Amagua C.E.M. Designs Solar-powered Water Treatment and Distribution

Using Bentley Technology Saved USD 1.2 Million in Costs and Helped Eliminate 6,905 Tons of Carbon Emissions

ADOPTING SOLAR ENERGY FOR A NEW INTEGRATED WATER SYSTEM

Amagua C.E.M. provides drinking water and wastewater management for the La Puntilla Parish in the Samborondón district of Ecuador. Committed to offering a quality, efficient water supply and sewerage service, they also provide complementary preventive system management, as well as consulting for network design, construction, and maintenance of residential facilities. To streamline operations and ensure a reliable water supply, Amagua decided to build an integrated water capture, transportation, and treatment system.

“To have operational autonomy, we determined the need for an integrated collection, conduction, and treatment system that allows it to supply [...] a complete flow of 880 liters per second (l/s),” said Leonidas Dávila, engineer and project director at Amagua.

The project was divided into two phases, providing a flow of 440 l/s in the first phase and an additional 440 l/s during the second phase. It involved designing a catchment, distribution line, and treatment plant. To make the project self-sustainable and reduce its carbon footprint as much as possible, Amagua contemplated using solar panels to power the network and pump the water to the distribution tanks. The solar energy captured by the panels would power surface pumps that draw water from a river or well and pump it to the raw water tank and distribution system, reducing and potentially eliminating the network’s reliance on conventional energy sources, such as grid electricity or fossil fuels.

ADDRESSING UNDULATING TERRAIN AND PIPELINE TRANSIENTS

While solar panels are advantageous to reducing environmental impact and supporting a more sustainable and economical water supply, Amagua needed to consider several factors to optimize pump and network operations. “It is important to consider the appropriate capacity and size of solar panels, as well as the efficiency and capacity of storing energy in batteries, for optimal operation of the pump system,” said Leonidas Dávila. In addition to the panel specifications and energy considerations, Amagua also had to address semi-undulating terrain and irregular topography, as well as avoid problems with transients in the 4.2-kilometer-long pipeline in the high elevation area.

To identify and mitigate potential problems that could affect the pressure and flow and compromise operations, as well as ensure that the solar panels could generate the necessary power to deliver a reliable water supply, Amagua had to perform various modeling scenarios. They needed an integrated 3D design and hydraulic modeling and analysis solution to optimize optioneering, determine the most effective network arrangement, and validate the use of solar energy.

LEVERAGING BENTLEY’S 3D DESIGN AND HYDRAULIC MODELING AND ANALYSIS APPLICATIONS

“It was proposed that MicroStation and OpenFlows Water be used to optimize the execution of the project,” said Leonidas Dávila. Amagua selected MicroStation to design the entire architecture of the system in 2D and 3D, as well as OpenFlows Water to model and analyze the pipeline arrangement of the network and estimate energy consumption costs, based on both electricity and renewable energy. The advanced algorithms and 3D visualization features of Bentley’s applications allowed Amagua to perform digital simulations of numerous scenarios, verifying the optimization of both the existing and future distribution networks, and validating the use of solar panels as the most efficient source

PROJECT SUMMARY

ORGANIZATION
Amagua C.E.M.

SOLUTION
Water and Wastewater

LOCATION
Samborondón, Guayas, Ecuador

PROJECT OBJECTIVES
• To deliver an integrated water capture, transportation, and treatment system.
• To achieve a more sustainable, economic water supply.

PROJECT PLAYBOOK
MicroStation®, OpenFlows® Water

FAST FACTS
• Amagua provides drinking water and wastewater management for La Puntilla Parish.
• They determined a need for an integrated water capture, transportation, and treatment network.
• The project involved designing a self-sustainable, energy-efficient plant, using solar panels to power the pumps.

ROI
• Using MicroStation and OpenFlows Water optimized design, shortening the construction period by 97 days.
• Bentley’s applications reduced Amagua’s modeling time by 80% and saved on material costs.
“By harnessing solar energy, the environmental impact is reduced, and a more sustainable and economical water supply is achieved over the long term.”

– Leonidas Dávila Viera, Engineer and Project Director, Amagua C.E.M.