Waterless urinals

Choosing the appropriate model for your business

There is increasing interest in waterless urinals and ultra-low flush urinal systems as a way to save water in large buildings and public amenities.

This fact sheet describes the different design features of commonly available waterless urinals, and the things you should consider to make sure your waterless urinal installation is successful.

It's important to remember that while urinals use a lot of water, even more significant water and energy savings can be made by investigating and fixing leaks, installing flow restrictors in taps and showers, and improving cooling tower performance.

These basic water saving measures should be the first steps in any water conservation program. Installing waterless urinals can be an excellent way to save even more water once these easy efficiencies have been gained.

Conventional urinals

Conventional water-flushed urinals are water intensive. Multiple stalls connected to one flushing device use between five litres and 20 litres a flush. In some commercial buildings urinals can account for up to 20 per cent of total water use – and it's estimated that they use about two per cent of Sydney's drinking water.

Many conventional urinals are designed to flush automatically. This is usually achieved with a pre-set cyclical flush, a smart demand system or a motion sensor that detects when someone has used the urinal.

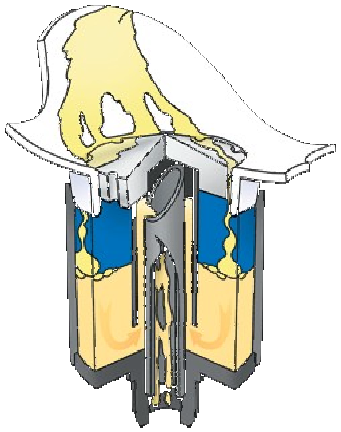
Left: Waterless urinal
Right: Conventional urinals waste large volumes of water if they flush continuously

Urinals can waste water if they are set to flush continuously, if the radar/infra-red motion sensor malfunctions or if the motion detection sensor is activated by general bathroom traffic. Corrosion of solenoid valve seats can also cause leaks.

A single inefficient urinal in a high use location can use up to 700L/day, or 255 kL/year. Building owners pay sewer usage charges, meaning that they are also paying extra for wasted drinking water to be flushed straight down the drain.

Well maintained, single stall, smart demand or manual flush urinals are the most efficient type of conventional urinal. They are only flushed after use, and flush volumes can be controlled.

Designs



Waterless urinals have three main designs:

1. Oil barrier (either refillable or replaceable cartridge)
2. Mechanical designs
3. Microbial blocks.

Each design has different requirements for installation and maintenance, and offers different advantages and disadvantages.

Oil barrier – refillable cartridge or oil seal trap

How it works: A refillable oil cartridge or oil trap creates a physical barrier between the user and the plumbing. Oil seal traps are a variation of the standard plumbing 'S' trap. Oil floats on liquids, including urine, and the oil layer prevents any odours from entering the room through the trap.

Advantages:

- Physical barrier between user and plumbing system.
- Cartridge is easy to refill, improving ease of maintenance and reducing costs and waste.
- Minimal waste creation.

Disadvantages:

- Cartridge may still require use of a proprietary oil.
- Cleaners and maintenance staff need to be trained to know when the cartridge needs replacement.
- Seals may be lost if cleaners empty water into the unit.

Oil barrier – replaceable cartridge

How it works: A replaceable oil cartridge creates a physical barrier between the user and the plumbing. Oil floats on liquids, including urine, and the oil layer prevents any odours from entering the room through the trap.

Advantages:

- Physical barrier between user and plumbing system.
- Cartridge is easy to replace.

Disadvantages:

- Cost of replaceable cartridge.
- Disposable cartridges generate waste.
- Cleaners or maintenance staff need to know when and how to replace cartridges.
- Cartridges can become fouled by urinary sediment deposits or hair and need periodic replacement to maintain effectiveness.
- Seals can be lost or moved when cleaners empty water into the unit.

Mechanical designs

How they work: One-way valves enable urine to pass into the plumbing system, but stop odours going back into the washroom. These are the newest type of waterless urinals.

Advantages:

- Physical barrier between user and plumbing system.
- Barrier will not break down with large water volumes that may be used by cleaners.
- Mechanical design allows a wide range of cleaning products to be used (no blocks or oil to be damaged).
- Some manufacturers give five year warranty on seals.

Disadvantages:

- Relatively new on market so durability is less tested.
- Cleaners still need to be aware of corrosive tendency of some cleaning agents on pipework.
- One way valves may still require regular replacement of valves and seals.

Microbial blocks

How they work: Bacteria are contained in a water-soluble block (like a large sugar cube) that is placed in the urinal. The blocks are designed to break down on contact with urine to release odour-masking agents and bacteria that will break down the components of urine that cause scale and odour. A small amount of water is required each day to keep the bacteria active.

Advantages:

- Can retrofit an existing urinal without expensive plumbing works or installing new urinals. Water 'S' trap is retained to create barrier between user and plumbing system.
- Users report that microbial blocks work most effectively in single stall urinals because cleaning, maintenance and block placement can be better managed.

Disadvantages:

- May cause odour in older urinals, especially if pipes are old, corroded or have scale build up.
- Sanitary flushing may still be required.
- Cleaning techniques need to be changed – common cleaning chemicals can harm the bacteria. Special cleaning fluid may need to be used.
- Blocks can break down and become trapped, causing urine to pool and create odour.

Ultra water efficient urinals

How it works: These urinals aren't waterless, but use a very limited amount of water for flushing. They may suit situations where public perception, design standards or existing plumbing fixtures and pipe work make waterless urinals difficult to install. Units that use less than one litre of water per flush and incorporate smart demand "urine sensing" technology can achieve a Water Efficiency Labelling Standards (WELS) 6 Star rating.

Advantages:

- Plumbing and design requirements are well understood.
- Users will be familiar with the design.
- May not require such rigorous oversight of cleaning practices.

Disadvantages:

- Don't entirely cut out water use.

Preparing for installation

It may be necessary to clean urinal pipework before installing waterless urinals. Heavily corroded pipework should be replaced with PVC pipes.

Floor waste drains connected to the sewer may need to be reconfigured. In older buildings where the age, location and maintenance history of sewage connections is unknown, it may be better to investigate options for ultra-efficient conventional flushing urinals, rather than waterless urinals.

It is also important to ensure that all plumbing and building work meets the relevant Australian standards and codes. Some products allow you to convert a standard flushing urinal to waterless or ultra low flush urinal. However, if the design and installation of the existing urinal is old or inadequate, you might need to replace pipework, and ensure that the fall of both the urinal pan and pipes is adequate to cleanly drain urine away.

Replacing urinals can be expensive but this may reduce running costs in the long term. A properly designed waterless urinal may save more water and be easier to

maintain than a retrofitted traditional urinal. Newer waterless urinals will be more acceptable to users and cause less odour than older styles.

Issues to consider

The physical properties of urine can create problems for users and maintenance staff if waterless urinals aren't installed properly.

Urine contains urea, ammonia and other compounds of nitrogen as well as salts, phosphates and sulphates.

Ammonia will corrode copper and copper alloys. In moist conditions, including those in urinals, ammonia rapidly attacks copper. This may lead to corrosion and stress cracking of sewer pipes. Copper pipes should be replaced with PVC pipes before installing waterless urinals.

Bacteria can precipitate calcium from human urine, causing a build up of hard calcium scale on urinals and plumbing fittings. This can increase if water does not frequently flush away urine.

Allowing scale to build up can cause odours and reduce the capacity of your pipes. It can be a costly problem to fix, especially in older buildings where sewer pipes may be inaccessible, or their location unknown.

Because urine can cause scale build up it is also important to consider the age, design and condition of the sewer pipes servicing your urinal. It is important to confirm that sewer pipes have sufficient fall to allow urine to drain freely away without causing a build up of sludge or scale in pipes. It is recommended that the fall of pipes draining urinals should be at least two degrees, and preferably more.

Bacteria can also cause chemical reactions and produce ammonia, which can be corrosive, and create a very unpleasant odour for users. In confined spaces a high level of ammonia gas may also present a health hazard. Older pipes may already have these problems, which will become more apparent when they are no longer being flushed with water.

To avoid odour, urinals should have a physical barrier between the plumbing system and the user, and ventilation should be high.

Potential water and cost savings

Water savings achieved will depend on the efficiency of the original flushing urinal, the number of times the urinal is used, and the efficiency of the waterless replacement.

A single stall, smart demand or manual flush urinal will already be very water efficient if it is maintained properly. Water and cost savings from replacing these units with a waterless type may be small.

If you are fitting out a new building, or replacing an inefficient cyclic flush system, water savings from waterless urinals or ultra water efficient urinals may be significant. For example, a three-stall, automatically flushing urinal may cost up to $3,000 a year to operate. Savings of up to $2,000 may be achieved after conversion to a waterless unit.

Waterless urinals can cost between $350 to nearly $1,500. This compares favourably with the upfront cost of flushing urinals, and you may save money by avoiding the need to install items such as sensors and flush valves.

Fittings for waterless urinals, such as oil cartridges used in some models, are not yet standard. This could make it more difficult to find replacement in the future. It may be advisable to invest in a product that can be easily maintained using standard plumbing or cleaning equipment.

Microbial blocks have ongoing replacement costs and special cleaning equipment is needed . Such costs will often be offset by reduced water bills.

Waterless urinals may also make maintenance easier. As waterless urinals don't flush, there may be a reduction in bacteria or pathogens that are transported in aerosols to users.

Without the need for a flushing lip, waterless urinals may be more

streamlined, making cleaning easier and reducing areas where bacteria breed.

Case Studies

Investa Property Group

Investa Property Group has trialled a number of different waterless urinals in its property portfolio and has retrofitted most urinals with microbial blocks.

"We've learnt that for urinals retrofitted with microbial bocks to work effectively, a well defined cleaning regime is the most important factor," Shaun Condon, Investa's OHS & Environment Manager said.

"Training cleaning staff is critical. Cleaners use bleach for many of their cleaning processes. This kills off the bio-treatment capability of the microbial blocks.

"Ensuring that every urinal is cleaned every evening is very important, and property managers need to conduct ongoing spot checks to check that this is being done.

"There have been some leaks in the urinals we retrofitted. At first we assumed that uric acid was corroding the pipework. After commissioning testing from a university research laboratory, we determined that undiluted bleach was actually causing the problems. Flushing had previously washed the problem away.

"We now use more environmentally friendly products for cleaning. This provides a double environmental benefit – less water and milder chemicals.

"Smell can sometimes be an issue, but it's usually the chemical fragrances causing the odour. This can be overcome by increasing ventilation volumes," Shaun said.

University of New South Wales

The University of New South Wales (UNSW) is one of the largest universities in Australia, with more than 40,000 students. It implemented a 'waterless urinals only' trial after calculating that urinal flushing used more than 11ML of drinking water a year.

Standards that apply to waterless urinals

There are several Australian rating systems and standards that apply to waterless and ultra low water use urinals.

WaterMark certification applies to water supply, sewerage, plumbing and drainage goods, including urinals. WaterMark certifies that plumbing products meet quality standards. Australian Standard 5200.000 – 2006 Technical Specification for Plumbing and Drainage Products outlines the WaterMark Certification Scheme.

Water Efficiency Labelling and Standards (WELS) is a water efficiency standard that applies to toilets, water-using urinals, showers, taps, flow controllers, washing machines and dishwashers. All these products must display a water efficiency star rating. WELS does not apply to waterless urinals.

Australian Standard 6400 covers the rating and labelling of water efficient products, but does not apply to waterless urinals.

Australian Standard 3500.2:2003 outlines standards for sanitary plumbing and drainage.

Australian Technical Standard 5200.459:2004 covers waterless urinals (wall hung) Level 1, while 5200.469:2004 covers waterless or limited flush urinals.

The university uses oil seal trap style urinals for new installations, and uses microbial blocks to retrofit existing urinals. The university also uses bore water for some other toilet and urinal flushing.

UNSW has estimated that using waterless urinals saves between 95 and 140kL of water for each urinal (or per metre of wall hung urinal) every year. Savings vary between the two different types of urinals and also depend on the how often the urinals are used.

To make sure that oil seal trap urinals are refilled often enough to avoid odours in extremely high use areas (near the university's quadrangle), the university uses one maintenance contractor, whose

service frequency depends on how often urinals are used in each building. UNSW has also discovered that installing privacy screens between urinals helps to even out urinal use in washrooms, making it easier to schedule maintenance.

The university has worked with microbial cube suppliers to produce multilingual training material after noting the importance of educating cleaners to avoid using strong disinfectants in these type of urinals.

Westfield

Westfield trialled different brands and types of waterless urinals in several shopping centres across Australia.

The urinals trialled included microbial cubes, mechanical and oil barrier designs.

Westfield discovered that all four brands trialled had similar payback periods and that the oil barrier and mechanical barrier urinals used had the lowest ongoing maintenance costs. Westfield is now installing these two designs on an ongoing basis.

Recommendations for all waterless urinals

Before installing your waterless urinal, you should ensure:

n the urinal is WaterMark approved

n you understand all the relevant technical standards and Australian Standards

n current sewer pipes are not made of copper or a copper alloy

n there is enough fall in the urinal to avoid urine pooling and odour

n the fall of the sewer pipes is sufficient (at least two degrees) to avoid the build up of scale and sludge in the pipes

n current sewer pipes are well cleaned and don't have pre-existing blockages

n the area is effectively ventilated to prevent odour

n you have good sewer service diagrams and are confident that pipes leading from the urinal are accessible if you need to maintain them

n cleaning staff implement regular cleaning regimes, and don't use strong bleaches that may damage pipework or bio cubes when there's no regular water flushing

n there is a physical barrier between the user and the sewer pipes. This may take the form of a proper seal in mechanical waterless urinal units, a properly maintained oil barrier, or retaining the water trap when retrofitting existing urinals with bio blocks

n other water using facilities – such as showers or washbasins – are upstream of waterless urinals where possible. The flow of water should help to flush urine through the pipes, and avoid scale build up

n privacy screens are installed between individual urinals to help even out urinal use in washrooms, making it easier to schedule maintenance.

Education and awareness

Some users will not be familiar with waterless urinals and might notice problems – such as odours – that would not be noticed in a normal flushing urinal.

If your urinal is operating correctly, an education campaign can be useful to explain how the urinal is working, how it is saving water, and how waterless urinals fit in with your other water conservation programs.

It's important to resolve all serious plumbing or odour issues before running internal education campaigns.

If users are exposed to unacceptable odour or hygiene issues, they may become negative about waterless urinals, and you might lose important support for your entire water conservation program.