International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES)
Impact Factor: 5.22 (SJIF-2017), e-ISSN: 2455-2585
Volume 5, Issue 06, June-2019

Water Management is influenced by Smart (AMR) Water Metering

Mr. Sunil Sawardekar, Dr Arunkumar Dwivedi, Ms. Swati patil, Ms. Pranoti Sabale

[1]*PG Student, School of Engineering & Technology, Department of Civil, Sandip University Nashik*
[2]*Dean (Acadmics & Engineering), Sandip university, Nashik*
[3]*Assistant professor, School of Engineering & Technology, Department of Civil, Sandip University Nashik*
[4]*Assistant professor, School of Engineering & Technology, Department of Civil, Sandip University Nashik*

Abstract
This paper serves as a guideline to us for developing and globally deploying smart water metering as a part of the urban water management. Identifying the potential that smart metering holds over revolutionizing the whole consumer engagement and water management of urban water.

Water is the origin of life on earth. Every living organism is somehow dependent on water to sustain their life. There is no Life without Water. Thus, Water is Life! And now, thousands of years after that first living cell was originated, we have evolved, we have developed and we have created such a scenario that this Life is in danger now as we have been ignorant towards this inexpensive and plentiful utility.

Water is a basic necessity but the ability to pay for it in India is very limited. If the water is lost in distribution . When Transmission, Supply systems are reduced then only it is possible to deliver water in the areas which not receiving the water supply properly. This greatly improves the revenue of the organization with comparatively lesser investment.

The major portion of the total usable water is wasted as leakage, some of it is lost to inaccurate metering, and the rest is wasted in unauthorized use, and only some of it is delivered to customers. A water audit helps determine end point of the water and how much of it managed to get there. The depth of detail in the water audit varies on the basis of the information available in the system.

Shirpur, a city suffering from water crises due to scanty rainfall. So, to escape this problem, they accepted mission save water by installing 14000 smart meters they save Daily 20 lakh liters of water.

INTRODUCTION

Water is the origin of life on earth. Every living organism is somehow dependent on water to sustain their life. There is no Life without Water. Thus, Water is Life! And now, thousands of years after that first living cell was originated, we have evolved, we have developed and we have created such a scenario that this Life is in danger now as we have been ignorant towards this inexpensive and plentiful utility.

Water being an essential resource for all life on the planet, it is desperately needed to sustain life. Of the resources of Water available on Earth, only three percent of it is fresh (drinkable) and the major portion i.e. two-thirds of that freshwater is unfortunately locked up in ice caps and glaciers. Of the remnant, puny one percent, a fifth part is in the extremely inaccessible, remote areas. Seasonally varying rainfall and floods cannot easily be put to an use. With the ascent of time, water is beginning to be more and more scarce such that the access to clean, safe and drinkable water is limited among most countries. Only about 0.08 percent of all the world's fresh water remains un-exploited by mankind at present. It's a very big issue in this ever increasing demand for sanitation, drinking, manufacturing, leisure and agriculture. As a result of this small percentage, optimized utilization of the remnant fresh water left from natural resources has been a challenge in several locations worldwide.
The first and easiest step to be taken by councils towards sustainable urban water management is Demand Management. Only this step can have a significant impact on the bottom line.

WATER AUDIT

As a human being, our needs never end, thus, the usage of water everywhere is way greater than the resources that we have. Now, with increase in population, the demand for water consumption has hiked up exponentially. To streamline this problem, Measurement of Water or Audit of Water is must. Water Audit gives you the scientific, rational information of your system, its purpose is to do actual calculation of the water use by the concerned body.

Water Audit determines the shortage, leakages, losses of Water and it helps to maintain the water balance of the city/ organization/ system etc. Through water audit we can calculate the non revenue water, it is a fantastic tool to regenerate the system and for water management.
Effective management of non-revenue water (NRW) could be one of the possible solutions for improving the finances of ULBs. NRW management is very beneficial for concerned organization, city, system etc, due to its effective resource utilization, effective utility management, consumer satisfaction and postponement of capital, intensive addition to capacity.()
As per the current scenario in developing countries, the water losses in systems are 40 to 60%, due to the leakage and NRW issues. But as prescribed by MOUD/CPHEEO it should be below 15%.
Water is a basic necessity but the ability to pay for it in India is very limited. If the water is lost in distribution. Transmission, Supply systems is reduced then only it is possible the areas which not receiving the water supply properly are getting the water and it results improve the revenue of the organization with competitive lesser investment.

AMR - automated meter reading
Automatic collection of metered data and transfer of that data to a central database for the purpose of analysis and billings is carried out generally by equipments called "smart meters". Detailed data of water usage can be collected on a continuous basis at regular intervals (for example, every 30 minutes). This data can be read remotely via an automated process, with the utilization data being sent to the utility's management and billing system. AMR can comprise of a wide range of varying methods, from a simple drive-by meter (a cruising down meter reader on the street automatically downloading the meter data) to one way communications with the utility.

• AMI - advanced metering infrastructure
Begins with smart meters and goes on to adding two-way communication between the meter and utility, and also between the meter and consumer. It can be concluded from this that, in addition to garnering accurate readings, the meter can also act as a receiver to the instructions sent from the utility or consumer.

OBJECTIVES
- To reduced costs associated with field visits and customer calls
- To improved billing accuracy and improved cash flow
- To improved outage information and response
- To more efficient asset management and distribution engineering design
- To greatly grow the revenue collected from water which has been previously unaccounted for
- Reduction in meter reading expenses that takes into both, the regular cycle reading and special reads
- Reduction in the issues concerning the safety / security
- Service that's inclined towards customer satisfaction
- Play a part in recognizing and pinpointing the losses (customer and system)
- Help keep a check on theft of service
- Billing that's more efficient
- Better cash flow
- Improved Conservation/Efficiency
- Provides output management and detection
- Other impalpable benefits

The Use of Water Smart Meters

Improvements in understanding the consumption of water and flow patterns
- Tracking and prediction of changes in trends and demands
- Highlighting the anomalous behaviors
- Warning in case of high or low flows
- Identification of leakages and other opportunities to waste minimization
- Water consumption's shifting to the other parts of the day

City-Wise Analysis of Metropolitan Cities in India

Hyderabad

The Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB) is a statutory authority in charge of providing and maintaining water supply and sewerage facilities in Hyderabad. The Board is at present serving Hyderabad city covering a population of 5.05 million and also provides bulk supply to peripheral areas. It has adopted the geographical coverage method to estimate the population served. HMWSSB estimates that its water supply network covers about 66% of the service area either through direct service connections or public water points; 63% of the connections are metered. With a little over half the population being metered, the HMWSSB claims a recovery of 69% of its cost .
According to service level benchmarking indicators, the NRW of Hyderabad is at
38% of the total water supplied. Based on the extent of metering and total NRW, further division of NRW is calculated as: (1) apparent losses, (2) real losses, and (3) unbilled authorized consumption. The apparent losses stand at 23% of the total NRW and the real losses at about 49% of the total NRW. The unbilled authorized consumption stands at 28% of total NRW (Figure 7). By this we can observe that a fourth of the lossesoccur at the consumer level and 2/4th at the distribution end (refer Appendix 2 for calculations). This implies that the utility incurs huge revenue losses due to distribution related losses (leakages, etc.).

Delhi

The responsibility of production and distribution of potable water after treating raw water rests with the Delhi Jal Board (DJB) from numerous resources like river Yamuna, Bhakra storage, upper Ganga canal and groundwater sources. The DJB provides water in bulk to the New Delhi Municipal Council (NDMC) and cantonment areas. It has adopted the geographical coverage method to estimate the population served. According to the current estimates, its water supply network covers about 71.5% of the service area either through direct service connections or public water points. 55.3% water connections are metered. With moderate metering, the DJB recovers 41.4% of its cost, which shows that the losses are happening at the consumer and distribution levels. In spite of 71.5% coverage, the cost recovery is only 41.4%The huge gap in the cost recovery, coupled with poor metering in the nation's capital points to gross mismanagement of distribution along with poor revenue collection systems of the DJB According to service level benchmarking indicators, the NRW of Delhi is 52.4% of the total water supplied. Based on the extent of metering and total NRW, further division of NRW was calculated as: (1) apparent losses, (2) real losses, and (3) unbilled authorized consumption. With a metering penetration of 55.3%, the unbilled authorized consumption accounted for 68%, apparent losses 16% of total NRW, and the real losses about 16% of total NRW (refer Appendix 2 for calculations). From this we can conclude that the losses are occurring at the distribution and consumer levels. A majority is going through public stand posts (unbilled authorized consumption). This implies that the NRW Losses – Delhi

Pune

The Pune Municipal Corporation (PMC) provides water supply and sewerage services in the city of Pune. The total amount of water that PMC lifts is approximately about 1,100 MLD. As per the PMC (2010), the city's yearly requirement of water is around 14 TMC. Having adopted the geographical coverage method to estimate the population served with water service, the PMC estimates that its water supply network covers about 94% of the service area through direct service connections. Of this, only 30% are metered connections. The metered installations appear very low, yet the PMC claims to be recovering 70%

of its cost. This may be attributed to the presence of a large number of bulk consumers which allows the PMC to recover revenue twice the production cost incurred. Further, the PMC data shows that 30% of the total water supplied is NRW (WSP, 2008) . When combined with the data on the percentage of metered connections (30%), the data reliability of the claim with regard to NRW and actual consumption is questionable. In reality, it may be
estimated to be much higher than the actual figures indicated. However, going by the official statistics of 30%, it is still a high incidence of NRW which has prevented the utility from recovering revenue from the users. In other words, the utility is incurring huge potential revenue losses due to NRW. Based on the data on metered consumption (30%) and the total NRW (30%), we can arrive at the percentage of real losses versus apparent losses. In Pune, with 30% of metering, the apparent losses notified are 39% of total NRW and the real losses are about 30% of
total NRW . From this, we conclude that the losses occur at the consumer level and are almost three times of the losses that occur at the distribution level. This implies that metering inaccuracies, thefts and unbilled water supply are the major problems associated with NRW in Pune. The unbilled authorized consumption is
31% which is supplied through public stand posts. Needless to say, a loss to utility.

Now the latest example of smart metering is the effective tool for Water Management is Shirpur city at Dist. Dhule of Maharashtra. Shirpur, a city suffering from water crises due to low rain so for thet they accepted mission save water by installing 14000 smart meters they save Daily 20 lakh liters of water.

CONCLUSION

It is very clear from above study after water meter are installed the water usage is decreased after water meter installed. water usage before and after the installation of water meter is seen pr day is per 1000 liter) which is a great thing. Water meter installation cost is apparently recovered in every month bill. Also this saved amount can be useful in development of water supply system, Due water meters installation considers the pipe losses. But the water losses in pipes and other system can be known. water meter is very essential step for management of water loss.

REFERENCES

1. Isha Khedkar Raisoni college of Engineering Water audit. August 2011 article
2. Mona N shah Thilak Babu Gottipati, Non –Revenue waterimparatives to improve water managemet of ULBs/WBs in Indian cities Art. Sept.12
3. IWA manual
4. Lon W House Phd, AMR/AMI for water utilities.
5. Water Audit Report prepared by NJSEI for Nashik Municipal corporation
6. Holmes Matthew (2007), "Water Use Auditing", New Mexico Rural Water association pp 1-20
7. Fanner V.P, Sturn R., J.Thornton (2007), "Evaluating Water Loss and Planning" manual, chapter 7 pp 7
8. Rathi Dinesh (2005), "Water audit in National scenario" National conference on water management.
9. Nguyen Cong Thanh (2006), "Non-Revenue Water Assessment" pp 1-14
10. Halcrow Water Services Appendices Report (2003)
11. Derek Matthews, History of Auditing. The changing audit process from the 19th century till date. Routledge-Taylor & Francis Group.
12. *Furness, Richard A. (1989). Fluid flow measurement. Harlow: Longman in association with the Institute of Measurement and Control.*
13. Helena Alegre, Jamine M. Baptista, Enrique Cabrera Jr, Francisco Cubillo, Patricia Duarte, Wolfram Hirner, Wolf Merkel, Renato Parena (2016), Performance Indicators for Water Supply Services, Vol. 2
14. Indian standard code 1172 (1993), Code of basic requirement of water supply, drainage sanitation, vol. 4
15. Intermittierender Wasserversorgung (M. Sc.). Karlsruher Institut fur Technologie (KIT), April 2006.
16. Lis Stedman: Motivations for metering, Water 21, The Magazine of the International Water Association, April 2006, p. 26-28
17. Ministry of water resource, Government of India (2005), General Guidelines for water audit and water conservation
18. Ofwat, Exploring the costs and benefits of faster, more systematic water metering in England and Wales, October 2011
19. Peter Mwangi Department of Physics Kenyatta University, PO BOX 43844, Nairobi, Kenya Elijah Mwangi School of Engineering University of Nairobi, PO BOX 30197, Nairobi, Kenya Patrick M. Karimi Institute of Energy Studies and Research Kenya P International Journal of Computer Applications (0975 – 8887) Volume 142 – No.12, May 2016 7 Ower Nairobi, Kenya

19. R.A.Ganorkar, P.I.Rode, S.A. Deshmukh and Dr.R.M.Dhoble (2013), Water-Audit-A Tool for assessment of water losses
20. Sapient Techno Consultants and Multi Media Consultants (2010), Preliminary water audit: Estimation of water losses and strategy for loss reduction
21. Water Research foundation (2015), Water audit in the united states: A review of water losses and data validity