Greening my home: How do I reduce my water footprint?

Why we must think of water efficient life style?

Reducing water consumption and improving water efficiency in buildings is a major step towards sustainable water management. We can all contribute towards saving water in our homes with actions that are simple yet efficient. Installing water efficient fixtures in toilets and kitchens could be the first step.

Traditionally, water using plumbing fixtures in a building would include toilets (cisterns and commodes), faucets, showerheads, urinals etc. apart from other appliances like washing machines and dishwashers. Over the years, significant technological improvements have taken place aimed at improving water efficiency with minimum compromise on performance.

In India, the standard daily per person water consumption recommended is 135 (litres per capita per day) which includes drinking, cooking, flushing, bathing, washing uses. Of these uses toilets and bathrooms are the biggest water guzzlers in buildings.

Average Domestic Water Consumption in Indian Cities

Use	Consumption in litres/day/person
Drinking	5 Litres
Cooking	5 Litres
Bathing (incl. ablution)	55 Litres
Washing clothes	20 Litres
Washing of utensils	10 Litres
Cleaning of houses	10 Litres
Flushing of latrines	30 Litres
Total for urban areas	135 Litres

Source: Central Public Health and Environmental Engineering Organisation (CPHEEO), India Water Portal, 2010

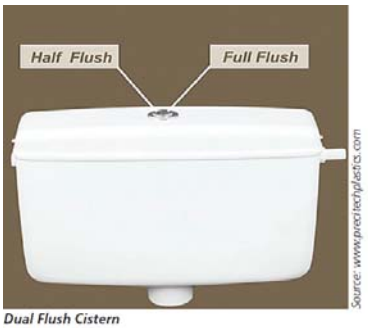
There is little doubt that by installing more efficient water fixtures and regularly checking for leaks, households can reduce daily per capita water use by about 35 per cent. Water efficient fixtures have been widely accepted and are been used across the world especially in the countries like Australia, USA, parts of Europe etc. Fixtures like dual flush toilets, low water using/ sensor based/ waterless urinals, sensor faucets/faucets with flow restrictors, water efficient showers etc. are some of the available technologies.

Improvements in Fixtures Technologies

1. **Toilets**

   a. Dual-flush toilets- A significant way to save water in buildings is to replace existing single-flush toilets with dual-flush toilet. The current standard dual-flush toilets use 6 liters on full and 3 liters on a half-flush'. The most common dual-flush toilet is the 6 liters full flush/3 liters half flush, although a 4.5/3 litres dual-flush toilet is now available in select models.

   b. Interruptible Flush Cistern- The flushing action can be interrupted at will and the discharge begins once the button



Dual Flush Cistern

is pressed and a second press interrupts it, so using just the amount of water necessary.

c. High Efficiency Toilets (HET) - High-efficiency toilets goes beyond the standard 6 liters and use 4.8 liters per flush.

d. Waterless toilets or composting or ecosan toilets- Although not very common for commercial buildings, urine-separating toilets separate the waste at the source and reduce the nutrient load by composting. They require little or no water for flushing reduces nutrient and strength of wastewater for treatment.

e. Pressure Assist Toilets- These toilets use either water line pressure or a device in the tank to create additional force from air pressure to flush the toilet. The water used for a single flush varies from 4.1 – 4.5 liters per flush.

f. Power Assist Toilets- operate using a pump to force water down at a higher velocity than gravity toilets. Power assist toilets require a 120V power source to operate the small fractional horsepower pump. Typical flush volumes are between 3.78 – 4.9 liters per flush and dual-flush models are also available.

2. Urinals

*a. Low water use urinals***-** In some of the standard systems water is applied automatically through a continual drip-feeding system or by automated flushing at a set frequency, 24x7, regardless of whether or not the urinal has been used. Water consumption varies with the system model at an average of 4 liters per flush. While water-efficient urinals uses 2.8 litres per flush and in recent times. Smart Flush systems using 0.8 litres per flush have also been launched.

b. Sensor operated - urinals detect the presence of people through movement sensors or door switches (combined with an electronic delay to stop flushing for a set period after flushing)

c. Waterless urinals- there are various technologies available for waterless urinals. In oil barrier technology the urinals operate through the use of an oil wall between the urine and the atmosphere, preventing odours from escaping. While in the other technology the barrier has been replaced by a seal with a collapsible silicone tube that closes after the fluid has passed through it, to prevent gases attempting to flow from the sanitary pipe work, into the room. A third system uses biological blocks which include microbial spores and surfactants which can be placed into any urinal thus eliminating water use. Therefore, by breaking down the urine into components, the build up of sludge and crystals which causes blockages are prevented. The potential water savings from a waterless urinal compared to a 2.8 liters per flush, is almost 100 per cent.

Waterless Urinal

3. Faucets/ Taps

a. *Aerators*- Modern taps often have aerators at the tip to help save water and reduce splashes. Without an aerator, water usually flows out of the tap in one big stream. An aerator spreads the water flow into many small droplets. Conventional faucet aerators don't compensate for changes in inlet pressure, so the greater the water pressure, the more water you use. New technology compensates for pressure and provides the same flow regardless of pressure.

b. Flow Fixtures- controls, deliver a precise volume of water in faucets, showerheads, and hose outlets, typically 5.6 – 8.3 liters per minute (1.5 -2.2 GPM), irrespective of varying line pressure. Flow controls work differently than faucet aerators, as aerators add air to the water stream to make the flow feel stronger, while flow controls, on the other hand, work by producing dozens of parallel streams of water.

c. Sensor taps- are automatic shut-off taps, such as push-button or lever-operated taps that shut off automatically after a set time to reduce the potential for taps to be left running too long or not turned off (e.g. a 6-star WELS-rated tap has a running time set between 5 to 10 seconds at a flow rate of 4 litres per second). Sensor taps with a flow rate of 2 litres/minute can also be installed. These taps cut off water supply when the hands are removed from under the tap, or when the preset timing of 30 or 60 seconds is reached, whichever is earlier.

d. Thermostatically controlled electronic dual-purpose mixing or diverting valves- are used within industrial and commercial applications (hotels, corporate office etc.) to automatically provide liquids as required.

Tap with aerators

Source: www.bathroom-kitchen-faucets.com

Tap with flow fixtures

4. Showers

a. Water efficient showerheads- deliver water at 9 litres per second or less than that. Further, showers can also be fitted with digital read-out meters that show the user the amount of water being consumed and the duration of the shower.

5. Washing Machines

a. Front loading - In general, front loading washing machines are much more water efficient than top-loading machines.

What do I gain from water savings?

The benefits of implementing water efficiency initiatives in buildings include, cost savings on water bills, increase in water and energy savings, reduced pressure on water treatment systems, and improving the image of the a business/building as a water efficient facility. With water using fixtures accounting for the majority of residential/ commercial building water consumption, the best opportunities for increasing efficiency are also found there.

Details of the water efficient cisterns and faucets and estimated water savings

Fixture	Operation	Water Savings
CISTERNS		
D2D 3/6 liters Dual flush cisterns Fittings	Two concentric buttons, pressing the circular button discharges 3 liters only and pressing both the buttons discharges 6 liters.	Savings 4 - 7 liters/ flush (Standard flush uses 10-13 liters/flush)
Interruptible Flush Cistern Fittings	The flushing action can be interrupted at will and the discharge begins once the button is pressed and a second press interrupts it so using just the amount of water necessary.	Savings 3 -6 liters/ flush (Standard flush uses 10-13 liters/ flush)
URINALS		
Sensor operated	Water is applied automatically through a continual drip-feeding system or by automated flushing at a set frequency, 24*7, regardless of whether or not the urinal has been used. Uses around 2.8 – 4 liters of water per flush.	Savings 2.2 – 10 liters (Standard urinal uses 4 liters and can go up to 10-13 liters when toilet pan with flush is used for urinating)
Waterless	Biological blocks, Sealant liquid traps and membrane traps	Savings 4- 13 liters
FAUCETS		
Single lever mixer- Eco Disk Cartridge	If the mixer tap is fitted with this type of cartridge, only the ecodisk devise has to be activated turning it through 180° and the flow is reduced by 50per cent. At the same time, or independently, by turning it slightly to the left (anti clockwise) the maximum temperature of the mixed water is lowered to the desired point, with consequent saving of water and energy.	50 per cent (from taps without regulators)
Single lever mixer- Plus Cartridge	It incorporates a simple system of water control that permits discriminating between the economical and full flow zones. On raising the handle to increase the flow, an elastic stop that offers a slight resistance advises of passing to the maximum flow zone. It also has a limiter for the maximum temperature of the mixer.	50 per cent
Single lever mixer- Star Cartridge	As well as the hydro control system (separating the economical flow zone from that of the full flow), this new generation cartridge include another novelty; on opening the tap in the front position, in the zone of the economical flow, cold water runs and not the mixture. On turning to the left an increasingly warmer mixture is gradually obtained. Opening the tap completely and going beyond the elastic stop takes it into the maximum flow zone. In this case, with the handle in the front position, it now works like a traditional cartridge and mixed water is obtained.	50 per cent
Thermostatic Mixers	Can select the desired temperature for the mixture. They are fitted with a flow regulator button (50per cent saving) and temperature limiter button (energy savings)	40 per cent
Electronic mixers	Mixers or non mixers, powered by alkaline batteries or from the electricity mains. They are opened or closed by the proximity detectors. Putting the hands near the taps opens it and withdrawing them closes it.	50 per cent
Flow regulators	They limit the maximum flow from the tap in the washbasin, kitchen and shower as indicated, whatever the pressure of the installation and also mix air. Available in 3 variations Regulator of 6 liters/ min Regulator of 8liters/minute Regulator of 10liters/minute	 6 liters/ min- 65 per cent 8 liters/minute- 55 per cent 10 liters/minute- 30 per cent
Flow Restrictors	They regulate the flow rate in the fittings between 7.5 and 9 liter, depending on the system pressure Restrictors of 9 liters/minute (@ 3 bar) Restrictors of 9 liters/minute with a check valve system	9 liters/minute with a check valve system- 45per cent

The table is also to an extent reflective of the similar brands or the ones in the same league offered in the market.
Source: Various Sources (Including document of Roca Solutions for Saving Water and Energy, Version 1, June 2008)

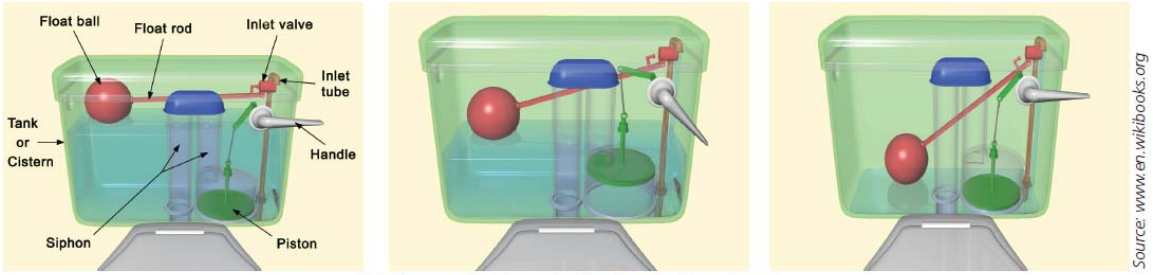
Understanding the Technology that governs a Standard and an Efficient Toilet

A toilet is made up of several interrelated components like tank with flushing and refill mechanism, bowl siphon, outlet sewer pipe etc. that together work to make a toilet functional.

Typical components of a toilet system

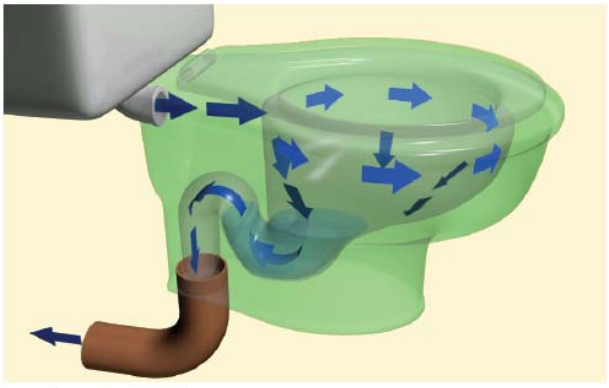
The top portion consists of a cistern or a tank and the bottom unit is called a bowl or a commode with inlet and outlet respectively. The handle or a button is pressed to flush the toilet which is stored in the cistern. The tank contains some important parts which includes, an inlet valve which controls the water supply coming into the tank and it lets water in when the tank is empty, and stops water coming in when the tank is full. The float ball rises as the tank fills with water.

As it rises, the float rod attached to it presses against the inlet valve. When the tank is full, the rod is pressing against the inlet valve hard enough to turn the water off. This stops the tank from overflowing. When the handle is pressed, a lever inside the tank pulls the piston up, forcing some water through the siphon. This provides suction in the siphon, and the rest of the water follows, emptying the tank. The tank empties quite quickly, and the float ball floats to the bottom. That means the float rod is no longer pressing against the valve, so water begins to flow into the tank, filling it up again.



Working mechanism of a flushing tank or cistern

The water which left the tank goes through a short pipe to the toilet bowl. It sloshes around the rim, down the sides of the bowl, and out through the drainpipe, cleaning the bowl and carrying the waste with it. Some of the clean water coming behind remains at the bottom of the toilet bowl. That's because modern toilets have an 'S' bend which remains filled with water between flushing. The water in the 'S' bend stops bad odours escaping from the drainpipe. During flushing the 'S' bend also provides siphon action which helps speed up the flushing process (Wikibooks 2010) .


Bowl Outlet Mechanism

A dual-flush toilet looks like any other toilet, except that it doesn't have a flush lever. Instead, the user chooses one of two buttons, depending on the type of waste. One button is for the reduced or half flush, while the other marked button releases the full flushing water volume (Elliott 2008).

Dual-flush toilets are currently available in three different flushing mechanisms; washdown, washdown siphonic action and power assisted. Siphonic toilets swirls water around the bowl to create a vacuum or siphon in the trapway, so water leaves the bowl first, pulling waste out afterward. While this system works very well when large qualities of water are allowed, it is much more problematic when water is limited to 6 litres. To still be able to create the siphonic action, trapways had to be reduced to generally around 2 inches. Naturally, the reduced trap size made clogging common. Wash down systems donot have to create a siphon in the trapway. A steeper pitched bowl coupled with an open rim design pushes the water very quickly through the trapway, forcing the waste out first, followed by water. Because of the steep sides, only a small amount of water is required in the bowl. Splashing during use isn't a problem and any staining of the walls is usually washed away in the flush. As with any toilet, an occasional scrubbing is necessary. Dual flush toilets employ a larger trapway (the hole at the bottom of the bowl) and a wash-down flushing design that pushes waste down the drain. Because there's no siphoning action involved, the system needs less water per flush, and the larger diameter trapway makes it easy for waste to exit the bowl. Combined with the savings from using only half-flushes for liquid waste, the dual flush toilet design can save up to 68 percent more water than a conventional low flow toilet. There are several advantages to wash down. Because they do not have to create a siphon, trapways are able to stay much larger. And larger the trapway, the less likely the toilet will clog. There are international companies like Caroma which uses a 4-inch trapway- compared with the 2" industry standard. This innovation virtually eliminates clogging. The Caroma system cleans in one flush, 95 per cent of the time.

Finally the last design is the power or pressure assisted system which uses compressed air to force the water to flush the waste. There is no freestanding water in the bowl. The water is held in a pressure tank which is inside the toilet tank. This system gives a powerful flush but it is more expensive and relatively noisier than a gravity-fed system.