

Non Revenue Water Reduction- A Tool for Achiving 24x7 Water Supply

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Abstract: The availability of water at cheaper rates promotes the wasteful use of water. People give little or no attention towards conservation of water. For sustenance of any water supply scheme it is essential that revenue collected should be sufficient to maintain O & M cost and further development activities. Presently there is major portion of Non Revenue Water (NRW) in the developing countries and there is urgent need to curb it for efficient functioning of water supply schemes.

Key Words: NRW, Non Revenue Water, 24x7 water supply

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I. Introduction

Water scenario in the world / world water inventory

The total quantity of water in the world is roughly 1357.5 million cubic kilometers (Mkm³). About 97% of this water is contained in the oceans as saline water and only 37.5 Mkm³ is fresh water. Out of this about 8.5 Mkm³ is both liquid and fresh and the remaining is contained in frozen state as ice in the Polar Regions and on mountains tops and glaciers[2]. Water demand is increasing day by day due to increase in population, urbanization, agriculture, industrialization etc. The groundwater table is falling rapidly throughout the world due to wide spread over pumping using powerful pumps. World is facing 'Silent Emergency' as billions struggle without clean water or basic sanitation as per reports of WHO and UNICEF. More than 2.6 Billion people – Over 40% of the world's population do not have access to safe drinking water. Water Scarcity in India is widespread in all states[5][6].

NRW levels in the World

The World Bank has estimated the total cost of Non Revenue Water (NRW) to utilities worldwide at US\$14 billion per year. Reducing by half the current levels of losses in developing countries, where relative losses are highest, could generate an estimated US\$ 2.9 billion in cash and serve an additional 90 million people. Most available data on NRW levels are expressed in percentage terms, ranging from 7% in Germany to more than 90% in Lagos, Nigeria. NRW levels are 10% in Denmark, 19% in England and Wales, 26% in France, 29% in Italy. In Asian large city NRW varies from 10% to 60%. According to a report by the European Environment Agency NRW in Yerevan, Armenia, was almost 80% [4].

NRW levels in India

From the study conducted by Seureca Consulting Engineers components of NRW are 1.5 to 3.5% public use, 3.5 to 6.5% illegal / unmetered connection, 10 to 15% meter under registration and 75 to 85% is leakages[3]. Table 1 shows Comparison of Water Utility Performance for some cities in India[1]

Measures to reduce NRW in Jaipur city

Public Health Engineering Department, Rajasthan has started pilot project in areas of Mansarovar of Jaipur city in Nov 2010 for 24x7 water supply and take measures to enhance the water supply along with reduction in NRW. Pilot project for converting intermittent water supply into 24X7 water supply of selected areas was started with the help of Eco-Asia, Ranhill Malaysia, Maharastra Jeevan Pradhikaran and PHED Rajasthan. The objective of pilot activity is to build confidence that water supply is feasible and realistic through applied water loss management technique.

Details of Area selected under present studies are given in Table-2.

TABLE-1 Comparison of Water Utility Performance for some cities in India[1]

Measure	Indicator	State Govt Operated	Municipal Independent Operator			International Standard
		Jaipur	Banglore	Chennai	Hydrabad	
Service Level	Water supply coverage	82%	94%	84%	99%	
	Supply period/ day	1~3 hr	2~4 hr	1~2 hr	2~4 hr	3~6 hr
Operational efficiency	Staff per 1000 connections	11.5	8.6	9.0	12.5	3~6
Asset maintenance	NRW	50%	35~40%	40%	40%	30% or less
Financial soundness	O&M cost recovery by tariff	34%	101%	121%	100%	100% or more

TABLE-2 Details of area selected.

District Metered Area	NO. OF HOUSE HOLD	NO OF CONSUMER	TOTAL POPULATION	CATEGORY OF HOUSES	AVERAGE FAMILY SIZE
Mansarovar Sector-01	139	139	693	HIG & MIG	4.98
Mansarovar Sector-09	128	128	730	HIG & MIG	4.98

Pilot Activities Undertaken

In order to reduce NRW level in Jaipur following Pilot activities were taken.

- Baseline data collection
- Conducting IEC campaign
- District Metered Area (DMA) creation

IEC activities includes following

- Preparation & Release of IEC material and Publicity of project through newspapers
- Information of benefits of 24X7 water supply scheme to beneficiary consumers
- Saving in Power charges on account of direct supply in roof top tanks
- Adequate water supply
- Less possibility of water contamination
- Saving in provision for new storage tank cost
- Higher life of service pipelines
- Saving in purchase of equipments and Operation and Mentainance Cost
- Tracing of water seepage in under ground tanks giving saving in water bills
- Reliable water supply

DMA creation includes following

- Ground verification of data and Pipeline interconnections.
- Laying of pipelines for pilot areas from Service Reservoir to prepare DMAs
- Installation of Isolation Valves and DMA Valve at Service Reservoir
- Inter-connection work of DMA Pipeline and installation of DMA Meter in each Zone.
- Replacement of existing leaking main supply valves of Service Reservoirs in each Zone.
- Installing equipments such as bulk meters, replacement of defective domestic meters, service line, valves, pipelines etc.
- Identification of leaking service pipelines.
- Instrumentation Cabling for connectivity of DMA Meters and Pressure Censor with RTU
- Installation of Data Loggers
- Installation of Bulk Meters at Service Reservoirs for metering of remaining areas
- Replacement of doubtful non functional meters on the basis of regular water reading
- Commissioning of Pilot Area and examination of Isolated DMAs for ensuring prevention of loss of water outside DMAs

- Sample testing of consumer meters already installed.
 - Bench testing of available new meters for replacement of non functional meters.
 - Replacement of non functional consumer meters in pilot areas.
- Tbble-3 gives details of non functioning meters replaced in pilot areas.

TABLE -3 Details of non functioning meters replaced

Details	Sector – 1 Mansarovar	Sector -9 Mansarovar
Total Consumers	139	128
Non Functional Meters Replaced	87	90

Various activities taken up under project studies are

- DMA meter reading each day on hourly basis.
- Daily reading of each consumer in each pilot area.
- Surveillance of Pilot Area Pipeline Network for leakages
- Surveillance of Property Connections for abnormal flow and leakages in service pipelines
- Counseling of consumers for avoiding under ground water storage and keeping check on float valves etc. at roof top tanks

II. Performance Of Pilot Areas

Mansarovar SECTOR – 1

Date of commissioning – 17 November 2010

Table 4 gives per capita consumption of water during project period

TABLE 4 Consumption of water

	Consumption (KLD)	Peak Flow KL/hr	Minimum Flow KL/hr	Consumption (Per Capita)
18.11.10	586	52	44.4	845
25.12.10	197	19.8	5.9	284
24.01.11	253	21	9.2	365
21.02.11	165	18	3.3	238
08.03.11	161	17.7	3.2	232

NRW ANALYSIS

Table 5 gives NRW levels during project studies.

Date	Consumption As Per Bulk Meter (Litres)	Consumption As Per Cons. Meter (Litres)	Difference (Litres)	% Losses
26.01.2011	236000	87712	148288	62.83%
28.02.2011	165000	87450	77550	47.00 %
04.03.2011	170000	119064	50936	29.96 %

TABLE- 5 NRW levels

Mansarovar SECTOR – 9

Date of commissioning – 15 November 2010

Table 6 gives per capita consumption of water during project period

TABLE 6 - Consumption of water

Date	Consumption (KLD)	Peak Flow KL/hr	Minimum Flow KL/hr	Consumption (Per Capita)
16.11.10	288	20.2	10.5	394
27.12.10	172	21.7	2.3	235
20.01.11	142	15.7	3.6	194
19.02.11	180	16.1	4.2	246
08.03.11	150	15.7	2.4	205

NRW ANALYSIS

Table 7 gives NRW levels during project studies.

TABLE- 7 NRW levels

Date	Consumption As Per Bulk Meter (Litres)	Consumption As Per Cons. Meter (Litres)	Difference (Litres)	% Losses
26.01.2011	197000	98867	98133	49.81 %
28.02.2011	170000	129975	40025	23.54 %
04.03.2011	174000	134053	39947	22.96 %

Impact on water consumption - Table 8 gives Consumption Pattern in Pilot Areas

TABLE- 8 - Consumption Pattern in Pilot Areas

Pilot Area	Initial Consumption (lpcd) as on 18.11.2010	Consumption (lpcd) as on 08.03.2011
Mansarovar Sec. 1	845	232
Mansarovar Sec. 9	394	205

III. Conclusions

Pilot area studies have given following outcomes.

- 24x7 water supply has increased service reliability among consumers.
- Due to leakages removal loss of water (NRW) has reduced to great extent.
- Water losses reduced from 63% to 30% in Mansarovar Sector 1 and 50% to 23% in Mansarovar Sector 9 areas,
- Water saved from leakages is the extra water generated which can be utilized to enhance supplies to other areas.
- Per capita consumption has reduced in pilot area due to prevention of leakage.
- Greater satisfaction of consumer, with overall less supply of water to the pilot areas as compared to earlier supplies.
- Adequate water pressure, even sufficient to fill overhead water storage tanks of consumers. Hence energy saving to lift the water to overhead storage.
- Increased knowledge about the distribution system.
- Reduced risk of contamination.

References

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