



Geoinfo Services Designs a Low-carbon Water System to Provide Clean, 24/7 Service to One of India's Holiest Cities

Effective Network Design Incorporating Variable Frequency Drive Pumps Will Greatly Reduce Energy Use while Improving Health and Quality of Life

Water Issues in an Important City

The ancient city of Ayodhya is one of the seven holiest cities in India for Hindus, and is said to be the birthplace of Rama, the central figure of the ancient Hindu epic Ramayana. However, it lacked regular and reliable access to water. Its old water system was laid out haphazardly, with many pipes that were too large and took too long to fill, and massive leaks causing nonrevenue water to reach 50%. Water quality suffered greatly as a result. To improve the health and standard of living for both residents and visitors, as well as to encourage economic development, Geoinfo Services was tasked with redesigning the water system to provide a pressurized, consistent supply 24 hours per day, seven days per week.

Energy-saving Technology

Like many water systems in India, Ayodhya's previous system was gravity based. To fully eliminate problems with low pressure and ensure a consistent supply, the new system would need to incorporate conventional water pumps. However, these pumps require a significant amount of energy to operate, which had the potential to greatly increase carbon emissions and electricity costs. Geoinfo's solution was to incorporate variable frequency drives (VFDs) into the new water system. This technology operates the pumps at different speeds depending on moment-to-moment demand and pressure, greatly improving energy efficiency. To ensure that the integration of VFDs would enable the pumps to operate more efficiently and economically, resulting in significant energy savings, the team needed to find the right water network modeling and analysis solution.

Modeling All Elements for System Optimization

Geoinfo soon determined that OpenFlows applications would help them model and visualize all elements of the new water system, including VFD pumps. First, they modeled the service area, including the roads that could provide pathways for water pipes. This model incorporated population densities and the predicted demands for individual nodes in the system. Next, they created a digital twin of the network comprising all elements, including pumps and pipes. Lastly, they ran a hydraulic analysis on the design and adjusted elements as needed, ensuring consistent water pressure and availability to all areas of the city.

Greatly Improving Life in the City

Because of Geoinfo's accurate design, the finished water system will deliver clean, consistent water to all residents and visitors, easing pilgrimage and making the city more appealing to developers. The effective network design that includes the integration of VFD pumps will reduce carbon emissions by an estimated 347 tons per year and lower the city's electricity costs by USD

46,025 annually. Improving the water quality will greatly impact the health of residents, cutting their monthly medical costs by 50%. Panics and conflicts from water scarcity are set to become a distant memory. The efficiently designed network eliminated the need for construction over 1.35 hectares of land, and controlling leaks will lower costs, conserve water, and boost energy efficiency. Geoinfo plans to use the digital twin to monitor the water system and swiftly address any problems.

Project Playbook: OpenFlows HAMMER, OpenFlows WaterGEMS, OpenFlows WaterSight

Outcome/Facts:

- The effective network design that includes the integration of VFD pumps will reduce carbon emissions by an estimated 347 tons per year, while lowering electricity costs to the city by USD 46,025 annually.
- Improving the water quality will greatly improve the health of residents, cutting their monthly medical costs by 50%.
- The efficiently designed network eliminated the need for construction over 1.35 hectares of land.
- Controlling leaks will lower costs, conserve water, and boost energy efficiency.

Quote: “This [water network] digital twin brings SCADA, GIS, hydraulic modeling, and consumer information into a connected data environment, delivering cost-effective operations strategies in real time.” – Dr. Sanjay Dahasahasra, Member of the National Task Force of 24x7 Water System, Government of India



[Image link](#)

Image caption/courtesy 1 (header image): The effective network design that includes the integration of VFD will reduce carbon emissions by an estimated 347 tons per year, while lowering electricity costs to the city by USD 46,025 annually. *Image courtesy of Geoinfo Services*

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