Best practice guidelines for water efficiency

City West Water LIMITED

Best practice guidelines

- Amenities
- Kitchens
- Laundries
- Cleaning
- Cooling towers
- Fire protection systems
- Landscapes
- Swimming pools and spas

Overview information

- Industry benchmarks
- General maintenance
- Green leases
- Resources

Contact City West Water

Water is set to continue as a key issue affecting businesses across Victoria.

Be it the effect of diminished water allocations for irrigators in the state's north, water management practices for Melbourne's major venues, or the planned price increases over the coming years, there is little doubt that water will become an increasingly important consideration for businesses in both the short and long term future.

Benefits of improving water efficiency include:

- helping to secure our water supply for future generations
- reducing water and energy bills
- carbon footprint reduction
- improved corporate image.

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Best practice guidelines

We have developed a range of best practice guidelines to assist building managers, owners, and maintenance staff to manage their water consumption as efficiently as possible in the various high water use areas in typical industrial, commercial and institutional facilities, including:

Amenities

Kitchens

Laundries

Cleaning

Cooling towers

Fire protection systems

Landscapes

Swimming pools & spas

Best practice guidelines for water efficiency

City West Water LIMITED

Overview information

To compliment these guidelines, we have developed an overview of information relating to:

Industry benchmarks

Using benchmarks to measure against your water efficiency is an important step in reducing the water used on your site.

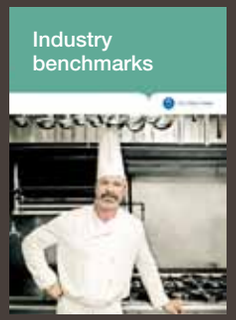
General maintenance

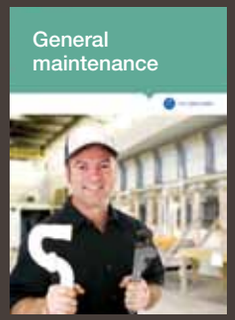
A proactive approach to maintenance of your water system will help avoid water leaks and inefficiencies, which can waste thousands of dollars in water and energy costs.

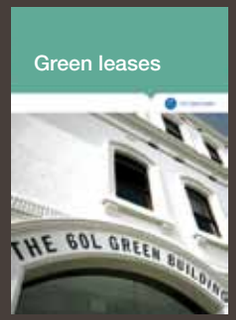
Green leases

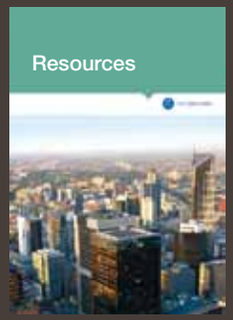
Green leases address split incentives between developers, building owners and tenants, to ensure that parties with influence over resource efficiency have every opportunity to implement change where it would be beneficial.

Resources









Best practice guidelines for amenities in buildings

City West Water
LIMITED

Amenities in buildings

Water usage in toilets, showers and basins often forms a large component of water use at commercial properties. Average daily demands of these conveniences can be as high as 155 litres per person in commercial and institutional settings.

Savings of 25 to 30 per cent are readily achievable in sites not operating efficiently. Furthermore, installing water-efficient appliances in high water usage amenities and maintaining fixtures can be very cost effective.

WaterMark and the Water Efficiency Labelling Scheme (WELS)

To aid in the selection of water efficient products, the Australian Government introduced the WaterMark program and Water Efficiency Labelling Scheme (WELS).

WaterMark is a product quality certification mark provided by independent certifying authorities. It relates to the quality of the product, including aspects of health and safety, and warrant that it is fit for purpose. Certification is mandatory for products to be legally installed in accordance with state and territory plumbing regulations. Those products required to be certified are listed in the Plumbing Code of Australia and covered by Australian Standards.

WELS sets minimum performance standards for domestic water using devices including, taps (with some exceptions), showers, toilets, urinals and flow controllers (optional). For new construction and major refurbishments, higher rated equipment is nearly always justified. Those buying a WELS labeled product which does not carry the WaterMark should ask their local water authority or plumber if it can be legally installed.

For more information on WaterMark or WELS, refer to http://www.waterrating.gov.au/

Toilets

Public toilets can account for 15 to 40 per cent of total water usage, depending on the type of business. A single toilet in a public amenity area is typically used 50 times per day, meaning savings of 50kL a year are readily achievable.

To better understand the water saving potential of toilets, it is important to understand the current system type in place at your facility. Various toilet flush types are presently used, including:

- **gravity tanks,** which comprise a bowl or pan with a tank connected by a flush pipe. On modern toilets the tank is integrated with the pan. Gravity tank toilets are relatively inexpensive and are most commonly found in residential and older commercial and public buildings. They rely on water in the tank to flush waste. Low water pressure means longer tank refill periods which can cause problems in high use toilets. For new installations, the highest efficiency 4.5/3 litre dual flush cistern should be considered if appropriate for the building's hydraulic system.
- **flush valve operated** systems, which are designed for more heavy duty use than the gravity tank and are often found in hospitals, high use public areas and office buildings. These systems can accommodate different water pressures at different points in the building. To operate effectively they generally require a water pressure of 175 – 275kPa. These toilets use a valve directly connected to the water supply plumbing. In new installations it is important to ensure the valve is installed correctly to ensure the correct operation of the toilet and ensure optimal water usage.
- **pressurised tanks,** which are less common than the other options. The pressurised tank uses water line pressure to achieve a higher flush velocity. Water is not stored inside a cistern, but in a vessel that compresses a pocket of air and releases pressurised water into the bowl and out the trap-way. Pressurised tank toilets require a minimum pressure of 175kPa to operate effectively and may not be appropriate for retrofit installations, depending on the nature of the existing plumbing.

Best practice toilets

Best practice	Typical existing usage	Savings per person		Description
L/flush	L/flush	kL/year	$/year	
4.5/3L dual flush (average 3.5L per flush)	11L/flush	11	29.40	New pan and cistern. Assumes the average person uses the toilet 4 times during the day

Based on City West Water charges of $1.3987 per 1kL drinking water and a Sewage Disposal Charge of 0.9kL per 1kL of drinking water charged at $1.4153.

Potential water saving opportunities

Behavioural change

- Educating toilet users about the correct use of dual flush toilets is important to ensure maximum benefit is achieved. Using a full flush when not necessary, or repeatedly pushing the flush button, can create wear and tear on the system and cancel out water savings achieved by more efficient units. Signage around the toilets can often be the best way to educate users of the most water efficient operation. Stickers encouraging the use of the half flush when appropriate are freely available from City West Water.
- One of the major causes of blocked toilets is their misuse as rubbish bins. The high volume of water used in traditional 9 litre or larger cisterns enabled items to be carried through with the greater volume of water. With the water efficient 4.5/3 litre cisterns, even if waste appears to flush, there is effectively less water to propel it through the pipes and resulting blockages can occur if used for purposes other than those intended. Again, it is important to inform users about the problems associated with flushing wastes, to provide waste bins and perform regular maintenance and audits of toilets to ensure proper use.
- To reduce toilet paper blockages, reduce the quantity of paper going into the toilet bowl by replacing toilet roll dispensers with interleaved toilet paper. Where this is impractical, try switching to a toilet paper that breaks down quickly.

Maintenance

- It is recommended that an inspection should be performed on toilets every 6 months to:
  - » check that overflow pipes are set for the correct flush volume for gravity fed tank toilets
  - » check that the flush mechanisms of gravity fed tanks are working correctly so that water will not continually leak into the pan
  - » check timing cycles and volumes for flush valve systems to eliminate excessive flushing, or retrofit a lower flow diaphragm if suitable. Automatic flushing should be aligned with the building's operating hours
  - » replace worn diaphragms, clean debris from the by-pass orifice, or bleed air from the line to stop slow leaks or continuous flush occurring in flush valve systems
  - » check the relief valve setting and/or control lever water seals on flush valve systems to stop slow leaks.
- Rubber cistern seals should be replaced approximately every two years before leaks occur.
- Periodically replace valves and ballcocks. When flapper valves (valves that control the flow of water to the bowl) become worn their seats corrode causing water to continually leak into the pan. These leaks can be very hard to detect. A few drops of food colouring added to the cistern makes leaks more evident. These valves should be replaced every two years as part of programmed maintenance.
- Use qualified, licensed plumbers with experience in commercial office buildings to perform the checks and undertake any plumbing work. They will know how best to adjust timing and flush volumes to suit available pressure and bowl design.

Equipment modifications

- Reduce flush volumes cost effectively by modifying the float arm or installing a displacement device. Ensure the toilet bowl will function as required using the reduced flush volume.
- Many single flush cisterns can be retrofitted with early closure flapper valves to reduce flush volumes. Ensure the toilet bowl will function as required using the reduced flush volume.
- Some pans with 11 litre cisterns can accept a simple replacement of a 6/3 litre cistern, however other bowls will not clean solid waste properly with the reduced flushing volume and will require a complete toilet suite changeover.
- Conversion kits are available to fit hand basins to the top of toilet cisterns allowing grey water used for hand washing to be re-directed for later use in toilets, providing a low cost option for water conservation.
- Flow control regulators inserted into valve bodies of flusherrette systems can reduce water use by up to 30 per cent and overcome adjustment difficulties due to aged equipment. Ensure the toilet bowl will function as required using the reduced flush volume.

Equipment replacement

- The most effective solution is to replace inefficient toilets with a 4.5/3 litre dual flush system.
- Selected suppliers have manufactured 4.5/3 litre pans specifically for retrofitting applications. The new pans will cover the footprint of older pans, eliminating the need for redecorating, and come with adjustable tubing to avoid re-plumbing.
- Replace highest use toilets first to gain fastest payback.
- Know your plumbing infrastructure and match the type of toilet with the waste water piping and water pressure.
- Consider package toilet basin kits, with hand basins fitted to the top of the toilet cistern. These kits allow grey water used for hand washing to flow into the cistern for toilet flushing, saving water and space. These systems have been used in Japan for many years and are now available through selected Australian suppliers of water efficient products.
- Plan for the legal disposal of old toilets by consulting with your local solid waste authority for recycling options or disposal requirements.
- Consider composting toilets, which collect waste in a chamber, aerate the waste and mix it with mulch to form compost. While they require no water and remove waste from the sewer, composting toilets do require significant levels of ongoing maintenance to ensure correct levels of moisture, oxygen, temperature and carbon are maintained to avoid issues with odour.
- You should always consult a qualified licensed plumber when considering modifications or replacement of equipment.
- Rebates may be available for toilet changeovers and/or project co-funding for efficient water saving projects. For more information and to find out if your project may be eligible for co-funding, speak to your Business Resource Efficiency Consultant.

Did you know?

Replacing an 11 litre single flush toilet with a 4.5/3 litre dual flush toilet can save about 11 kilolitres of water a year per person (based on an average of four flushes per day).

Urinals

Several types of waterless and low water use urinals are available, which can save thousands of litres of water each year. It is highly recommended you consult with a qualified licensed plumber for independent advice to determine which urinal solution will be most appropriate for your building.

Waterless urinals consume the least amount of water during operation but require ongoing cleaning and maintenance regimes and may not be suitable for retrofitting to all existing plumbing systems. If waterless urinals are not installed and maintained in line with manufacturers' instructions, struvite (magnesium ammonium phosphate) may build up immediately downstream of the urinal, causing blockages. Plumbing regulations have recently been changed to provide control measures for struvite build up with waterless urinals.

Where waterless and low flush urinals are not suitable, single stall, on-demand or manual flush cisterns are the most efficient type of urinal. Unlike cyclic flushing cisterns and multiple stalls with shared flushing devices, single stall sensor or manual urinals are only flushed after use and flush volumes can be controlled. Urinal flushing that flushes the whole stall after one use is considered the least efficient option as these models are often activated over large areas when not actually required.

Sensor driven urinal flushing systems and waterless urinals are now becoming common. These systems can lead to dramatic reductions in water use but require regular maintenance to ensure correct operation.

Potential water saving opportunities

Maintenance

- Educate cleaning staff to ensure waterless urinals are cleaned regularly using products and practices that do not damage pipe work, bio cubes (if used), or protective oil layers (often used to seal the waste trap vapours from the room).
- If using solenoid valves, ensure that they are not suffering from pitting corrosion. If they are, replace them immediately. If these valves do not seal properly, water can pass through the valve even when shut, wasting water.
- Motion sensors require routine maintenance and adjustment in order to function well and be water efficient. Regularly check the operation of the sensor to ensure it is operating properly and not being activated by general bathroom traffic or malfunctioning in any way, causing the urinal to flush continuously. When maintaining motion sensors:
  - minimise sensor flush times, which should be approximately 5 seconds. Consult a licensed plumber if unsure of hydraulic requirements for flushing
  - adjust, move or add sensors to ensure they are flushing only when required
  - ensure the battery or power supply to sensors is maintained
  - ensure the time between automatic flushes is at least 6 to 8 minutes.

Equipment modifications

- Installing individual sensor flush units will mean urinals flush only when required.
- You can reduce flush volumes to the minimum by adjusting or replacing valves. As little as 1–2 litres per flush may be adequate. Consult a licensed plumber to determine minimum flushing requirements.

Equipment replacement

To dramatically cut water use, replace cyclical flushing systems as a priority in maintenance programming. Even if your urinals are not cyclical flushers, you still may be able to make significant water savings by upgrading to a waterless or water efficient urinal.

While waterless urinals are optimal for water efficiency, there may be some situations where cleaning practices, existing plumbing, or public perception may make waterless urinals inappropriate. In these instances low flush water efficient urinals should be considered. Some of the issues to be considered when retrofitting your urinals are summarised below. In all instances, there should be an appropriate fall line in piping and conventional plumbing practices should be adhered to.

- **Water efficient urinals**
  High efficiency 6-star WELS rated urinals use less than one litre of water per flush and incorporate urine sensing technology.
- **Waterless urinals**
  Waterless urinals do not consume any water during operation and rely on gravity, a bio agent and routine cleaning to treat the urine and clear the urinal surface. They generally resemble conventional wall hung fixtures, are easily retrofitted in existing installations and offer short payback periods.


Male Toilet

Because no water is required in their use, WELS does not apply for waterless urinals.

To prevent corrosion and blockages, waterless urinals require a regular flush of water through pipes. To manage the build up of struvite (magnesium ammonium phosphate) in pipes, a minimum of two fixture units such as hand basins must be installed upstream of each waterless urinal to comply with plumbing regulations.

While this measure will assist in preventing blockages of main drain lines, trials demonstrated it will not prevent build up of struvite in the discharge pipe from the waterless urinal to the main drain. It is recommended that facility owners and managers arrange for waterless urinals to be inspected and cleaned at periods of no less than 6 months, unless a more appropriate maintenance interval can be established. The maintenance interval will be dependent on a number of factors such as usage patterns, waterless urinal type, drainage design and other factors. Consult a licensed plumber for assistance.

There are three main types of waterless urinals. The advantages and disadvantages of each are detailed in the table below.

Urinal type	Oil barrier – refillable cartridge or oil sealed trap	Mechanical designs	Microbial block
Description	A refillable oil cartridge or oil block floats on top of urine creating a barrier between the room and the plumbing	A one way mechanical valve allows urine to pass into the plumbing but stops odours from going back into the washroom	A water soluble block containing bacteria is placed in the bottom of existing urinals. When in contact with urine, this will react to produce agents that reduce scale and odours forming
Advantages	Cartridge is easy to refill and reduces waste	• Wide range of cleaning products may be used • Barrier will not be broken down by large volumes of water entering the urinal	Existing urinals can be retrofitted without requiring re-plumbing
Disadvantages	• Cartridge may require use of a proprietary oil • Cleaners and maintenance staff need training on changing of cartridges • Seals may be lost if cleaners use excessive water or chemicals in the system	• Relatively new on the market so durability is yet to be determined • One way valves may require replacement	• May cause odour in older urinals, especially if pipes are old, corroded or have scale • Sanitary flushing, albeit at reduced rates, will still be required • Cleaning techniques may need adjusting to remove chemicals which will harm the microbial block • Blocks can break down and cause blockages

Before installing a waterless urinal it is strongly recommended that you:

- familiarise yourself with the applicable rating systems and standards. WaterMark certification ensures water supply, sewerage plumbing and drainage goods (including urinals) meet relevant Australian Standards. These include AS3500.2:2003, which outlines standards for sanitary plumbing and drainage, AS5200.459:2004, which covers wall hung waterless urinals and AS5200.469:2004, which covers waterless or limited flush urinals
- beware that urine breaks down to ammonia and can cause corrosion of copper piping. Any copper or copper alloy piping connected to a waterless urinal should be replaced with PVC piping, ensuring pipe work complies with Australian Standards. Waterless urinal systems can also increase scale formation in the waste piping system
- ensure the area is effectively ventilated to prevent odour
- consider the associated chemical and maintenance costs
- ensure there is enough slope in the urinal's drain line to avoid urine pooling, odour and build up of scale and sludge in the pipes. Confirm specific requirements with your licensed plumber
- where practical, other water using facilities such as showers or washbasins should be plumbed upstream of new waterless urinals to flush urine through the pipes to avoid struvite build up
- ensure you have good plumbing diagrams and are confident that pipes leading from the urinal are accessible if you need to maintain them
- consult a licensed plumber.

Showers

Depending on your type of business, showers may account for a large portion of water use on your site. This is particularly true of hotels, healthcare and recreational facilities.

Installing water efficient showerheads and encouraging shorter showers is one of the easiest ways to reduce the overall cost of your water and energy bills. Contact City West Water to organise the free replacement of your old showerheads with water efficient models as part of the Business Resource Efficiency Program and enjoy the significant cost savings that water efficient showerheads provide.

Best practice

Currently, best practice showerheads are benchmarked as achieving flows of around seven litres per minute or less. A range of water efficient showerheads are now on the market, including water efficient rain showerheads (suitable for luxury facilities) and hand held showerheads (particularly suitable for hospitals and aged care facilities where mobility issues are an important consideration).

A summary of typical showerhead water and energy savings are outlined in the table below. Low flow showerheads also have fewer problems with calcification of nozzles and are less prone to dripping when installed appropriately, which can save you money on maintenance and cleaning.

When evaluating savings, it is important to consider the number of people using the appliance. Savings will be much higher if people limit their shower time to a maximum of four minutes.

Best practice flow rate (L/min)	Typical flow rate (L/min)	Savings per person (based on average shower time of 4.74 minutes and 0.77 showers per day)							
		kL/year	water $/year	Electricity savings kWh	Electricity $/year	Green house gas saving for electricity kg CO2-e	Gas savings MJ (80% heating system)	Gas $/year	Green house gas saving for gas (kg CO2-e)
9.0	15.0	8.0	$28.48	310.1	$46.52	378.3	1395.5	$10.47	71.4

Based on City West Water charges of $1.3987 per 1kL and a Sewage Disposal Charge of 0.9kL per 1kL, charged at $1.4153. Energy savings have been calculated for both electric and gas systems, with electricity charged at 15c/kWh and gas at 0.75 c/MJ and a boiler setpoint of 40 degrees Celsius with system efficiency of 80%. Green house gas calculations are based on the June 2009 NGA Factors workbook.

Potential water saving opportunities

Behavioural changes

- Encourage people to take shorter showers, and aim for a four minute “power shower”. Stickers and timers promoting shorter showers are freely available from City West Water.
- Encourage people to inform maintenance personnel if they notice a leak. Display stickers or signs that encourage the reporting of leaks, also freely available from City West Water.

Maintenance

- Check showerheads for leaks and replace worn showerheads with efficient 3-star rated models on appropriate plumbing systems.

Equipment modifications

- Where low flow showerheads cannot be retrofitted, flow restrictors are a good option. These washer-like disks fit inside the showerhead and limit water flow. Alternatively, they can be fitted to the shower taps. A licensed plumber should be hired to determine sustainability and conduct this work.

Equipment replacement

- Replace existing inefficient showerheads with 3-star rated models which only use about 7.5 litres per minute. These showerheads have a narrower spray area and a greater mix of air and water than conventional showerheads. Ensure your plumbing system is appropriate for a low flow showerhead, especially if you have a gravity fed system. A licensed plumber can help determine sustainability.
- Installing fixed flow taps that deliver a set quantity of water when operated over a specifically set time will reduce water usage in areas where behavioural change initiatives encouraging users to cut shower times have failed. These are often push-button systems.
- A licensed plumber should always be consulted when considering modification or replacement of equipment.

Taps and sinks

Several different types of taps are available to suit the vast range of potential end uses. When installing tapware, you should ensure the flow rate matches the desired end use. Excessive unregulated flows will cause splashing onto floors, wasting water and causing safety hazards and unnecessary cleaning requirements. 6-star WELS rated tapware is available with flow rates as low as 3.2 litres per minute. Reducing flows from hot water taps has the added benefit of saving energy.

Best practice

Best practice tapware for kitchen sinks requires a 6-star WELS rating and a flow rate of less than 4.5 litres per minute, with 3.2 litres per minute considered optimal.

The following table shows the water and cost savings achieved by reducing existing sink and basin flows to best practice. The table considers only the water savings achieved by a single user operating the appliance for 5 minutes, and does not take into account the energy savings that will also follow from heating less water. To calculate savings accurately, it is important to consider the number of people using the tap and the duration of use.

	Best practice	Existing use/ common practice	Potential savings per person	
	L/min	L/min	kL/year	$/year
Sinks	4.2	25	23	62
Basins	4.2	12	23.4	23

Flow control in spout or in taps. Based on City West Water charges of $1.3987 per 1kL and Sewage Disposal Charge of 0.9kL per 1kL, charged at $1.4153. If you have a trade waste agreement, savings may be greater.

Potential water saving opportunities

Behavioural changes

- Encourage people to turn taps off when not in use by displaying stickers or posters that inform them about the amount of water they are wasting when they leave a tap running. A range of stickers and posters are freely available from City West Water.
- Encourage people to inform maintenance personnel if they notice a leak.

Maintenance

- Check flow rates and install restrictors to reduce water use where possible.
- Regularly check for leaks to avoid unnecessary water wastage.

Equipment modifications

- Aerators can be used for flow control on existing taps. Aerators screw onto the tap head and add air to the water flow. Water flow is reduced and washing effectiveness is maintained.
- It may be appropriate to adjust flow valves or install flow regulators in the hot and cold water feed lines to the tap where aerators are not suitable or where there is tap misuse.
- Where appropriate, consider installing pedal-operated tap controllers to ensure valves are closed when the basin is not in use.
- As insurance against future unreported leaks and to reduce maintenance costs, it may be appropriate to fit long life tap washers (usually with a rubber O-ring and mechanical protection against over-tightening).
- Where appropriate, update the tap system to include:
  - automatic shut off – when the handle is released, the valve shuts off
  - metered shut off – when a lever is depressed, the tap delivers a water flow for a pre-set time, then shuts off
  - sensor activation – a beam of infrared light detects the user then delivers a fixed quantity of water, eliminating the likelihood of taps being left on. Ensure the sensor is equipped with shut of valves to prevent the taps from running continuously when the system fails. The sensor should be adjusted to deliver the appropriate activation time and flow rate for your application (best practice being 3.2 litres per minute).

Equipment replacement

- It is recommended that when replacing taps, the new tap has at least a 3-star WELS rating. Quarter turn taps with ceramic seats give greater flow control and are less prone to leaks.
- Consider installing fixed flow taps that deliver a set quantity of water when operated (e.g. push button taps).
- Consider installing spring-loaded taps that shut off immediately after use.
- Consider installing small hand basins with a pop-up plug that closes the drain until a lever or button is pressed. These discourage running taps as the sink fills quickly.
- Consider package toilet basin kits, with hand basins fitted to the top of the toilet cistern. These allow the water used for hand washing to flow into the cistern and be reused for toilet flushing, saving water and space.
- A licensed plumber should always be consulted when considering equipment modification and replacement.

City West Water

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For case studies relating to Amenities, go to:

- **Case Study:** AMP Capital Investors
- **Case Study:** 101 Collins St
- **Case Study:** Old Colonists
- **Case Study:** The Westin Melbourne

City West Water
LIMITED

Best practice guidelines for kitchens

Business Resource Efficiency

The need to save water has never been greater. In recent years, we experienced the worst period of drought and lowest stream flows in our state's history. Our future water resources depend on individuals and businesses using water wisely, and kitchens are one area of a business that can make a difference.

The main types of water-using equipment found in kitchens are dishwashers, sinks, pre-wash spray rinse units, ice-making machines and garbage disposal units. There are many opportunities to improve the efficiency of appliances and water use behaviour in kitchens.

As well as saving Victoria's valuable water resources, some benefits of efficient kitchens include:

- more sustainable energy usage
- reduced sewage volumes
- reduced costs
- improved business image.

Water use and sewage disposal charges are based on the amount of water you use. The less water you use, the less you pay. And by using less water, you are likely to be left with a lower energy bill, due to a reduced amount of energy used to heat the water.

By becoming more water and energy efficient, the public image of a business can be improved as the general public appreciate businesses that promote environmentally friendly practices.

How can we improve water efficiency in the kitchen?

First, businesses need to understand where their water is used and how they can improve efficiency. Complete a Water Management Action Plan (waterMAP) to identify where water is being used and develop a strategy of short, medium and long term actions to save water and money.

You can work through your waterMAP with your City West Water consultant, who can provide advice on how a combination of behavioural change and modifications and upgrades to equipment can help your kitchen to become more water and energy efficient.

Did you know?

When you use hot water more efficiently, you will also save on your energy bill!

Tips to improve water efficiency

Behavioural changes

Food service

- Instruct waiters to serve water from jugs to prevent half empty bottles or carafes of water being discarded.
- Turn off any continuous flow used to wash drain trays of post-mix drink machines and cleaning trays.

Behavioural change

- Seek commitment from your staff to save water. It is important to communicate the importance of saving water to your staff.
- Place stickers and simple signs in areas of high water usage to remind staff to save water.
- Post simple instructions near equipment that uses water to help people remember to do the right thing.

Food preparation

- Rather than defrosting frozen foods under a tap, it is more water efficient to defrost food in the refrigerator or using the microwave.

Washing practices

- Wash vegetables or rice in a bowl or a plugged sink rather than under running water. Water collected from washing could be used to soak dirty utensils.
- Soak dishes in a plugged sink instead of under running water.
- Scrape food scraps from plates or use a five or six-star high pressure pre-rinse spray gun.
- Only run dishwashers on full loads.

Tips to improve water efficiency (cont'd)

Maintenance

- Check for worn gaskets in sinks
- Check for dripping taps or obvious leaks
- Ensure regular maintenance of water-using devices, such as dishwashers and ice makers. Repairs and regular maintenance should be conducted by a qualified technician.

Equipment modifications

- Garbage disposal units, while not water intensive, add to pollutants in the sewer and reduce wastewater quality, making water harder to recycle. An alternative to garbage disposal units is to use strainers or traps that employ a mesh or steel screen to collect food waste for later disposal. Many companies provide a service of collecting food wastes to make compost for garden fertiliser. Investigate this opportunity for your kitchen.
- Install flow control to the rinse line to ensure the water flow and pressure is matched to the minimum settings recommended by the manufacturer.
- Where practical to do so, consider modifying dishwashers to recycle final rinse water for next initial rinse.

Equipment replacement

Pre-rinse spray guns

- Replace pre-wash units with manually operated pre-rinse spray guns, which are used for rinsing cooking utensils, pots and pans, for soaking dishes and cleaning. They are designed with automatic shut-off valves at the hose head to supply water only when needed. Low-flow high pressure spray heads can be used as a replacement for conventional taps or automatic pre-rinsers.
- Investigate replacing pre-wash units with a high efficiency dishwasher which includes pre-rinsers that recycle water. An efficient dishwasher will save water, power and minimise the labour required for pre-rinsing. The size of the dishwasher should be matched to your kitchen's needs.

Did you know?

Water cooled ice-making machines use up to 10 times as much water as air cooled machines, typically using 600 litres of water a day for cooling. This can account for more than half of the water that is used by the machine.

Ice-making machines

- The type of condenser in an ice-making machine will have the greatest effect on water use. There are two types of refrigeration condensers available – air cooled and water cooled. Air cooled condensers are significantly more water efficient. Ice makers can consume water during cleaning cycles as well as during ice making. High efficiency ice makers should not exceed 12 litres of water per 10 kilograms of ice produced. More information is available at www.energyrating.gov.au/library/pubs/200410-mepsicemakers.pdf
- Consider buying ice from commercial suppliers instead of buying an ice making machine.
- Adjust the quantity of ice that is dispensed to ensure the machine is not used unnecessarily. When upgrading, ice makers should be sized to dispense the amount of ice required.
- Transfer unused ice to the freezer for later use.

Dishwashers

- If your dishwasher is over seven years old, it is likely that upgrading to a newer model will provide significant water and energy savings. Typical water consumption for new commercial dishwashers is 2.5 to 4 litres per cycle and can differ between manufacturers and models. To gain the most benefit, make sure you have the right type of dishwasher to suit your business. The table below indicates what types of dishwashers are typically appropriate for various numbers of restaurant patrons.

Serving capacity (no. of patrons)	Optimal dishwasher type
Less than 60	Under counter
60 – 200	Pass through dishwasher (hood)
More than 200	Conveyer

- Train staff to follow the manufacturer's operating instructions for correct dishwasher use to ensure it is used efficiently.

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Best practice guidelines for laundries

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The amount of water, energy and associated labour used in laundries can have significant impacts on operational costs. This section outlines a number of low-cost (and no-cost) ways to improve resource efficiency in laundries, which can save your business time and money.

This information applies to laundrettes and in-house laundry facilities, such as those used by hotels, rather than large commercial dry cleaning and laundry facilities. For information on water saving options for commercial laundries refer to the AIG website: http://www.aigroup.com.au/portal/site/aig/environment/managingwater/

A cool or cold wash reduces hot water costs and greenhouse gas emissions and can increase the life of fabrics

Potential water saving opportunities

Behavioural change

- Reduce the need for unnecessary washing through education. For example, hotels may minimise towel washing by asking patrons to hang up towels rather than leaving them to be washed every day.
- Review rewash standards administered by laundry staff to ensure that items are being washed to a standard appropriate for the end use without overwashing.
- Operate machines only when fully loaded (but not overloaded) to avoid unnecessary costs.
- Consider washing everyday laundry in cold water, which can save water and energy while increasing the life of fabrics. A number of processes will require hot water to activate chemicals in the wash and maintain compliance with Australian Standards. Hot water is usually necessary when a heavy duty wash is required to remove grease, fats and oils. Warm washes are suitable for soiled fabrics including grass, dirt, food stains and spot stained clothes, while cold washes are appropriate for everyday whites, colours, sheets, towels and delicates such as silk, woollens and lace.
- Pre-sort items before loading the machine to ensure the appropriate wash cycle can be chosen.
- Adhere to the detergent manufacturer's recommended dosage and regularly check that water levels are correct during operation to assist mechanical action during the wash cycle.
- Discuss ways that you can reduce water and chemical consumption with your laundry detergent supplier to help ensure the right amounts and types of detergents are used, which will minimise their impact on wastewater quality. This may help compliance with your trade waste agreement (if you are required to have one) and will help water authorities recycle treated wastewater more sustainably.
- Turn off and isolate the steam and water supply to equipment when not in use. This will conserve energy required for heating and reduce the make-up water demand of your boiler while reducing leaks.

Maintenance

- Regularly check for leaks and ensure all staff are aware of whom to contact to report water leaks.
- Develop a regular maintenance schedule to help ensure equipment is well maintained.

Equipment modifications

- Most commercial washer-extractors can be retrofitted with a tank to save the final rinse water, which can then be reused as a pre-wash in the next load. The storage tank may be fitted within or on top of each machine, or located separately and supplied by pump.
- Consider using a heat exchanger to transfer heat from wastewater to preheat incoming cold water.

Reusing water from the final rinse cycle of your washing machine can cut water consumption by up to 30 per cent

- If you operate a water cooled dry-cleaning machine, assess the possibility of converting the cooling operation to a closed or air-cooled system.
- Consider installing an ozone type washing system. Injecting ozone into the wash formula reduces the need for hot water and energy because ozone allows washing in cold water. Using ozone can also reduce water usage and discharge to sewer by up to 40%, reduce cycle times and lower the cost of heating the water used by 90%. Ozone systems are appropriate for some larger laundry facilities, but they are generally unsuitable for top loader washing machines and may not offer attractive payback periods for public access laundries. When installing an ozone system, the use of cold water requires validation to ensure effective disinfection that will meet Australian Standards relating to the processes and temperatures for disinfecting textiles.

Equipment replacement

- If you decide to buy a new launderette washing machine, a standard front loader will use up to 70 litres less water per wash than a current top loader.
- If you are cleaning large quantities of linen, it is worth considering the replacement of your conventional washer-extractor with a continuous batch washer of a similar capacity. A batch washer uses a counter-current flow and can save up to 70% of water and steam. The automation also reduces labour costs.
- If you are operating a domestic laundry, it is recommended that your machines be rated 4-star or higher.
- Design your laundry system to incorporate water recycling technology. In large laundry facilities, water recycling is now common practice and savings of up to 85% can be achieved. For smaller facilities, a number of possible reuse options for greywater may exist. For further suggestions, go to http://www.citywestwater.com.au/business/alternative_water_services_greywater.aspx

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Best practice guidelines for cleaning

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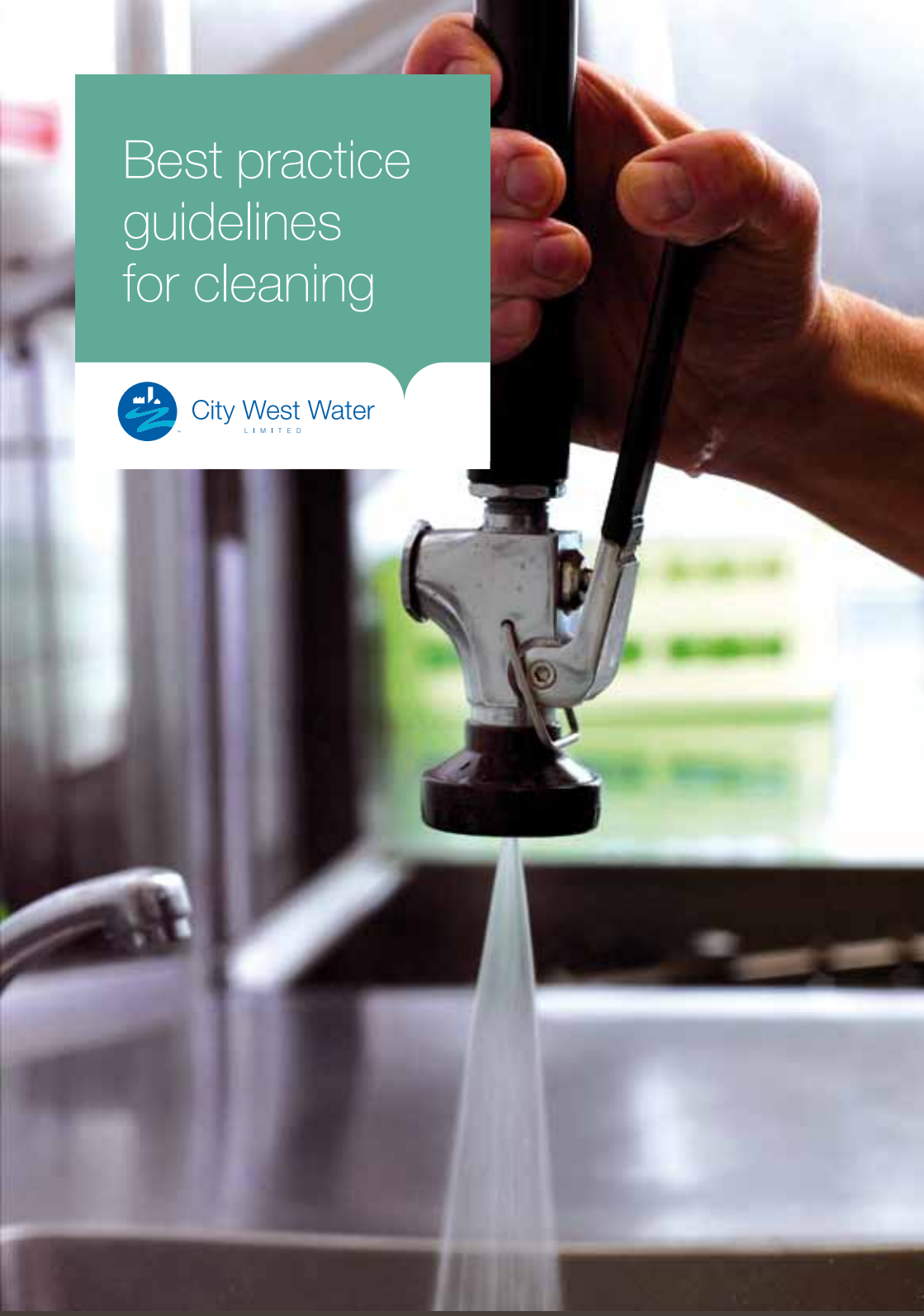

The Business Resource Efficiency program for businesses can help your organisation to improve its water efficiency. Employing best practice cleaning methods will deliver the following benefits:

Reduced water and energy usage, labour, cleaning chemicals and sewage disposal costs

Water use and sewage disposal charges are based on the amount of water you use. The less water you use, the less you pay. This is especially true for hot water systems where cost savings are doubled by saving both water and energy at the same time. Using the cleaning procedure and products that are best suited to your task will help you save time, effort and cleaning chemicals.

Improved health and safety management

Well cleaned spaces make healthy environments for people. Using the right chemicals will protect the health of occupants, cleaners, and sewer workers.

Contributes to the sustainability of Victoria's valuable water resources

The need to save water has never been greater. In recent years, we experienced the worst period of drought and lowest stream flows in our state's history. Our future water resources depend on individuals and businesses using water wisely.

An improved business image

The general public value businesses that promote environmentally friendly practices.

Did you know?

Reducing the amount of chemicals that go to sewer enables more water to be recycled for other purposes.

How can we improve water efficiency?

A Water Management Action Plan (waterMAP) improves water efficiency onsite, by helping businesses to understand where their water is used.

Businesses that have a waterMAP have succeeded in improving water efficiency and saving money. The waterMAP identifies short, medium and long term ongoing actions that will improve water efficiency and save money.

Most commercial businesses have a variety of cleaning and rinsing applications that can consume large volumes of water. Often these cleaning practices and the chemicals used will be based on habit rather than an evaluation of what cleaning is necessary.

A careful examination of your cleaning practices can save on cleaners' time, chemical costs and unnecessary water use. Most often this will cost no money to begin with, but the money and water you save will be ongoing!

Tips to improve water efficiency

Behavioural changes

Re-evaluate cleaning schedules

In areas that are seldom used, investigate if a reduction in the frequency of cleaning is appropriate to ensure cleaning does not occur unnecessarily.

- For high use areas such as entrances, exits and walkways, a high frequency cleaning routine will prevent the build up of dirt and grime, and eliminate the additional effort required to remove ingrained dirt if it is left to build up. Often this will involve regular sweeping of doorways, and spot mopping if necessary.
- Evaluating the cleaning requirements of areas before undertaking tasks that may be unnecessary will ensure that cleaning occurs on an 'as required' basis. For example, if it has just rained, it may not be necessary to wash windows.
- For efficient after hours clean ups, focus on team cleaning as opposed to zone cleaning. Having cleaners work together eliminates the need for unnecessary lighting of the whole building, as staff can turn on and off lights on an 'as required' basis.

Re-evaluate cleaning product use

Match products and quantity used to the amount and type of dirt

Ensure the correct quantity of cleaning product is being measured out for use to reduce the amount required to be purchased and save cleaner's time when removing the excess product. Over-application of cleaning products is very common and does not aid the cleaning process. Use dispensing systems where possible.

Consider environmentally friendly cleaning products, especially for maintenance cleaning. When selecting environmentally sound products, consider whether the product is:

- 100% biodegradable
- phosphate free
- chlorine free
- vegetable based
- unscented
- dye free
- concentrated

Match products to the surface type to avoid inappropriate product selection, which can result in unnecessary quantities of water and cleaning products being used.

Evaluate the need for the following products:

- Antimicrobial products (or disinfectants) – these are appropriate for cleaning environments that need to be sterile, but overusing antimicrobial products can place an unnecessary load on sewage treatment systems
- Abrasive products – extra time and water is required to clean off residual product
- Solvents – over-use can have adverse impacts on the health of staff and cleaners[1], create health and safety risks for sewerage system workers and contribute pollutants to the sewer which make water difficult to recycle. An evaluation of solvent use will ensure they are not being used unnecessarily

[1] Women's Voices for the Earth – November 2009

- Air fresheners – a suitably cleaned area will produce no smell. The use of air fresheners often masks odours which indicate cleaning is not being performed correctly.

Re-evaluate cleaning procedures

Switching from wet carpet cleaning methods, such as steam cleaning, to dry powder or steam vapour machine methods will dramatically reduce the water use of the procedure

Consult your carpet cleaner to ensure your carpet is suited to this change.

With water use in cleaning, 'less is best'

The more water that is used, the more water is required to be dried off. Using a spray bottle on wall and bench surfaces allows for the volume of water used to be better matched to the task at hand. The dirtier the surface, the more water is required. It is important to properly dry the surface after cleaning to avoid puddles, which can become a breeding ground for bacteria, especially in toilet areas.

Try the CLEAR-WET-WAIT-WIPE technique

CLEAR dirty surfaces to reduce the amount of grime to be removed by mopping and wiping. Use brooms, brushes, vacuums, squeegees, scrapers and other utensils to clean surfaces before performing a wet clean. By collecting the majority of waste, residue or contaminants in a dry form, large volumes of wasted water can be avoided. For example:

- sweep floors instead of hosing with water
- vacuum or sweep dry material spills such as salt or dyes instead of using water
- use squeegees to collect food processing residues from the floor before hosing with water
- consider using a high pressure 'water broom' for large areas that will use water more efficiently than a mains pressured hose.

WET the surface. Pre-spray stubborn spots on floors, benches etc with water. Using too much water will make it difficult to spread the water around and will also increase drying times.

WAIT if the dirt is not removed after a few wipes. Let the water do the work. Begin another task if necessary. When you return, the dirt should wipe away easily.

WIPE the area dry to ensure that no moisture is left for bacteria to grow in. Use squeegees on tables and bench top surfaces to eliminate the need for excessive water use.

Timber floors should not be cleaned with hot water as this will damage the surface over time.

Physical mechanical cleaning performed correctly can have more effective results.

Find and eliminate the source of spills and leaks to reduce the need for washdowns.

Tips to improve water efficiency (cont'd)

Staff education

- One of the most effective ways to save water in cleaning procedures is to ensure cleaning staff are supervised and educated on water saving cleaning practices. Specific cleaning practices should be defined and reiterated over time as cleaning staff often change.
- It is recommended that cleaning staff be made aware of the site's commitment to saving water and be rewarded for suggesting new water saving opportunities.
- Cleaners should be educated to understand the impact of hosing wastes and pollutants to sewer or stormwater systems and to present simple alternatives to prevent this from occurring.
- If waterless urinals are fitted at the site, educate cleaners on the cleaning techniques and products required. Embedding these requirements in cleaning contracts will help ensure the waterless urinals are successful.
- To protect the health of cleaners and occupants, a thorough inventory of the cleaning chemicals in use can be conducted in order to screen out chemicals that are unnecessarily harmful, and educate cleaning staff on their potential impacts.
- Ensure cleaners have knowledge of the Material Safety Data Sheets (MSDS) which are required to accompany a number of cleaning chemicals. MSDS contain information about health and environmental risks associated with cleaning chemicals, and how to mitigate and manage these risks. In particular, cleaners should be aware of potential health effects, first aid measures and handling and storage information contained on the sheets.

Outdoors

Please be mindfull of Permanent Water Saving Rules and prevailing water restrictions when considering the following tips.

- Sweeping paved areas and parking areas (rather than hosing) saves water.
- Reconsider the need to wash building exteriors or other outside structures. If possible, source rainwater or recycled water for this purpose.
- Where possible, reduce the frequency of cleaning external equipment and flooring.
- Change the window cleaning schedule from regular to 'as required' and use squeegees rather than hosing to save water and time.
- Wash vehicles only when needed unless necessary for operator safety. Use recycled water if possible, or go to a water efficient commercial car wash.

Equipment modification

- Floor mats, 'clean zones', and other methods can be used to reduce the tracking of waste and dirt throughout a facility.
- Fitting washing equipment with aerated spray nozzles and shutoff valves will reduce water use.
- Efficient trigger spray nozzles on hoses can cut down unnecessary water wastage.
- Consider high-pressure washers to clean more quickly and efficiently.
- Consider using low-flow 'fogging' nozzles to rinse parts efficiently.
- Installation of flow restrictors in water lines that supply hoses and pressure washers can be used to prevent excess water use.
- Timers that shut off process water when a process is shut down will ensure water is not used unnecessarily.
- Checking and adjusting stationary spray nozzles so they are aimed properly will ensure the optimum application of jets.
- A review and adjustment of nozzles' spray patterns will assist with achieving the optimum application of spray.
- Equipment can be coated with a non-stick surface to allow for easier cleaning.

Equipment replacement

- Steam vapour cleaning machines (not to be confused with carpet steam cleaning) prove effective in areas requiring an intensive clean, and can provide a high level of disinfection. These machines heat a very small amount of water and release it as steam vapour. In facilities with high disinfection requirements such as aged care facilities and hospitals, this can be a healthy and environmentally friendly alternative.
- A number of cleaning surfaces, including sensitive bench tops and floors, can be cleaned using micro-fibre cleaning cloths in place of cleaning products. Microfibre cloths are particularly effective in food preparation areas, as only cold water is required to remove grease. This saves on water heating, reduces chemical costs, and often reduces cleaning times.

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For case studies relating to Cleaning, go to:

Case Study: Tollman

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Best practice guidelines for cooling towers

City West Water
LIMITED

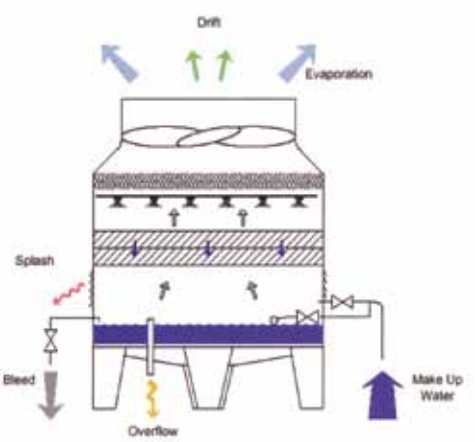
Cooling towers

A cooling tower is a heat rejection device that uses water evaporation to cool a water stream to a lower temperature. In a commercial setting, cooling towers are typically used to cool buildings by delivering a cooled water stream through coils in the building's incoming air stream. Hot air that comes in contact with the cooled water stream in the cooling tower will be rejected through the evaporative process.

Cooling towers can consume huge volumes of water, most of which is of drinking quality. According to the Australian Institute of Refrigeration, Airconditioning and Heating (AIRAH), this process can account for up to half of a building's total water use.

Cooling towers require routine maintenance to ensure they are using water and energy efficiently. Water losses occur in cooling towers due to:

- general evaporation
- drift
- overflow
- blowdown
- splash-out
- system leaks.



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Schematic of the water balance in a cooling tower, courtesy of Sydney Water Corporation »

A trial conducted by City West Water in Melbourne's Central Business District has shown that annual savings of up to 9.5 million litres are possible in some cooling towers by ensuring they are in good condition, operated properly and well maintained.

Optimising the operation and maintenance of cooling tower systems will save on cleaning and maintenance requirements, treatment chemical costs and bills for sewage, trade waste and electricity.

Did you know?

Cooling tower systems in commercial buildings account for an estimated 30% of a site's total water use.

Important – Legionella risk management

Under no circumstances should you modify cooling tower equipment to save water if the actions result in a foreseeable and unacceptable risk of Legionnaires disease to you or your staff, or if any action contravenes regulations governing the safe operation of cooling tower systems.

Before undertaking works on your cooling towers, it is highly recommended that you consult with an appropriately qualified cooling tower service provider to ensure your proposed modifications do not compromise the integrity of the system or the health of its users. If any modifications are made, ensure this is well documented and communicated to your staff and the service provider maintaining the system.

Effective Legionella control is an important component of cooling tower operation which includes, but is not limited to, management of biocide, water temperatures, environmental conditions and regular maintenance and cleaning. Components and equipment that require maintenance and cleaning include basins, fill packs, drift eliminators and side stream filters.

Recent changes to legislation mean that cooling tower requirements are now maintained by the Department of Human Services (DHS), which maintains up to date information on Legionella risk control and legislation on its website at www.health.vic.gov.au/environment/legionella

Legislation requires the registration of cooling towers with the DHS, cooling tower audits and the development of risk management plans. The legislation now also requires businesses to take measures to maintain and test their cooling tower systems.

Legislation for Legionella control is detailed in the *Public Health and Wellbeing Act 2008* – which replaces parts of the *Building Act 1993* that dealt with cooling towers – and is available at www.legislation.vic.gov.au

Check the efficiency of your cooling towers by using ARIAH's free cooling tower efficiency calculator at www.ctwec.com

Best practice

The two primary measures of assessing performance in cooling towers are the 'Co-efficient of performance' (COP) and the 'Cycles of Concentration'.

COP relates to chiller efficiency and measures the energy required to cool the water. The COP should be approximately 10 to 12.

'Cycles of concentration' is the relationship between the quantities of blowdown water quality and make-up water quality. With the quality of water supplied by City West Water, cycles of concentration of 10 – 15 are achievable. If you are operating at lower cycles, speak to your water treatment service provider about improving the efficiency of your cooling tower.

AIRAH has a number of resources available to assist you with ensuring your cooling tower is performing at best practice, including:

- **cooling tower efficiency calculator –** to assess the water efficiency of your cooling tower, AIRAH has produced an online calculator, available at www.ctwec.com. You will need data from routine service reports provided by your service provider to complete this
- **training information –** remote learning program on maintaining cooling towers. Details are available at www.ctwec.com
- **Best Practice Guidelines for Water Conservation in Cooling Towers –** includes audit checklists for assessing cooling tower performance and is available on AIRAH's website at www.airah.org.au
- **Technical Design Application manual –** DA 17 Cooling Towers, DA 18 Water Treatment and DA 19 HVAC&R Maintenance are available on the members' section of the AIRAH website – www.airah.org.au

You should also ensure your cooling towers adhere to relevant legislation detailed in the *Public Health and Wellbeing Act 2008.*

In all cases, whether making changes to existing systems, maintenance schedules or selecting new equipment, you should consult an expert service provider.

Potential water saving opportunities

Behavioural change

- It is recommended to work closely with your cooling tower service provider to minimise blowdown by increasing the cycles of concentration. Minimum blowdown rates must be determined in conjunction with the optimum water treatment program for cooling water. This is dependent on the feedwater quality, including pH, total dissolved solids (TDS), alkalinity, conductivity, hardness and micro-organism levels, the extent of use and the sensitivity of the cooling system.
- Australian Standards require that blowdown is controlled automatically. Cooling towers are automatically bled off when the conductivity of the water reaches a certain level. Aim to operate the bleed off on a continual basis, optimising the conductivity of the tower and eliminating wide fluctuations of TDS. Use a conductivity controller to continuously bleed and refill water in the system.
- If appropriate, set up performance-based service contracts with key performance indicators such as level of water use, corrosion rates, microbe levels etc. Ask your service provider to make sure you are using the right chemicals for the metals in your system, that your biocide program is effective and the dosing equipment is automated.
- Energy efficiency within buildings will minimise cooling load, reducing the water used in cooling towers. Some ideas for reducing a building's cooling load include:

- raising temperature set points to reduce the heat rejection required of the cooling tower
- adequate insulation in walls and ceilings to help retain a constant temperature in buildings
- double glazing windows or adding a solar guard film or shade, and placing plants around windows to prevent excess heat from entering the building
- making sure your system is set to service only the areas that are in use. Most ducted HVAC systems enable you to split your building into zones so not all areas have to be heated and cooled at the same time
- ensuring powered equipment, heating and lighting is on only during occupancy hours. Consider placing equipment on timers to ensure it is turned off when not required, or use a sensor activated system. Consider a smart controller that will allow your heating system to turn off and on at optimal start and finish times, and program computers to automatically shut down when not required
- using an economy air cycle or natural ventilation in favour of the cooling tower whenever the outside air conditions are favourable
- using heat recovery systems to help minimise the amount of heat rejected through a cooling tower. For example, the saved heat can be used to preheat hot water, saving on heating and cooling costs
- checking whether it is possible to install or use fan motors with variable speed control
- investigating a reduction of the lighting load. In many buildings it is possible to effectively reduce the power consumed by the lighting systems by at least 30 per cent without any discernable loss of amenity by cleaning light fittings, using task lighting in areas with high lighting requirements, and changing to energy efficient light bulbs.

For further advice on improving the energy efficiency of your building, go to www.sustainability.vic.gov.au

A variable speed drive allows cooling towers to operate at their optimal speed, depending on the weather conditions and the level of cooling required at any given time, saving water and energy.

Maintenance

- Work closely with cooling tower service providers to manage the water quality in cooling towers to help track water use. Principal quality issues are the prevention of scale and corrosion to maintain a clean heat transfer surface, control of microbiological growth and fouling. Effective control of these concerns prevents system failure, maintains water and energy efficiency, minimises system maintenance and ensures the system meets relevant discharge limits. AIRAH has produced an audit checklist, which is freely available as part of the *Best Practice Guidelines – Water Conservation in Cooling Towers* at www.airah.org.au
- Leakage in cooling towers can occur around pipes, joints and seals. Joints may need to be adjusted or sealed if water is leaking from the tower casing or basin. You may consider replacing packed gland pump seals with mechanical seals to help prevent any wastage of water. If water is leaking from any pump seal, ensure your maintenance personnel attend to it promptly, even if it is minor, as small leaks can result in significant water wastage if left unattended over a long period of time.
- Spray nozzles in the cooling tower need regular cleaning to ensure effective heat transfer. Your cooling tower service provider will be able to advise you when this is necessary.
- All water treatment must be performed by qualified workers and monitored according to Victoria's cooling tower regulations (refer to the Legionella section for relevant references to legislation) to ensure the correct procedures are followed to prevent Legionnaires disease and water wastage. AIRAH maintains a list of accredited water treatment service companies. Further details are available at www.airah.org.au. Service providers should provide a written report of each service call, and be sure they explain the meaning of each analysis performed, chemicals added and the test results.

Did you know?

Savings of up to $17,000 per site per year can be made my making simple modifications and improving the maintenance of cooling tower systems.

Equipment modifications

- Consider using alternative water sources such as recycled water and rainwater for makeup water, which can be used when the concentration ratio in the tower is set conservatively low. Similarly, blowdown water may be suitable for reuse elsewhere on the site. For guidelines on the safe use of alternative water sources in cooling towers, the Department of Human Services has published guidelines on managing the risks associated with the use of alternative water in cooling towers, available on their website at http://www.health.vic.gov.au/environment/legionella/index.htm
- Consider installing check-meters on the make-up water feed line and, if technically possible and economically feasible, on the blowdown line. This will help you to better understand the water consumption. To make the most of your meters, read and record check-meter data regularly, establish tower water use and set best practice targets accordingly.

- If the condenser water system has a low heat load, the flow of condenser water through the cooling tower can be reduced via a cooling tower bypass valve. This enables the condenser water to return directly to the chiller, thus heating it to a point where maximum cooling can occur across the cooling tower. Minimising the number of times the condenser water flows through the cooling tower also minimises water losses from evaporation, splash and drift. Care must be exercised when using a bypass valve, which can cause rotating sparge cooling towers to stop rotating, and it can compromise spray nozzle patterns if flow through them falls below intended levels. In either case, it is recommended to consult with an appropriately qualified cooling tower service provider to ensure modifications do not compromise the integrity of the system

- If cooling tower water is cloudy, airborne contaminates are common or cooling water pipes are clogging, it is likely that suspended materials are degrading the quality of cooling tower water. Consider installing a side stream filtration system to clean water drawn from the tower's basin and filter out sediments before returning water to the tower. This should enable the system to operate more efficiently with less water. However some rapid sand filter systems use a lot of water to backwash the filter. In this case, consider capturing bleed-off in a backwash holding tank and use it to backwash the side-stream filters. Using a bag or cartridge filter saves more water than sand filters because a backwash cycle is not required.

- If water flows out of the drain pipe when the pump stops, the most common cause is an incorrectly set ball float valve. Setting the water level correctly can be difficult in towers with a low water volume such as those with a V-shaped basin. If the water level is too high, you have an overflow problem. If it is too low, you run the risk of emptying the basin on pump start-up. Consider either using a break tank to increase the effective volume, or replacing the ball float valve with a solenoid valve linked to electronic level detectors.

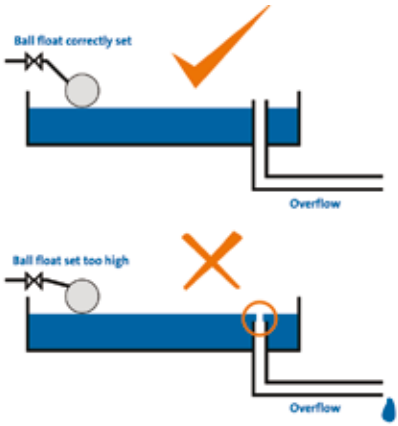

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Diagram of correctly and incorrectly set ball float valve, courtesy of Sydney Water Corporation

- Sometimes an overflow problem can be corrected by a level controller. Check if the ball valve is in a sheltered position within the cooling tower. If the tower is pressurised by the fan, the overflow pipe may require a trap. If it is subjected to a water cascade, it may also require a shield.

- Incorrect water balance may be an issue where there are two or more interconnected towers. The cause can be as simple as ball float valves set at different heights, in which case the floats need to be adjusted. If the cause is more complex, an engineering review may be required.

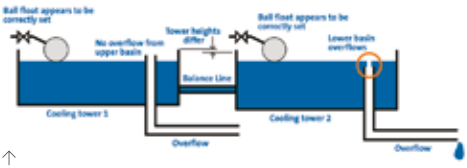

Diagram of incorrect water balance in connected cooling towers, courtesy of Sydney Water Corporation

- If condenser water pipes run above the height of the tower spray heads, water could flood back into the tower when the pump shuts down, causing overflow. Fixing the problem usually requires reconfiguring the pipe work. The use of non-return valves is not recommended because, over time, dirt lodges in the seals and renders them ineffective. Be sure to consult a hydraulics engineer before making changes.

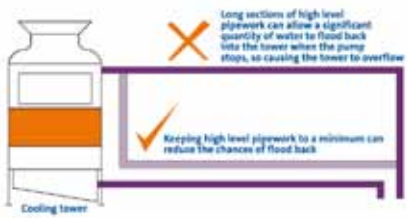

Diagram of correct and incorrect piping configuration, courtesy of Sydney Water Corporation

- If the area around the cooling tower is wet on a regular basis, it might be that water is splashing out of the tower. This type of water loss is known as drift, which occurs when water droplets are carried out of the tower by air draughts. This may be a design issue or it could be due to high winds. Reduction of drift can usually be achieved through baffles or drift eliminators. If the water loss is caused by wind blowing through the towers (known as splash out), a wall can be installed in the middle of the cross-flow tower, preventing wind from blowing through it. A drift rate of .002 per cent is the maximum allowable under Australian Standards.

- Many facilities use 'once-through' water to cool small, heat-generating equipment such as vacuum pumps, air compressors, condensers, hydraulic equipment, rectifiers, degreasers, X-ray processors, welders and occasionally air conditioners. To reduce the wastage of once-through cooling water options, consider:

  - connecting equipment to a recirculating cooling system if available. Excess cooling capacity within the plant may be available for use

  - reusing the once-through cooling water for other onsite purposes, such as cooling tower make-up, rinsing, washing and landscaping (subject to water suitability for landscaping design i.e. that any biocide present in water will not inadvertently affect plants).


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Equipment replacement

Cooling tower equipment, like all plant equipment, requires replacement once approaching the end of its useful life. The careful selection of water efficient or waterless cooling equipment can have a dramatic effect on a site's water usage.

Consider replacing your cooling tower with an air-cooled system. This is appropriate for smaller systems (under 500kW heat rejection) but may not be suitable for higher capacities or process cooling water.

Advantages of air-cooled systems are that they:

- do not consume water
- do not regularly discharge water and harmful chemicals into the sewer, as there is no need for a bleed system
- carry a lower risk of Legionnaires disease, therefore requiring minimal water treatment other than ensuring that the chilled water corrosion control chemicals are periodically checked
- are easier and cheaper to maintain, because they do not require an annual clean of the condenser water box
- are small (rated less than 500kW), so chillers may have lower operating costs.

The disadvantages of air-cooled systems are that they:

- are comparatively more expensive to purchase
- occupy greater floor space
- can have a significantly greater electrical demand
- are noisier, bigger and heavier
- have lower heat transfer efficiency – on very hot days their performance may be compromised and they may have heavy electricity demands.

Geothermal systems could be appropriate for some new buildings. Geothermal systems make use of the fairly constant temperature underground to deliver a constant temperature to the space requiring heating or cooling. Traditional heating and cooling systems are used to provide 'top-up' heating and cooling as required, rather than providing the full load.

Water source geothermal systems directly or indirectly use underground aquifers for cooling. Direct use geothermal systems draw water from the ground, pass it through a heat exchanger and return

it to its source. Indirect systems use closed pipe work loops that pass through the aquifer. By passing cooling water through a series of long loops buried deep in the ground, unwanted heat is passed to the soil and rocks, where it is dissipated. As this is a closed loop system, there is little or no water usage.

Geothermal systems will generally have higher initial costs than conventional cooling systems. However, because the ground temperature is relatively low and constant, very high efficiencies are possible and operating costs will be lower over time. Geothermal systems make minimal noise, have almost no Legionella risk and are relatively low maintenance. However, they do require the drilling of bores, which is impractical in built-up areas.

Ice storage and chilled water storage systems can be used overnight to save water and considerably cut operating costs, as electricity is charged at off-peak rates. Capital costs can also be reduced because it is not necessary to install large chillers which have to deal specifically with peak loads which only occur on as few as 10 days of the year. These systems can potentially save 15 per cent in electrical energy. Ice systems take up less space than chilled water systems. Installation is dependent upon skilled engineering design and manufacture, so they are generally used in large installations.

Natural heat sinks can be used when a building is close to a large water source such as the sea, a river or a lake. Sea cooling is used by several buildings in Sydney, including the Sydney Opera House, and some of the newer buildings in Melbourne's Docklands precinct. Issues to consider in the design phase include corrosion of metals in contact with seawater, macro-organisms such as mussels that can foul heat transfer equipment, and limits of chemicals that can be discharged to the water body. Initial costs would normally be higher than a conventional water-cooled system, however overall savings may outweigh the initial outlay.

Dry coolers use a heat exchanger and fan to replace cooling towers. The cooling water is pumped through the heat exchanger and a fan forces air over it to pick up and remove the heat from the cooling water. Being a closed loop system, there is little or no water use. The main disadvantage of dry coolers is that they suffer from reduced efficiency at higher ambient temperatures. This can be overcome by using water sprays to pre-cool the air when ambient temperatures are high before it enters the dry cooler. Spray coolers must be installed and operated with care to prevent the formation of scale on the surface of the dry cooler. Alternatively, pre-cooling pads can be useful as they do not create water droplets on the dry cooler surface. They also eliminate problems with scale and have low Legionella risk due to their operating temperature.

Hybrid coolers use air to provide the first stage of cooling, only employing water cooling as demand increases. A section of the cooling coil surface is wet with water recirculated from a sump at times of high ambient temperature, but at other times the cooler acts as a normal drycooler. By draining the sump at night (when the load on the cooling system is generally low) and running the cooler dry for a few hours, hybrid coolers can be Legionella free and do not need microbial water treatment. Water consumption is much lower than in traditional systems. The effect on energy use will vary depending on the coolers, so evaluating changes in energy use is an important consideration when making a purchase decision.

For further information, please refer to *Water Conservation in Cooling Towers* available on AIRAH's website at http://www.airah.org.au/Content/NavigationMenu/Resources/BestPracticeGuides/default.htm#Cooling_Towers

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For case studies relating to Colling Towers, go to:

- **Case Study:** CSR Ethanol
- **Case Study:** Olex

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Summary of best practice guidelines for fire protection systems

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Victoria's Plumbing Industry Commission estimates that over 500 million litres of drinking water is being used for testing fire sprinkler systems every year in Melbourne alone.

Buildings with large pump-boosted fire systems use a significant amount of drinking water for fire testing purposes. These systems use large volumes of cooling water through pressure relief valves and for operating diesel pumps.

Businesses are strongly encouraged to efficiently manage water usage in fire systems by adopting a number of available options that tackle water wastage without compromising the overall efficacy for fire protection. Successful alterations and variations made to testing regimes and systems can reduce water use by around 70%. Adopting efficient fire testing practices within your building can also reduce the life cycle costs of equipment and contribute to an improved Greenstar rating for new commercial developments.

Guide to Fire Sprinkler System Water Saving

City West Water has worked closely with Victoria's Plumbing Industry Commission to develop the *Guide to Fire Sprinkler System Water Saving*. This aims to provide detailed information on how to improve fire sprinkler systems and their operation.

The Guide is freely available at Victoria's Plumbing Industry Commission website.

Go to the *PlumbSmarter – Fire Sprinkler Water Conservation* section at http://www.pic.vic.gov.au/

The Guide details the seven best water saving opportunities for fire systems and how to apply them. The following recommendations highlighted in the Guide are suitable for a range of businesses – from high rise offices, hotels, shopping centres, manufacturing sites and hospitals:

- reduce the frequency of sprinkler and pump maintenance testing from weekly to monthly to achieve water savings
- reduce quantities of water used for fire system testing. This can be achieved through either system optimisation or alterations such as the recirculation of fire water, pressure optimisation within the operating system and/or better zoning management for efficient drain down procedures
- capture and reuse spent fire water for onsite applications.

City West Water may also be able to provide you with assistance in assessing fire sprinkler options. It is important to engage a qualified fire professional to tailor solutions for your site prior to implementation. This ensures that any modifications are compliant with relevant Australian Standards and that systems are optimised for space, water use and better protection for occupants and buildings.

Below are some common examples of how spent fire water is wasted.

Potential water-saving opportunities

Behavioural changes

- Work closely with your fire sprinkler service provider to ensure that appropriate procedures for testing, drain downs and recharging are followed for maintenance of pump systems. Check that system performance complies with Australian Standards.
- During sprinkler testing, only one pump is usually required to be operational at any given time. If a second pump automatically starts as a result of a pressure drop in the system, this will consume additional water during the test. If so, we recommend that you consult with your fire sprinkler tester or fire sprinkler service provider to ensure the correct system pressure is achieved.
- Correct maintenance procedures require an electric pump to operate for three whole minutes and a diesel pump to operate for ten minutes. Check if testing times have exceeded these limits. If so, we recommend that you consult with your fire sprinkler tester or fire sprinkler service provider to ensure pump cooling water is not being wasted.

Equipment modification

- Adoption of current Australian Standards will allow a move from weekly to monthly testing where practicable. Any perceived risk as a result of less frequent testing is minimised by other safeguards introduced under the maintenance regime. These may include equipment upgrades, interface and pressure gauge scheduling and a more rigorous and comprehensive testing procedure to fulfil all pre-requisites of the Australian Standard for Fire Protection. Depending on when the fire system was last altered or serviced, a Registered Building Surveyor will need to be consulted to determine whether a variation to the occupancy permit is required.

- Pressure setting adjustments must be carried out by a qualified fire services engineer and approved by a Registered Building Surveyor. Pressure setting adjustments will typically include:
  - » increasing the operating pressure of the pressure relief valve to reduce the amount of water wastage during testing
  - » increasing the operating pressure of the pressure relief valve in diesel pump raw water heat exchanger lines to reduce cooling water flow to waste
  - » adjusting pump start pressure switches in multi-pump installations to ensure multiple pumps do not operate simultaneously during testing
  - » provision of a pressure schedule.
- Pressure can be reduced in pumps by decreasing pump speed, decreasing the size of the pump impellor or installing pressure reducing valves. Such projects have the potential to save millions of litres of water per year.
- Fire water used to test the operational readiness of a fire sprinkler system can be drawn from a tank and recirculated during the test. This can be particularly effective where pumping systems contain pressure relief valves which discharge directly into drains. This option requires space for tanks.
- Sprinkler, hydrant and hose reel system drain-down arrangements can be configured to drain to greywater storage systems (in accordance with EPA guidelines). This allows water to be reused by the sprinkler system or for other uses such as irrigation, cooling tower make-up water, toilet flushing or cleaning. Recycled fire sprinkler water can become part of a property's large water capture and reuse system that may also include rainwater, or greywater. Water quality can vary from system to system, therefore it is imperative that the water is tested before reuse options are considered.
- Sprinkler system drain-down valves can be installed, located and arranged to allow the isolation and drain-down of systems on a floor-by-floor basis or by zone for the larger floor areas. This enables portions of a sprinkler system to be isolated while major refurbishment of a building or modification to a system is being undertaken. This may supplement or replace the need to install valves to zone sprinkler installations.

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Best practice guidelines for landscapes

City West Water
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Landscapes

Advances in landscape design and maintenance technologies have made the upkeep of healthy, water-efficient landscapes simple and cost effective.

Ecologically balanced landscapes physically improve properties and offer important benefits, such as:

- minimal environmental impacts from runoff of storm and irrigation water, which contain pesticides and fertiliser, keeping nutrients onsite
- improvement in the quality of landscape, while providing for pedestrian movement and the needs of surrounding habitat
- reduced costs for water pumping, water treatment, energy use, maintenance and labour
- improvement in public health through access to outdoor recreational spaces
- combating the urban heat island effect in built up areas
- improved air quality.

Permanent Water Saving Rules apply in periods when water restrictions are not in place. The five key rules are:

1. Use manual watering systems only between 8pm – 10am

Manual watering systems (that you turn on or off by hand) can only be used to water gardens and lawns between 8pm – 10am, any day of the week. This rule also applies to public gardens and recreational areas.

2. Use automatic watering systems only between 10pm – 10am

Automatic watering systems that are set to turn on and off automatically can only be used to water gardens and lawns between 10pm – 10am, any day of the week. A rain or soil moisture sensor must be fitted to all new systems installed from 1 September 2005. These rules also apply to public gardens and recreational areas.

3. Fit your hose with a trigger nozzle

A hand-held hose must be fitted with a trigger nozzle and can be used to wash your car and water your gardens and lawns at any time.

4. No hosing paved areas

Hosing down driveways, paths, concrete, timber decking and other paved areas is not permitted. This does not apply in the case of an accident, fire, health hazard or other specified circumstances.

5. Apply to fill a new pool

Before filling a new pool or spa, owners must submit a plan and have it approved by their government water retailer. This plan must show how the volume of water required to fill the pool or spa will be, or has been, offset by water saved around the home. This rule only applies to pools or spas with a capacity of 2000 litres or more.

Planning and maintenance

Best practice

A comprehensive design plan is the first step to a water-efficient landscape. A well thought-out and researched design will help determine the optimal plant and sprinkler placement to minimise cost and water use. For assistance with plant selection and planning, a list of accredited water saver garden centres is available at **www.ourwater.vic.gov.au**

A critical element in maintaining water efficiency in any landscaped site is ensuring that a regular maintenance schedule is met. Regular maintenance will reduce costs and increase the effectiveness of irrigation.

Potential water saving opportunities

- Do not allow heavy construction equipment to compact soil around trees or other sensitive natural areas.
- Keep nutrient levels balanced throughout the seasons to ensure optimal plant growth.
- Aerate clay soils regularly to improve water-holding abilities and prevent runoff.
- Regularly check outdoor taps and hoses for leaks and make required repairs as soon as possible.
- Consider using soil wetting agents in garden areas for new plantings and in particularly dry areas. This enables water to soak in and sit in the root zone of a plant. Excessively dry soil will repel water.

Mulching can reduce water evaporation by up to 70 per cent.

- Use mulch around plantings, as it is highly effective in retaining soil moisture and nutrients and reduces the need for watering and maintenance. Mulches can be made of various organic materials such as pine/oak bark, pine straw, aged wood chips or compost mixtures and are most effective when placed around the root zone of plants. Mulches and gypsum promote better infiltration for clay soil during the summer months and better drainage in winter.
- Prevent weed growth by ensuring the mulch does not contain seeds. Spread mulch evenly approximately 70mm deep to insulate roots from heat and limit the germination of weeds. Fine textured mulches help retain more moisture than coarse mulches.
- When improving the soil, it is important to treat a large area around the planting to allow ample space for spreading root systems.

Outdoor garden modifications

- It is recommended that you do not make major changes to your garden in summer. Distributed soil loses its moisture rapidly and, combined with water restrictions, can make it hard for gardens to recover. The ideal time to schedule most planting and install irrigation systems is after autumn rains.

Outdoor garden replacement

- Incorporate existing trees, plants and wildlife areas to add value to the site.
- Consider creating shade areas, which can be much cooler than unshaded areas.
- Minimise the use of impervious surfaces and use grading to direct surface runoff to landscaped areas via rainfall gutters to prevent stormwater pollution.
- When choosing areas in which to plant, consider site conditions such as drainage, soil type, sun exposure, shade, existing plants, slope/grade, and water and nutrient availability. Soil testing will help determine soil quality and absorptive capacity.
- Select drought-tolerant, locally sourced native species that are more adapted to Australian conditions. This will greatly reduce maintenance costs and can improve the aesthetic presentation of a site.
- Where practicable, avoid using potted plants as they use more water than plants in the ground. Where pot plants are used, watering requirements can be reduced by using a wetting agent in the potting mix and keeping plants together, out of wind and preferably in a shaded area during summer.
- Trees, shrubs and grasses all require different amounts of water. Grouping plants according to their respective water needs will allow the design of an irrigation system that can properly match plants to appropriate soils and weather conditions. Place plants with high water demands at the bottom of slopes.

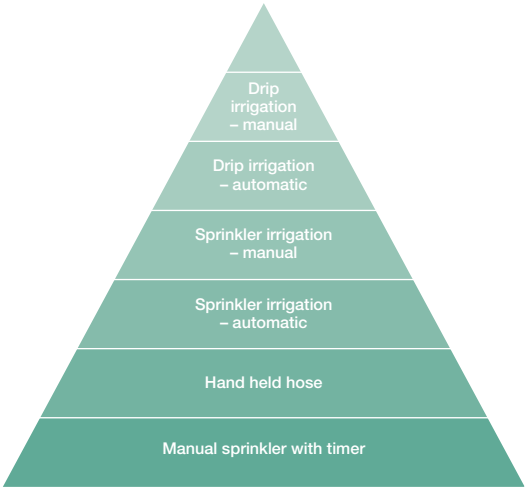
Irrigation

Fixed watering irrigation systems are convenient and versatile. They are available with drip, micro-spray or pop-up sprinklers. They can be controlled manually, although a timer is preferable to prevent users from forgetting to turn the system off. Timers can be manual or automatic, however automatic systems require sensors which prevent the system being activated during times of rain when additional water is not required.

Best practice

To achieve the highest level of water efficiency, it is important to water a plant's roots rather than the leaves. Accordingly, highly efficient irrigation systems employ 'drip irrigation', which emits water at or below the ground surface. Drip irrigators are more efficient than spray irrigators, as water is applied directly where it is required and evaporation is minimised. Watering in the evening or the morning will minimise the amount of water lost to evaporation and ensure most water is absorbed by plants.

Hierarchy of garden irrigation methods



As much as 30% of water used can be lost to evaporation when watering lawns at midday. Early morning is the most efficient and plant friendly time to water your garden.

For optimal soil, plant and water management, smart irrigation controls incorporating soil moisture measurements should be considered for scheduled irrigation events at large sites such as council parklands and sporting reserves. When planning your irrigation controls and scheduling, ensure that you comply with Victoria's existing water restriction levels, which will influence system design and usage hours. These can be viewed at www.citywestwater.com.au

Potential water-saving opportunities

Behavioural changes

- Regularly inspect the planting site to gain a good understanding of the exact water requirements for your outdoor plants. This will help you to determine early signs of plant stress and to set a schedule for irrigation. An interactive tool to help assess a garden's water requirements is available at www.smartgardenwatering.org.au

- Ensure spray heads are aligned with the grade of the land and orientated to target the root zones of plants so that water is used where it is needed and not on footpaths or roads.
- Water plants deeply, infrequently and slowly. Saturating soil deep enough to assist root growth is crucial. Light, frequent watering will restrict growth. Consideration should be given to having heavy irrigation, spread over two nights with longer intervals between irrigations, rather than completing watering in one night. This practice has the potential to increase root growth by slightly stressing the grass.
- Schedule operating times of sprinklers to match seasonal or monthly requirements to prevent the excessive or improper use of irrigation systems. This can severely affect soil nutrition, causing nutrients to leach out of the soil and contaminate groundwater or adjacent waterways.
- Use extra water during establishment for most plantings, including the changeover from cool season to drought tolerant warm season grasses.
- Check that the operating pressure, nozzles used and the sprinkler spacing are appropriate across the system to ensure even watering.
- Use separate irrigation zones for different planting areas and turf areas to allow irrigation to be matched to requirements.
- Schedule irrigation for early morning to maximise absorption and minimise evaporation. This can save up to 25 per cent of water used. Irrigation during the hours of darkness is preferred if automated systems are available. For automatic sprinklers, watering outside accepted water restriction times will require an exemption from your local water authority. Check local water restrictions for information on allowable watering times.
- To reduce water losses through drift, do not water gardens when there are strong winds.

Maintenance

It is recommended to perform a monthly inspection that could include:

- adjusting the sprinkler emitters, filters, valves and controllers for proper operation
- replacement of worn spray nozzles
- regulating pressure to match system demands
- checking for leaking valves
- inspecting low-volume emitters for blockages
- inspecting sprinklers for clogged nozzles
- observing the water consumption rates of plants (called evapo-transpiration rates) to learn their needs as seasons change. Automated systems are available that will assist with adhering to changing water requirements
- looking for any overly saturated areas of the garden which may indicate a leak in the irrigation lines – inspect and repair as soon as possible.

Equipment modification

- Convert spray irrigation systems to drip irrigation by removing spray risers and inserting 6mm drip lines in their place.
- Install a checkmeter on the water supply line to the irrigation system to help control the amount of water used for irrigation and also help identify leaks.

- It is mandatory to install rain and/or soil moisture sensors in non-residential gardens. These devices act as an override facility to temporarily prevent the system from working when there is enough moisture in the soil. Rain sensors are inexpensive and are a common add-on for most automatic timers. To be effective, sensors need to be uniformly placed and selected to ensure readings are not affected by soil fertiliser. Water running off the surface of the grounds during irrigation indicates excessive water use.

Equipment replacement

- Automatic systems are a cost-effective way of ensuring that proper watering occurs, although it is important to adjust the system regularly for weather changes and plant growth. Systems could include electronic controllers with precise timing, multiple irrigation zones, multiple cycles, and rain sensors.
- Consider alternative sources for irrigation water, including directing surface runoff and rainfall into collection tanks that can supply water to landscape areas, reusing greywater or purchasing recycled water.
- Rainwater and greywater are not affected by water restrictions, which apply only to mains drinking water and, when managed properly, can have significant environmental and cost benefits. When considering recycled water for irrigation, issues to be considered include:
  - » soil suitability – soil should be deep and well structured with no restricting layers. Well prepared and managed soil is also good for water retention and plant growth
  - » groundwater – increasing the level of water applied to an area can affect groundwater levels
  - » water suitability – there may be chemicals present in recycled water which could be unsuitable for plant growth or even toxic at high levels
  - » nutrient balance – as reclaimed water often contains nutrients, the application of fertilizers needs to be reviewed to prevent build up of nutrients that can cause problems such as soil acidification
  - » salt balance – domestic waste water typically has higher levels of salinity than drinking water. The additional salinity has the potential to build up to levels that can cause toxic effects on grass in the long term. Use a low salt detergent in laundry and only use greywater from the rinse cycle. To find out which detergents are lowest in salinity, go to www.citywestwater.com.au/residents/choosing_laundry_detergents.aspx
  - » the likely human health impacts when using greywater – appropriate controls must be put in place to manage these and engineering may be required to ensure that no water leaves the site
  - » compliance with relevant EPA guidelines for managing recycled water or greywater.

Turf management

Grass requires 30 – 50% more water than shrubs and other groundcovers. Limit grass areas and where possible replace with native trees, shrubs and other plants with low water requirements to keep an aesthetically pleasing and water efficient area.

Suitable sporting facilities have been shown to have significant community benefits, including improvements to social and environmental health, community pride, crime prevention, personal wellbeing, self-esteem, mental health and social cohesion to name but a few. The provision of turf or an equivalent playing surface is critical for many of the sports that provide these benefits.

Given the importance of both water efficiency and the availability and upkeep of sporting areas for the community, it may be necessary to rationalise the provision of turf facilities by making use of synthetic surface alternatives where possible. In such circumstances, only priority turf areas would be irrigated, using alternative water sources to keep turf surfaces at their optimal levels.

The playing performance of grassed sports surfaces depends on a combination of the turf and the top layer of soil. By careful species selection of grass type and effective management, a grassed sports surface can be kept playable during periods of low rainfall, avoiding the costly expenses associated with re-establishing new turf.

Turf grasses have the largest water consumption patterns of any plant group. However, experience around the world has shown that people tend to over water rather than under water grasses. Follow the steps previously outlined in the Irrigation section.

Engaging an appropriately qualified consultant to undertake a water conservation review of your turf area will identify which irrigation solutions are relevant for your site.

Did you know?

On average 11.7 gigalitres of water is used every year to maintain sports facilities, representing 1.24% of Victoria's total urban water use. Through good turf selection and management, savings in drinking water of up to 50% can be achieved.

Source: Municipal Association of Victoria.

Best practice

Behavioural change

- Speak to your ground staff and ask them for advice – the people who work on the surfaces can offer a fountain of untapped knowledge.
- Gain a thorough knowledge of your existing system to discover what works and what doesn't to assist with setting future water use targets and strategies.
- Gain an understanding of your local climate conditions to help you optimise your turf management.
- Talk to other people experienced in grounds management to help keep you updated of industry and technological changes.
- Make a budget bid for new technology to allow implementation of best practice techniques.
- Implement best practice watering of turf as previously outlined in the Irrigation section, such as less frequent and deeper watering instead of frequent and light, to promote deep root development and make the turf more drought tolerant.

Maintenance

- Keep cool season grasses long in summer, while warm season grasses such as couch and buffalo can be kept short. It is recommended not to mow cool season grasses to less than one-third of their original height. Longer grass has deeper roots which will last longer in hotter weather. Leave cool season grass at two centimetres or higher and maintain this length by cutting off the top third of the leaf area.
- In dry conditions, leave clippings on the lawn to assist with keeping moisture in the ground.

Equipment modification

- Planting a grass species that has low water requirements is the best method of decreasing the total water needs of a sports facility. Use warm season grasses such as kikuyu or couch grass to make turf more water efficient, drought tolerant and adaptable to alternative water sources. Warm season grasses will often provide cushioning against hard ground.
- Warm season grasses also respond rapidly to rain or irrigation after severe moisture stress. The creeping varieties are self repairing during the playing season. However, in winter, they are susceptible to frost damage and can become dormant, causing the grass to lose its colour and warm season grasses may also struggle to recover from the wear and tear associated with winter sports such as football. For improved aesthetics, warm season grasses can be over-sowed with cool season grasses as winter approaches. The species in season will grow up as the season changes.

Warm season grasses have been shown to use 30 – 40% less water than cool season grasses if watered efficiently

- Cool season grass species, which are prevalent on Victorian sporting fields, have higher water demands and are more susceptible to drought and salinity. Varieties are available that have lower water demands including fine-leaved fescues (eg. creeping red, chewing's hard and tall fescue). Some of the varieties of cool and warm season grasses and their properties are outlined in the following table:

Grass type	Cool season	Warm season	Drought resistance	Salinity (mg/L)	Growing conditions
Buffalo		Yes	Good	1,000 to 5,000	Slightly lower drought tolerance than other summer grasses
Couch		Yes	Good	1,000 to 5,000	Has poor shade tolerance
Kikuyu		Yes	Good	1,000 to 5,000	Prefers warm conditions and moist, medium textured fertile soil. Can take a season to fill a ground
Tall fescue	Yes		Fair	300 to 800	Needs significant irrigation to maintain growth
Fine ryegrass	Yes		Fair	300 to 800	Needs significant irrigation to maintain growth
Seashore paspalum		Yes	Good	10,000 to 30,000	Requires vegetative propagation.

- Conversion of grassed sports surfaces from cool season to warm season species can be achieved by removing existing turf and installing new instant turf. This method is fast but can be expensive. Alternatively, line planting can be used to insert small sections of warm season turf in lines approximately 100mm apart and waiting for the turf to spread between strips. This method will cause minimal disruption to turf use.

  The conversion process usually occurs in spring, however where there are mild winter conditions and limited irrigation, it may be necessary to commence the process as early as autumn.
- It may also be worthwhile to investigate periodic oversewing to make a gradual transition, while keeping the ground available for use.

Equipment replacement

Some of the approximate costs and options for upgrading turf areas are listed in the table below.

Typical refurbishment/upgrade costs for a 1.5 Ha oval

Proposed works	Approximate cost	Comments
Convert to warm season grass by line planting	$12,000 – $25,000	New warm season grass will take approximately a year to develop, but an oval with existing cool season grasses can be used within 6 weeks of planting
Convert to warm season grass using turf sods	$150,000	Quick conversion and oval can be used when turf stabilized
Install spray irrigation system	$50,000 – $70,000	Includes basic controller with plough installation of pipes
Install subsurface irrigation	$75,000 – $100,000	Plough installation required
Install weather station	$35,000	Additional costs for software and linking several sites to station
Bore	$45,000 – $70,000	Includes pump. Short term storage may be required for low yield bores
Subsurface drainage	$75,000 – $150,000	Dependant on soil type. May be needed to prevent salt build up when bore supply or saline reclaimed water used
Storage between irrigations	$14,000 – $17,000	Tank storage of 45,000L
Storage tank for between rainfall events (30 days)	$35,000 – $300,000	Based on providing equivalent of 15mm of rainfall per week during the growing season
Storage tanks – up to 3 months storage	$100,000 – $900,000	Based on providing equivalent of 15mm of rainfall per week
Pipe for alternative supply	$40,000 – $1,000,000 per km	Pipeline requirements are site specific. Transportation could require several km of pipeline
Pump for alternative supply	$10,000 – $30,000	Additional booster pumps may be required for long pipelines.

- Consider using reclaimed water to maintain turf and where possible, locate sporting facilities close to alternative water sources. Recycled water is exempt from water restrictions and generally costs less than drinking water. Issues that need to be considered include soil suitability (ideally deep with no restricting layers), groundwater, contaminant levels in the recycled water and the nutrient and salt balance of the soil. A review of fertiliser use may be necessary. Selecting salt tolerant grass species is the easiest way to deal with high salinity water. If designed well, it is possible to capture sub-surface drainage water from previous rain events which can be stored for later use.
- Whenever possible, plant alternative groundcovers that require less water, or consider the use of synthetic surfaces, patios or decks as outdoor recreation space, further reducing water demand. Common conversions include artificial grass golf tees, bowling greens, tennis courts and some artificial grass soccer pitches. It is worth noting that some synthetic surfaces will require watering in summer months, can cause abrasions, have higher initial set up costs and require regular maintenance.
- Ensure new playing areas are sized appropriately to minimise unnecessary watering, which will also minimise overall costs of turf maintenance and irrigation infrastructure.

Some of the information in this brochure is sourced from *Strategies for Managing Sports Surfaces in a Drier Climate*, a report prepared by Municipal Association of Victoria's Sports Surfaces Task Force, available at www.mav.asn.au

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Best practice guidelines for swimming pools and spas

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Pools and spas can lose many times their total water volume per year through evaporation, splashing, filter operations and leaks if they are not managed efficiently.

To manage water use efficiently, it is important to ensure all relevant stakeholders, including management and maintenance staff, have access to the facility's water usage information. Sub-metering for swimming pools can be extremely useful for identifying specific areas of water use.

Water efficiency in swimming pools can be achieved in many ways, such as improved management of evaporation and pool backwash and by upgrading onsite toilets and showers to water efficient models. For more information on how to improve the efficiency of showers and toilets, refer to the *Best Practice Guidelines for Amenities*.

A loss of 25 millimetres per day in a 5 x 10 metre pool can waste approximately 450,000 litres of water per year.

Potential water saving opportunities

Behavioural change

- Appoint a staff member to monitor water use and manage water efficiency as part of their daily duties and embed this responsibility in their key performance indicators or job description.
- Use educational signage to promote water efficiency among pool users. City West Water provides free stickers and posters that provide patrons with a contact name or number to report leaks and encourage them to switch off running taps, use the half flush when appropriate and limit their shower time.
- Implement training and induction procedures for staff to educate them about water efficiency.
- Encourage staff to save water through staff awards and competitions that reward and recognise involvement in sustainability initiatives.

Evaporation is the major cause of lost pool water.

Maintenance

- In outdoor pools and spas, use a cover after hours to significantly reduce evaporation and heat loss. The effectiveness of a pool blanket indoors will depend on the indoor humidity of the complex, as additional water loss can be experienced with their removal.
- Minimise evaporation for indoor pools while maintaining a comfortable environment for patrons, by carefully balancing the air temperature and humidity of the pool room with the pool temperature. The air temperature should be equal to or above the water temperature, while the humidity should be upwards of 70%.
- Maintain proper chemical levels and adequate circulation time to keep pool water safer and cleaner. This will prevent the need to drain the pool or use excessive water to correct problems.
- Repair leaks in swimming pools and spas immediately.
- Use water efficient cleaning equipment such as hoses fitted with spray guns, and use brooms and mops in place of hoses.
- Check pool filter performance against specified pressure and flow rates as part of a regular maintenance schedule. Over time, contaminants will build up on filters and sand will become tightly packed causing degradation of filter performance and the need for increased backwashing. If performance has reduced significantly, filter sand can be cleaned or replaced to restore the filter to its original performance.

80 – 90% of backwash water discharged to waste is recoverable for use in toilet flushing or irrigation through simple filtration.

Equipment modification

- Lower pool water levels to reduce water lost through splashing.
- Evaluate the pool filter backwash schedule to identify opportunities to reduce backwash without compromising public health and safety.
- Reduce the water temperature of heated pools and spas to minimum levels suitable for patron comfort to reduce water evaporation and energy costs.
- Check-meter the supply lines of the pool and regularly record this information to help identify any water leakage or excess use.
- Install drainage barriers around pools to collect any overflows or splashes for reuse in pool make-up water.
- Where possible, use treated backwash water for toilet flushing, pool makeup or cleaning. Many councils operate swimming pools located next to football ovals or other sporting facilities, where backwash water can also be used for irrigation.
- Consider installing a UV filtration system for pools with high chloramine levels and where water is being diluted or regularly bled to control the impact. UV light breaks down free chlorine chemicals and choloramine which can be topped up with additional chlorine. The extra chlorine will lead to an increase in levels of total dissolved solids (TDS), requiring the pool operator to dump water to reduce TDS. If a pool has high TDS and bleeding water is used to control this, the addition of UV will not be beneficial.

Equipment replacement

- Evaluate the available water efficient technologies when purchasing new equipment. The WELS water rating scheme can be useful for identifying the most water efficient appliances such as spray nozzles, showerheads, washing machines, flow restrictors and other replaceable items. Go to www.waterrating.gov.au
- When purchasing a spa, ensure spa jets are located low in the spa bath to allow effective operation using minimal water.
- Consider the water use requirements of various filter options – such as sand, zeolite or glass granular filters or cartridge filters – at the time of equipment installation or upgrades.

For further information on water efficiency in pools and spas, please go to these websites:

www.smartwater.com.au/projects/round5/arv/Documents/ARV_SmartWaterBestPracticeGuide_April2010.pdf

www.spasavic.com.au/water/water-neutral-pool

www.aquaticsandrecreation.org.au

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City West Water
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Industry benchmarks

City West Water
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Industry benchmarks

Using benchmarks to measure against your water efficiency is an important step in reducing the water used on your site.

Selecting a key performance indicator and tracking your water efficiency against this indicator will provide a benchmark for your water efficiency over time. This information can be used as a tool to inform the various stakeholders in your business, such as landlords, facility managers and tenants, of the extent to which efficiency gains are likely to be achieved and to set meaningful targets for future water use.

Benchmarking in the institutional, commercial and industrial sectors

Benchmarking information on the water usage across the institutional, commercial and industrial sectors is available in a report conducted by Melbourne's three water retailers, *Benchmarking Best Practice for Water Use in the Commercial and Industrial Sector*. This report was completed in October 2006 and classifies sectors by their ANZSIC codes. It is available at

http://www.citywestwater.com.au/documents/Benchmarkingreport.pdf

Benchmarking in commercial buildings, hotels and the retail sector – NABERS

Information is available to help you benchmark your water use against that of other similar businesses. The most widely recognised rating of water efficiency for buildings in Australia is the NABERS water rating, which provides a performance-based rating for existing buildings.

The current NABERS water benchmarks only apply to the commercial and hospitality sectors, however the scheme is continually evolving and additional modules are under development which may be applicable to your business. Check the NABERS website for further developments that may be relevant for your site at www.nabers.com.au

- Commercial office benchmarking – NABERS Water measures the water consumption of office buildings and hotels on a scale of one to five stars, reflecting the performance of the building relative to the market, from least efficient (one star) to best practice (five stars). Two and a half stars is the current market average. For Melbourne, the following whole building benchmarks apply:

Star level	Melbourne kL/m2/yr
1 star	1.03
1.5 stars	0.94
2 stars	0.86
2.5 stars	0.77
3 stars	0.69
3.5 stars	0.6
4 stars	0.53
4.5 stars	0.43
5 stars	0.35

To use the free online calculators which can be used to determine the rating of your building, go to www.nabers.com.au

Average water use for example hotels in Melbourne. These figures correspond to the mid-point of the 2.5 star band.

- Hotel benchmarking – NABERS Water for Hotels effectively calculates a custom benchmark for each hotel. For all hotels, statistical information has been used to produce a formula that predicts the average water use expected for the hotel given its particular combination of facilities. This average is set to the mid-point of the 2.5 star band, and the other ratings are set on a linear scale between this point and a climate independent 5-star level.

The graph above illustrates some typical figures for this rating based on a 500 bed hotel with (optionally) 500 fully laundry serviced rooms, 500 conference seats and a 100m² heated pool.

As the rating is linear with room numbers, these numbers can be used for any hotel size, as long as the ratio of laundry serviced rooms and conference seats to rooms remains the same. To calculate a customised rating for your building, go to www.nabers.com.au

The Green Star rating system and best practice in construction

New buildings can have their overall design and construction performance benchmarked using the Green Building Council of Australia's Green Star rating system. A building's water use characteristics are one of nine categories that contribute to a building's overall Green Star rating.

As the green star system does not measure the ongoing performance of a building, it is not being covered within these best practice guidelines. Should you wish to find out more about the Green Star rating, refer to the Green Building Council Australia website at www.gbca.org.au

For more information on best practice in construction, refer to relevant references listed in the Resources section.

If the water consumption of your business is higher than the benchmarks listed in *Benchmarking Best Practice for Water Use in the Commercial and Industrial Sector*, or if your building has achieved poorly in the NABERS rating system, there is a good chance the building's water system is either leaking or inefficient. The best practice guidelines provide advice to help you identify high water use areas and ways to improve your site's water efficiency against these benchmarks.

For further assistance, speak to your City West Water Business Resource Efficiency Consultant.

General maintenance for water efficiency

City West Water
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General maintenance

A proactive approach to maintenance of your water system should be favoured over a reactive one and will help avoid water leaks and inefficiencies which can waste thousands of dollars in water and energy costs.

Water audits

Water audits are a key part of good water management, and are used to help target key water usage areas. This information can be used to prioritise items in your maintenance regime, and form the basis for sound decision making in the allocation of capital. There are a variety of service providers who can deliver water audits, listed at www.citywestwater.com.au/business/service_providers.aspx

A water audit should provide you with a water usage inventory for the devices on site, reconciled against total metered water consumption. This will help you identify any leaks that may exist on site, from minor leaks to larger bursts.

Managing leaks

An effective maintenance program should:

- regularly assess water use records and identify any increases
- inspect and test hot water system pressure relief valves
- inspect tap washers and seals on an annual basis
- include regular inspections of grounds and storm water pipes to observe damp areas or unexpected to flows to drains.

Common areas for leaks to occur include:

- piping joints
- urinal and toilet cisterns or flushers
- pump seals
- hose nozzles
- shut-off valves
- taps
- drinking fountains
- cooling towers systems.

By prioritising leak reporting for cleaners, maintenance contractors, security personnel and other staff, and notifying your visitors to report leaks on an easily identified hotline, water wastage can be resolved quickly.

To find specialist leak detection companies to help your business identify leaks, refer to the service provider list available at

www.citywestwater.com.au/business/service_providers.aspx

To ascertain if a leak is present, temporary data logging of the main meter can ascertain usage patterns that may be associated with leaks. Contact City West Water if you suspect you may have a leak and require further assistance.

Maintenance tips for specific key water use areas can be found in the relevant Best Practice Guidelines for that area.

One leaking toilet or urinal can waste up to 3000 litres per year.

Pressure reduction

Premises with excessive water pressures are more vulnerable to larger leaks and water wastage in the event of a leak. Multiple points in and around the building should be checked for system pressure. This is especially true of multi story buildings, where pressure at higher levels or above floors with booster pumps may be lower owing to static head (vertical distance) and friction losses required for the water to reach higher floors.

These checks can be arranged with a licensed plumber or by buying a simple pressure test kit at a plumbing supply store. Most facilities only require a water pressure operating range of between 250 – 300kPa to fulfil operational requirements. 500kPa is considered the maximum required for most buildings to function appropriately. If ground level pressures are in excess of 800kPa, you should consider the feasibility of installing a pressure reduction valve on the potable water line at the property boundary.

Before installing a pressure reduction valve at the property boundary, a thorough inspection should be conducted by a licensed plumber to ensure that the operation of fixtures within the building will not be affected. The following considerations will need to be taken into account:

- building design
- pressure losses occurred across backflow prevention devices (these can range from 14kPa to 100kPa depending on the backflow device used)
- number of floors (and related pumping stations) in a building
- fixture pressure demand, and current pressure.

Pressure reduction is unlikely to be appropriate for fire sprinkler systems, which typically require higher pressures for their correct operation. Fire sprinkler pressure requirements are governed by Australian Standards to ensure the correct operation of fire sprinklers and sprinkler hose reels. In rare situations, a single supply line will be used to deliver drinking and fire system water. Pressure reduction devices at the boundary should not be considered in such circumstances. Fire services experts must be consulted when changes.

In practice, reducing excessive water pressure will reap noticeable results including lower water use, less basin water splashing onto floors, lower system maintenance costs, and extended equipment life.

Metering

If you can't measure it, you can't manage it.

By installing smart meters on your site you can further improve your awareness of water usage on your site. Smart meters are an integrated system of meters recording a site's water usage in real time and can be used to quickly detect unexpected leaks. Smart meters can be particularly useful in detecting out of hours water use. If you are interested in setting up smart metering on your site, your City West Water Business Resource Efficiency Consultant may be able to assist you.

Check-metering high water usage areas such as cooling towers will assist you in planning facility upgrades and assessing the water and trade waste costs associated with various high water using systems on site. This can simplify trouble shooting when a leak does occur, help you appreciate the water saving potential in upgrading your plant and equipment, and help identify and manage overall water usage areas on your site.

Backflow prevention

If you own a commercial or industrial property you are required to ensure that you have an appropriate back flow prevention device at the water meter outlet. Backflow is an important measure to protect the drinking water supply from cross-contamination. If you find you have no back flow prevention device or are unsure, please contact City West Water immediately for installation assistance.

Staff and user awareness

In businesses where water use is a key component of operations, it can be helpful to appoint a member of staff to manage water conservation and water use as part of their daily duties. Embedding this responsibility in their Key Performance Indicators or job description will be beneficial to results.

User awareness of water conservation can be increased through adequate signage and staff training and induction procedures. This can be particularly beneficial in the training of cleaning staff, who can be significant users of water. Display stickers or posters that provide users with a contact name or number to report leaks.

Involving staff and cleaners in innovative ways to save water, such as competitions that provide reward and recognition for sustainability initiatives that are of benefit to the site, will help empower staff to make meaningful reductions in water use.

Green leases

City West Water
LIMITED

Green leases

Best practice leases address split incentives between developers, building owners and tenants, to ensure that parties with influence over resource efficiency have every opportunity to implement change where it would be beneficial. Such leases are increasingly referred to as 'green leases' and are rapidly growing in popularity within the commercial building market.

A green lease requires cooperation between all parties to meet minimum, ongoing, operational building energy, water and waste performance targets. Lease schedules are developed to include mutual obligations for owners and tenants to achieve these targets. A tenant or building owner may wish to develop a specific green lease, or performance targets and obligations can be included in the body of a standard lease.

For assistance with building a business case for a green lease, or for support when deciding what owner and tenant commitments to include, the *Green Lease Guide* has been developed by Investa Property Group and is freely available at:

http://www.livingthing.net.au/rc/guides/2007_11_GreenLeaseGuide.pdf

As part of its Energy Efficiency Opportunities program, the Department of Environment Water Heritage and the Arts has developed *Green Lease Schedules* and supporting *Energy Management Plans*. While aimed at government operations, these documents may be easily adapted to form the basis of a green lease schedule. The documents are freely available at:

http://www.environment.gov.au/sustainability/government/eego/index.html

Photography courtesy of Matthew Trigg of the Facility Management Association of Australia.

Resources

City West Water
LIMITED

Resources

Australian Institute of Refrigeration, Airconditioning and Heating (AIRAH)

Water Conservation in Cooling Towers – Best Practice Guidelines

Australian Federal Government – Department of Environment Water Heritage and the Arts

ESD Operations Guide for Owners, Managers and Tenants

Water Efficiency Guide – Office and Public Buildings

Australian Rainwater Industry Development Group

http://www.arid.asn.au/images/stories/documents/rainwatermagazine.pdf

A comprehensive guide on rainwater systems

Australian Water Association – www.awa.asn.au

For information and updates within the Australian water industry and broader water environment sector

Building Commission Victoria

Options for Cutting Water Use in Fire Sprinkler Maintenance

http://www.pic.vic.gov.au/resources/documents/Fact_Sheet_-_Options_for_cutting_water_use_in_fire_sprinkler_maintenance.pdf

City of Melbourne

- *Greening Your Building Toolkit* – a guide for improving asset performance designed for building owners and facility managers containing management, maintenance and refurbishment initiatives https://www.melbourne.vic.gov.au/info.cfm?top=218&pg=3933
- 1200 Buildings program – http://www.melbourne.vic.gov.au/info.cfm?top=218&pa=4019&pg=4462

City West Water – www.citywestwater.com.au

Our website contains customer information such as water usage rates and restrictions, other resources including case studies and Liquid Assets magazine

Department of Environment Water Heritage and the Arts – www.environment.gov.au

For information on national water conservation guidelines and legislation

Envirowise – www.envirowise.gov.uk

UK resource efficiency information

Green Building Council of Australia – www.gbca.org.au

Provides information on assessing building efficiency and administers the Green Star suite of rating tools

Green Plumbers – www.greenplumbers.com.au

Trained and accredited plumbers with best practice skills and information on water efficiency and alternative water supplies

Melbourne Water – www.melbournewater.com.au

Information on Melbourne's water storage levels

Resources

Municipal Association of Victoria – Sports Surfaces Task Force

Strategies for Managing Sports Surfaces in a Drier Climate

NABERS Office Rating System – www.nabers.com.au

For information on getting a rating for your building's energy, waste and water efficiency by approved assessors

New South Wales State Government

Green Lease Guidelines

http://www.environment.nsw.gov.au/resources/sustainbus/2006_1212_greenleaseguide.pdf

Our Water Our Future – www.ourwater.vic.gov.au

Comprehensive information on water planning and management in Victoria

Plumbing Industry Commission – www.pic.vic.gov.au

For information regarding registered plumbers, fire sprinkler system water saving, alternative water supplies and plumbing requirements

Property Council of Australia – www.yourbuilding.org

Water Use and Sustainable Commercial Buildings

www.savewater.com.au

A collection of water saving tips and case studies

Sustainability Victoria – www.sustainability.vic.gov.au

For broader information relating to resource efficiency including waste and energy use

Sydney Water – www.sydneywater.com.au

Industry specific best practice guidelines and water saving fact sheets

University of Melbourne – www.smartgardenwatering.org.au

Online tool with advice about gardening water requirements

Water Efficiency Labelling and Standards (WELS) and WaterMark schemes

www.waterrating.gov.au

Water Services Association of Australia – www.wsaa.asn.au

Information on the urban water industry with a national focus

Women's Voices for the Earth

Disinfectant Overkill – How to Clean May Be Bad For Our Health

Waterless urinals help to slash water usage

Water Efficiency Case Study

Business Resource Efficiency

Project Overview

PARTNER
AMP Capital Investors

OBJECTIVE
To reduce reliance on drinking water used in amenities

HOW THE SAVINGS WERE ACHIEVED
Installation of waterless urinals across four buildings

TECHNOLOGY UTILISED
Waterless urinals and solenoid valves

WATER SAVINGS
61.1 million litres of drinking water per year

TOTAL PROJECT COST
$99,500

PROJECT FUNDING
$47,500 from City West Water

PROJECT PAYBACK
- 16.2 years without City West Water funding
- 8.5 years with City West Water funding

PROJECT COMPLETED
August 2007

AMP Capital Investors is a specialist investment manager with over $100 billion in assets under management. The group owns and manages a range of high-profile properties in the Melbourne Central Business District including office towers, food courts, retail precincts and hotels.

The water used across the company's property portfolio is primarily attributed to bathrooms, kitchens, tearooms and cooling towers. The Collins Place site also uses additional water in its retail precinct, which has food courts, retail spaces, hotels and office towers. Demonstrating a proactive approach to its property management strategies, AMP Capital Investors strive to reduce water and energy usage, minimise waste, and embed environmental and OH&S practices when managing all elements of its portfolio.

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July 2010

Waterless urinals help to slash water usage

Water Efficiency Case Study

Business Resource Efficiency

In order to reduce its reliance on drinking water, AMP Capital Investors consulted with City West Water to identify simple, low cost solutions that would significantly reduce water use at its four* flagship sites. The resulting water efficiency project undertaken by AMP Capital Investors entailed the installation of waterless urinals with a unique, low cost design. The new urinals eliminate the need for constant flushing and the use of harmful cleaning chemicals, while minimising odours.

The aim of the project was to save 25 million litres of drinking water per year – a target which has been well exceeded, with the waterless urinals delivering actual savings of 61.1 million litres.

Savings achieved per site	
Bourke Place	25.1ML per annum
Collins Place	17.9ML per annum
Exhibition Street	1.6ML per annum
William Street*	16.5ML per annum

AMP Capital Investors continue to proactively seek out new water saving opportunities. Another building within its portfolio uses storm water for toilet flushing, fire hose reels and air-conditioning cooling towers. Meanwhile, the water saving plan established in collaboration with City West Water has become the blueprint for similar sites through AMP Capital Investors' national portfolio, in an effort to achieve similar water savings and make it a more sustainable business.

* AMP Capital Investors sold 15 William St in June 2009 and is no longer managing the property.

Contact

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City West Water LIMITED

101 Collins St is flush with water savings

Toilet Upgrade Case Study

Business Resource Efficiency

Project Overview

PARTNER
101 Collins St

OBJECTIVE
To improve water efficiency within the building, reducing the volume of water used

HOW THE SAVINGS WERE ACHIEVED
Replacing single flush toilets with efficient dual-flush models

TECHNOLOGY UTILISED
6/3 litre dual-flush, low pressure solenoid activated valves and compatible pans

WATER SAVINGS
Over 14 million litres per year

TOTAL PROJECT COST
$750,000

PROJECT FUNDING
$100,000 from City West Water

PROJECT PAYBACK
- 17.6 years without City West Water funding
- 15.3 years with City West Water funding

PROJECT COMPLETED
August 2009.

101 COLLINS | 101 CARES

101 Collins St is among the tallest buildings in Melbourne, with 83,000 square metres of office space accommodating approximately 4,000 office workers. Toilet flushing, tenants' use and wash basins previously accounted for 70% of the building's water use. Having already improved water efficiency in the building's cooling towers, management committed to doing the same with its toilets.

To achieve this, new water-efficient 6/3 litre dual-flush toilets were installed in the building's 44 tenanted floors. Although dual-flush toilets are becoming increasingly common in Melbourne's commercial and industrial buildings, a number of buildings still have inefficient 11 litre single-flush or 11/6 litre dual-flush toilets. By retrofitting 6/3 litre toilets, 101 Collins St is now at the forefront of water-efficient commercial office spaces.

The water feature at 101 Collins St uses rainwater harvested from the roof of the building.

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September 2010

101 Collins St is flush with water savings

Toilet Upgrade Case Study

Business Resource Efficiency

Pressure ratio valves have been used to maintain the water pressure in all toilets, and computer-based monitoring of the system has been integrated into the maintenance program, making leaks easily identifiable and quick to fix. To complement this, 101 Collins St switched to a less fibrous toilet paper, which is more suitable for toilets with minimal flush volumes, and began a behavioural change campaign to alert tenants to the changes.

The toilet upgrade has not only improved water efficiency, but has helped contribute to the overall sustainability of the building's operations. Careful planning has ensured workplace disruptions were minimised by carrying out the toilet retrofits after hours and on weekends.

The project is anticipated to save a total of 14 million litres of drinking water each year, helping the building to exceed the 2007 Melbourne water retailer industry best practice benchmark for commercial office water usage.*

* Industry best practices are taken from *Benchmarking Best Practice Water Use in the Commercial and Industrial Sector*, which is available at http://www.citywestwater.com.au/business/3052.aspx

For commercial property benchmarks refer to sector ANZSIC 6712.

Contact

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Old Colonists invest in new ways to save

Resource Efficiency Co-Funding Case Study

Business Resource Efficiency

Project Overview

PARTNER
Old Colonists' Association of Victoria

PROJECT TITLE
Old Colonists' Water Saving Project

OBJECTIVE
To reduce water consumption at the site (in amenities and irrigation) and offset energy use through solar power.

HOW THE SAVINGS WERE ACHIEVED
Amenities were upgraded to dual flush toilets, flow restrictors on taps and water efficient showerheads. A drip irrigation system connected to rainwater tanks has also been installed to increase water efficiency and provide an alternative fit-for-purpose supply for the heritage listed site. The increase in energy use – required for pumping water through the drip system – has been offset by energy generated by solar panels.

TECHNOLOGY UTILISED
- Two 5000 litre water tanks
- Taps with flow restrictors
- Three dual flush toilets
- Water-efficient showerheads
- Solar power system

WATER VOLUME SAVING
1.72 million litres

RENEWABLE ENERGY OFFSET
Additional energy use of 11,200kWh (kilowatt hours) per year, created by the use of a pumped irrigation system (as opposed to hoses), is generated by the use of a solar panel.

GREENHOUSE GAS OFFSET
If the project used conventional electricity, as opposed to solar, it would have generated an additional 13.7 tonnes of CO2e annually (or over 3 cars worth of CO2e annually).This has been offset by the use of solar power.

TOTAL PROJECT COST
$35,226

PROJECT FUNDING
$17,613 from City West Water

PROJECT PAYBACK
- 11.1 years without funding
- 5.5 years with funding

The Old Colonists' Association of Victoria (OCAV) is a not-for-profit organisation that operates multiple aged care facilities, and has been doing so since 1869. Their largest site, located in Fitzroy North, is situated within the City West Water service area. The Fitzroy site consists of 135 individual cottages suitable for single residents and couples.

Water is used in a number of ways across the site: by residents in their self-contained cottages and personal garden area, for the care of residents in the low-care and high-care facilities and for irrigation of communal gardens throughout the site including the nursery.

As part of their Water Management Action Plan, the maintenance team identified a number of ways in which water could be saved at the site, without increasing energy use.

Dual flush toilets were installed to help reduce water use. Similarly, flow restrictors on taps and water efficient showerheads have resulted in a reduction of water and energy use (due to a decrease in quantities of hot water required).

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September 2009

Old Colonists invest in new ways to save

Resource Efficiency Co-Funding Case Study

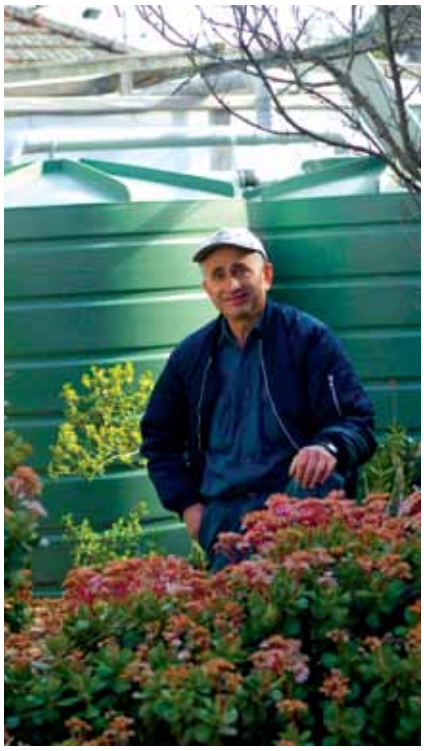
Business Resource Efficiency

Furthermore, a new and more water-efficient drip irrigation system using rainwater harvested from the site was installed at the Fitzroy site (previously, the gardens were watered by mains water spray irrigation). Drip irrigation systems are significantly more water efficient than spray irrigation systems, as water is not lost through wind, over-spraying or surface evaporation.

While the new irrigation is more water-efficient, it did result in an increase in energy use at the site as energy is required to power the rainwater irrigation pump. To offset additional energy use, the maintenance team had a solar panel installed on-site. Energy from the sun is used to power the pump, which operates the irrigation system for one hour a week.

The Old Colonists' Association of Victoria continues to explore further ways to save water – a potential future project is the capture and use of stormwater.

City West Water can provide information on gardening practices such as converting spray irrigation systems to drip irrigation.



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City West Water LIMITED

Luxury showers with saving powers

Premium Showerheads Co-Funding Case Study

Business Resource Efficiency

Project Overview

PARTNER
The Westin Melbourne

OBJECTIVE
To reduce the amount of water used per hotel guest at The Westin Melbourne, while maintaining the luxurious quality befitting of a 5-star hotel

HOW THE SAVINGS WILL BE ACHIEVED
Through the use of premium water-efficient showerheads

TECHNOLOGY UTILISED
Luxury overhead and hand-held showerheads

WATER VOLUME SAVING
12.6 million litres of water per year

ENERGY SAVINGS
3,600 gigajoules of gas per year, which is equivalent to 184.9 tonnes of greenhouse gas emissions or more than 3.6 million black balloons

TOTAL PROJECT COST
$69,067

PROJECT FUNDING
$10,800 from City West Water

PROJECT COMPLETED
July 2009

THE WESTIN MELBOURNE

The Westin Melbourne is a modern, elegant and luxurious 5-star hotel in the heart of the city. Last year, over 110,000 guests stayed at the hotel, using over 50 million litres of drinking water.

As part of its waterMAP actions in 2008, The Westin Melbourne replaced the employee and swimming pool showerheads with more efficient models, using the City West Water Business Showerhead Exchange program. For the 540 guest showers, the hotel has installed new premium showerheads that not only improve water efficiency, but also deliver a luxurious shower that matches The Westin Melbourne's 5-star quality standards.

City West Water agreed to contribute $10,800 to the project – equivalent to the cost that City West Water would normally have incurred by providing standard showerheads under its Business Showerhead Exchange program – greatly accelerating the showerhead changeover and the subsequent water savings at The Westin Melbourne.

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January 2010

Luxury showers with saving powers

Premium Showerheads Co-Funding Case Study

Business Resource Efficiency

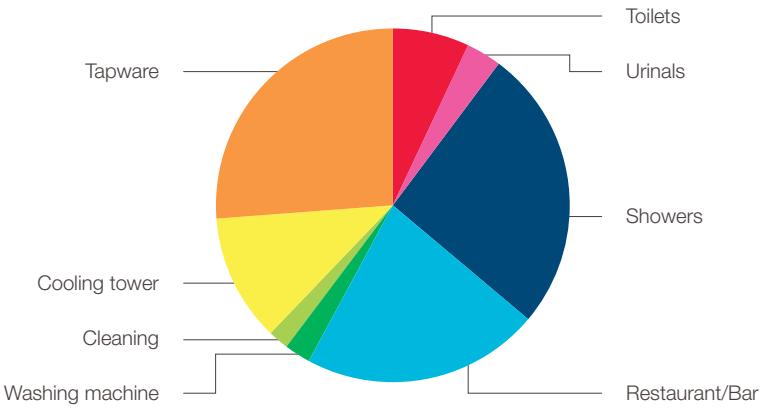
As demonstrated in Figure 1 below, showers account for more than a quarter of water use in Melbourne hotels, which is greater than consumption in a hotel's restaurants and bars, cooling towers and toilets. The new showerheads are expected to reduce water use at The Westin Melbourne by 12.6 million litres per year.

In addition to its water saving initiatives, the hotel has committed to reducing its carbon footprint and is now monitoring energy consumption to help achieve its overall sustainability goals. The showerhead upgrade will make a significant contribution towards these goals, as energy used for heating water accounts for a large proportion of the hotel's overall energy consumption. This project alone will reduce gas consumption by 3,600 gigajoules per year, and has reduced greenhouse gas emissions by 184.9 tonnes, equivalent to more than 3.6 million black balloons.

From a customer satisfaction perspective, early feedback from guests regarding the new showerheads has been extremely positive, proving that water-efficient showers can also be luxurious.

Showerhead exchanges are one of the cheapest and easiest ways to reduce utility costs. They can be exchanged with minimal disruption and save significant amounts of both water and energy. City West Water encourages all our business customers to consider exchanging old showerheads for water-efficient ones. To find out more about our Business Showerhead Exchange program, please contact Snezana Jagos at City West Water on (03) 9313 8254.

Figure 1 - Water consumption of a hotel with a cooling tower in Melbourne
Source: City of Melbourne, Hotel Water Assessment study, 2007



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City West Water LIMITED

Tollman take their water and energy savings to a new level

Resource Efficiency Co-Funding Case Study

Business Resource Efficiency

Project Overview

PARTNER
Tollman Pty Ltd

PROJECT TITLE
Cleaning In Place (CIP) system

OBJECTIVE
To investigate using a more water and energy efficient CIP system for cleaning vessels

HOW THE SAVINGS WERE ACHIEVED
By changing the tank wash method from boil out (which used 16,000 to 22,000 litres of water per wash) to a CIP system (which uses just 800 litres per wash)

TECHNOLOGY UTILISED
Fluid driven orbital high pressure cleaning nozzle and high pressure pump

WATER VOLUME SAVING
80,000 litres per week or 4.16 million litres per year

ENERGY SAVINGS
Reduced gas consumption by 1 terajoule per year

OTHER SAVINGS OR IMPROVEMENTS
- Reduced total dissolved solids or salt discharge by 27.9 tonnes per year
- Reduced greenhouse gas emissions by 45.4 tonnes CO2e per year (around 908,000 black balloons)
- Reduced downtime by 676 hours per year

TOTAL PROJECT COST
$18,500

PROJECT FUNDING
$5,500 from City West Water

PROJECT COMPLETED
June 2009

TOLLMAN

Tollman Pty Ltd is a contract chemical manufacturer that formulates, blends, packages and distributes chemicals for a range of industries including agriculture, mining, paper, building/construction, cement and recycling throughout Australia.

Having already installed a system to recycle vacuum pump seal water and a hot box to reduce steam requirements, Tollman were keen to do even more to save water and energy, and reduce their trade waste discharge.

After consultation with a City West Water Cleaner Production Consultant and studying other business examples and researching suppliers, Tollman decided to trial a new Cleaning in Place (CIP) system to reduce their use of wash water.

The system consists of portable orbital high pressure cleaning nozzles – situated inside cleaning tanks – that eliminate the need to completely fill the tanks with water and boil them out with steam.

As a result of the CIP system, the water savings achieved to date have been enormous

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October 2009

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for a small chemical manufacturer: 4.16 million litres per year or approximately a third of the site's total water use. Trade waste discharge has also been reduced by this amount.

Reducing the amount of water used for each tank wash has also had flow on benefits. Now, only a fraction of the energy and chemicals are required to achieve the same temperature and chemical concentration in the wash water.

The reduction in energy use has resulted in Tollman using 1 terajoule per year less of natural gas in their boiler, removing the annual equivalent of 45.4 tonnes of carbon emissions from the atmosphere.

The reduction in chemical use has seen total dissolved solids entering the sewer from Tollman's operations reduce significantly, thus helping to make recycling easier at Melbourne's Western Treatment plant.

Tollman will continue to monitor their CIP system to ensure it continues to deliver the great water, energy and waste savings they have benefited from to date.

The company, located in Laverton North, won a 2009 Wyndham Council Business Award (in the category of small manufacturer) for their resource efficiency initiatives that save water, money and reduce waste generation.

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The sweet success of water savings at CSR Ethanol

Water Conservation Co-Funding Case Study

Business Resource Efficiency

Project Overview

PARTNER
CSR Ethanol

PROJECT TITLE
Yarraville Distillery Cooling Tower Replacement Project

OBJECTIVE
To reduce drinking water usage by reusing column effluent as tower make-up water.

HOW THE SAVINGS WERE ACHIEVED
Redirection of column effluent to the main process cooling water stream for use as make-up water. This is required as a result of losses through cooling tower evaporation.

TECHNOLOGY UTILISED
Baltimore Aircoil three cell induced draft counterflow cooling tower model RCT-2594

WATER SAVINGS
- Overall site drinking water use decrease with installation of new cooling towers: 13% (approximately 18ML per annum) based on a decrease in make-up water of 6kL/hr whilst running the Barbet distillation column, and 1.6kL/hr when not running the Barbet distillation column.
- Reduction in make-up water use on cooling towers with new setup: 93%.

TRADE WASTE SAVING
Reduction in amount of trade waste discharged from site after installation of new towers: 43% (approximately 9ML per annum).

OTHER SAVINGS
Energy reduction achieved with the use of variable speed drives on fan motors to vary fan speed based on cooling water temperature.

TOTAL PROJECT COST
$303,549

PROJECT FUNDING PAYBACK
$131,633 grant from City West Water

PROJECT
- 6.7 years without City West Water funding
- 3.4 years with City West Water funding

PROJECT COMPLETED
June 2008

CSR ETHANOL

CSR produces ethanol (ethyl alcohol) by fermenting molasses which is a by-product of sugar fermentation. CSR is one of three major Australian producers of ethanol products, and is a significant supplier to the food, beverage and industrial markets as well as the growing renewable fuel market in Australia.

The Yarraville Distillery uses water in its plate and tube heat exchangers and condensers to cool ethanol vapours leaving the distillation columns. The site contains nine distillation columns and approximately 90 percent of all water on site is used in heat exchangers and condensers. The effluent leaving the base of two of the distillation columns is predominantly water. In 2007, CSR Ethanol investigated reuse options for the effluent in order to reduce water usage onsite and reduce the volume of trade waste discharged.

The company decided to redirect the effluent from the distillation columns into the main process cooling towers for use as make-up water. This compensates for the losses of water through evaporation.

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July 2009

The sweet success of water savings at CSR Ethanol

Water Conservation Co-Funding Case Study

Business Resource Efficiency

However, it was found that the cooling towers did not have the capacity to handle larger flowrates. As a result and because of the inefficiencies of the cooling towers, CSR Ethanol opted to replace its cooling towers.

City West Water partially funded the project, as the upgrade of the cooling towers was deemed to achieve large water savings. The new cooling towers were commissioned in June 2008. A saving of 18 million litres of water per year was achieved at the CSR Yarraville Distillery since the upgrade of the cooling towers, with further savings expected as production increases. CSR Ethanol continues to monitor the water usage and trade waste discharge at the site to identify further potential water savings.

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A cool way to save water and energy

Variable Speed Drives on Cooling Towers – A Research and Development Project

Business Resource Efficiency

Project Overview

PARTNER
Olex Cables

OBJECTIVE
To reduce the amount of water and energy used by cooling towers in the cable manufacturing process

HOW THE SAVINGS WERE ACHIEVED
Applying technology that allowed greater control over cooling tower operation

TECHNOLOGY UTILISED
Variable speed drives were installed in the existing motor control systems of cooling towers

WATER VOLUME SAVING
4.8 million litres per year

ENERGY SAVING
Energy reduction of 78.1 megawatt hours per year, which is equivalent to a reduction of 95.2 tonnes of greenhouse gas emissions, or 1,904,000 black balloons

TOTAL PROJECT COST
$67,144

PROJECT FUNDING
$20,000 from City West Water

PROJECT PAYBACK
- 5.2 years without City West Water funding
- 3.7 years with City West Water funding

PROJECT COMPLETED
December 2009.

Olex a Nexans company

Olex is Australia's largest manufacturer of electrical cables for the energy and infrastructure sectors. The company's plant in Tottenham uses a water recirculation system to cool water from the various processes involved in cable insulating and sheathing. The system involves two cooling towers, which both use two fans. The fans were run at 100% capacity, regardless of the water temperature, consuming nearly 15 million litres of drinking water per year and a great deal of energy.

Significant opportunities were identified when the operation and maintenance of the cooling system was analysed from a water and energy efficiency perspective. Olex decided to address this inefficiency by using variable speed drives on the cooling towers. Installation of variable speed drives allowed the cooling tower fans to operate at their optimal speed, depending on the weather conditions and the degree of cooling required at any given time.

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March 2010

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Business Resource Efficiency

The results of Olex's project have been outstanding. The changes have saved 4.8 million litres of drinking water per year, by reducing water losses through cooling tower drift. Additionally, there has been a significant reduction in energy consumption of 78.1 megawatt hours per year and greenhouse gas savings of 95.2 tonnes per year.

Olex's proactive water saving plan was supported with funding to the tune of $20,000 from City West Water to implement the project. The energy savings that have resulted from the project are a bonus towards further improving Olex's sustainability.

In addition to slashing the consumption of precious drinking water and lessening its carbon footprint, Olex's commitment to implementing more efficient processes has brought the company's annual operating costs down by almost $13,000.

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