Water efficiency audits of steam systems

Melbourne, Australia

water scarcity impact

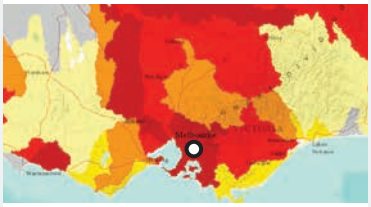
Reduced withdrawal	●
Reduced consumption	●
Improved water quality	
Increased productivity	●
Net basin benefit	●

volumetric impact
11 000 m^3/yr

capital cost
$278 000

estimated unit cost of water
155 ¢/m^3

Water Stress
Melbourne, Australia



Arid & low water use
Low (<10%)
Low to med (10-20%)
Med to high (20-40%)
High (40-80%)
Extremely high (>80%)
No data available

Water Stress Map:
Gassert, F., M. Landis, M. Luck, P. Reig, and T. Shiao. 2013. "Aqueduct Global Maps 2.0."

Confidence level
Low Medium High

Water Scarcity Impact Key
Main Minor

Credits
We wish to acknowledge the input of John Fawcett and Audra Liubinas of City West Water in the preparation of this case study.

Project Overview

Australia is the driest inhabited continent in the world with its supply of freshwater becoming increasingly susceptible to drought and climate variability. City West Water (CWW) is one of Melbourne's three retail water businesses and over 100 of CWW's large business customers use steam within their processes. CWW launched a programme focused on assisting business customers to understand how they can make steam systems more efficient. Steam systems were targeted because energy efficiency improvements are typically effective with a high likelihood of implementation. For example, the energy use per 1 000m^3 of water used in a steam system in Melbourne is over 300 times higher than the energy used to supply water and treat wastewater combined. As such, initiatives to improve the efficiency of steam systems simultaneously reduces water and energy use. The programme involves conducting site audits and the provision of training courses as well as investigating and implementing technical improvements. CWW also offers grants for cost effective water efficiency actions to leverage business sector investment. The programme commenced in June 2010 and to date it has achieved water savings of 11 000m^3/yr and greenhouse gas reduction of 893 tonnes CO_2 equivalent (CO_2e).

Key Elements

- Audits of customers business to identify water and energy losses
- Provision of detailed information to customers on best engineering practices to improve steam system performance.
- Delivery of training courses to facility managers and maintenance personnel on how to optimise energy and water use.
- The two-part programme was funded by CWW as a research programme with a contribution of $50 000 from Environment Protection Authority Victoria. The cost to businesses for implementing the interventions was $48 000.
- Availability of grants to co-fund water and water related energy efficiency actions.

Key Outcomes

- Across the programme, 30 audits were conducted and 150 actions were identified.
- To date, 25 actions have been implemented, achieving reductions in withdrawal of 11 000m^3/year of water, 17 400GJ/yr of gas, and greenhouse gas reductions of 893 tonnes CO_2e/yr.
- Other actions being implemented or planned will achieve reductions in withdrawal of 100 000m^3/yr of water, 53 400GJ/yr of gas, 68 000kWh/year of electricity and greenhouse gas reductions of 2 823 tonnes CO_2e/yr.
- Consumptive use decreased through recovery of vented steam, condensate and reduction in steam leaks.

Melbourne, Australia

Intervention Features

¬ Condensate recovery and reuse ¬ Steam leakage reduction ¬ Prevention of operation of water tank overflows
¬ Provision of grants ¬ Water audits ¬ Education, technical training and capacity building

Project Levers

(1) Provision of Training Courses:

The courses provide an introduction to a steam system and its components with information on how to identify problems and optimise energy and water use.

(2) Audit Programme:

The audit programme identified 150 actions which could improve water and energy efficiency. These included:

- Steam trap maintenance to reduce steam leaks.
- Monitoring of make up water to identify leaks.
- Interventions to prevent operation of water tank overflows.
- Capture and reuse of condensate in the steam process.
- Recovery of vented steam and subsequent. condensation using an air-cooled condenser.

(3) Provision of resources:

Once the audits and training were completed, CWW worked with the customers to implement the action items by providing resources such as co-funding or assistance to help them overcome the barriers to implementation including lack of data and cost benefits.

(4) Co-funding of actions:

The amount of co-funding grant was decided using criteria that include:

- Cost per megalitre of water saved. The net present cost must be less than $1/m^3$ on the grant amount over the lifetime of the infrastructure or measure installed for projects that save more than 20 000/m^3/yr. Smaller water savings projects must generally deliver savings to CWW at less than ¢50/m^3 for those delivering less than 5 000/m^3/yr and in a sliding scale up to $1/$m^3$ for those delivering between 5 000/m^3/yr and 20 000/m^3/yr.
- The payback to the customer is not less than three years.
- Grants are limited to 50% of the project cost.
- A net energy and greenhouse gas saving must be achieved.
- Other criteria such as transferability of the solution to others, waste water and salt load savings on sewage treatment plants are also considered.

Outcomes and Challenges

Across the two phases of the programme, thirty audits were conducted and 150 actions were identified. To date, 25 actions have been implemented, achieving savings of over 11 000m^3/year of water and 893 tonnes CO_2e/year of greenhouse gas. 21 actions are being implemented presently or are planned to be implemented. If all the actions identified across the programme are implemented, the savings are estimated to be 295 000m^3/year of water 186 000GJ/yr of energy, and greenhouse gas reductions of 9 960 tonnes CO_2e/yr; this would represent more than half of CWW's greenhouse emissions. Customer energy and water bills will also be reduced by $1.5m/yr.

Implementation has been slower than anticipated. Common barriers to implementation include:

- Further investigation by the customer may be required to determine savings are accurate and opportunities are practical to adopt.
- Customers not being able to justify the initial capital expenditure when the project payback period is too long as environmental benefits alone are not sufficient to warrant implementation.
- Opportunities with shorter paybacks such as steam leaks can be seen as a low priority to business, when they are working on other environmental initiatives that achieve greater efficiencies.
- Customers may not have the in-house capabilities or resources to develop, implement and then manage changes. Actions could also add complexity to maintenance of their system.

Above: Pressure valve © City West Water