Assessment of Non-Revenue water in District Meter Area (DMA)

Gaikwad Prashant L. and Pravin S. Chaudhari

Abstract— Every year more than 32 billion m$^3$ of treated water are lost through leakage from distribution networks. An additional 16 billion m$^3$ per year are delivered to customers but not invoiced because of theft, poor metering, or corruption. Increasing urban populations and expanded service areas, many water supply systems in Asia and the Pacific continent are struggling in providing pure drinking water to their consumers. In Asian cities there is common water supply problems related to the sources and use of raw water, irregular supply, and tap water quality at the consumer’s end. One of the major issues facing water supply system is the huge water loss in distribution networks. If a huge quantity of water that is supplied is lost, not fulfilling the consumer demands is much more difficult. Since this water results in NRW, heavy losses also make it difficult to keep water tariffs at a reasonable and affordable level. This situation is common in many Asian cities. “Non-Revenue Water” (NRW) defined as the difference between the amount of water put into the distribution system and the amount of water billed to consumers. Averages of NRW found to be 35% in the region’s cities and can reach much higher levels. While many efforts have been made for reducing NRW but not results in positive way in the developing world. While there are many explanations and excuses, much of the failure is due to under reckoning the technical difficulties and difficulty of NRW controlling, along with the potential benefits of taking action. In this thesis efforts have been made to analyses NRW problem by qualitative analysis instead of quantitative analysis by questionnaire survey and finally concluded the phenomenon that can reduce the NRW up to maximum extent.

Keywords- Non-Revenue Water, District meter area, leakages, questionnaire survey, qualitative analysis, Distribution network.

I. INTRODUCTION

In developing countries, about 45 million cubic meters are lost daily through water leakage in the distribution networks—enough to serve nearly 200 million people. Similarly, close to 30 million cubic meters are delivered every day to customers, but are not invoiced because of pilferage, employees’ corruption, and poor metering. A recent report by the Asian Development Bank (ADB) mentions a study performed by the South East Asian Water Utilities Network (SEAWUN) analyzing NRW levels of 47 water utilities across Indonesia, Malaysia, Thailand, the Philippines, and Vietnam, which concluded that the levels of NRW average 30 percent of the water produced, with wide variations among individual utilities ranging from 4 percent to 65 percent. The World Bank database on water utility performance (IBNET, the International Benchmarking Network for Water and Sanitation Utilities, at www.ib-net.org) includes data from more than 900 utilities in 44 developing countries. The average figure for NRW levels in developing countries’ utilities covered by IBNET is around 35 percent. It is likely that the 35 percent figure is less than the global NRW level in the developing world because large developing countries with known high levels of NRW are still not covered by IBNET and the utilities that report operating data tend to be the ones with the better performance levels, while the worst-performing utilities rarely report data or, if they do, the information is not reliable. The actual figure for overall NRW levels in the developing world is probably more in the range of 40–50 percent of the water produced.
Losses can be quantified into direct and indirect costs. Direct costs include property damage, damages to human health, environmental damage, loss of production, repairs costs, cleanup and remediation costs, etc. Indirect costs include litigation and contract violations, customer dissatisfaction, and political reactions, loss of market share, and government fines and penalties. (Hussam Fares and Tarek Zayed, Feb 2010)

The failures were examined by age, type of failure, and degree of spatial and temporal clustering for each of the four most common failure types: namely, joint, circular crack, longitudinal split, and hole. (I. C. Gowlter, 1989)

The estimated annual volume of NRW in urban water utilities in Asia is in the order of 29 billion cubic meters (m$^3$). Assuming a value of water of $0.30 per m^3$, Asia’s water utilities are losing nearly $9 billion per year. By cutting physical losses to half the present level (which is technically feasible), 150 million people could be Supplied with already-treated water. (Rudolf Frauendorfer et al 2010)

Aging water-distribution networks constitute a major financial challenge for municipalities and a capital issue for the service quality provided to citizens. (Babacar Toumbou et al 2013)

II. RESEARCH OBJECTIVE

To establish the level of contribution of accounting errors on the overall amount of non-revenue water. To determine the level of contribution of leakages and bursts on the overall amount of non-revenue water. Ease assessment of the utility’s water loss situation

III. CASE STUDY

Ambarnath is part of Mumbai Metropolitan Region (MMR). The name Ambarnath literally means Sky-Lord. Ambarnath lies on Mumbai to Pune railway route. Like all Mumbai suburbs Ambarnath is divided into Ambarnath East and Ambarnath West by the railway. Ambarnath west is in an industrial zone and is home to hundreds of small and large chemical factories.

![Fig. 1 Location of Ambarnath (DMA6)](image-url)
IV. METHODOLOGY

Fig. 2 DMA6

Fig. 3 Water main data collection process
V. MAIN STAKEHOLDERS OF THIS SYSTEM

1. Planner
2. Designer
3. Consultant
4. Site engineer
5. Plumber
6. Operator
7. Consumer

Questionnaire form are created for each stakeholders and accordingly questionnaire survey is carried out and accordingly responsibility of role of each stakeholders in NRW is concluded.

VI. RESULTS AND DISCUSSIONS

After doing site survey and taking meter readings in NRW DMA6 which includes major area such as Mohan Puram in Ambernath (East) in year 2015-2016 for the month of December-February is found to be 34.11%.

After doing qualitative analysis following suggestions to competent authority for reducing above NRW
1. For reducing loss competent authority needs good quality meter.
2. Replace the faulty meter as early as possible
3. Register all the meters.
4. By controlling above three points it can save up to 16.42% of NRW.
5. Give the training to plumbers for legal water connections and closing water connections.(this may reduce NRW up to 10% loss of water)
6. Use of advanced electric instruments for detecting water leakages. (This may reduce NRW up to 5%).
7. Give the training of operator. (This may reduce may NRW up to 2.69%).

VII. CONCLUSION

For reducing NRW for maximum content qualitative analysis is most necessary as compared to only quantitative analysis. by strictly adopting the above suggestions we can reduce NRW up to certain limit.

REFERENCES

[1] Babacar toubou , 2013 , General Model for Water-Distribution Pipe Breaks Development, Methodology, and Application to a Small City in Quebec, Canada DOI:10.1061/(ASCE)PS.1949-1204.0000135
[8] Genev’è Pelletier1; Alain Mailhot2; and Jean-Pierre Villeneuve3, April 2003 “Modeling Water Pipe Breaks—Three Case Studies”