

<b>Title of the Initiative</b>	<b>: Hydraulic model for transforming intermittent into continuous (24x7) water supply system in Badlapur Municipal Council</b>
<b>Category of the Nomination</b>	: Technical Innovation
<b>Name of the Nominee</b>	: Dr. S. V. Dahasahashra, Member of Secretary, Maharashtra Jeevan Prahikaran
<b>Nominating Authority</b>	: Dr. S. V. Dahasahashra, Member of Secretary, Maharashtra Jeevan Prahikaran

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**1. Background and Objective:**

The water supply system in Badlapur is owned and maintained by Maharashtra Jeevan Pradhikaran (MJP). Supply is intermittent with only four hours of daily water flow. During the non-supply, and therefore non-pressurized periods, there is risk of injection of contaminated water/sullage through leakages. Intermittent supply also increases the possibility of 'no supply' to poor hamlets. A Hydraulic Model was used in this effort to convert the intermittent supply to a 24x7 water supply.

**2. Implementation Process**

The existing water infrastructure utility was studied and its operation mapping recorded. GIS was used to assess distribution network. Taking the development plan of the town into consideration, a population forecast was generated. Operational zones have been reframed using a transformation study to assess the various possibilities. Studies of the unaccounted for water loss (UFW) has been conducted and leakage reduction in the city is underway. Pressure has been reduced in high pressure areas and the existing distribution network has been upgraded. To date, 30% of the entire city has attained the transformation from intermittent supply to 24x7.

**3. Output and Outcomes**

- Seven of thirty-four wards have round the clock water supply
- UFW has been significantly reduced
- Uniform water pressure is being maintained

**4. Stakeholder Participation**

- MJP

**5. Success Factors (e.g. Leadership / Team work)**

- Upgradation of existing distribution network before moving to 24/7 supply
- Teamwork
- Using new technology to assess the situation and to suggest alternatives

**6. Sustainability and Replicability**

A hydraulic model simplified the redefinition of the existing distribution network for 24x7 water supply. Similar efforts of reducing UFW and upgrading distribution networks will allow other municipalities to replicate this effort.

## Field Assessment Report

**Title of the Project / Initiative** : *Hydraulic model for transforming intermittent into continuous (24x7) water supply system in Badlapur Municipal Council*

**Name of the Organisation** : *Maharashtra Jeevan Pradhikaran, Mumbai*

**Date and Duration of the Spot Study** : *9th April 2008.*

<p><b>Spot Study Team</b></p> <ul style="list-style-type: none"> <li>● <b>Sreedevi Uppalapati</b>, Assistant Professor, Administrative Staff College of India</li> <li>● <b>Vaibhav Purandhare</b>, Senior Research Associate, Administrative Staff College of India</li> </ul>	<p><b>Places visited during the Spot Study</b></p> <ul style="list-style-type: none"> <li>● Badlapur Water Supply Scheme, Tal. Ambarnath, Dist. Thane, Maharashtra, where the 24 x 7 WSS is implemented.</li> <li>● Shirgaon M.B.R., DMA-SH<sub>2</sub>D<sub>1</sub>, SH2D<sub>2</sub> (Wards 34,33,24), Badlapur Barrage Head Works</li> </ul>
<p><b>Stakeholders met</b></p> <ul style="list-style-type: none"> <li>● <b>Mr. Ram Patkar</b>, President, KBMC</li> <li>● <b>Mr. Anand Mrs. Dilip Surval</b>, Councilar, KBMC</li> <li>● <b>Mr. Tawade, Mrs.Saraf</b> and residents of wards where the 24 x 7 WSS is in operation</li> <li>● <b>Dr.Vishwasrao</b>, Medical Practitioner of the area.</li> </ul>	<p><b>Officials who accompanied ASCI/CII team</b></p> <ul style="list-style-type: none"> <li>● <b>Dr. Sanjay Dahasahastra</b>, Member Secretary, MJP</li> <li>● <b>Mr D.C. Suryavanshi</b>, Chief Engineer, MJP, Thane</li> <li>● <b>Mr B.K. Sawai</b> , Superintending Engineer, MJP, Thane</li> <li>● <b>Mr G. S. Patil</b> , Executive Engineer, MJP, Ambarnath</li> <li>● Field staff of MJP</li> </ul>

### Findings

#### (i) Pre and Post Project Situation (quantitative and qualitative details)

<p>Badlapur is 'B' class Municipal Council covering population of 1.60 lakhs. The town is divided into 34 municipal wards. The source of Water Supply Scheme is <i>Ulhas</i> river, which is perennial. The amount of water supplied to the city is 25 mld.</p>		
<p>The pre and post project situation of 24 x 7 system for 8 wards is as below:</p>		
Parameters	Pre project	Post Project
1) Supply hours	3 to 3.5 hrs. per day for 34 wards	<ul style="list-style-type: none"> <li>● 24 hrs. for 8 wards</li> <li>● 18 hrs. for 2 wards</li> <li>● 7 hrs. for 7 wards</li> <li>● 3.5 hrs for remaining 17 wards</li> </ul>
2) Rate of consumption	156 lpcd	140 lpcd (where under ground tanks are not leaking).
3) Nature of human health risk	2 to 3 cases of Dysentery, Jaundice and Typhoid per month were observed.	No cases are recorded.

4) Quality of water (Source: Public Health Lab.)	100% potable as per reports (10 samples per week). Sporadic turbidity problems were observed.	100% potable as per reports (10 samples per week). The water is crystal clear.
5) No. of complaints about contamination of water	5 to 6 complaints per annum	No complaints are received
6) No. of visible leakages rectified per month	30 to 40	10 to 12
7) I. E. C. carried out	No	1) Door to door campaign 2) Involvement of local elected councilor for IEC. 3) Through Media such as news papers and local cable network etc.
8) Energy charges to the consumers	Quite high due to storage in sump and pumping to overhead tank	Saving in energy charges is observed at Bungalows and individual houses as the residual pressure are now enough to supply water even to the second storey of buildings.
9) Awareness about conservation of water.	Tendency of storing excess water and later on throwing the stale water when fresh water is supplied.	Reduction in consumption/wastage of water due to change in habit of storing of water to non storing.
10) Assessment per month Revenue recovery per month	Rs. 6.00 lakhs Rs. 4.50 lakh (75%)	Rs. 10.10 lakhs Rs. 9.10 lakhs (90%)
11) Percentage of non working meters.	35%	23%
12) Invisible leak detection and removal.	Nil	4 to 5 invisible leaks are detected per month with sounding rods and other equipments and then the same are repaired.
13) Public stand posts	In slum area 3 group connections were given.	Individual connections are given. Hence, no stand posts exist in the city.
14) Reliability and satisfaction of water supply system	Inconvenient supply hours affected poor people. Large size of storage was required and consumers had to pay for pumping. Results in poor sanitation leading to increase in health risks and mortality.	A better demand management is possible due to elaborate metering and effective leakage control. Reduction in consumption due to change in habit from storing of water to non storing. Excellent consumer satisfaction Enhanced willingness to pay even in the slum pockets.
15) Housewives time for house hold activities	Anchored to water supply schedule, i.e., 3.5 hours per day.	Since water is readily available house wives can effectively manage time for other productive activities and house responsibilities.

## (ii) Implementation Process (step-by-step)



### Steps taken for implementation of 24 x 7 water supply

- Satellite image was procured from NRSA Hyderabad.
- The entire city was digitized and the map showing road network, house properties (with house ID number) etc was prepared in AutoCad drawing which was then used as backdrop of the hydraulic model.
- City Development Plan (CDP) was obtained from the Municipal Council.
- Water distribution network was plotted on CDP in Auto Cad which was then superimposed on the digitized map.
- Population was forecasted by Density method.
- Water Distribution pipe network of city was divided into 10 Operation Zones (OZ).
- Each OZ is further sub-divided into 3 to 4 District Metering Area (DMA)s so that each DMA contained not more than 1000 connections.
- Property survey was carried out to determine number of people residing in all 28,000 houses. Thus demand at nearest node was computed which was then compared with the earlier population figure computed by the density method.
- Distribution network has been simulated using latest WaterGem Software and hydraulic model was prepared.
- The data was validated and the pipe network was calibrated. This model was used for taking decisions in field.
- According to model design OZ and DMAs are hydraulically discreted at site of work.
- As per analysis carried out by the hydraulic model, new pipelines were laid, some old pipes were replaced.
- Using DMA methodology Non Revenue Water (NRW) for each OZ and DMA was worked out.
- The OZs and DMAs with high NRW (profusely leaking) were tackled first for leak detection and repair.
- Toll free contact number is provided for consumer redresses.
- 8 Wards out of 34 Wards tackled in first phase for 24x7 water supply system.
- Rest of the area will be covered in two phases.
- European Economic Community (EEC) mark meters are being installed.

**(iii) Innovations** (specify briefly, if any)

- A hydraulic model for transforming intermittent water supply to 24x7 continuous water supply was prepared for the first time in India which is used for the city of Badlapur.
- The model described simulated behaviour of system and particularly helped MJP engineers to hydraulically discrete (isolate) the Operation Zones (OZ) as well as District Metering Areas (DMA).
- Merely hydraulically discretizing OZ and DMAs, and repairing visible leaks, they were able to transform water supply of 8 wards (out of 34 wards) into 24x7 continuous water supply.
- The model so prepared has been proved to be very useful tool for metering strategy (in normal situation where 2 to 3 meters costing 4 to 5 Lakhs each are required, using this model they were able to use only one meter). Thus number of costly bulk meters used for determining net night flow are optimized by this unique model. The MJP saved about Rs 60 Lakhs using this model.
- Using the model for transformation to 24x7 system helped MJP to increase revenue and improve service delivery.

**(iv) Stakeholder Participation**

- President, Badlapur Municipal Council motivated people during MJP's campaign.
- Local elected councilors actively participated in IEC (Information, Education and Communication) program.
- Prompt payments of bills by consumers.
- Prompt customer feedback and leak reporting.
- Consumers came forward for replacement of their non working meters.

**(v) Benefit Cost Analysis** (Economic viability of the innovative technique/practices including environmental advantages)

- The number of expensive bulk meters procured for determining net night flow in DMAs are optimized by this unique model. Out of 127 bulk meters initially estimated, now MJP required only 50 meters, thus they saved Rs 60 Lakhs.
- Initially the assessment in 8 wards was Rs. 6 lakhs per month and recovery was 75%, i.e., Rs. 4.50 lakhs per month. Now the percentage of recovery has increased to 90 % which gives addition revenue of Rs. 4 lakhs per month. Due to this the expenditure of Rs 26 lakhs which was incurred for 24x7 activities has now been recovered.
- The transformation process to 24x7 system benefited MJP engineers as their capacity is built up especially in reducing NRW significantly. They are now well trained in computation of water balance as suggested by the IWA.
- With implementation of this initiative, the overall health of the people (especially in slum which constitute 5% of population) improved.
- Since the housewives can now saved their time and devote more time for amelioration of their family and living standard is improved.

**(vi) Output and Outcomes – Benefits Accrued** (Tangible and Intangible)

- It reduces contamination level.
- Better health conditions achieved, since good sanitation practices are adopted by consumers.
- Life of distribution system is improved, due to steady pressure in pipeline.
- Better demand management is now possible due to elaborate metering and effective leakage control.
- Excellent consumer satisfaction which enhances willingness to pay bills even in slum pockets.
- Consumer can manage their time effectively. They can allot more time for rewarding other activities. Women can spare their time for other household activities.
- The pipe network requires less doses of Chlorine.
- Reservoir capacities are now fully utilized.
- Valves suffer less wear and tear, hence their life enhanced.
- Less man power is now required (due to DMA methodology no zoning is required).
- High quality of water bettered cities' economy and attracted more industries and business.
- Increased accessibility of water to poor.

**(vii) Scope of Replicability to transfer to other Communities and Sustainability**

- Considering success and achievement in area where 24x7 system is implemented, other areas in vicinity of these wards are demanding for 24x7 system. The model helps to distribute water equally to all the parts of the city. The other areas are being covered in near months to come.
- With the help of model MJP has decided to transform intermittent water supply of other 25 MJP water works to 24 x 7 systems. They intend to showcase their water works to other ULBs in Maharashtra for replicability. This will increase MJP's business activities.
- 24x7 experiment at Badlapur can be replicated provided Hydraulic Modelling work for the other cities are carried out with GIS mapping and digitized maps.
- Normally leaking under ground tanks are the constraints for replicability. If telescopic tariff is designed for such scenario (higher water charges for more consumption) the 24x7 system can be achievable in other cities also. The consumers may not bypass their leaking tanks initially till the confidence is built up. But once they get water even in second storey, their confidence level will increase. This will help replicability.

**(viii) Other factors which speak of the Positive Nature of the Initiative**

- Media appreciated the Badlapur 24x7 initiative while commenting on the deliberations of the seminar organized by Municipal Corporation of Greater Mumbai.
- Increase in property rates at Badlapur is realized due to improved quality and delivery of water supply service. This has attracted more business and the collection of municipal tax has increased.
- During investigation it is learnt that recently the HSBC bank along with their non technical team from various countries had chosen Badlapur's 24x7 system as their research project with IIT Powai acting as the nodal institution. They unanimously concluded that the Badlapur 24x7 is a bankable project.
- International engineering community has taken note of this initiative and has

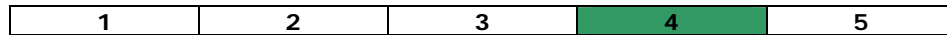
invited Member Secretary of MJP to share this experiment with them at Kuala Lumpur in the month of July.

- The initiative of Badlapur 24x7 experiment attracted US-AID authority and they organised a twinning programme between Ran-Hill Company of Malaysia and MJP.

**(ix) Specific Remarks from the Team**

The team was very satisfied with the initiative and dramatic improvements brought about in quality of life of the residents. It provided numerous benefits, particularly for those most in need, and created no significant disadvantages. Even the minor details of the project were taken care during the design and implementation of the scheme.

**Rating**



**For further details contact:**



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