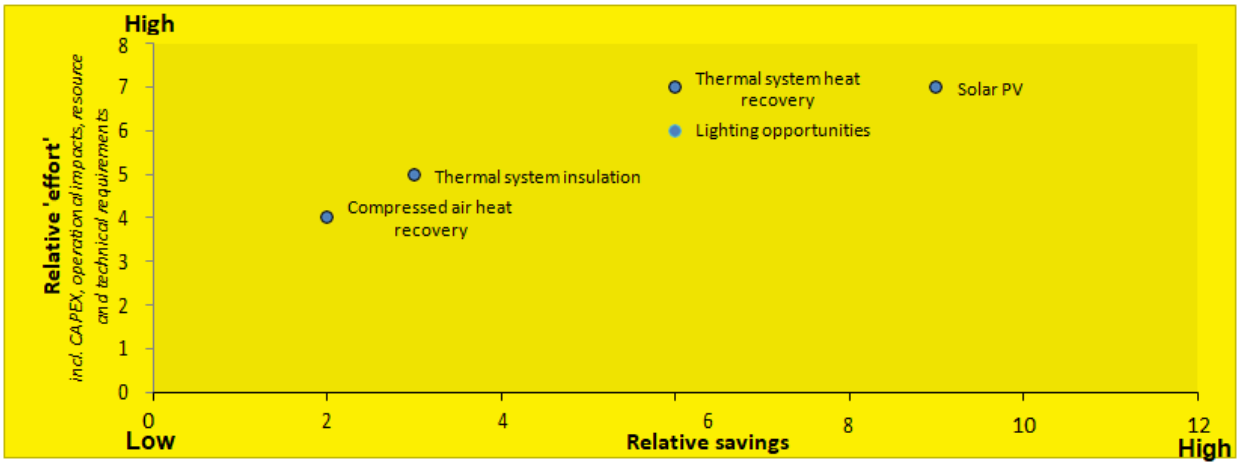

Figure 4: Illustrated effort versus reward for energy efficiency used to help prioritise project implementation

This analysis enabled Capilano to visualise the relative 'effort' and savings associated with the opportunities. Capilano preferred to assess opportunities that were technically more challenging while they had access of Energetics' skills as part of the AFGC empower program. Hence, quick wins[3] were not a key focus. Furthermore, a deliberate decision was made to use Energetics to quantify energy benefits of the pasteuriser regeneration project as this has not previously been a focus. Consequently, the compressed air heat recovery, lighting upgrades, solar PV and thermal system insulation opportunities will be further investigated by Capilano, leveraging the relationships with local suppliers to develop an in-depth understanding of the 'effort' required to implement.

Outcome

The AFGC empower assessment has provided Capilano with a better understanding of their energy use. They are now in a better position to plan the optimal path to reduce energy consumption and associated costs. The preliminary estimates of the cost and direct energy savings benefits are detailed below for all the measures identified during the audit. This enables Capilano to engage their network of suppliers from a better informed position:

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	Estimated Cost ($)	Estimated Saving ($)	Estimated Savings (kWh)	Payback Period (years)
Compressed air heat recovery	$12,600	$6100	70,000	2.1
Lighting opportunities	$25,100	$6500	47,000	3.9
Solar PV	$121,000	$22,100	158,000	5.5
Thermal system insulation	$47,100	$6300	70,300	7.5
Thermal system heat recovery	$85,000	$6600	92,000	12.9

Note that the capital allocation for the thermal system heat recovery or pasteurisation generation phase project includes the cost to fully upgrade the pasteuriser. This explains the long payback period. To better understand return on investment it would be prudent to isolate the regeneration phase cost. A return of 2-4 years is expected when in isolation.

References

Raw honey is delivered in 66 litre (44 gallon) drums which has to be heated slightly for extraction and to allow pumping.

For confidentiality reasons, axis values are illustrative only. Businesses can utilise the AFGC empower Energy Cost Savings Tool to develop a similar prioritisation matrix, assigning percentage savings and investment values to the respective axils that matches company specific decision making criteria. The AFGC empower program website also provides additional guidance on the prioritisation of opportunities and techniques to gain support of management for energy savings projects.

Small projects that do not demand much capital or does not have much technical risk and is sure to show results in a short period, namely compressed air heat recovery

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