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Assessment and Optimization of Water Usage: A Case Study of Government Polytechnic Karad

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Abstract - *This project describes about the" Rural Development (Water Audit of GPK Institute Campus".) water audit is performed in the college with various aspects of water such as sources, supply, utilization, disposal etc. On location perception and talk with the related staff was taken up to get the information. Bore wells fulfil the all requirements of institute. Water audit is a powerful control device for minimizing losses, optimizing numerous makes use of and accordingly permitting sizeable conservation of water. Water audits stability the quantity produced with the quantity billed and account for the closing water (loss). Comprehensive audits can provide the software an in-depth profile of the water delivery device and water users, permitting less difficult control of assets and advanced reliability. It is an essential step toward water conservation and, if connected with a leak detection plan, can keep the software a good-sized sum of money and time.*

Key Words: - Water audit, Non-revenue water (NRW), effluent unaccounted for water (UFW),water conservation

1.INTRODUCTION

The water audit displays the volume of water that the consumer uses, enters, and exits. A water audit is a systematic, empirical investigation of the water accounts for the project. It provides a rational, empirical framework that categorizes each use of water in your system. It is an instrument to counteract shortages, leakage, and systemic losses. A water audit can be used to identify and quantify the steps that can be taken to reduce water use and losses. In addition to providing solutions for various water-related problems, water audits and their analysis have the potential to save valuable public cash. A water audit is the most effective instrument for controlling water.

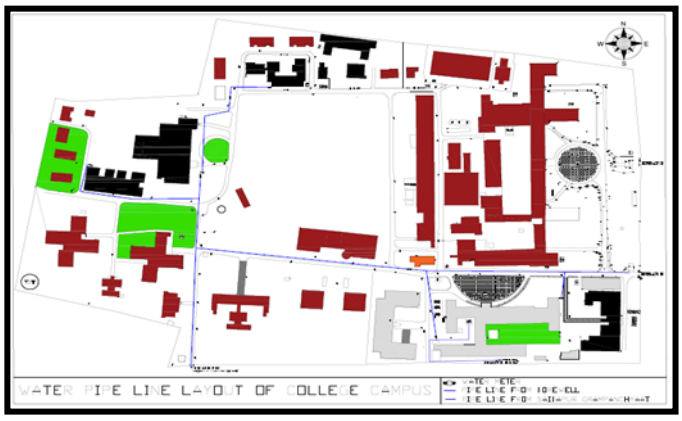

Fig.1 Existing Pipe Distribution Network

1.1 OBJECTIVES

- To determine the actual losses brought on by overflow, unauthorized connections, and pipe leaks.
- To determine which areas, require control and maintenance measures to be taken immediately.
- To monitor excessive and unnecessary water use and waste.

2. LITERATURE REVIEW

2.1 R.A.Ganorkar, Isha. P. Khedikar, Nagpur.

They proposed that although water resources are limited globally, the globe has an endless supply of water. population growth. Throughout history, the emergence of civilizations has been largely dependent on the development of water supplies for human use. However, there are fewer high-quality water resources available as our populations continue to expand and change. The building of cities in arid regions, pollution, and climate change are a few of the elements aggravating the changing supply and demand imbalances. Man must use the water resources that are currently available as carefully and effectively as possible to account for this. A logical, scientific foundation for classifying all of the water use in your system is provided by water audits. In order to address issues linked to shortages, leaks,

and losses caused by drought, the American Water Work Association (AWWA) and the International Water Association (IWA) launched a comprehensive effort to assess the aforementioned issues with the use of audits.

2.2 Pramod Kumar Mahish,Chennai

A component of green or environmental audits is the water audit, which is defined as the examination of work done inside of firms whose operations may pose a risk to the environment and public health. The National Assessment and Accreditation Council (NAAC) considers this aspect seriously when evaluating the educational institution. Accordingly, a water audit covering several areas of water, including sources and supplies, is carried out in the college. Use, discarding, etc. In order to obtain the information, a discussion with the relevant staff about perception was held. Bore wells meet all of the institute's requirements and are a requirement for staff colonies. provided by the municipality. Water from the institution is consumed by the following areas: laboratories (30–35%), gardens (20–25%), restrooms (15–20%), boys' hostel (15–20%), drinking water (10–15%), sports fields, and other areas (5–10%). Seepage in the previous construction, water reuse, and lack of rainwater gathering are the reasons for the institute's transformation. concluded that while the institute has its own water supply and source based on necessity, there were still areas for improvement.

3.METHODOLOGY

3.1 Water Supply and Usage Study

To comprehend the existing water utilization and project future requirements, an examination of the availability of water sources and historical consumption trends for different sectors is required. It is imperative to take into account data pertaining to the advancement of sustainable water sources, including those derived from the adaptive reuse of wastewater.

3.2 Process Study

Direct eye observation was utilized to precisely measure the amount of water each user received, accounting for both drinking and non-drinking applications. Water is also utilized in a variety of ways in the day-to-day operations of colleges, such as gardening, manual labour, cleaning, restroom flushing, food preparation, sprinkling, and so forth. Future system updates, additions, and modernizations will benefit from this research as well.

3.3 System Audit

Examination of the current water usage and systems for various sectors in routine college activities such as gardening, practical work, flushing toilets and washrooms, cleaning corridors, preparing some food and drinks, sprinkling lawns, and other tasks is necessary to determine their level of upkeep and operational efficiency.

3.4 Discharge Analysis Input data:

It is necessary to investigate the effluents from companies, irrigation return flows, and home wastewater to ensure that they meet environmental regulations and that there is a chance to recycle waste water and recover valuable byproducts.

3.5 Report Water Audit

1. A water audit report may, contain
2. Quantity of water allotted for a specific activity.
3. Water loss and system efficiency, as well as the causes of such losses.
4. Recommended actions to reduce water loss and boost effectiveness.

3.6 Tests Performed

It is crucial to conduct a variety of tests on water to ensure its quality. This will provide insight into the quality of water that is fit for human use.

Following tests are performed:

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

4. VISUAL EXAMINATION AND COMPUTATION

Table 1. Visual Examination

Pipeline from	Pipeline e to	Capacity of storage tank	Diameter of pipe	Power of Pump or Motor
Gram panchayat Saidpur	College storage tank	20,000 liters	4 inches	-
Bore well	College storage tank	20,000 liters	2 inches	5 HP
Gram panchayat Saidpur	Drinking water tank	60 liters	1 inch	RO plant

4.1 Process Study Data Input:

Phase I (New Building, Main Building & Workshop)
Total consumer of Institute:

- Total staff = 210 Nos
- Total students = 1839 Nos
- Total supply water :-

Grampanchyat = 514500 liter, per month.

Borewell = 125000 liters, per month.
College working days consider 26
Total water supply per day 24596.15 liter from both sources.

Table 2. (Flushing + Toilet + Basin) use by per consumer.

Day	Per head consp.	Total consumer	Actual consumption
1	10.185	2049	20869.06
2	10.185	2021	20583.88
3	10.185	1900	19351.5
4	10.185	2021	20583.68
5	10.185	2010	20471.85
6	10.185	2007	20441.29

Total Consumption per day average **20383.57 liter/day.**

Table 3. For drinking purpose

Day	Per head consumption in liter	Total consumer	Actual water consump.
1	1.454	2049	2979.24
2	1.454	2021	2938.53
3	1.454	1900	2762.6
4	1.454	2021	2938.53
5	1.454	2010	2922.54
6	1.454	2007	2918.17

Average = 2909.93 liter/day

• Regarding Additional College Activities:

1. Cleaning of tiles :- 245 liter / day.
2. Chemistry laboratory 30 liter / day.
3. Geotechnical lab. 45 liter / day.
4. Gardening. 150 liter / day.
5. Physic laboratory. :- 20 liter / day.

Total daily average consumption :
For drinking + for flushing / basin / toilet / for other all activity.
2909.93 + 20383.57 + 245 + 30 + 45 + 150 + 20
= 23783.5 liter /day.
• Actual water supply = 24596.15 litre.
Total daily average loss = 24596. 15 – 23783.5
= 812.65 liter/day

Phase II (Girls Hostel)
Source of water :- Grampanchyat Saidapur
Total supply of water considering
= 16761.11 liter / day
Considering 30 days:
• Consumer :- 160 girls.
• Water Consumption :-
1.For bathing = 3.5 liter / Capita / day.
2. For toilet = 3 .5 liter / Capita / day .
3. For drinking = 3 Liter / Capita / day .
4. For washing cloth and other activity
= 25 lit / day / cap.
• For mess. = 600 lit / day.
• Gardening. = 40 lit / day .
Total Consumption per day = per capita activity ×Consumer)+ mess+ Gardening
= (98 × 160) +800 +40
Consume = 16520 liter / day.
• Actual water supply = 16761.11 lit / day.
• Total daily average loss = 16761.11 – 16520 .
= 241.11 liter /day.

Phase III (Boys Hostel)
Source of water :- Grampanchyat Saidapur
Total supply of water = 19000 liter / day
Considering 30 days .
Consumer = 240 student.
Water consumption :-
1. For bathing = 30 liter / day.
2. For Toilet = 30 liter /day .
3. For Drinking = 3 Liter / day.
4. For wash cloth and other activity = 15 liter / Capita.
• Total Consumption per day :-
= (per capita activity × consumer)
= (78 × 240)
= 18720 liter / day.
Total daily average loss = 19000 - 18720
= 280 liter / day

Phase IV (Canteen)
Source: Grampanchyat Saidapur.
Total supply of water = 1711.53 liter / day .
Considering = 26 days.
Canteen all activity use of water = 1650 liter / day.
Total average loss = 1711.53 – 1650
= 61.53 liter / day.

5. RESULTS

Results are obtained by performing above tests mentioned in 3.6

Table 4. Water Test and 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	14mg/lit	less than 200mg/lit.
4.	Alkalinity	44 mg/lit	100 mg/lit
5.	Hardness	65 mg/lit	300mg/lit to 600mg/lit

6. CONCLUSION

Following conclusion are obtained from above results:

1. The executive summary acknowledges the collaboration with Government Polytechnic Karad for the water assessment study and highlights the key findings, observations, and recommendations for water reduction. It outlines the scope of the water audit and the measures proposed for conserving water resources.

2. The project examines a water audit at Government Polytechnic Karad, focusing on water distribution, leaks, fixtures, and consumption patterns, suggesting measures like replacing high-flow fixtures.

3. The project report provides important information about the value of water audits, how well they are carried out, and the possible benefits of putting water conservation measures into place across a range of industries.

7. REFERENCES

1. C.G. Shruthi, N.S. Sathisha, and P. Jeevitha, Water Auditing of Chikmagalur Water Supply Scheme, Journal on Environmental Science, Computer Science and Engineering & Technology. 2013, Page No.1088-1093.

2. Kenneth Bedu-Addo, William Gariba Akanwariwiak, Isaac Frimpong Mensa- Bonsu, "Water Audit of Breweries: A Case Study of a Modern Brewery in Ghana" Universal Journal of Environmental Research and Technology, 2013 Volume-3, Page No. 311-317.

3. General Guidelines for Water Audit & Water Conservation, Government of India Ministry of Water Resources, December 2005.

4. Rathi Dinesh (2005), "Water audit in National scenario National conference water management conservation and sustainable development. Abstract Vol 1, pp 26-27.

5. Rathi Dinesh (2005), "Water audit in National scenario National conference water management conservation and sustainable development. Abstract Vol 1, pp 26-27.

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