

Water Audit - Need of the hour

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SYNOPSIS

About 2.5% of the water on the earth is available in fresh form. Of this 2.5%, about 0.25% is available for household purpose. Worldwide the consumption of water is doubling every two decades. Water audit is the most effective tool for water management. Through audit we identify and quantify what steps can be taken to reduce water use and losses. Water audits trace water use from its point of entry into the facility/system to its discharge into the sewer. The audit also identifies and quantifies unaccountable water losses, leaks at each point of use within and around the facility. This article deals with the water audit at a micro level and possible ways of water use reduction in the typical urban Indian household.

INTRODUCTION:

Water is continuously moving around the earth and constantly changing its forms in the nature. Potable water is a scarce resource on this earth, it is precious. Increasing population, economic development, aging infrastructure and urbanization is resulting in severe pressure on this resource. The price of water is bound to increase, regulatory pressure on near-zero discharge will increase and the availability of quality water will become difficult. India is one among the top 12 water poor countries with the per capita availability of 1850 m³/person/year as against the world average of 7690 m³/person/year.

A comprehensive water use audit will examine the major areas in which a facility uses water, including sanitation, maintenance, mechanical systems, building processes and irrigation. For each of those areas, the water use audit will provide breakdown of the how, when and where of water use. In addition, water use audits will take into consideration the water quality. Some of the large potential savings that can be achieved is through the recycling of water and the use of rain water. Water audits can help identify potential uses and optimization of water use.

APPROACH

Based on the extent of water consumption, Water Audit can be divided into four categories.

1. *Large Water Consumers:* 15 MLD (large Industries, Agricultural and Municipalities/Metros will fall in this category).
2. *Medium Water Users:* 3 MLD to 15 MLD or 3000 cum/day to 15000 cum/day (Industrial clusters, CETP's, Medium Industries and Township will fall in this category)
3. *Small Water Users:* 500 cum/day to 3000 cum/day (Large Hotels, IT Parks, Theme Parks, Industrial and Private Township will fall in this category)
4. *Tiny water Users:* < 500 cum/day (Commercial complexes, Government Offices/Buildings, Builders, Colonies etc fall in this category).

A household water audit is an assessment of how much water is used and of identifying simple ways for saving water in the household.

The first step is estimating the water use in household. This is usually done by using water meter. This gives overall water consumption for a household. For the micro level assessment, flow rate from all fixtures should be assessed.

Flow rate is how fast the water leaves your tap. All you need is a bucket that can measure volume and a stop watch. Put the bucket under the tap and record how much water flows out in 60 seconds for various activities. e.g. Flow rate for each minute = ----- liters/minute.

Assessment for typical Indian Urban Household (Apartment)

Let us consider a typical household having a family of 5 members in a metro like Mumbai. According to the usage pattern, the water consumed in the house for each utility like bathroom shower, running taps in kitchen, laundry, toilet and leaky fittings are taken in to consideration for the purpose of this case study. Water consumption summary is given in the following Table-1.

Table-1: Normal Water Consumption Pattern

Utility	Water Consumption in		Observation
	Liters/day	Liters/Week	
Bathroom Shower	400	2800	An average shower head with mains pressure uses at least 10 liters of water per minute.8 minutes/day and 7 No of showers Per Week are considered.
Running taps in Kitchen	212.25	1485	This part measures water used for rinsing vegetables, dishes, washing hands etc. The table assumes the flow rate for each use is 2.83 liters per minute. Average duration a tap runs a day/person is 15 minutes. And Number of persons considered is 5.
Laundry	140	700	Top loader uses about 140 liters of water per load. It is assumed that the washing machine is loaded 5 times a week.
Toilet	135	945	The average single flush toilet uses 9 litres per full flush. A household with 5 occupants flushes, on average, 15 times per day which is 135 liters per day.
Leaky Fittings	32.4	226.8	It has been found that there is a leakage in one pipe with a rate of flow 0.0225 liter/minute. Leakage may vary with pressure of flow and time taken to repair it.
Total	919.65	6156.8	

This gives 920 liters/day consumption for a typical household considering normal usage of water & fixtures.

WATER SAVING PROPOSAL:

The Table-2 shows how much water can be saved in a day for a family of 5 and with water conservation measures.

Table-2: Water Consumption with Water Saving Fixture.

Utility	Water that can be saved in liter/Week	Recommendation
Shower	1400	Decreasing shower duration and by using low flow showers can save water up to 50% Sensor light arrangement on the water shower outlet, stopping the water flow after the preset duration.
Kitchen	742.5	Changing habits of washing utensils and using smart fixtures like aerator faucets can save water up to 50%.
Laundry	100	When buying a new washing machine, choose the one that is water efficient. Front loaders use about half the water that top loaders use. Improved washing machines use between 45 and 120 liters per load.
Toilet	420	Modern dual flush toilets use only 3 or 6 litres of water per flush. This is 30% less than older dual flush cisterns and up to 9 litres less than single flush toilets. Water closet flush tanks with a smaller volume
Fittings	226.8	Have a tap that requires the user to press a handle and keep it pressed, for water flow. The moment the user releases the handle, the tap closes and water stops. A sensor light can be installed below/above the tap/sink. When the user puts hands below the tap, the sensor light operates and opens the tap. Water flows. When the user removes the hands, the sensor closes the tap. The water flow stops. Keep optimum pressure in water supply system. Fixing leakage saves huge amount of water.
Total	2889.3	

Other measures to save water are:

- Install individual, water meter at each user unit (say household) rather than one single meter for the entire housing / industrial complex.
- Enforce the municipal rule of the maximum tap size at consuming points in the housing / industrial complex.
- Promote awareness program among the people.
- Create water saving attitude of the people. Acquire a set of values and feelings of concern for the water. Motivate for active participation in the saving of the water.
- Promote effective water management strategies. Incentives should be given for motivating the stakeholder for water conservation and improvement of efficiency in water use.

Some typical daily activities identified in Table -3 can be modified to save large quantity of water.

Table-3: Water Saving with Change in Water use Habits

Activity	Method Adopted	Quantity Used (Ltr.)	Method to be adopted	Quantity required(Ltr.)	Quantity Saved(Ltr.)
Brushing teeth	Running tap for 5 min	45	Tumbler	0.5	44.5
Washing Hands	Running Tap for 2 mins	18	Use Mug and Bucket system	2.0	16.0
Shaving	Running Tap for 2 Mins	18	Shaving Mug	0.25	17.75
Shower	Letting shower run while soaping; Staying under shower too long	90	Wet down, tap off, soap up, rinse off	20	70

CONCLUSION:

- More water can be conserved. With the help of modern water conserving equipments like the water less urinals, dual flush, auto operated taps the water savings is assessed as 47%.
- A 30 to 50 % saving of water in a green building which can ultimately lead to a LEED accreditation for a green building.
- Water Auditing, as a necessary action for buildings should be taken up to check the water use. This has already been implemented in a large scale in developed countries.
- The traditional ways of water use saves water to a large extent.