

Uninterrupted Water Supply -A Pilot Study

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Abstract:

Safe, adequate and reliable water supply at a minimum cost is the prime objective of any water supply system. Only continuous supply can ensure safety by way of keeping adequate pressure in the water distribution system to avoid contamination from outside and making water available round the clock, to maintain its hygienic quality. In continuous water distribution system, the average consumption decreases thus it is more economical as compared to intermittent system. In this project we have tried to understand the effectiveness of continuous water supply system over intermittent system and convert it by designing a hydraulic model using software EPANET. An effort has been made to study the pilot area of Nagpur city where it has already been implemented.

Keywords: Continuous Supply, EPANET, Pilot Area Study.

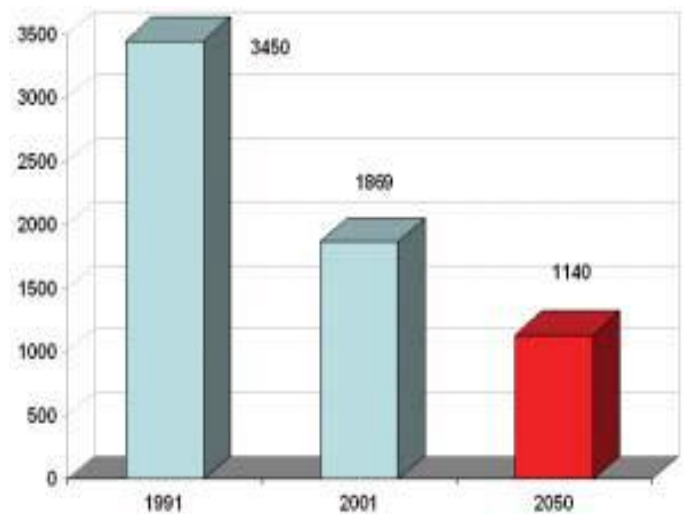
The water crisis

Water is indispensable for life but is finite and therefore precious. Serving pure and potable water to the dense populations in developing countries, especially in India, is a daunting task. According to the World Water Development Report, 1.1 billion people worldwide do not have access to safe drinking water. This figure is expected to touch 2 billion by 2050. 1.6 million die every year due to diseases related to poor sanitation and polluted water supply and 160 million are infected with Schistosomiasis while 133 million suffer from highintensity intestinal helminth infections.

Access to safe water- Indian scenario

Though 82 % of the urban population has access to safe drinking water, only 63 % of them have access to tap water. Besides, as against a target of 140 liters per capita per day (LPCD), the average per capita water supply in the country varies from 57 to 160 LPCD. In slum areas, the LPCD stands at a mere 27. Some of these statistics are really staggering. For example, the infant mortality ratio in India is 70, which is

closer to some of the African countries. One of the main reasons for this state-of-affairs is the inaccessibility of safe drinking water and intermittent water supply. In Asia only 8 cities, Hong Kong, Kualalampur, Changdu, Osaka, Phnum Penh, Seoul, Shanghai and Tashkant get continuous water supply. Currently, Nagpur is the only city in India which has sanctioned 24x7 water supply in whole city.



Why is intermittent supply bad?

Water supply systems do not operate as designed. Therefore, reservoir capacities are often underutilised. The valves suffer wear and tear. Since, water is supplied by zoning the distribution system, more man power is required. During non-supply hours, pipes are empty and dirt water enters pipelines at vulnerable spots and water is contaminated. Large doses of chlorine or other disinfectants are required to make water safe from microbial pollution. Due to limited hours, peak factor is often in the range of 4 to 6 in most of the systems. Therefore, large sizes of pipe mains are required for strengthening the

network to meet the hydraulic requirements. Inconvenient supply hours affect poor people. Large size of storage is required and consumers have to pay for pumping. Also, it results in poor sanitation practices leading to increase in health risks and mortality. Due to intermittent water supply, often meters go out of order resulting in loss of revenue. Besides, due to uncertainty consumers store a large quantity of water and waste it before collecting fresh water again. This adds to a huge undue wastage of precious treated water.

Intermittent System consumes more water:-

1. Consumer taps are usually kept open.
2. There is a tendency to store more water than what is required.
3. The 'STALE' water is thrown to store 'FRESH' water.
4. High peak needs strong network and more capital investment.
5. Low pressures increase the coping cost of the consumer.
6. Leak detection & management is difficult.

Benefits of 24x7 water supply:-

24x7 continuous, pressurised water supply overcomes shortcomings of intermittent supply and ensures customer convenience and benefits the poor. Continuous high quality water supply system reduces contamination level as the pipes are under positive pressure and entry of contaminants into the pipes is restricted. Life of distribution networks increases as steady pressure in the pipes causes less damage to the pipes. A better demand management is possible due to elaborate metering and effective leakage control. It also results in less storage of water or none at all, which in turn reduces wastage of water. Continuous supply of pure water boosts the economy and attracts more industries and businesses.

Objectives of implementation of Un-interrupted Water Supply in a pilot zone are :

- Provide consumers with un-interrupted water supply at desired pressure.
- Reduction of an Un-accounted Flow of Water (UFW) to within 15% by reducing leakages and unmeasured supply.
- 100% metering with good quality meters having long life spans.
- Improved billing mechanism (Reading, bills generation & distribution) to reduce time & cost per bill including spot billing.
- Better services to Urban poor by implementation of slum policy.
- Attending consumer complaint within short time.
- Improved satisfaction for stake holders.

- Implement good engineering practices to upgrade existing network.
- Bring accountability on design, implementation, and O&M with single agency through performance based contract and Bench Marking of Services.
- Implement the lessons learnt from pilot zone to other parts of city.

Objective of Present study-

Usually, water supply systems are designed as continuous water supply systems. Due to inadequate funding, improper implementation coupled with complications caused by unprojected urbanisation, increased population and rise in demand for water, distribution systems are expanded without taking cognizance of the hydraulic design. Second law of thermodynamics on entropy, i.e., orderly systems become disorderly as time moves on, applies to the ever expanding water supply distribution systems as well. Transforming the disorderly distribution system into a well disciplined and properly designed system (pressurised pipelines with optimum pressures) is the task of 24x7 supply system. For that, it needs to meet the present and future requirements. Unless a proper hydraulic model is prepared, it is not possible to convert old intermittent system into a 24x7 system. We are designing a hydraulic model using software EPANET.

Case study-

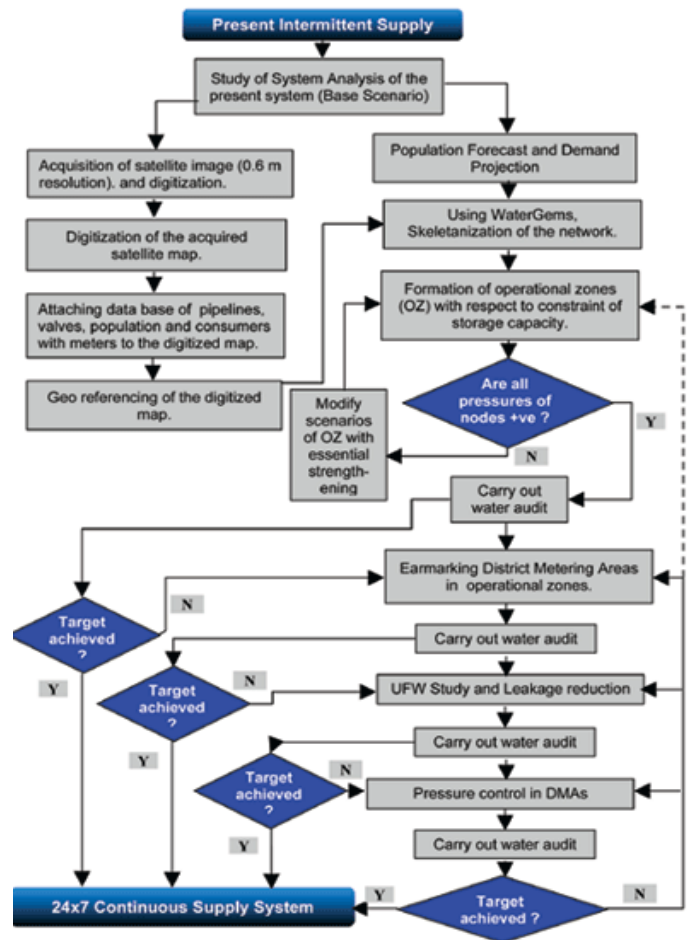
The case study covers the application of the approach to convert its old intermittent system into the 24x7 continuous water supply system of Bajiprabhu Nagar area of Nagpur. The complete project is taken by Orange City Water Pvt. Ltd. In Public Private Partnership under JNNURM Scheme. So far in Nagpur city, Bajiprabhu Nagar, Ramdaspeth, Dharampeth, Shivaji Nagar, Shankar Nagar, Laxmi Nagar have been successfully transformed into 24x7 continuous water supply using critical hydraulic modelling.

Satellite Image of Baji Prabhu Nagar-



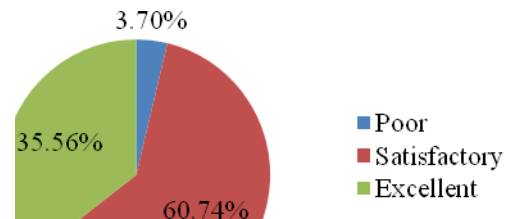
Currently, Nagpur is delivering 24x7 water to 10 per cent of its population. The pilot project for continuous water supply in Baji Prabhu Nagar in Dharampeth zone was conceived in 2007 and commissioned in 2009. This reflects the recognition that continuous water supply is vital for both health and sanitation, and that leapfrogging in this respect is a desirable and feasible option. Nagpur was the first city to conduct the water audit, which revealed water losses to the extent of 52 per cent. The transportation loss from the bulk source was 30 per cent. The distribution network of approximately 2,100 km of pipes in Nagpur's 10 zones for water distribution also had a massive water loss problem, resulting in non-revenue water and commercial losses for the corporation.

Action Plan for Transformation into 24x7 Water Supply System-

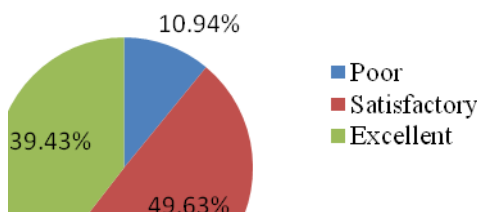


Survey-

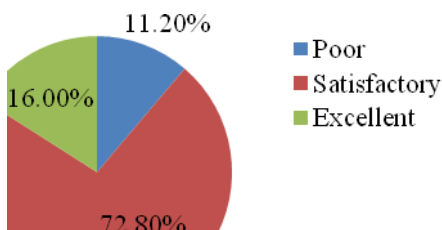
The Survey was conducted in Bajiprabhu Nagar area of Nagpur under which following conclusion was drawn-



Are you satisfied with current water pressure?



Are you satisfied with the Customer services?



Improvements compared to previous situation (before 24X7) -

Water Audit-

This activity measures the total inflows and outflows of the system with the help of various methods, which involve use of instruments like pressure gauges, flow meters. The activity is like a pathology test, which reflects the health of water supply system in terms of its components under different parameters recording the transformation. The water audits need to be repeated several times after every experimentation to evolve the appropriate decision making and to document the progress of the improvements. Accurate metering of the retail consumers is an important job to be carried out in order to achieve 24x7 continuous water supplies. It is an essential prerequisite for demand management. A water balance is required to be achieved by ascertaining –

- 1) The total quantum of water entering the system by installing bulk meters.
- 2) The total quantum of water consumed by taking readings of retail meters installed at consumer's end. The water audits provide leads for leakage studies, for ascertaining the changing flow rates during transformations towards 24 x7, for throttling exercise for equitable pressures and also for assessing the progress achieving of 24 x 7.

Conclusions-

Intermittent water supply may seem to be a solution to a water shortage situation. Safe, adequate and reliable water supply at a minimum cost is provided by the uninterrupted water supply system. This system also proves beneficial for the users because of the better quality and availability of water. Also, EPANET software proves effective in analysing the existing water distribution system.

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