Factsheet

June 2016

Winery saves by making hot water from free sunshine

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Why consider solar?

Installing a solar thermal (hot water) system presents a great opportunity to meet your winery's hot water requirements, while reducing your energy costs and decreasing fossil fuels emissions. Water heating can account for up to 20 per cent of your winery's total energy use. Installation of a solar thermal system shifts your heating costs from an operating expense to a capital expense, which once paid off, can reduce your operating costs in the long term. By going solar, you can insulate your business against rising energy prices and protect the environment, making your operations more sustainable on both fronts.

This fact sheet looks at the benefits and considerations around converting to solar hot water, demonstrated through the recent experience of one Australian wine company.

Solar thermal system information

De Bortoli Wines (Griffith, NSW)
Crush: 100,000 tonnes
Solar irradiance: 1,880 kWh/m²
System: 3,000 solar tubes (100 × Apricus AP-30 manifolds)
Water temperature output (max.): 95°C
Storage volume: 12,000 L
System size: 200kW
CO_2 reduction: 17 tonnes p.a.

De Bortoli solar hot water install:

De Bortoli Wines is the 6th largest winery in Australia, crushing around 100,000 tonnes per annum. In 2013, they installed a 200kW solar thermal system as part of their continuing commitment to sustainable production. The installation was part of a larger upgrade which also included a 230kW Solar PV installation, new bottling plant, power factor correction, and a filtration upgrade.

How does it work?

Solar thermal systems come in either flat plate or evacuated tube style arrangements. The flat plate design consists of a dark coloured absorber plate under a glass surface. The water or transfer fluid is run over the absorber, which transfers its heat to the fluid. Evacuated tubes consist of two glass tubes separated by a vacuum with a copper pipe or a heat rod running through the centre of the tubes. In copper pipe designs, water is run directly through the tubes, whereas the heat rod design takes heat directly up to the header for transfer with the fluid. The hot water is then stored in insulated tanks, making solar thermal an effective form of solar storage, without the need for batteries. Evacuated tube systems are more efficient than flat plates due to the greater insulation properties of the vacuum and greater surface area however, these systems can be more expensive.

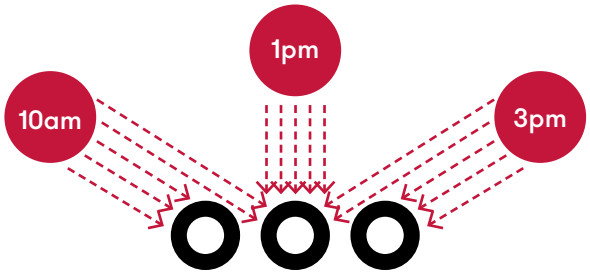

Figure 1: Evacuated tubes.

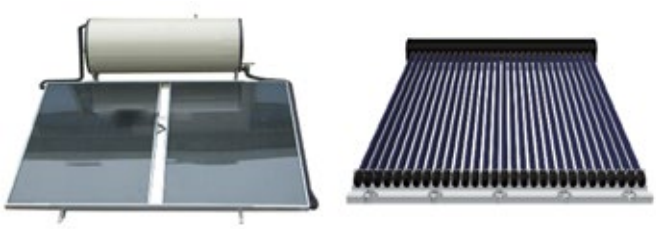

Figure 2: Solar thermal collector types: a) flat plate; b) evacuated tube.

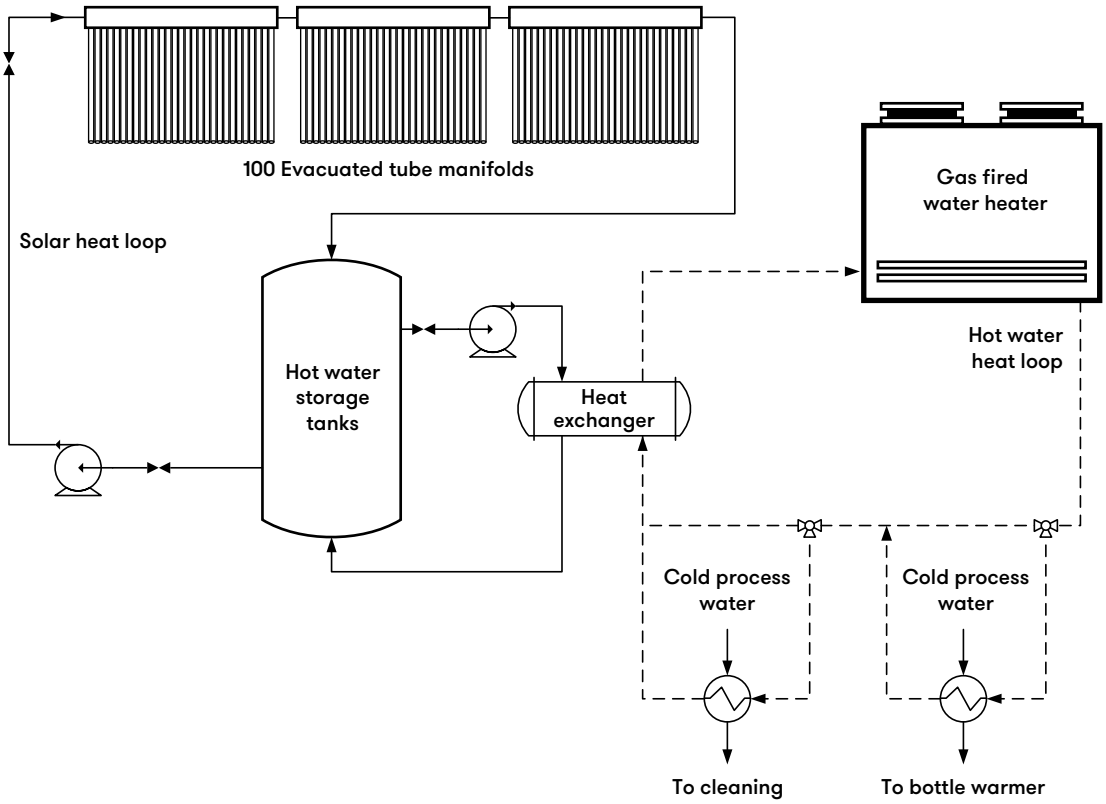

Figure 3: De Bortoli's closed loop system (simplified)

De Bortoli's solar thermal system:

The De Bortoli system uses 3,000 evacuated tubes (100 × Apricus AP-30 panels) to preheat the feed to the condensing boilers to greatly reduce their gas consumption. The tubes are efficient with built in frost protection and good low temperature performance. Frames were installed to tilt panels to 47°C to improve performance, especially important in winter. The rooftop system weighed about 10 tonnes (with tubes full of water) which meant the building's roof needed to be reinforced. The system employs a closed loop configuration (Figure 3) where a fixed volume of hot water from the tubes is used to heat the boiler feed through a heat exchanger. Open loop systems can also be used where the hot water from the panels is sent directly to the boiler.

Evacuated tubes are more efficient than flat plates but can be more expensive.

Boosters

Generally a solar thermal system will not be able to handle the entire hot water requirement of the winery and will be complemented by a gas or electric heater. Given that gas is cheaper and more efficient fuel source than electricity, gas boosters are recommended over electric if access to gas or LPG is available.

De Bortoli's system is designed to produce 12,000L per day at 95°C, depending on solar conditions. The water is used for the bottling line and for cleaning. The control systems allows them to switch between using full solar, solar pre-heat of the gas water heater, or using no solar at all.

Solar Thermal systems are capable of generating temperatures up to 95°C.

De Bortoli's system has performed exceptionally well, consistently producing water at 95°C. De Bortoli have shifted more hot water use to the daytime to take greater advantage of the hot water as it is produced.

CO_2 emissions in perspective

17 tonnes p.a. = Electricity for 4 homes = 4 cars off the road = 435 trees planted

System Costs

The cost of a solar thermal system varies based on panel type, mounting brackets and any extra structural upgrades to existing roofs. Payback will be influenced by system cost, solar heating efficiency and the type and cost of the energy being replaced. Due to cost, wineries converting from electric hot water will see a stronger return on investment than wineries converting from gas hot water.

The economics are much stronger for wineries converting from electric hot water than converting from gas.

Figure 4: De Bortoli solar thermal array.

More information

Contact a suitable supplier or speak with the AWRI Helpdesk for advice in your situation on (08) 8313 6600 or email helpdesk@awri.com.au

Figure 5: De Bortoli solar thermal array.

Wine Australia for Australian Wine

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This factsheet was first published in June 2016.