

# Heat recovery

Heat recovery can be a good way to reduce the costs of producing hot water. If you are using water with high hardness levels, i.e. from a bore, then more care needs to be taken with equipment selection.

## How much could you save with heat recovery?

See Figure C below for a quick estimation of your annual energy cost for hot water heating and to see how heat recovery could impact these costs.

Putting your waste heat to work can save you big time. Heat recovery will typically reduce your hot water heating costs by around 40 per cent. for example, a dairy shed using 1,200 litres of water per day with an electricity tariff of \$0.25 per kilowatt-hour (kWh) will save around \$3,925 annually.

A heat recovery typical system will cost around \$12,000 to install giving a payback of less than three years.

There are three main types of heat recovery systems:

- 1 Simple brazed plate heat exchanger installation that takes the hot refrigerant from the compressor through a brazed plate heat exchanger then to the existing condenser unit. The other side of the brazed plate exchanger has water re-circulated from the pre-heat water tank using a small pump. This solution requires good water quality.
- 2 Brazed plate heat exchanger but with advanced controls which automatically turn off the fan on the condenser unit and regulates the water flow rate which can provide an additional 10 to 20 per cent heat recovery and an additional 5°C to 10°C of water heating. This solution requires good water quality.

- 3 Copper tubing heat exchanger which takes the hot refrigerant from the compressor through copper tubes inside the pre-heat water tank then to the existing condenser unit. No water circulation required. This solution can use lower quality water.

## Issues to be aware of:

### Pre-heat water tank

This tank will typically reach 40°C to 45°C, which represents a good temperature for the growth of legionella bacteria – this can cause pneumonia when water droplets are inhaled. Care must be taken to keep the tank clean and to empty the tank daily to ensure no build-up of legionella.

### Scaling of the heat exchanger

If you are using bore water with hardness greater than 70ppm for the hot water washing, you can expect scaling of the heat transfer surface leading to poor performance. If using bore water with high hardness, you should not use a brazed plate heat exchanger in combination with hot refrigerant that will get clogged due to precipitation of calcium salts.



**Figure C** Annual cost of hot water heating at different electricity prices using resistance heating and showing reduced costs with heat recovery and 40 per cent saving.



**Assumptions:**

- Electrical resistance heating.
- Fifteen per cent heat losses.
- Average water inlet temperature of 15°C, target hot water temperature 82°C.

For 1,200 litres per day, the approximately annual cost will be \$7,800 with an electrical supply cost of \$0.20/kWh.

