

Industrial Water Audit

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Abstract- A water audit is an on-site survey and assessment of water-using hardware, fixtures, equipment, landscaping, and management practices to determine the efficiency of water use and to develop recommendations for improving water-use efficiency. The selected Industry for Industrial Water Audit is Sanjay Techno Pvt. Ltd, MIDC, Waluj, Aurangabad. The study reveals that the systematic approach towards water audit helps the industry to conserve the water and savings of water through appropriate measures. Reduction in leakages, carrying out roof top rain water harvesting works, making consumers aware about water consumption and allied water loss and expenses help the judicious utilization of water. The nature of water audit technique may differ from industry to industry as per quality and quantity of consumed water, processes carried out in industry, number of personnel in the industry, water using hardware and generated waste water.

Keywords-

1. MIDC-Maharashtra Industrial Development Corporation
2. CETP- Common Effluent Treatment Plant
3. RTRH- Roof Top Rainwater Harvesting
4. STPL-Sanjay Techno Private Ltd.
5. 3P Stages- Pre Audit, Process Audit and Post Audit.

I. INTRODUCTION

Water is a precious natural national resource with almost fixed quantum of availability. With continuous growth in country's population, per capita availability of utilizable water is going down. Unabated discharge of industrial effluents into water bodies is further aggravating the situation of scarcity of water of acceptable quality. The highly variable rainfall in Maharashtra ranging from 400 to 6000mm occurs in 4 months period. Declaring water conservation a national mission, in June 2003, the Prime Minister of India, appealed to all countrymen to collectively address the problem of alarmingly progressive water shortage, by conserving every drop of water and suggested for conducting water audit for all sectors of water use.

II. WATER AUDIT

A. Introduction-

Water audit is a qualitative and quantitative analysis of water consumption to identify means of reducing, reusing and recycling of water. Water audit determines the amount of water lost from a distribution system due to leakage and other reasons such as theft, unauthorized or illegal withdrawals from the systems and the cost of such losses to the utility. Elements of water audit include a record of the amount of water supplied and stored by various sources, water

consumption, water delivered to unmetered users, water loss and suggested measures to address water loss, waste water generated and treated etc..

Industrial water use audit examines the major areas which includes water used by industrial process, human consumption, personal hygiene & sanitation, washing, cleaning, , gardening etc.. In Aurangabad, according to recent study; for Maharashtra Industrial Development Corporation (MIDC) area, water rate supplied by MIDC is Rs.16/m³.

B. Benefits of Water Audit-

1. Water audit improves the knowledge and documentation of the distribution system, problem and risk areas and also better understanding of what is happening to the water after it leaves the source point.
2. Leak detection programs help in minimizing leakages and tacking small problems before they become major ones.

These programs lead to:

- a. Reduced water losses.
- b. Improved financial performance.
- c. Improved reliability of supply system.
- d. Enhanced knowledge of the distribution system.
- e. Efficient use of existing supplies.
- f. Better safeguard to public health and property.
- g. g. Reduced disruption, thereby improving level of service to customers.

3. Water audit creates the foundation for a broader plan.

C. Approach and Methodology for Water Audit-

The water audit is completed in 3P stages. These stages are:

1. Pre audit includes collection of primary data regarding sources of water, water consumption of various purposes, waste water generated, etc.

Steps followed in pre audit are:

- a. Water supply and usage study.
- b. Process study.

2. Process audit is the examination of system to determine whether the water is being consumed efficiently and effectively.

3. Post audit includes following steps.

- a. Awareness in system about water conservation.
- b. Documentation of Water consumption and time to time remedial measures

III. CASE STUDY

The selected Industry for “Industrial Water Audit” is Sanjay Techno Pvt. Ltd, MIDC, Waluj, Aurangabad.

A. Pre Audit:

1. Basic information about industry;

Sanjay Techno Pvt. Ltd. is located in the MIDC Waluj of Aurangabad district in the state of Maharashtra according to the state administrative boundary. The industry is spread over an area of 18,000 ft². Sanjay Techno Products Pvt. Ltd. deals with manufacturing of plastic products and various plastic molding works.

2. Water Supply to the Industry;

Sanjay Techno Pvt. Ltd. has water supply from the Maharashtra Industrial Development Corporation (MIDC), Waluj, Aurangabad and it acts as a primary source of water. Majority of water requirement is fulfilled by MIDC water supply and the remaining is supplemented by private water tankers.

Generally, in the period of March to June, water supply by MIDC is lowered and hence requirement of private water tankers is increased. Approximately, 25 tankers of 5000 lit each are required per month during this period. The incoming water from MIDC is measured by the ‘water flow meter’ available at the entrance of the industry.

B. Process Audit:

1. Water Consumption of Industry;

In this industry, water is required for following purposes:

a. For Industrial Processing:

The industry requires water for the purpose of chilling the heated components (chilling process). 2500 liters is a water evaporation loss per day for this process; thus, 75m³ per month water is lost as evaporation.

Wash out of recycled water is 8m³ per month.

Hence, total water consumed for industrial processing is 83m³ per month.

TABLE I
INCOMING WATER QUANTITY (IN M³)

Source	Aug-16	Sept-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	March-17	April-17	May-17	June-17	July-17
MIDC	432	283	478	402	326	256	295	174	244	326	217	334
Tanker	-	-	-	-	-	-	-	125	125	125	125	-
Roof Top Rainwater Harvesting	Only 20 ft. * 20ft. area used for this purpose. Other area is yet to be used.											

b. For Domestic Use:

The company runs in three shifts. Total number of persons working in the industry is 180. The domestic demand of water includes water requirement for the toilets, basins, urinals, drinking, etc.

- Toilets – 9 Nos.
- Urinals – 7 Nos.
- Basins – 7 Nos.

Various types of taps are used for consumption of water by personnel. The leakages through taps are related with type of taps and habits of workers. The various types of water taps are shown in Table No.2

TABLE II
SPECIFICATION OF TAPS USED IN INDUSTRY

Source	Quantity	Type of Tap
Basins	7	Rounded cap
Urinals	7	Push button
Latrines	9	Single lever handle

The water required for the domestic use is assessed by discussion with consumers. Considering the water consumption for drinking, washing of hands and toilet purpose, the average consumption works out to 20litre/day/person. Thus 20 x 180 =3600 lit/day water is consumed for domestic purpose.

Hence approximately 108m³ of water is consumed for domestic use per month.

c. For Other Purposes:

It includes water requirement for the gardening, washing, etc.

Garden area is about 110 sq m.. Number of plants in the factory premises is 70.

For the purpose of gardening, the water is provided three times per week. Water from the MIDC is used for the purpose of gardening. Thus, 30m³ water is required for gardening purpose per month. Therefore, Total average water consumption per month works out to 221m³.

TABLE III
EXPENDITURE INCURRED FOR INCOMING WATER (IN RS)

Source	Rate	Aug-16	Sept 16	Oct- 16	Nov-16	Dec-16	Jan -17	Feb -17	Mar-17	Apr-17	May-17	June-17	July-17
MIDC	Rs 16 /m ³	7392	5008	8128	6912	5696	4576	5200	2597	4384	7899	7952	8079
Tanker	Rs 90 /m ³	-	-	-	-	-	-	-	11250	11250	11250	11250	-

2. Observed Water Loss Due to Leakage;

From 4 washrooms:

1. Tap of Urinal:
Leakage = 32.12 lit/hour (23.563 m³/month)
2. Tap of Toilet:
Leakage = 32.12 lit/hour (23.563 m³/month)
3. 3 Taps at Urinal:
Leakage = 3 lit/hour (2.160 m³/month)
4. 3 Taps at Toilets:
Leakage = 3 lit/hour (2.160 m³/month)
5. At Water loader:
Leakage = 4.2 lit/hour (3.024 m³/month)

Thus total leakage is 63.109 m³/month.

Water rate= Rs 16/ m³

Thus total Cost of leakage water is Rs 1376.86 per month i.e. Rs 16,522.32 per year. Though the amount seems to be meager, considering the fact that each drop of water is precious, we can save huge quantity of water by prohibiting the leakages of water through taps for entire industrial area.

On an average, this wasted quantity of water can fulfill monthly water requirement of 3 to 4 families.

3. Total Water (Consumption + Leakage);

From the incoming water details of industry, it is observed that, average incoming water is 306m³ per month.

From above details, total consumed water = 221m³.

Total leakage of water = 64m³.

Following pie chart shows the details of water consumption.

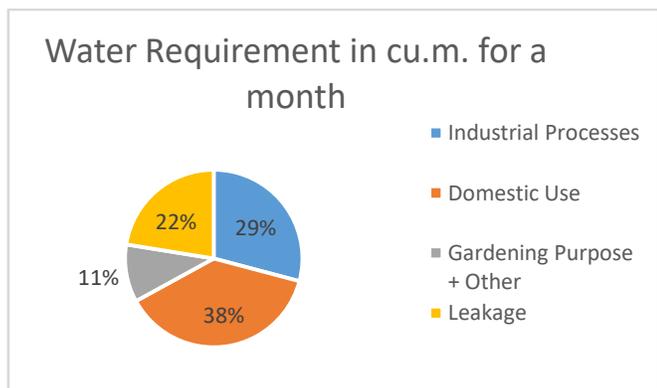


Fig.3 Details of Water Consumption

4. Sources of wastewater;

- a. Processed water obtained after the chilling process
- b. Processed water obtained from the annealing tank.
- c. Domestic sewage water obtained from the basins, toilets, urinals, etc.

The wastewater is sent to the common effluent treatment plant (CETP) of the Waluj, MIDC area.

C. Post Audit:

1. Awareness in system regarding water conservation;

For accurate understanding of water consumption by each individual in the industry, a survey is conducted regarding details of daily water usage.

Following actions are taken for optimal use of water:

- a. Posters and stickers are pasted at proper places which has created awareness among workers and staff. These posters are made in local language and the pictures on the same has made the consumers to save water and use it judiciously.
- b. Numbers were assigned to every taps and tanks so that the tap can be identified easily for repair purpose. Similarly, each toilet, taps, tanks, general drinking water taps, etc. are numbered.
- c. Workers are briefed about importance of water conservation.

2. Suggestions for water conservation;

Following suggestions are given to the administration of the industry. These suggestions are more or less applicable to all industries for water auditing and water savings.

- a. The water leakages through taps can be minimized by fixing the problems in plumbing system.
- b. Push taps can be provided in basins/toilets to minimize water use.
- c. Drip irrigation can be taken into practice for the purpose of gardening, to optimize the consumption of water.
- d. Roof Top Rainwater Harvesting (RTRH) works shall be completed on top priority.

IV. CONCLUSION

Water audit is a qualitative and quantitative analysis of water consumption to identify means of reducing, reusing and

recycling of water. Water audit is important for the management of water usage for industries. With the help of water audit one can find the leakage and calculate the losses in the system.

As per the need of industry Sanjay Techno Private Ltd., (STPL) Waluj, Aurangabad, Pro-forma for water audit is developed. With the help of this pro-forma the information is collected. The data is useful for water auditing and allied measures. Primary data regarding sources of water for the industry, consumption of water for various purposes, leakages in the system, etc. is collected and analyzed. Monthly consumption of water in the industry is about 306 cum. The leakages observed are about 64 cum per month. The water audit can help to reduce the water losses in the industry as well as to save the expenditure.

Awareness program is conducted among staff of the industry to aware about water conservation and water savings. Along with awareness, remedial measures are taken and suggested. Roof Top Rainwater Harvesting is suggested. The leakages were detected and repaired. The posters and symbols are

installed within the industry to save water. The numbering system for water storage tanks and taps is done, which will be useful to industry for maintenance of water tanks and taps in future.

ACKNOWLEDGEMENT

Authors are grateful to Mr. Prasad Kokil (Managing Director, Sanjay Techno Products Pvt. Ltd., Aurangabad, Maharashtra for extending help to carry out study.

Authors are grateful to Dr. U J Kahalekar, Professor in Civil Engineering Department, Government College of engineering Aurangabad, for valuable guidance during study.

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