

# WATER AUDIT OF AITRC CAMPUS, VITA

Thorat Pramod R.<sup>1</sup>, Mohite Ajay L.<sup>2</sup>, Jadhav Dipalee V.<sup>3</sup>,

Paramane Siddhi S.<sup>4</sup>, Pawar Suraj A.<sup>5</sup>, Thorat Sumit B.<sup>6</sup>

<sup>1</sup>Asst. Professor, Dept. of Civil Engineering, AITRC, Vita, Maharashtra, India.

<sup>2,3,4,5,6</sup>Students, Dept. of Civil Engineering, AITRC, Vita, Maharashtra, India.

\*\*\*

**Abstract** – Water audit is a qualitative and quantitative analysis of water consumption to identify means of reducing, reusing and recycling of water. Water audit is an important management tool for effective conservation of water. Broadly water audit should be conducted categorically in two systems, resource audit or supply side audit and the other one as consumption audit on demand side. All efforts should be made for improvement of not only water use efficiency and distribution system, but also on the efficient development and management of source of the water.

**Key Words:** Non- Revenue Water (NRW), Effluents, Unaccounted for Water (UFW), Water Audit, Water Conservation.

## 1. INTRODUCTION

The water audit displays how quantity of water flows into and out of the distribution system and to the consumer. Water auditing is a systematic & scientific examination of water accounts of the projects. It provides a rational, scientific framework that categorizes all water use in your system. It is a tool to overcome shortage, leakage and losses in the system. With the help of water audit, we identify and quantify what steps can be taken to reduce water use and losses. Water audit and its analysis which can solve not only many water related problems but also save precious resources and public money. Water audit is most effective tool for water management.

### 1.1 Objectives

- To find out real losses due to pipe leakages, over flow & un-authorized connections.
- To check unwanted excess usage of water.
- To identify priorities area which need immediate attention for control and maintenance.

## 2. LITERATURE REVIEW

### 2.1) Pramod Kumar Mahish (2017):

In this case study, they told that, water audit is a part of green or environmental audit which are identified with the inspection of work directed inside the organizations whose movement can make risk to the health of inhabitants and environment. The National assessment and accreditation council (NAAC) take a genuine note of this angle while reviewing the educational institute. Along these lines, water audit is performed in the college with various aspects of water such as sources, supply, utilization, disposal etc. After that study and on location perception and talk with the related staff they concluded that, bore wells satisfy the all necessities of institute while prerequisite of staff colonies is fulfilled by municipality supply.

### 2.2) Amol A. Kulkarni, et al (2015):

In this case study, they studied that the water audit information with case study. A water audit determines the amount of water lost from a water supply system and the cost of this loss to the utility. It will quantify Unaccounted for Water (UFW) and Non-Revenue Water (NRW). Water audits balance the amount produced with the amount billed and account for the remaining water (loss). It is an important step towards water conservation and, if linked with a leak detection plan, can save the utility a significant amount of money and time.

## 3. METHODOLOGY

### 3.1 Water Supply and Usage Study

A study of the availability of water sources and past consumption patterns for various sectors is necessary to understand the present water utilization and projecting future requirement. Data on development of sustainable source of water such as through effluent reuse should also be taken into consideration.

### 3.2 Process Study

The actual amount of water supplied to every consumer were calculated by directly visual observation contains actual amount of water used for drinking as well as other consumption. Also, there are various ways by which the water is used in daily activities of college such as for gardening, practical works, flushing of toilets and washrooms, cleaning of corridors, making some food and drinks, lawn sprinkling etc. Such studies will also prove useful for future extension, renovation and modernization of the system.

### 3.3 System Audit

The current water usages and systems for water use under various sectors in daily college activities such as for gardening, practical works, flushing of toilets and washrooms, cleaning of corridors, making some food and drinks, lawn sprinkling etc. and other needs to be studied to check their operational efficiency and level of maintenance.

### 3.4 Discharge Analysis

#### Input data:

1. Initial and final water level of the storage tanks.
2. Time duration of pumping.
3. All dimensions of tanks.

### 3.5 Water Audit Report

A water audit report may, invariably contain:

1. Amount of water allotted for a service.
2. Amount of water utilized for that service.
3. Water loss and efficiency of the system along with reasons for such losses.
4. Suggested measures to check water loss and improve efficiency.

### 3.6 Tests Recommended

It is very important to carried out various tests on water to check quality. This will give an idea about the quality of water available for drinking purpose.

Tests may include:

- ☐ Determination of pH value.

- Measurement of Turbidity by Digital Turbidity meter.
- Determination of Acidity of water.
- Determination of Alkalinity of water.
- Determination of Hardness of water.

## 4. VISUAL INSPECTION & CALCULATION

### 4.1 Visual Observations

**Table 1.** Visual Observations

Pipeline from	Pipeline to	Capacity of storage tank	Diameter of pipe	Power of Pump or Motor
Main source(well)	Tank at Boy's Hostel	30,000 liters	4 inches	7.5 HP
Tank at Boy's Hostel	College storage tank	60,000 liters	2 inches	5 HP
College storage tank	Drinking water tank	2,000 liters	1 inch	RO plant
-	Waste water tank	3,000 liters	1 inch	RO plant
Drinking water tank	Consumer	-	0.75 inch	By gravity
Waste water tank	Consumer	-	0.75 inch	By gravity

### 4.2 Discharge Analysis

The following procedure is carried out for calculating discharge (Pumped water and Delivered water) of water which is collected into any storage tank:

1. Measuring the initial water level of the both pumping and delivery tank and note down carefully.
  2. Starting the pump and stopwatch simultaneously i.e., at same time.
  3. Stop the pump and stopwatch simultaneously.
  4. Measuring the changed water level means final water level of both the tank.
  5. Workout the difference between those two readings.
- ☐ Calculate the discharge in liter per second. Discharge in storage tank at Boy's hostel = 3.11 lit/sec.
- ☐ Discharge in storage tank at terrace level of degree college = 1.954 lit/sec.
- ☐ Loss of discharge = 3.11 lit/sec – 1.954 lit/sec
- = 1.156 lit/sec

The Major losses includes losses due to the friction in internal pipe surface and wáter flow. Also the Minor losses includes the losses occurred due to:

1. Change in pipe diameter.
2. Change in gradient of pipeline.
3. At starting and exit of the pipe.
4. Due to change in direction of pipeline.

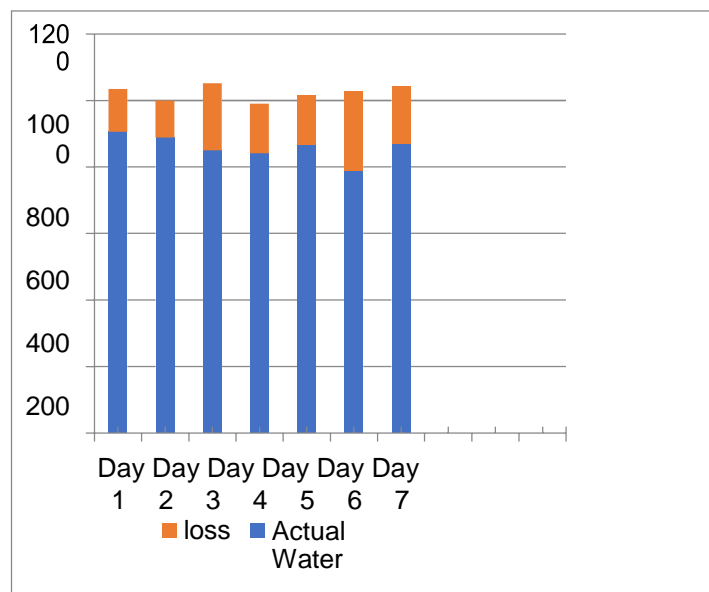
#### **4.3 Process Study Input data:**

1. Circumference of both potable wáter tank and non- potable water tank.
2. Reduced wáter level of tanks calculated from initial and final water level.
3. Total, numbers of consumer.

### 4.3.1 For Drinking Water

**Table 2.** For Drinking Water

1	2	3	4	5	6	7
Day	Initial water Level (In m.)	Final water Level (In m.)	Water Cons. (In lit.)	Total Cons. (In nos.)	Per Head daily cons. (In lit.)	Actual Water Cons. (In lit.) (5 x 6)
1	0.76	0.17	1034.52	627	1.445	906.015
2	0.82	0.25	999.45	615	1.445	888.675
3	0.9	0.3	1052.05	588	1.445	849.66
4	0.835	0.27	990.68	582	1.445	840.99
5	0.79	0.21	1016.98	596	1.445	867.18
6	0.745	0.16	1026.08	545	1.445	787.525
7	0.78	0.185	1043.28	603	1.445	871.335



**Figure 1.** Bar Graph of Day v/s. Drinking Water Consumption

### 4.3.2 For Flushing Purpose

**Table 3.** For Flushing purpose

Day	Initial water Level (In m.)	Final water Level (In m.)	Water consumed (In lit.)	Total consumers (In nos.)	Per head daily consumption (In lit.)
1	1.823	1.66	5044.77	574	8.788
2	1.711	1.55	4982.87	602	8.277
3	1.397	1.23	5168.46	590	8.76
4	1.124	0.956	5199.52	611	8.509
5	1.195	1.03	5106.67	570	8.959
6	1.058	0.9	4890.09	540	9.055
7	1.68	1.515	5106.67	580	8.804

### 5. TESTS AND RESULTS

**Table 4.** Water tests and its Results

Sr. No.	Test	Result obtained	Permissible Value (As per WHO)
1.	pH	7.02	6.5 to 8.5
2.	Turbidity	Nil.	5mg/lit to 10mg/lit
3.	Acidity	14 mg/lit	less than 200mg/lit.
4.	Alkalinity	44 mg/lit	100 mg/lit
5.	Hardness	65 mg/lit	300mg/lit to 600mg/lit

### 4.3.3 For Other College Activities:

1] Cleaning of tiles-

In summer and winter season- 128 lit. /day

In rainy season- 160 lit. /day

So, avg. requirement- 144 lit. /day

2] Washing utensils- 24 lit. /day

3] Gardening- Whole water is supplied through wastage water.

4] Laboratory practicals- 2 lit. /day

Total average daily water consumption including losses

= For drinking water + for flushing purposes + for other college activities

$$= 1023.29 + 4901.28 + 170$$

$$= 6094.57 \text{ liters.}$$

Total average daily actual water consumption = 5930.04 liters.

Total average daily loss of water = 164.53 liters.

### 6. CONCLUSIONS

With the help of this project we are able to-

1. To find out real losses due to pipe leakages, over flow & un-authorized connections.
2. To check unwanted excess usage of water.
3. To Identify priorities area which need immediate attention for control and maintenance.

### 7. SCOPE AND FURTHER STUDY

1. Water audits provide decision making tools to utility managers, directors, and operators. i.e., knowing where water is being used in your system allows you to make informed decisions about investing resources such as time, and money.

2. Water audits allow managers to efficiently reduce water losses in the system.

3. Reducing water used at the source may even result in delaying or avoiding capital investments such as a new well, more treatment technology or additional water rights.

4. Water audits also identify which water uses are earning revenue for the utility and which water uses are not. Thus, System personnel can increase revenue by ensuring all appropriate uses are being accurately measured. This leads to more financial capacity in the water system, reduced cost per customer and better management of the water resource.

5. Creating awareness among water users i.e., customers can see and understand that the utility is taking proactive steps to manage wasted water and save for the future.

**8. REFERENCES**

- 1) Amol A.Kulkarni, Avinash A. Patil, and Balasaheb B. Patil“Water Audit: A Case Study of Water Supply Scheme of Shrivardhan”. Journal of Computing Technologies (2278 - 3814) / # 5 / Volume 3 Issue 6, 12 June 2015.
- 2) K. S. Renukumar, Dr. Pushpa Tuppad, “Water Audit in Distribution Network By Establishing District Metered Area (DMA)”International Journal Of Civil Engineering And Technology (IJCEIT), Volume 5, Issue 9, September (2014).
- 3) Mansi Master, Khushbu Gandhi, “Water audit and inevitability of water meter” International Research Journal of Engineering and Technology (IRJET) Volume: 04 Issue: 04 | Apr -2017.
- 4) Ramraje D. Sonvane<sup>1</sup>, Dr. P. B. Nagarnaik<sup>2</sup>, Dr. V.P. Thergaonkar<sup>3</sup>, A Review - Water Audit, International Journal of Software & Hardware Research in Engineering ISSN-2347-4890 Volume 4 Issue 2 February, 2016.
- 5) Pramod Kumar Mahish, Water Audit: A Case Study of Govt. Digvijay Autonomous Post Graduate College Rajnandgaon, Chhattisgarh.

**BIOGRAPHIES**



**Asst. Prof. P.R. Thorat**  
ADARSH INSTITUTE OF TECHNOLOYAND RESERCH  
CENTRE, VITA.



**Mr. Ajay Laxman Mohite**  
ADARSH INSTITUTE OF TECHNOLOYAND RESERCH  
CENTRE, VITA.



**Miss. Dipalee Vinayak Jadhav**  
ADARSH INSTITUTE OF TECHNOLOYAND RESERCH  
CENTRE, VITA.



**Miss. Siddhi Sunil Paramane**  
ADARSH INSTITUTE OF TECHNOLOYAND RESERCH  
CENTRE, VITA.



**Mr. Suraj Ananda Pawar**  
ADARSH INSTITUTE OF TECHNOLOYAND RESERCH  
CENTRE, VITA.



**Mr. Sumit Babanrao Thorat**  
ADARSH INSTITUTE OF TECHNOLOYAND RESERCH  
CENTRE, VITA.