

Study Tour to Maharashtra on SCADA and 24x7 Water Supply Initiatives

Performance Assessment System In Gujarat

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Submitted By

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Urban Management Centre (UMC)

The Urban Management Centre (UMC) is a not-for-profit organization based in Ahmedabad, Gujarat, working towards professionalizing urban management in India and South Asia. UMC provides technical assistance and support to Indian state local government associations and implements programs that work towards improvement in cities by partnering with city governments. UMC builds and enhances the capacity of city governments by providing much-needed expertise and ready access to innovations on good governance implemented in India and abroad. UMC is a legacy organization of International City/County Management Association (ICMA) and hence is also known as ICMA-South Asia.



Performance Assessment System (PAS)

PAS, a five-year action research project, has been initiated by CEPT University with funding from the Bill and Melinda Gates Foundation. PAS aims to develop better information on water and sanitation performance at the local level to be used to improve the financial viability, quality and reliability of services. It will use performance indicators and benchmarks on water and sanitation services in all the 400-plus urban areas of Gujarat and Maharashtra. UMC and the All India Institute of Local Self Governance are CEPT's project partners in Gujarat and Maharashtra, respectively. More details are available on www.pas.org.in.

Acknowledgements

We would like to thank Navi Mumbai Municipal Corporation (NMMC) and Nagpur Municipal Corporation (NMC) for sharing their experiences in 24x7 and SCADA system in their respective water supply system. We also wish to thank Mr. Jaswant Mistry, NMMC, Mr. Mahesh Deshmukh, Managing Director, Chetas Control Systems Private Limited, Mr. A. Rehman, NMC and Ms. Surabhi Sirsikar, Orange City Water Limited for their kind hospitality and extended support to the delegates and UMC team during their site visit.

We also wish to thank Vadodara Municipal Corporation and nagar palikas of Himmatnagar, Mehsana, Kadi and Kalol cities for participating in the study tour arranged by UMC.

UMC is also happy to have received financial and technical support from CEPT University under the Performance Assessment System (PAS) program. Special thanks to Prof. Meera Mehta and Prof. Dinesh Mehta from CEPT University for their advice and support for this study. We also thank Dr. Sneha Palnitkar, All India Institute of Local Self-Government (AIILSG) for establishing contact between NMMC, NMC and UMC for the study tour.

Lastly, we would like to appreciate the effort by the team working at UMC on PAS project including Arvind Singh and Anurag Anthony for both on-site and off-site management of the study tour.

Manvita Baradi
Director
Urban Management Centre

Abbreviations

CEPT	Centre for Environmental Planning & Technology
PAS	Performance Assessment System
UMC	Urban Management Centre
NMMC	Navi Mumbai Municipal Corporation
NMC	Nagpur Municipal Corporation
SCADA	Supervisory Control and Data Acquisition
MLD	Million Litre Per Day
ESR	Elevated Storage Reservoirs
GSR	Ground level Storage Reservoirs
HSR	Hill Storage Reservoirs
GSM	Global System for Mobile
GPRS	General Packet Radio Service
CCR	Central Control Room
PLC	Programmable Logic Inputs
WTP	Water Treatment Plant
MJP	Maharashtra Jal Pradhikaran
MIS	Management Information System
AMR	Automatic Meter Reading
SPV	Special Purpose Vehicle
OCW	Orange City Water
CCC	City Civic Centre
HDPE	High Density Poly Ethylene
CI	Cast Iron
GI	Galvanize Iron
WDS	Water Distribution Station
VMC	Vadodara Municipal Corporation

Background

Urban Management Centre with support of CEPT University is implementing Performance Assessment System (PAS) project in Gujarat since 2009. PAS is a five years' action research project funded by Bill & Melinda Gate Foundation through a grant to CEPT University. Under the project water supply and sanitation related services of all urban local bodies of Gujarat are being analysed and performance improvement activities are initiated in selected cities.

Under the PAS project, UMC organized a two days study tour on 25th and 26th April 2013 for chief officers and water supply engineers of selected urban local bodies to Navi Mumbai Municipal Corporation (NMMC) and Nagpur Municipal Corporation,(NMC) Maharashtra to understand SCADA system, water metering at consumer's end and 24x7 water supply system initiatives being implemented. The detail agenda of the study tour is attached as annexure-1. A delegation of 10 members participated in the study tour are as mentioned in table below:

Table1: List of delegates participated in study tour:

Sr.No.	City/ Institution	Name	Designation
1	Vadodara (Municipal Corporation)	Mr. A.M. Makvana	Executive Engineer, Water supply (Project)
2		Mr. V.R. Brahmhatt	Executive Engineer, Water supply (Distribution)
3	Kadi	Mr. Mahesh B. Parmar	Water supply Engineer
4	Himmatnagar	Mr. Navneet C. Patel	Chief Officer
5		Mr. Jignesh Gaor	Water supply Engineer
6	Kalol	Mr. Manoj R. Solanki	Chief Officer
7	Mahesana	Mr. Ramesh P.Joshi	Chief Officer
8		Mr. Jignesh C. Patel	Water supply Engineer
9.	UMC	Mr. Anurag Anthony	Program Manager
10.		Mr. Arvind Singh	Program Manager

Day1: 25th April 2013: Navi Mumbai Municipal Corporation- SCADA and Water metering system at consumer end:

The delegation visited NMMC's SCADA control room at CBD Belapur, Navi Mumbai. Mr. Jaswant N. Mistry, Executive Engineer, Navi Mumbai Municipal Corporation and Mr. Mahesh Deshmukh, Managing Director, Chetas Control Systems Private Limited welcomed the delegation followed by a quick round of introduction of the participants.

Mr. Mistry shared the brief history of the Navi Mumbai Municipal Corporation (NMMC). He has mentioned that NMMC is a planned city, a counter magnet for Mumbai, with the basic objective of curbing further growth of the mega city Mumbai. It has been developed as an independent fully self contained metro city. NMMC is spread over 162 Sq.km The population of the city is around **7,50,000** as per census 2011. The city has divided into 9 zones for the purpose of administration. These are Belapur, Nerul, Vashi, Koparkhairane, Turbhe, Ghansoli, Airoli, Digha and Dahisar.



Thereafter, Mr. Deshmukh made presentation on implementation of electronic data control and real time hydraulic data generation system for water supply network. The Supervisory Control and Data Acquisition (SCADA) system is being implemented in Navi Mumbai Municipal Corporation by the Chetas Control Systems Private Limited.



The following are the major objectives of the SCADA system being implemented by NMMC.

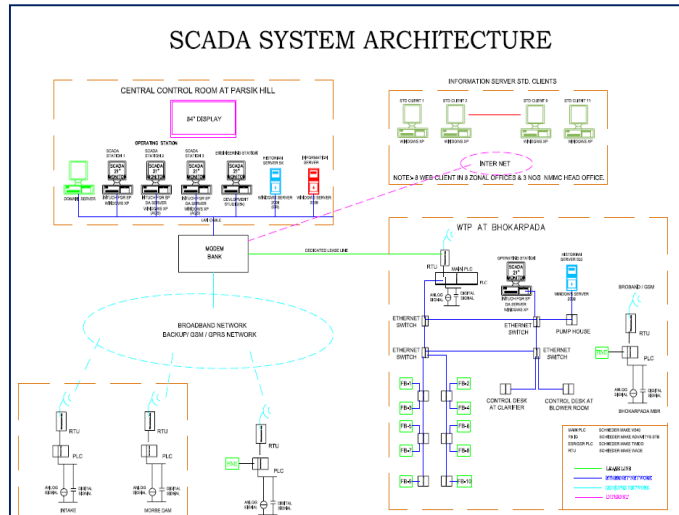
- To obtain real time hydraulic data at central location
- Centralized data analysis
- Nodal water supply analysis through trunk main metering
- Identifying root causes to non compliance to equitable distribution

The major water source for Navi Mumbai is surface water drawn from Morbe Dam situated on Dhavri river, tributary of river Patalganga. The capacity of Morbe reservoir is around 190.89 MCM and daily supply capacity is about 450 MLD. Water receive through gravity and flows to water treatment plant with 450 MLD capacity, located at Bhaokarpada.

There are 8 water distribution zones, 42 elevated Storage Reservoirs,(ESRs) 54 Ground level Storage Reservoirs(GSRs) and 10 Hill Storage Reservoirs (HSRs) as illustrated in the table given below.

Number of ESR/ GSR/ HSR in NMMC				
S. NO	ZONE NAME	ESR	GSR	HSR
1	CBD BELAPPUR	2	6	6
2	NERUL	6	9	4
3	VASHI	10	14	
4	TURBHE & SANPADA	5	7	
5	KOPARKHARINE	8	4	
6	GHANSOLI	6	6	
7	AEROLI	5	5	
8	DIGHA			3
TOTAL		42	54	10

Source: NMMC. 2013



To capture real time hydraulic data and the level of ESRs/GSRs, various instruments such as Ultrasonic multipath flow meters, Electromagnetic flow meters, Ultrasonic level transmitters, Pressure transmitters, etc. are installed for:

1. Capturing accurate velocity measurement through multiple velocity scanning through pipe cross section.
2. Online installation by hot tapping method, no need to water shut down
3. In built data logger to store the data locally for 5 years.
4. Wireless data transmission of flow records on GSM/GPRS to Central control room.

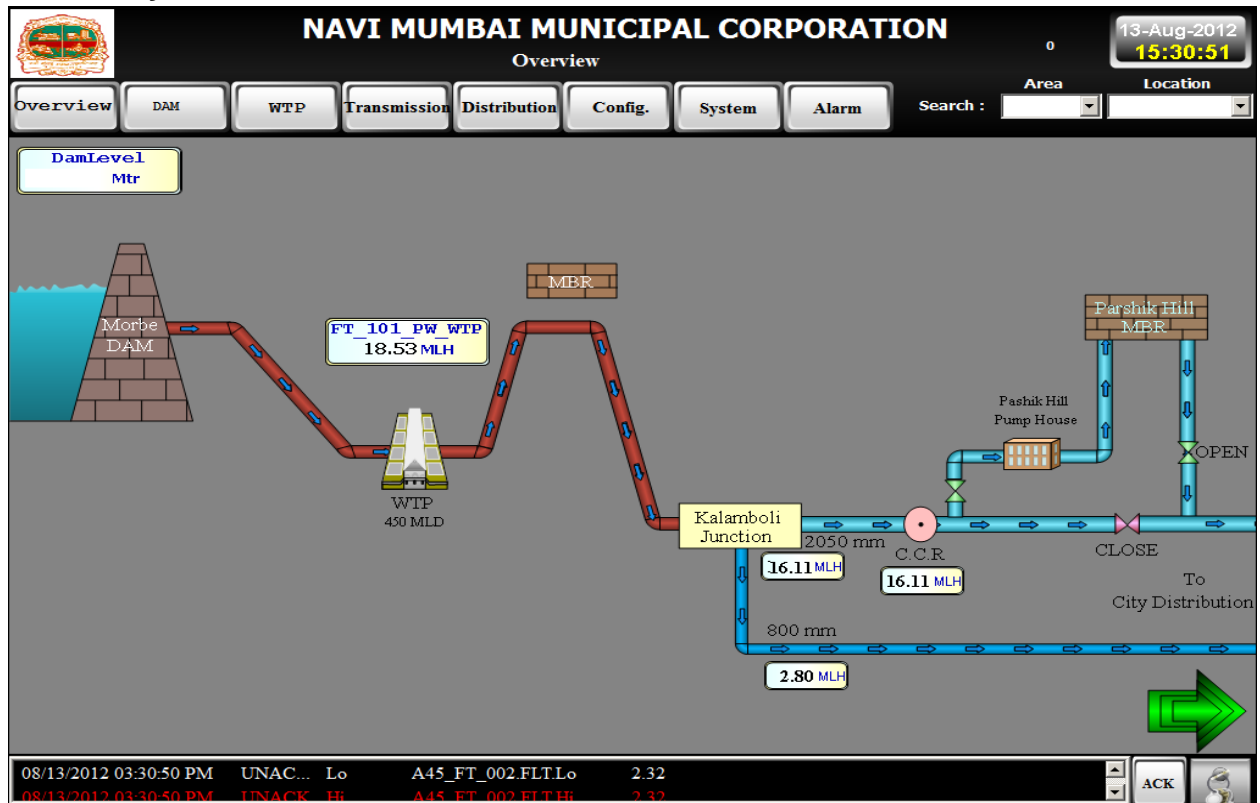


Source: NMMC. 2013

NMMC also installed instruments like PH transmitter, Turbidity analyzer, and chlorine analyzer to capture online data on water quality parameters.

Mr. Deshmukh also demonstrated online automated functions of SCADA system (centralized system fully computerised), Hydraulic data monitoring & control at Morbe Dam, Bhokarapad water treatment plant, Filter bed automation system at WTP, ESRs/GSRs automation and metering at water trunk, main distribution & consumer end.

SCADA System-Over View

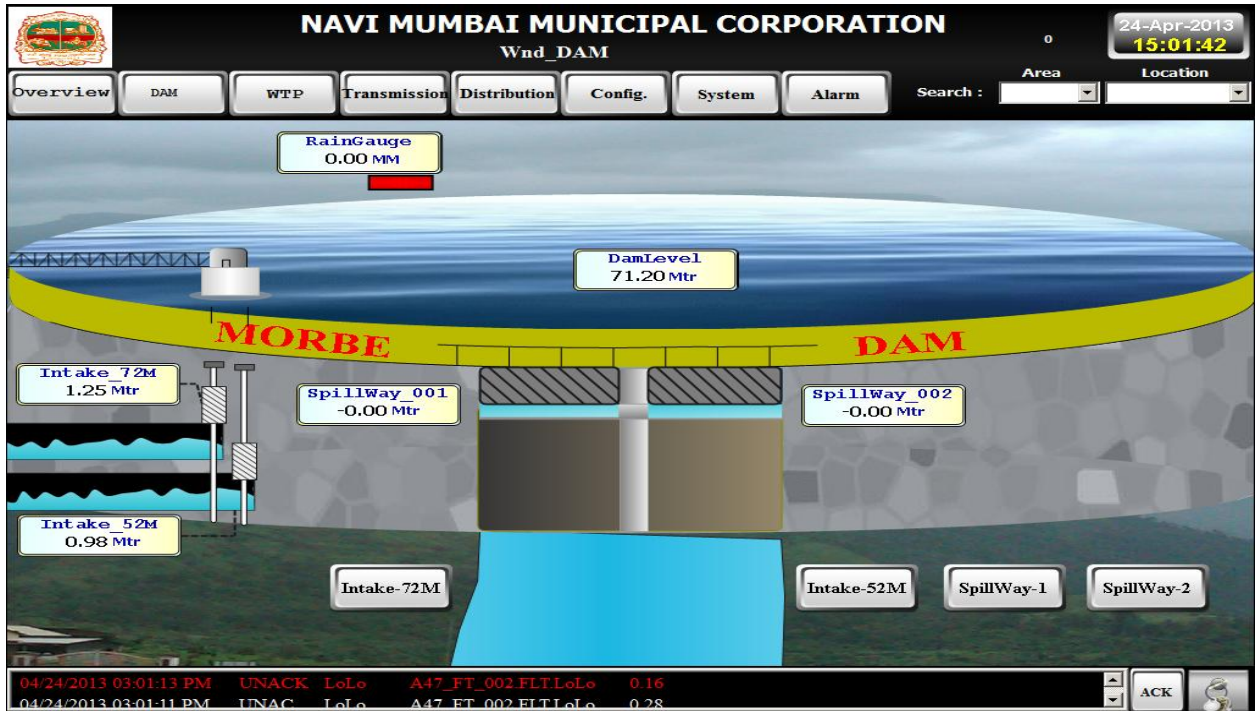


Source: NMMC, 2013

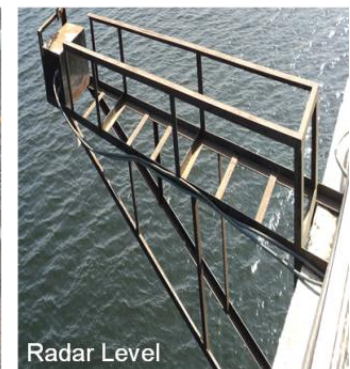
The merit of SCADA system is as follows:

- Provide hydraulic data on real time basis to acknowledge water distribution status throughout to Corporation.
- Enables to generate MIS data zone wise for analysis
- Implemented automation on Filter bed to improve performance

Hydraulic data monitoring and control at Morbe Dam



Source: NMMC, 2013



Source: NMMC, 2013

Situation before and after implementation of SCADA at Morbe Dam

Sr. No	Before SCADA Implementation	After SCADA IMPLEMENTATION
1	Dam level was monitored manually in Registers on hourly basis. Information was available to Concern Department and then it was circulated to Municipal authorities.	Digital Radar Level Transmitter is installed & commissioned to improve accuracy. Continuous Dam level monitoring made possible. Verbal Information loss on telephonic discussion if any got protected. Information made available globally accessible.
2	Rainfall was monitored manually in Registers on hourly basis. Information was available to Concern Department and then it was circulated to Municipal authorities.	Digital Rain gauge Transmitter is installed & commissioned to improve accuracy. Continuous rain monitoring made possible. Verbal Information loss on telephonic discussion if any got protected. Information made available globally.
3	Both Intake gates 72 Meters & 52Meters were controlled manually. Gate position was monitored manually with the help of Turns & Grease marks	Gate Position Indicators are installed for Both gates to get accurate gate positioning. Electrical Actuators are installed for Precise control. Controlling of gate made possible From Intek Well +From Local SCADA Room + From CCR CBD Belapur
4	Both Spillway gates were controlled manually. Gate position was monitored manually.	Gate Position Indicators are installed for Both gates to get accurate gate positioning. Precise Gate controlling made possible From Spillway gallery ++From Local SCADA Room + From CCR CBD Belapur
5	Spill Discharge calculation was done with the help of Model charts with respect to manually taken Dam Level & manually recorded gate positions of spillway gates	Spill Discharge calculation done from SCADA at CCR with Accurate Inputs of Dam level & Spill way Gate positions

SCADA at Water Treatment Plant



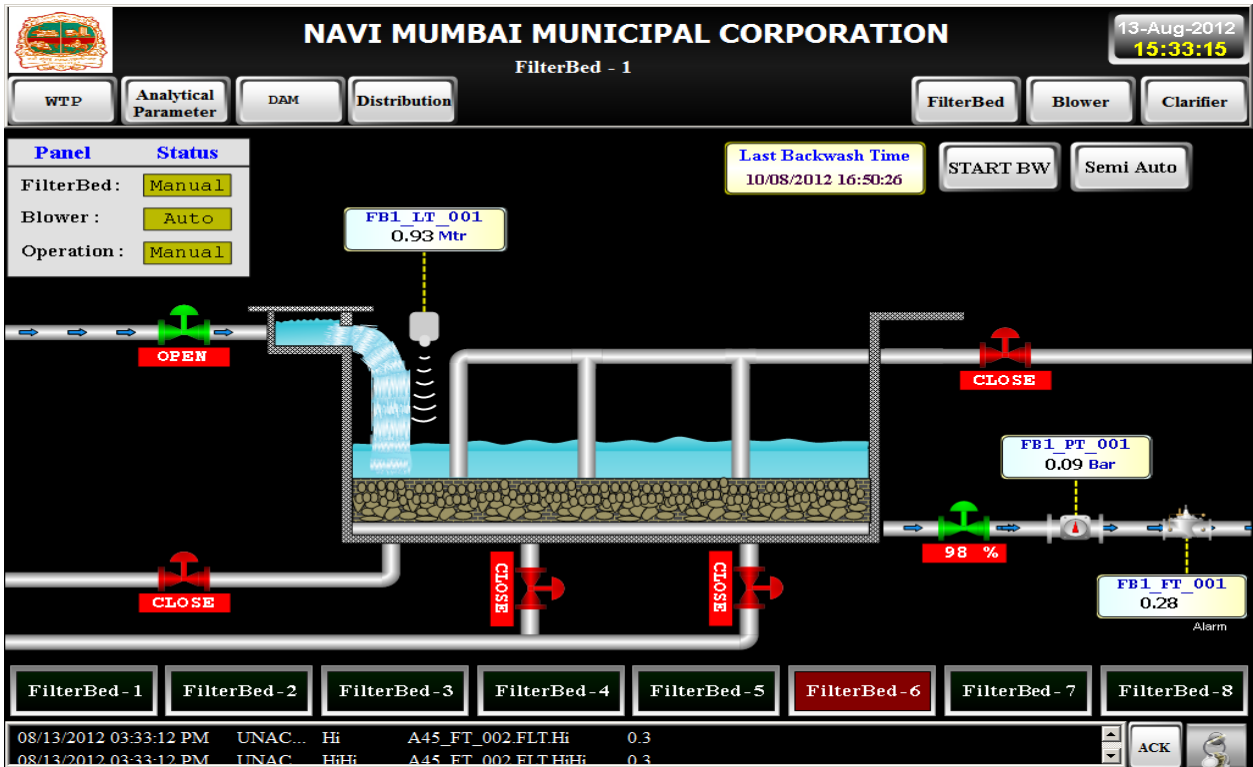
Source: NMMC, 2013

Situation before and after:

Sr. No	Before SCADA	AFTER SCADA IMPLEMENTATION
1	Monitoring Of Water Quality Parameters Chlorine, Turbidity, PH was done on periodic basis. Information was available to Concern Department and then it was circulated to Municipal authorities.	Continuous Monitoring Of water Quality parameters like Chlorine, PH & turbidity made available. Data generated & Supervisory control via alarm programming is done to maintain quality of water.
2	Bed washing decision was dependant on monitoring of Loss of Head & Predetermined time frequency. Most of the loss of head monitoring instruments were mechanical & old in age & were in non function condition.	Installed & commissioned Accurate Multipath Flow meters to work satisfactory at Limited straight run pipe conditions. Rate of Flow monitoring which is real derivative to acknowledge clogged bed condition is utilized to generate automatic BED WASH ALARM.
3	Bed wash process was implemented manually which involves controlling of 6 Nos valves/per filter bed.	Installed & Commissioned Electrical Actuators which helped user to save hectic operation.
4	In bed washing procedure valve operation at desired time was done manually.	All Electrical actuators are interfaced with PLC (Programmable Logic Input) hence valve operation at desired time sequence made possible. Excess wastage on Drain water is got controlled.
5	Bed wash tank overflow was connected to pure water sump & Circulating of 10 MLD water was happening inside plant instead of distribution.	After fixing ultrasonic multipath flow meter on input of Bed wash Tank water, water quantity monitored accurately & after analysis it Found in excess .It was observed that it was routed in Pure water sump. Appropriate Control instruction was implemented & 10 MLD water was routed to distribution instead of Circulating inside plant. Water quantity at Kalamboli junction are found increased by 10 MLD

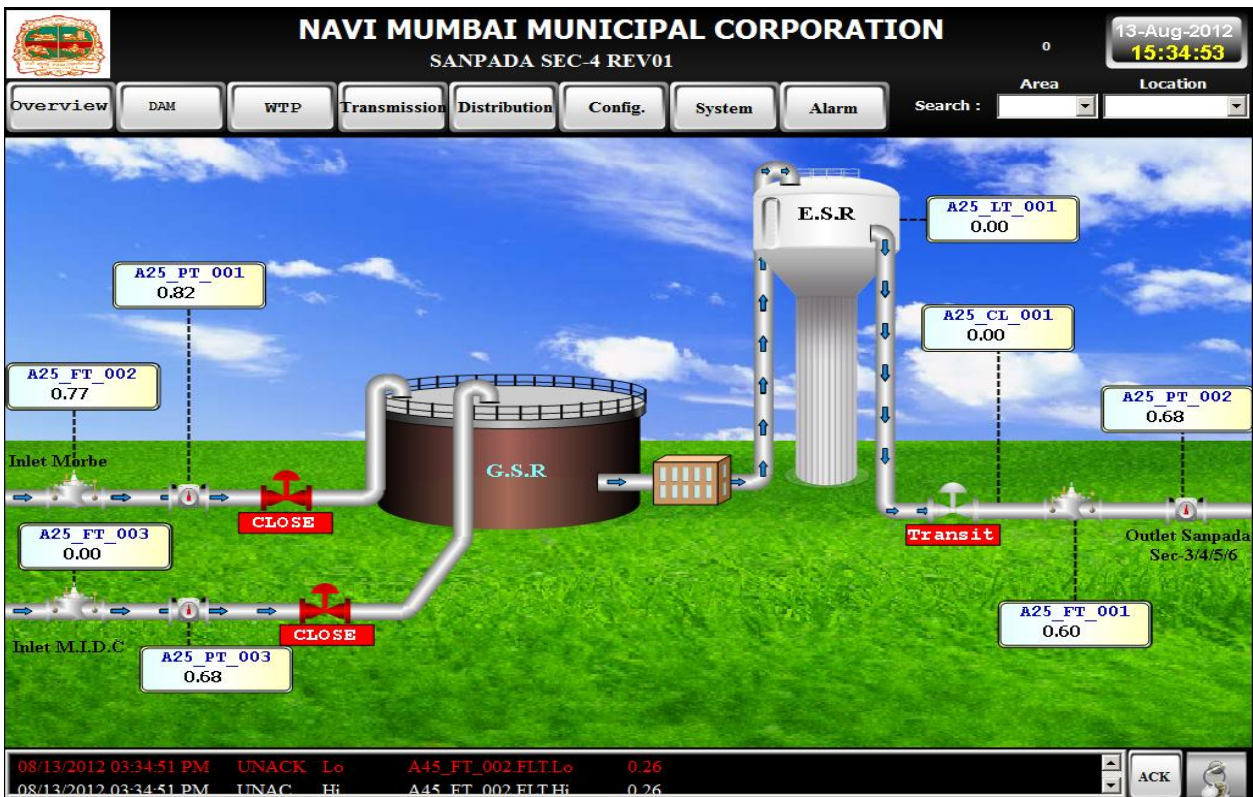
6	Bed wash frequency was earlier 8 hours	Due to appropriate control on valves Bed wash frequency is increased to 16 hours & filter bed performance is improved.
7	Energy management system was not in present.	For monitoring electrical parameters which are beneficial for PUMP performance is procured & decided to implement at NEW projected PUMP HOUSE with SCADA compatible Panels. Further Energy management software linked with Main server At WTP for Future data transfer from WTP for Global access.
8	Monitoring Of Water IMP control parameter i.e. PW sump Level was done on periodic basis. Information was available to Concern Department and then it was circulated to Municipal authorities.	Digital Level transmitter is installed & commissioned to acknowledge accurately IMP parameter which gives direct impact on Pure Water discharge qty.
9	Flow Measurement system was not available for Raw Water Inlet, Clarifier Inlets. Flow measuring system was available of pure water monitoring but readings were got recorded manually on hourly basis which is major input for water Audit.	After Installation Of Ultrasonic Multipath flowmeter on Raw water main Monitoring of DAM discharge made possible .Which had also helped to put supervisory control on MJP water allocation who are billed with pumping hours basis. Monitoring of performance of Pure water discharge made available globally.

Filter Bed Automation



Source: NMMC, 2013

ESR/GSR Automation

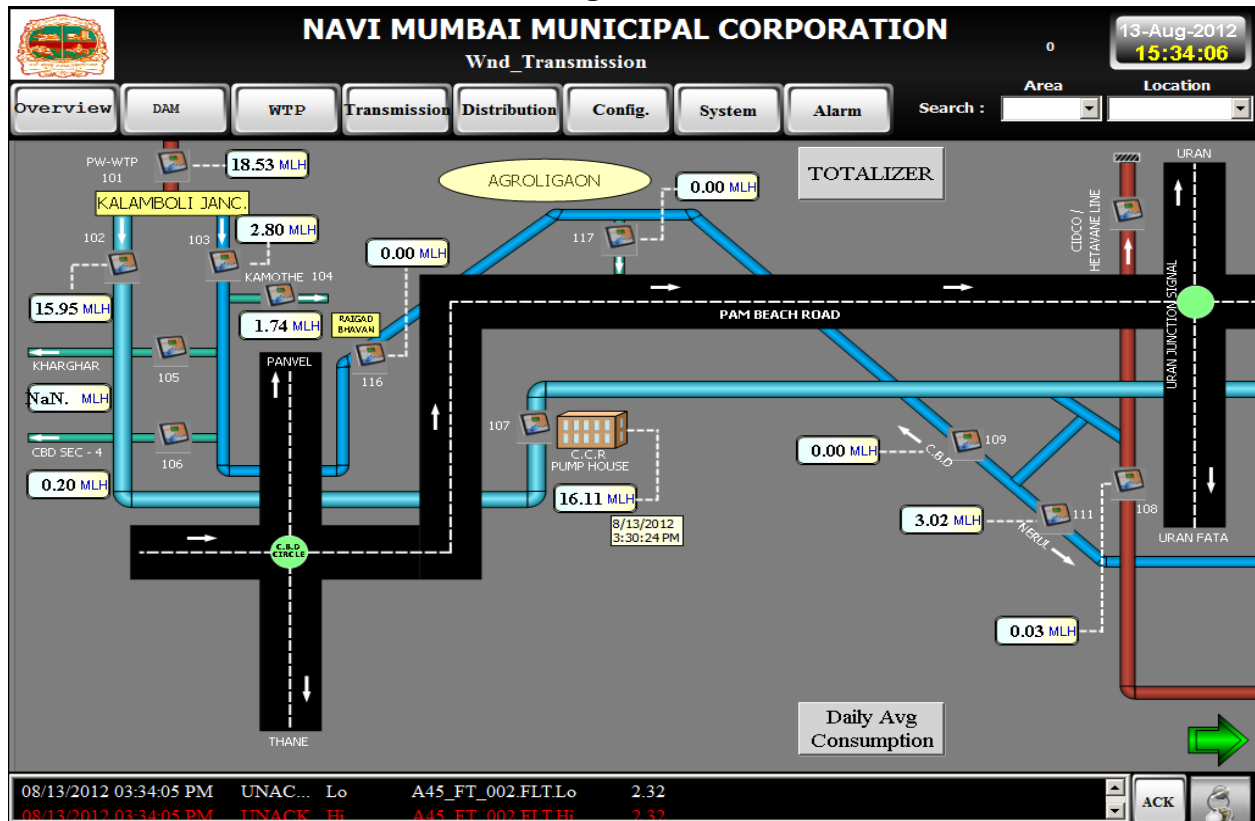


Source: NMMC, 2013

Situation before and after implementation of SCADA system at ESR/GSR

Sr. No	Before SCADA	AFTER T SCADA IMPLEMENTATION
1	Monitoring Of Water Quality Parameters Chlorine, was done on periodic basis. Information was available to Concern Department and then it was circulated to Municipal authorities.	Continuous Monitoring Of water Quality parameters like Chlorine, Data generated & Supervisory control via alarm programming is done to maintain quality of water.
2	Monitoring Of Water Control Parameters like ESR Level was done on periodic basis. Information was available to Concern Department and then it was circulated to Municipal authorities.	Continuous Monitoring of ESR Level made possible by installing ultrasonic level transmitters, Data generated & Supervisory control via alarm programming is done to maintain quality of water.
3	All inlets & All outlet discharges were not available at a glance.	Installed & Commissioned Ultrasonic flow meters to acknowledge Intek water & Out flow water to individual ESR/GSR & data made available for analysis
4	Valve operation was done manually	Electrical actuators are fixed for valve operation & interfaced with PLC (programmable Logic Controller) to have control from CCR CBD Belapur
5	Monitoring Of Water Control Parameters like Pressure at inlets & Outlets was done on periodic basis. Information was available to Concern Department and then it was circulated to Municipal authorities.	Continuous Monitoring of pressure made possible by installing digital pressure transmitters, Data generated & Supervisory control via alarm programming shall be used to better control

Water Trunk Main Distribution Metering



Source: NMMC, 2013

MIS reports generated through the system

SCADA system enables to generate MIS data for zone wise water distribution for analysis and also helps further to provide equitable water distribution to zones. MIS reports generated daily and monthly basis which is shared with Executive Engineer water supply on regular basis.

Metering at Consumer end

According to NMMC, 70,742 consumer meters are installed at project cost (free to consumer). Team visited to one of the residential colony where hundred percent metering at consumer end. Team interacted with few consumers and learnt about the experiences of having metering. Initially the consumption of water was more than before metering which was gradually decreases because they have to pay the bills accordingly. Team also witnessed in the field that the water reaches upto 4th floor without pumping.

It was learnt that the billing for more than seventy thousand consumers are being done effectively and timely due to Automatic Meter Reading (AMR), as a result water billing increased from Rs.57.83 million to 65.66 million , an increase of 13.8% per annum.



Salient features of AMR:

- Multy jet Water Meter with high low flow accuracy
- Assures longlasting accurate measurement
- Negligible maintenance – years of trouble free operation even in hard water
- Meters are adaptable to local and remote electronic data acquisition and processing system
- Cost around Rs.7500 with installation



Day 2: 26th April 2013: Nagpur Municipal Corporation- 24x7 water supply initiatives:

Nagpur Municipal Corporation (NMC) formed a special purpose vehicle (SPV) by the name of Nagpur Environmental Services Private Limited (under the Companies Act, 1956) as a 100 percent subsidiary owned by NMC in mid 20th century for water supply in the city. The water supply department since then has been operating with a fair amount of autonomy.

In 2008, NMC implemented 24x7 water supply system in one ward as a pilot project. With successfully completing the pilot phase, the city has now moved towards implementing city wide 24x7 supply. The pilot project provided clean drinking water with adequate pressure and 24x7 uninterrupted water supply to more than 16,000 consumers, including 5,000 slum household connections.

The team met Mr. A. Rehman, Executive Engineer, NMC at his office. Mr. Rehman provided a background of the pilot project to the team. According to him, NMC initiated water audit and identified that the city is incurring 60 percent losses (UFW) of water. NMC team then designed a pilot project and with requisite approvals from the higher officials, the team proceeded with its implementation.

Visit to City Civic Centre

With this background, Mr. Rehman led the team to City Civic Centre (CCC) operated by Orange City Water (OCW), a joint-venture between private contractor and NMC for implementation and operation of 24x7 water supply in Nagpur. The key functions undertaken by CCC include registering of water supply related complaints, collection of water tax and processing of new connections. The team was oriented to the operations of the CCC by Ms. Surabhi Sirsikar, Senior Service Point Manager, OCW.



Upon a briefing about CCC operations, the team was then taken for a site visit to pilot zone where 24x7 has been implemented. Mr. Rehman, NMC and Ms. Surabhi Sirsikar, OCW accompanied the team for the field visit.

Field Visit to Pilot Zone Water Distribution Station (Ramnagar)

The team visited Ramnagar Water Distribution Station (WDS) which supplies water to the pilot zone. A detailed discussion was held about where to start in order to implement 24x7 in a city. The first steps as described by OCW were as follows:

1. Conduct energy audit of water supply related equipments to identify the functional efficiency of pumps.
2. Based on the results of the energy audit (in case of NMC, the energy audit revealed average efficiency of pumps is 40 percent only as against an assumed 80 percent by NMC) suitable measures need to be adopted to refurbish or replace the faulty equipments.
3. Select a pilot zone with due consideration towards factors such as inequity in water supply, community awareness campaign and outreach and other factors such as topography, age of existing pipelines, etc.
4. Conduct a leak detection study in the pilot zone to identify the fault points and damaged sections of the pipeline.
5. Design a contract and tender works for refurbish or replacement of faulty sections of pipelines and joints. In case of NMC, it took 2.5 years for NMC to design a meticulous contract covering all aspects in great detail. Regular dialogue/ discussions were held by NMC with prospective applicants for 24x7 related capital works and operation.

Demonstration was given by Mr. Rahul Lohakare, General Manager, OCW about laying of distribution network and its operations to suit 24x7 including the following:

Material of pipes

OCW is of the opinion that metal to metal contact is the main cause of early wear and tear of distribution network, and hence should be avoided at all costs. OCW has used High Density Poly Ethylene (HDPE) pipes in order to eliminate any rusting caused in the distribution network due to natural causes. Also, as the pipeline is laid at a depth of 2 feet below ground, vehicular movement over the piped are had raptures the existing CI pipeline. HDPE pipes have higher malleability and ductility and can withstand higher compressive and tensile pressure.

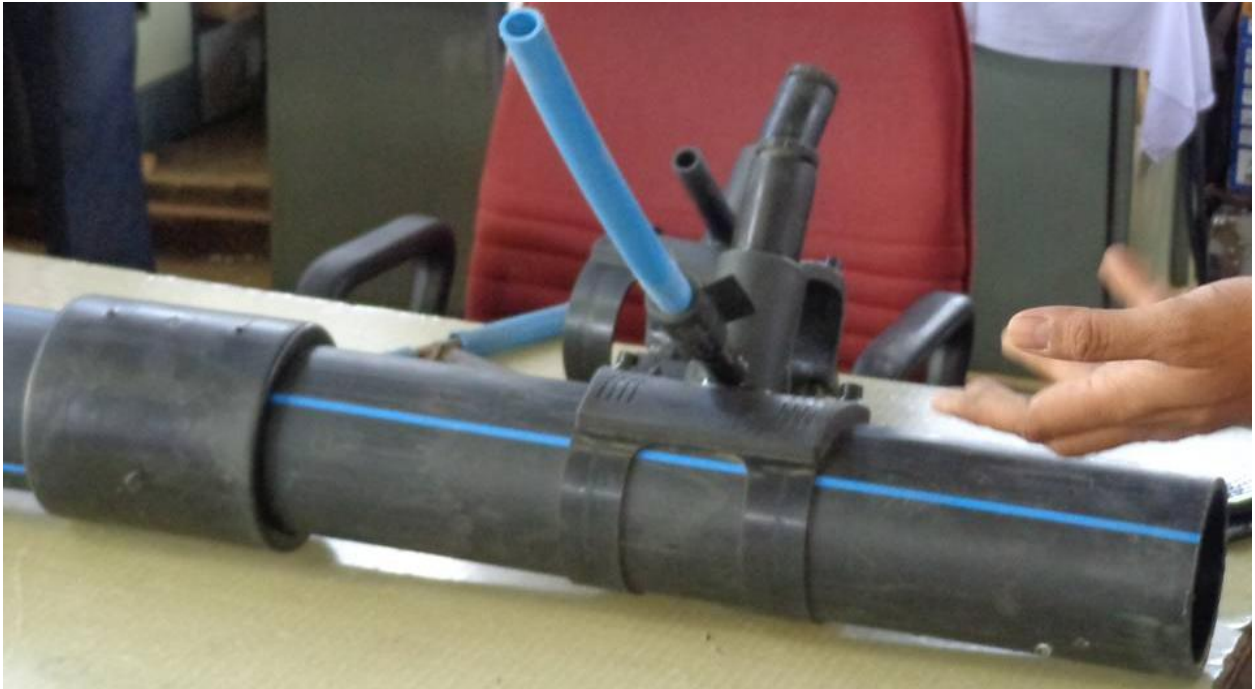


Corroded pipes replaced in the pilot zone of NMC

Joinery details of various sizes of pipes used

OCW has used technology to join pipes using heat to melt sections of the pipes and convert it into a composite material. This technology eliminates leaks at joints due to wear and tear

in conventional CI/ GI pipes. Clamps and bushes of various types have been used to seal any joint for extra strength.



Joinery details adopted by NMC for distribution network

The pipelines used are HDPE and hence are available in the market in the form of rolls unlike CI/ GI pipes which are available in lengths of a maximum of 15 to 20 feet. The HDPE pipes are available for lengths upto 100 feet thus reducing the number of joints

Pre fabricated joints are available with clamps having copper coil built-in the joint. Upon passing electric current through the joint, the coil heats up the joint and by applying pressure using clamps, composite joints are formed. After adequate cooling, the pipes can be covered with earth and the joint can be secured.

After laying the pipeline, a blue strip of plastic tape with 'NMC Water Pipeline' sign is laid over the pipes at a depth of 1 foot from the ground surface while the pipeline is laid 2 feet below ground. This measure has been adopted to ensure visibility/ information about water pipes and to avoid accidental damage, in case of any excavation works being undertaken by other public works departments or organisations.



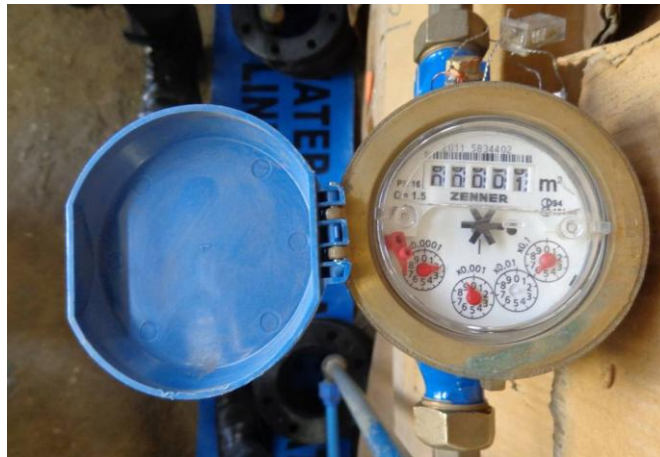
Hazard Plastic Tape laid by NMC over its water supply pipes to avoid accidental damage during excavation works

Consumer Connection and Prevention of Tampering of Water Meters

NMC has provided more than 16,000 water supply connections in the pilot zone including 5,000 connections in slums. All connections except slums have been provided with a water meter for recording the consumption and hence, billing of the consumers.

The meters have been designed to be tamper proof. However, enforcement of strict action against offenders is an issue yet to be resolved. In case of any tampering in the past, NMC has stopped supplying water to such consumers and the connections are restored after levying a penalty. Also, to avoid tampering and for the ease of taking manual readings, the meters have been placed in the front yards/ gates of houses, apartments or buildings.

The water meters have been provided with plastic clamp seals with metal wire inside which cannot be opened. In case of any tampering, the clamp would break and the meter reader would notice it while taking the next reading.



Water Meters installed by NMC at Consumer's End. The tamper proof wire seal can be seen in the top right.

Meter Reading, Billing and Fixing of Leakages in Private Domain

NMC has adopted manual meter reading as against automated meter reading system adopted by Navi Mumbai. Based on the reading, billing is done by NMC to all connections. During the initial phase, NMC observed disproportionately high water consumption by some consumers. This prompted NMC to inform individual consumers in case of very high consumption indicating leakages in the internal network or storages of apartments and buildings. A time window was given to consumers to rectify their respective internal leakages and billing was not done during this period. Nearly all consumer with disproportionately high consumption rectified their internal leakages and the billing was undertaken based on actual consumption beyond the time window.



Consumer meters installed in the front yards of buildings

Data Recording and Valve Operation at WDS

The data is recorded at various levels to monitor the supply. Pivot valves have been used at the WDS to regulate supply from WDS to various subzones. The data is recorded by connecting a computer manually to the meters installed at WDS. The readings are downloaded onto the computer and are used for monitoring the supply. This system can be upgraded to an automatic reading system by installing 'actuators' to activate data transfer, operation of pumps and operation of valves through the internet or SMS.

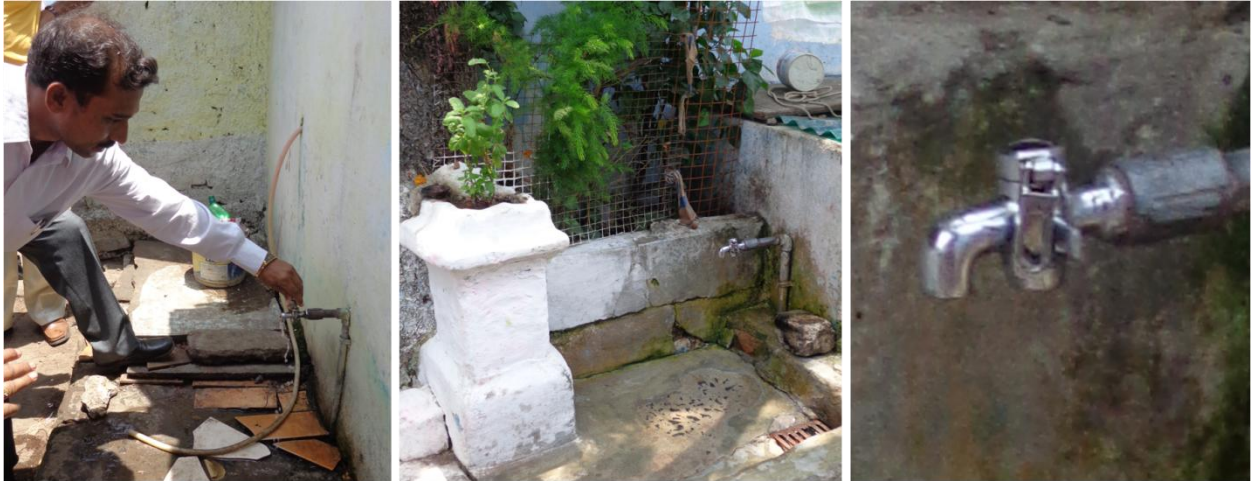


Replacement of Valves at WDS with Potential to operate the new Valves using actuators via internet or SMS

Social and Awareness Campaign and Equity

NMC and OCW both shared their experience of facing problems in convincing the citizens to implement 24x7 in the pilot zone. NMC shared that a long process of stakeholder consultations, door to door campaign, pamphlets and other means of communication were used to build consensus amongst citizens of the city. Elected representatives of NMC were first convinced and were then engaged in the outreach to citizens.

For around 5,000 slum households, water connections were provided free of cost with a fixed monthly user charge of INR 30 or INR 50 based on the size of the tenement. Slum households were provided a tap connection in front of the houses with a lockable-fixture. Rigorous awareness campaign was conducted in slums to convince all households to take a water connection.



Water Connection in Slums (left & centre); Lockable tap fixture in slums (right)

Thereafter, the participants filled a feedback-form evaluating the study tour. Based on the feedback-forms, Vadodara, Mahesana and Himmatnagar have shown their willingness to implement 24x7 water supply on pilot basis in select wards of their cities respectively. Vadodara Municipal Corporation (VMC) has additionally shown a keen interest in implementing SCADA system for water supply. UMC is also assisting VMC in preparing Information System Improvement Plan (ISIP) in water supply and sewerage sectors. UMC and VMC would incorporate the findings of the study tour while implementing the ISIP and subsequently, SCADA.

Annexure -1

STUDY TOUR on SCADA and 24*7 WATER SUPPLY INITIATIVES

Organised by: Urban Management Centre
Supported by: Performance Assessment System (PAS) Program

Dates: 25th & 26th April 2013

Day-1: Navi Mumbai Municipal Corporation – SCADA and Water Metering Systems

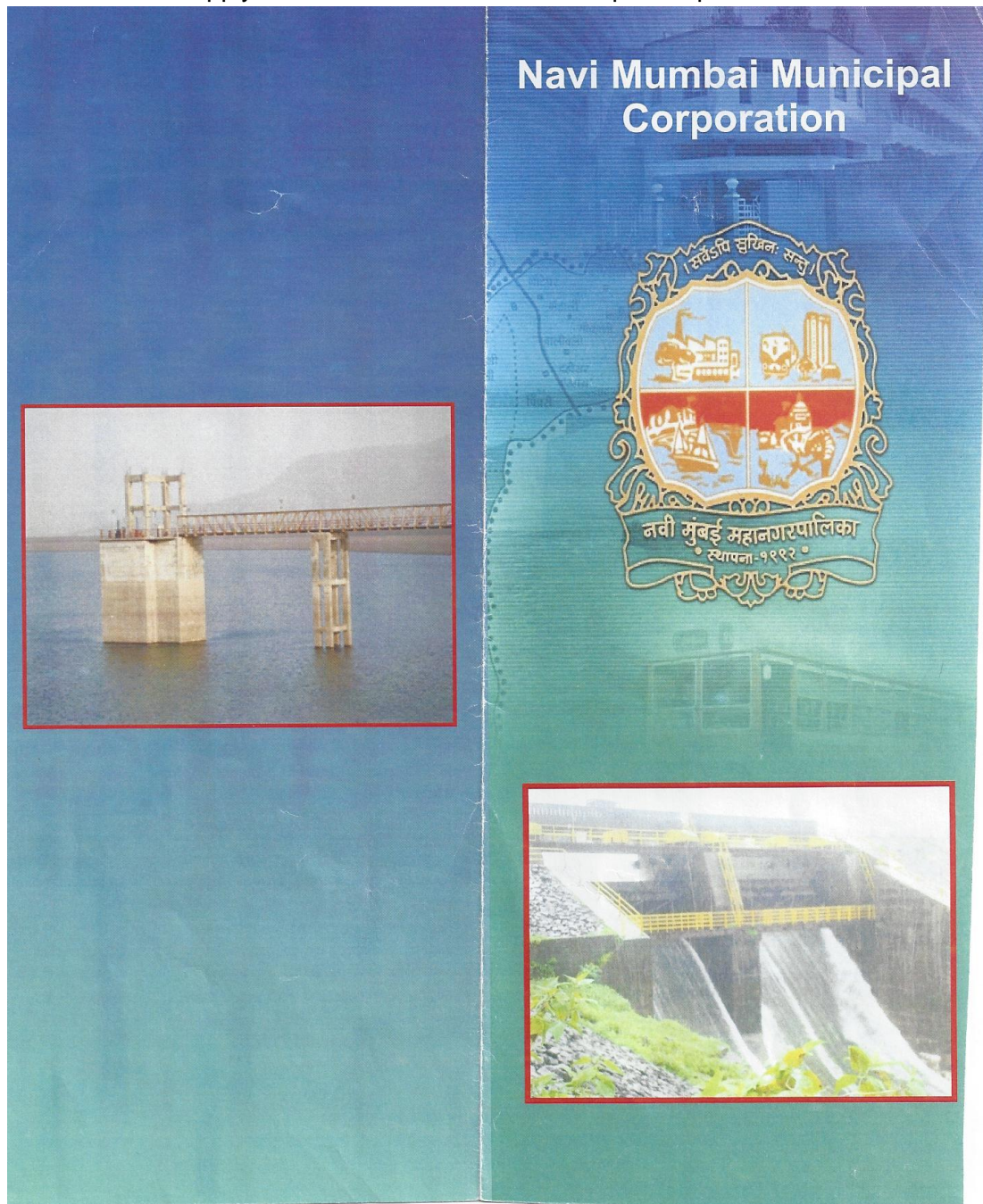
Day-2: Nagpur Municipal Corporation -24 * 7 water supply System

Agenda

Time	Agenda	Venue	Notes
Day 1: 25th April, Thursday			
6.45 am	Delegation to start from 6.40 am Ahmedabad to Mumbai Flight No: 9W338 (Jet Airways) Delegation to start from 7.10 am Vadodara to Mumbai Flight No: 9W342 (Jet Airways)		Delegates from Ahmedabad will have to report at the Airport at 5.15 am latest. Delegates from Vadodara will have to report at Mumbai Airport at 8.30 am latest.
8.00 am – 8.45	Check into Hotel and Breakfast	Hotel Suba Galaxy,	
10.00-11:30 am	Travel by Road to Navi Mumbai Municipal Corporation	NMMC,	Travel time 1.30 hr.
11.30 am	Introduction and Brief Presentation on SCADA & Water metering	NMMC Office	Navi Mumbai Municipal Corporation
1.30-2:30 pm	Lunch		NMMC
2.30 – 5:00 pm	Field visit for SCADA and metering at consumer end	Navi Mumbai	Mr. Mistri, Engineer, WS dept, NMMC
5:00-6:30	Back to hotel and dinner at Hotel Suba Galaxy,		
Day 2: 26th April, Friday			
5:15 am	Check out from hotel and leave for airport		
6:40-8:00 am	Flight from Mumbai to Nagpur at 6.40 am 9W-7041 (Jet Air ways)		
8:30 am	Breakfast at Nagpur		
10.00-10:30 am	Visit to Nagpur Municipal Corporation Introduction and Brief presentation on 24*7 water supply system	NMC	24*7 Urban Water Supply Mr. A. Rehmaan, Executive Engineer, WS
11.45 am- 2:00 pm	Site visit	NMC	
2.00-3:00 pm	Lunch		
4:20 pm onwards	Report to Airport for flight to Mumbai 9W-7134 flight, at 5:20 pm 9W-7103 flight from Mumbai to Ahmedabad		
9.30 P.M	Arrival at Ahmedabad		

Annexure -2

Brochure of Water supply scheme - Navi Mumbai Municipal Corporation –



Navi Mumbai Municipal Corporation Water Supply-Scheme

1. Morbe Dam

- Name of Water supply scheme :- N.M.M.C. water Supply scheme
- Name of River :- Dhavri (Tributary of patalganga river)
- Length of Dam :- 3250 m.
- Bottom Width of Dam :- 450m (In River Basin)
- Top Width of Dam :- 6.5m
- Maximum Height of Dam :- 53.40m
- Catchments Area :- 57.89 sq.km.
- Gross Storage Capacity :- 190.89 M.C.M.
- Live Storage :- 165.37 MCM (450 mld)
- Maximum water level :- 90.50m
- Top of Dam :- 93.00m
- Full supply level :- 88.00m
- Width of spill way :- 26.50
- Spill way Gates :- 2 No. Radial of Size 12 x 3m.
- Length of Tunnel & shape :- 459m & 2.5m Dia. Of D shape
- Details of Land acquisition & Rehabilitation of villages :-
- 1) Total project affected villages :- 11 No. (in submergence area – 7No & Partial affected – 4 no.
- A) Name of Villages in sub mergence area of project:-
 - 1) Morbe & Morbe Katkari wadi
 - 2) Nanivali, Bibewadi, & Numberachi wadi
 - 3) Bargaon(Bu.)
 - 4) Bargaon(ku.)
 - 5) Vadvihir & Vadvihir BoudhSawada
 - 6) Varose, Varose wadi, Varosechi katkariwadi, Arkas wadi, Pirkatwadi & Umberwadi
 - 7) Padaghe (Nirjan)
- B) Name of partially affected village of project:-
 - 1) Hatnoli
 - 2) Maniwali
 - 3) Sondewadi
 - 4) Wavarle.
- Affected families :- 776
- Population of Project affected Villages :- 2897 (As per census 1981)
- Acquired Area
 - 1) Private :- 1200-93-7 Hector
 - 2) Government :- 81-28-8 Hector
 - Total:- :- 1282-22-5 Hector

Navi Mumbai Municipal Corporation Water Supply-Scheme

2. Water Treatment Plant at Bhokarpada (Capacity 450 MLD)

Component of W.T.P

- Stilling chamber :- 2 Nos.
- Raw Water Channel :- 2 Nos.
- Flash Mixer :- 2 Nos.
- Clariflocculator :- 6 Nos.
- Filter bed :- 50 Nos.
- Pure Water Sump :- 3 No.
- Pumping Machinery :- 1200 HP VT pumps - 12 No.
750 HP Centrifugal pumps- 3 No.
- Chemical House :- 1 No.
- Raw Water Channel :- 1 No.

3. Pump House at Sec.28 CBD:-


- Sump :- 8.33 ML
- MBR :- 32.00ML
- Rising main – Pump house to Parsik :- 2042 mm Dia MS pipeline- 334 m hill MBR
- Pumping Machinery :- 1000 HP Booster pumps- 06 No.

4. Transmission main from Morbe Dam to Digha / Ganpatipada

- Raw water Gravity main from Morbe Dam to WTP Bhokarpada :- 2354 mm 5399 m
- Pure Water Rising main from pump house to MBR :- 1954 mm 675 m
- Pure Water Gravity main from MBR to Adai :- 2050 mm 13703 m
- Pure Water Gravity main from Adai to Kalamboli junction :- 1700 mm 2235 m
- Kalamboli to CBD Pump House :- 2042 mm 9585 m
- CBD Pump house to Uran signal :- 1845 mm 1749 m
- Uran signal to Sanpada signal :- 1745 mm 7887 m
- Sanpada signal to Vashi Bridge Garden :- 1545 mm 862 m
- Vashi Bridge Garden to Morden college, Vashi :- 1445 mm 864 m
- Morden college, Vashi to Koparkhairne Nursery :- 1293 mm 2731 m
- Koparkhairne Nursery to Airoli 1st underpass :- 1143 mm 6735 m
- Airoli 1st underpass to Airoli 2nd underpass :- 732 mm 883 m
- Airoli 2nd underpass to Airoli Skywalkways :- 530 mm 1135 m
- Airoli Skywalkways to Chinchpadagaon Entrance :- 450 mm 51 m
- Chinchpadagaon Entrance to Thomson press Digha :- 400 mm 732 m
- Thomson press Digha to Digha Lake :- 350 mm 850 m
- Digha Lake to Ganpatipada :- 250 mm 746 m
- Total 56822 m**

Annexure -3

Water tariff rate ,Nagpur Municipal Corporation



नागपूर महानगर पालिका
पाणी पुरवठा विभाग (२४x७ प्रात्यक्षिक प्रभाग)

Customer Care Centre
Behind DIK Dispensary
VIP Road, Gawalipura
Ph. no. 0712 6459430

ग्राहक सुविधा केन्द्र
डीक दवाखाना मागे,
व्ही आय पी. मार्ग, गवलीपूर
फोन क्र. ०७१२ ६४५९४३०

इंडेक्स क्रमांक Index No.: _____
देयक क्रमांक Bill No.: _____

देयक दिनांक Bill Date : _____

पाणी देयक
WATER BILL

देयकाची अवधी Bill Period : _____

मुदतपूर्वीची एकूण रक्कम (₹)
Total Amount Before Due Date (₹)

देयक भरण्याचे अंतिम दिनांक **Bill Due Date**

मुदतपूर्वीचे देयकाचे तपशिल BILL SUMMARY BEFORE DUE DATE

चालू देयक रक्कम Current Bill Amount (₹) _____
शकवाकी Arrears (₹) _____

भरणा केन्द्र Payment Points

विओलिआ ग्राहक सुविधा केन्द्र
VEOLIA Customer Care Centre:

- डीक दवाखान्या मागे, Behind DIK Dispensary,
- व्ही आय पी. मार्ग, गवलीपूर, VIP Road, Gawalipura

ना.म.पा. कार्यालय
NMC Offices:

- धरमपेट विभाग कार्यालय Dharampeth Zone Office
- गोकुलपेट, धरमपेट Gokulpeth, Dharampeth

महाराष्ट्र बँक
BANK OF MAHARASHTRA:

- धरमपेट शाखा Dharampeth Branch
- भरतनगर शाखा Bharat Nagar Branch
- शंकरनगर शाखा Shankar Nagar Branch
- ना.म.पा. सिव्हीललाईन्स शाखा NMC Civil Lines Branch

कार्यकारी अधिष्ठाता (पा.पु.)
Exec. Engr. (WW):

कृपया ही स्लीप शून्य पेमेंट बरोबर लावावी. **Please detach this slip and return with payment**

कनेक्शन क्रमांक Connection No. :	देयक क्रमांक Bill No. :
इंडेक्स क्रमांक Index No. :	देयकाची अवधी Bill Period :
मीटर क्रमांक Meter No. :	देयक दिनांक Bill Date :
देयकाचे आधार Basis of Bill :	चालू देयक रक्कम Current Bill Amount (₹) :
देयक भरण्याचे अंतिम दिनांक Bill Due Date :	मुदतीनंतरची चालू देयक रक्कम Bill Amount After Due Date (₹) :
	मुदतीपूर्वीची मागील शकवाकी Arrears Before Due Date (₹) :
मागील देयक भरल्याचे दिनांक Previous Payment Date :	मुदतीनंतरची मागील शकवाकी Arrears After Due Date (₹) :
मागील भरलेली रक्कम Previous Amount Deposited (₹) :	मुदतीपूर्वीची एकूण रक्कम Total Amount Before Due Date (₹) :
	मुदतीनंतरची एकूण रक्कम Total Amount After Due Date (₹) :
	पावती क्रमांक Receipt No. :

पाणी वापरचा तपशील WATER CONSUMPTION DETAILS

मागील वाचन Previous Reading	युनिट	दिनांक
चालू वाचन Current Reading		
एकूण वापर Consumption		

वातु देयक रकमेचा तपशील DETAILED CURRENT BILL CHARGES (₹)

चालू पाणी आकार Current Water Charge (₹)
मीटर भाडे Meter Rent (₹)
विद्युत अधिभार Electric Surcharge (₹)
कच्चे पाणी अधिभार Raw Water Surcharge (₹)
अनिवासी आकार Non-residential Charges (₹)
अन्य आकार Other Charge (₹)
समायोजित रकम Credit Balance (₹)

मुदतीनंतरचे देयकचा रकमेचा तपशील BILL SUMMARY AFTER DUE DATE

एकूण रकम Total Amount (₹)
चालू देयक रकम Current Bill Amount (₹)
धकबाकी Arrears (₹)

अटी CONDITIONS

- १ युनिट = १००० लीटर
- देयक न भरल्यास मुदतीनंतर सूक्ष्मचना न देता पाणी पुरवठा बंद करण्यात येईल.
- मीटर सुविधित व वाचन योग्य ठेवणे ही ग्राहकाची जबाबदारी आहे.
- जर ग्राहकाला धनदेशाद्वारे देयकचे भरणे करावयाचे असेल तर धनदेशाची रक्कम कमीत कमी ₹1,000/- (सहाशर व मिम यासाठी खाते मोगरु) असावी व धनदेशा कर्यकाराचे अधिपत्या, पाणी पुरवठा विभाग, ना.न.पा., नागपुरचे नावे असावा. धनदेशाचे आरजे अनुक्रमांक धनदेशाचे मागे लिहावे.
- धनदेशा परतल्यावर देयकाची रक्कम सोबत उरिवा भावव्याचे वाचनेसही आकारण्यात येतील व पाणी पुरवठा कोणतीही सुविधेच्या न देता काढण्यात येईल.
- ग्राहक नातू देयकावरल आरजे लिखित शब्द देयकाचे मुदतीचे अंत नोंदवू शकतो.
- पाणीपट्टी नागपुर शहर मर्यादत पाहिल्या पाणीपट्टी दर मुल्यांकन आणि वसुली (मुख्य) उपलब्ध २००९ व त्यातील सुधारणेनुसार आहेत. ग्राहक सुविधा केंद्रावर पाणी भ्रम बाधण्यासाठी उपलब्ध आहे.

पाण्याचे आकार WATER CHARGES

प्रति माह पाण्याचा वापरसाठी पाण्याचे दर Rates/Month for Water Consumption				मासिक पाण्याचे चार्जेस सारंज व वर्गाप्रमाणे प्रति गाळा: Monthly Water Charges as per Size & Category per Tenement in ₹										
अ. क्र.	प्रकार Category	बिलिंग स्लैब Billing Slab	₹ प्रति युनिट Per Unit	15 mm	20 mm	25 mm	40 mm	50 mm	80 mm	100 mm	150 mm	200 mm	250 mm	300 mm
				Upto 10 Units	Upto 20 Units	Upto 30 Units	Upto 60 Units	Upto 85 Units	Upto 150 Units	Upto 215 Units	Upto 425 Units	Upto 725 Units	Upto 1110 Units	Upto 1580 Units
1	निवासी Residential (R1)	1-20	5.51	55.13	110.25	198.45	562.28	887.51	1962.45	3037.39	6510.26	11471.51	17837.45	25611.08
		21-30	8.82											
		31-80	12.13											
		Above 80	16.54											
2	Institutional (IA)	1-20	14.33	143.33	286.65	452.03	948.15	1378.13	2668.05	3957.98	8125.43	14078.93	21719.25	31046.40
		21-80	16.54											
3	Institutional (IB)	1-20	16.54	165.38	330.75	518.18	1080.45	1565.55	2998.80	4432.08	9062.55	15677.55	24166.80	34530.30
		21-80	18.74											
4	Commercial (C1A)	1-20	27.56	275.63	551.25	937.13	2094.75	3114.56	6339.38	9564.19	19982.81	34866.56	53967.38	77285.25
		21-80	38.59											
		Above 80	49.61											
5	Commercial (C1B)	1-20	27.56	275.63	551.25	1102.50	2756.25	4272.19	9646.88	15021.56	32385.94	57192.19	89026.88	127890.00
		21-80	55.13											
		Above 80	82.69											
6	Commercial (C2)	1-30	86.15	661.50	1323.00	1984.50	7938.00	12899.25	45643.50	84341.25	209364.75	387969.75	617179.50	896994.00
		31-100	198.45											
		Above 100	595.35											
7	झोपडपट्टी Slum (S)	1-20	5.51	किमान मासिक पाणी चार्जेस झोपडपट्टी वर प्रमाणे Minimum Monthly Water Charges for Slum in ₹										
		21-30	8.8	Hut RCC Houses upto 500 sq ft area										
		31-80	12.13	Upto 10 Units Upto 12 Units										
		Above 80	16.54	33.08 55.13										

मागील पाणी वापर PAST WATER CONSUMPTION

पाणी वापर अनामत देव Water Consumption : Security Deposit (₹)

ग्राहक प्रकार Customer Category	:	
निवासी गाळा Residential Tenements	:	
अनिवासी गाळा NonResidential Tenements	:	
कनेक्शन दिनांक Date of Connection	:	
कनेक्शन साईज Connection Size	:	
देयकाचे बेसिस Basis of Bill	:	
चालू मीटर स्थिती Current Meter Status	:	
मीटर मालक Meter Owner	:	
मीटर क्रमांक Meter No.	:	

- 1 Unit = 1000 Litres
- Water connection will be disconnected immediately without any notice if payment has not been made within due date of Water Bill.
- It is consumer's responsibility to keep meter in safe and readable condition for the meter reader.
- If the consumer wants to pay the bill amount by Cheque, then the Cheque should not be less than ₹ 1000/- (Except Govt. and Semi-Govt. departments) and should be in favour of EXECUTIVE ENGINEER, WATER WORKS DEPT. NMC, NAGPUR only. The consumer should write his Index No. on the back of the Cheque.
- In case of bounced cheques, delayed payment charges will be levied in addition to bill amount and water connection will be disconnected without notice.
- Consumer can register complaints in writing against current bill amount before due date of water Bill.
- The water charges are as per the City of Nagpur Corporation Water Rate Assessment & Collection (Main) Bye-Laws 2009 and amendments thereof. A copy is available for consultation at our Customer Care Centre.

Annexure -4

**Study Tour to Maharashtra
on SCADA and 24*7 Water supply Initiatives**

Date: 25th -26th April 2013

STUDY TOUR EVALUATION AND FEEDBACK FORM

To enable us to assess the study tour, we would appreciate if you could complete this evaluation form by indicating the answer that best describes the extent to which you agree with the statements below. Please feel free to write your comments, views and suggestions in the spaces given below. These will provide the basis for us to plan next study tours.

Name: _____

Designation: _____

- 1. CONTENT- Please rate the following (4- fully agree; 3-agree; 2-disagree; 1-strongly disagree)**

Project Evaluation Attributes	4	3	2	1
The facilitator was/were knowledgeable Any comments: _____ _____ _____				
The facilitator(s) was/were prepared Any comments: _____ _____ _____				
The facilitator(s) was/were helpful Any comments: _____ _____ _____				
There was appropriate time for discussions Any comments: _____ _____ _____				
There was an appropriate mix of presentations and case studies Any comments: _____ _____ _____				
The study tour has improved my knowledge and skills Any comments: _____ _____ _____				
The itinerary of the study tour has met the stated objectives fully Any comments: _____ _____ _____				

2. ADMINISTRATIVE

Project Evaluation Attributes	4	3	2	1
The duration of the study tour was just right Any comments: _____ _____				
The time spent at each point of the itinerary was just right Any comments: _____ _____				
The general administration and management of the study tour was well coordinated Any comments: _____ _____				
The itinerary of the study tour has met the stated objectives fully Any comments: _____ _____				
The facilities- training venues, meals, local transportation were comfortable and well coordinated				

3. Specific Study Tour content (pls rate 1 to 4; 4 –Excellent 3-Very Good, 2-Good; 1-Fair)

Sr.	Presentation/Discussion	Relevance	Understandable
1	Presentations on SCADA & Metering by Navi Mumbai Municipal Corporation (NNMC)		
2	Field/Site visit to NMMC		
3	Presentation on the 24*7 water supply by Nagpur Municipal Corporation (NMC)		
4	Field /Site visit to NMC		

End of document