Solar: a better solution to inadequate power supply

THE FARM

Dohnt family

Monteith, South Australia

The Dohnt Family have undertaken a major replacement of the hot water system in their dairy at Monteith in South Australia.

The incorporation of 24 solar hot water collectors to reduce mains electricity demand by the water heating requirements means that this system also reduces greenhouse gas emissions.

The Dohnts undertook to upgrade their hot water supply after experiencing ongoing problems with the power supply to the dairy – the load placed by the vat, milking machine and roller mill when combined with the hot water service during the afternoon milkings was too great for the local service.

The Dohnts believed that the voltage drop was leading to failures in circuit boards and other equipment at the dairy shed and that by improving the system they could also potentially significantly reduce water heating costs. A new system would lead to "one less headache to worry about," Ray Dohnt said.

System requirements

- 2100 litres of hot water over 12 hours
- 70°C rise
- 183.3 kW/day requirement

The Dohnts selected an indirect heat exchange solar hot water system. An array of 24 solar collectors heat water and glycol (for frost protection) that is pumped from the heat exchange cylinder through the solar collectors when water in the collectors is more than 7°C higher

The solar system saves about 183.3 kW a day or 36 tonnes of CO_2 a year.

BUSINESS SNAPSHOT

- **Dryland area: 90 ha (220 acres)**
- **Irrigated area: 190 ha (470 acres); only 20 ha used due to reduction in water allocation**
- **Herd size: 520**
- **Milk production: 2007/08: 7,750 litres/cow 2008/09: aiming for 8,600-9,000 litres/cow**
- **Calving pattern: Split July-Oct, Dec-Feb**
- **Dairy type: 25 doubled-up herringbone with stall gates**

LESSONS LEARNED

- **Solar hot water heating is an opportunity for dairy farms, especially if conventional supply is limited or inadequate.**
- **The capital outlay of a solar system can be partly offset by a rebate linked to RECs (renewable energy certificates).**

than the water at the bottom of the heat exchange cylinder. As the water passes through the collectors, it 'scrubs' energy from the collector, heating the water. Water continues to circulate until the temperature differential reduces to 2°C then the pump shuts down. This treated water remains in the system during operation and is not consumed.

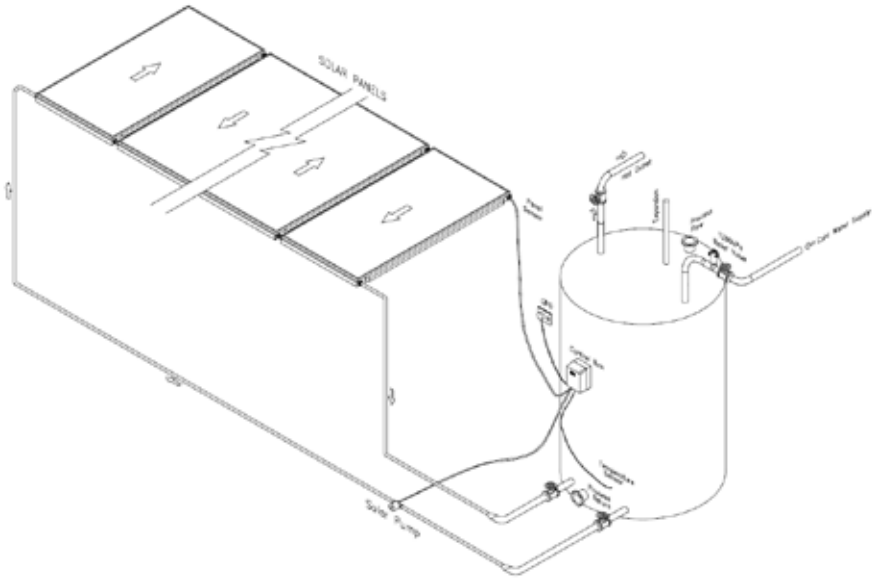
Located within the heat exchange cylinder is a copper heat exchanger coil that contains potable, consumable water. As the potable water is drawn through the heat exchange coil it is heated by the water from the solar collectors.

When they upgraded Ray opted for a 2500 L storage tank.

"We chose the larger tank in case our needs should change," he said.

The 2500 L system was estimated to cost approximately $60,000, with components ranging as shown below, however, because Ray already had existing electric hot water services that could act as the booster system, his only costs were the solar system. This was still an expensive system, but given that they did not have a suitable electricity supply to support an upgrade of the existing electric system Ray felt that it was necessary to pursue the solar option.

When moving to solar power, Ray Dohnt opted to install a larger (2,500 L) storage tank in case their needs increase in the future.



The Dohnts selected an indirect heat exchange solar hot water system (Picture courtesy Edwards Solar).

Likely costs

- Solar contribution $40,000-$45,000
- Booster units $6,000-$8,000
- Install solar $3,000-$15,000
- Install booster plant $4,000-$7,000
- Less RECS rebate $15,000

The 24 solar panels generated 326 RECS. The RECS have a value on the energy market that fluctuates but can be sold at the time of purchase of the system to effectively reduce to cost of the system. In this case the rebate was $15,000.

The system has now been running since March 2009 and has met Ray's expectations; his 'J' tariff electricity bill has fallen from $1000 to around $230 per quarter.

Ray has also found that they have had fewer problems with circuit board failures due to the power demand at the dairy.

"Solar hot water heating is an opportunity for dairies, particularly where there is limited access to power," he says.

RECs (Renewable Energy Certificates):

- An electronic form of currency initiated by the *Renewable Energy (Electricity) Act 2000*
- Created for each megawatt-hour of eligible renewable electricity generated or deemed to have been generated
- Validated by the Office of the Renewable Energy Regulator
- Registered
- Can be traded

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