



Design of 24-by-7 Water System Reduces Health Risks in India

By Bentley Systems

Supplying potable water to dense populations in developing countries is a perpetually daunting task for water service providers. It is one reason why 1.6mn people die each year from diseases due to poor service provided by an intermittent water supply. In India, for example, daily water supply ranges from just 27 litres per capita per day (LPCD) in poor areas to 160LPCD in affluent areas, compared to 260LPCD in a typical U.S. single-family home. During non-supply hours, pipes remain empty, and dirty water enters the pipeline at vulnerable spots, causing contamination and associated health risks.

Badlapur, India, part of metropolitan Mumbai, is one city stepping up its effort to supply its growing population with a

24-by-7 system. This will be a first for the country as currently no Indian city receives water around the clock. When the water supply source for Badlapur was severely damaged by a severe rainstorm in July 2005, construction of a new barrage gave occasion to optimise the distribution system for continuous

Project Overview

Transforming Intermittent Water Supply of Developing Countries to 24x7 System

Organisation

Maharashtra Jeevan Pradhikaran

Solution

WaterGEMS

“Technical innovation showcased as inspiration for other water utility authorities.”

Backdrop Drawing of Badlapur City



water supply to the city's more than 1,40,000 inhabitants. The city is expected to more than double in size to 3,00,000 by 2011.

Transforming the disorderly distribution system into a well-disciplined and properly designed water system with optimum pressure through pressurised pipelines relied on using a hydraulic model, according to Dr. Sanjay Dahasahasra, member secretary at Maharashtra Jeevan Pradhikaran. This complex model required modeling the city's entire water distribution system and its operations pattern. It also required calibrating the network, analysing the consumer withdrawal patterns during system modifications, and creating zones and district metering areas to further improve service. Water loss and diversion caused by leaking underground storage tanks and oversized above-ground tanks complicated the analysis.

The project team used Bentley's WaterGEMS to design the existing and proposed pipelines in Badlapur. Features such as flow-control valves, reservoirs as source nodes, pipe junctions, pipe elements, and demand nodes helped to analyse and optimise the distribution network. The design team used the software to create a modeling process to analyse the data, describe the real-world network system, test maps, and synchronise with a GPS.

Simulation of the real-world network also involved modeling the current behavior of the hydraulic systems. Additionally, a critical analysis for improving the system through various measures needed to be modeled under numerous scenarios and alternatives. The field results also had to be used in a proper manner to understand and then enhance the network's performance. The entire exercise involved management of a vast amount of data, comparison of permutations, and a combination of a large number of scenarios resulting from various alternative measures to create a comprehensive model.

According to Dr. Dahasahasra, using WaterGEMS will result in an annual savings of \$75,000 over the 30yr lifecycle of the project.

"Improving the water supply in Badlapur would not have been possible without analysing existing conditions using WaterGEMS," said Dr. Dahasahasra. "By developing a 24-by-7 water supply system, we have shown how to improve the quality of the water supply in developing countries and reduce the risk of contamination." www.bentley.com

By the early part of this year, seven of the city's 34 wards had been converted to 24-by-7 systems by hydraulically isolating operational zones. Supply hours in eight wards have already increased from three hours to 24hrs. Supply hours in two wards have been increased from three hours to 18hrs, while seven other wards have had their supply hours increased from three hours to seven hours. This progress has greatly improved drinking water quality, reduced contamination levels, and minimised health risks.

The project is expected to be completed by year-end 2008 and act as a model solution for other Indian cities as well as cities in developing countries to improve their potable water systems, enhance public health, and meet United Nations Millennium Development Goals.

About the Contributor

With over 2,800 employees in over 50 offices worldwide and annual revenues surpassing \$450mn, Bentley Systems has invested over \$1bn in research, development and acquisitions since 1993. Nearly 90% of the Engineering News-Record Top 500 Design firms are Bentley subscribers and Daratech has ranked Bentley as the world's No 2 provider of software solutions to the architecture, engineering, construction and owner-operator market as well as No. 2 in the GIS/geospatial market.

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