



Automatic Flow Control Valves Solve Raw Water Management Challenges

For all the historical and natural charm of Greenville, S.C., efforts to serve the city's water customers were hampered by raw water management challenges at a nearby reservoir. A new automatic flow control valve provided Greenville Water, City of Greenville Commission of Public Works, with a customized solution.

Greenville is situated about halfway between Charlotte, N.C., and Atlanta, up against the foothills of the Blue Ridge Mountains. With its natural beauty, Southern traditions, and historical districts featuring early 19th- and 20th-century architecture, it has become a year-round destination for visitors from all over the United States.

The local water system is owned and operated by Greenville Water, which serves more than 500,000 people in the region and produces what has been recognized as South Carolina's best-tasting water in national and state water quality competitions. In 2020, Greenville Water received the Association of Metropolitan Water Agencies' Sustainable Water Utility Management Award.

The most significant contributing factor to the exceptional purity and taste of Greenville's water is the pristine environment from which it comes. Greenville Water manages two properties known as the Greenville Watersheds of South Carolina: Table Rock Watershed is approximately 10,000 acres along the Pickens County line, and the North Saluda Watershed is approximately 20,000 acres in northern Greenville County. Being located in a largely undeveloped area helps protect the watersheds, with no gas stations, shopping malls, or dense populations that could compromise the quality of the raw water.

Controlling Water Flow

To support its service area, Greenville Water operates two water treatment plants (WTPs): L. B. Stovall WTP, processing 75 mgd, and the Witty Adkins WTP, treating 90 mgd. The utility also operates two man-made reservoirs: North Saluda and Table Rock.

For many years, excess raw water from the Table Rock Reservoir that wasn't being sent to a WTP flowed down a ramp-style spillway into the riverbed below. Depending on the runoff from other water sources originating in the Blue Ridge Mountains, just three inches of rainfall could easily exceed the reservoir's capacity, sending an uncontrolled flow of raw water cascading down the aging spillway. This presented three problems for Greenville Water:



Greenville Water replaced the existing outfall structure with a new weir (left) and added a flow control valve with a customized app (center and right) to automatically control water flow.

- The only way to stop and start flow down the spillway was a sluice gate that had to be raised and lowered using a manual crank, necessitating the deployment of crews to the gate site—sometimes daily.
- The frequent or sometimes continuous flow of water over the spillway was causing the structure to degrade, requiring an ongoing stream of repairs.
- The continuous flow of water made it difficult for operations and maintenance personnel to adequately inspect the spillway.

Looking to improve raw water management in the reservoir, Greenville Water undertook a capital improvement project to replace the existing outfall structure with a new weir and add a way to automatically control water flow. The project's desired result was to achieve a controlled diversion of water flowing from the reservoir into the riverbed. Greenville Water determined that a flow range between 2 mgd and 25 mgd would enable the utility to maintain an optimal level in the reservoir and lower the water level in the reservoir whenever rain was anticipated.

Collaboration Pays Off

In August 2019, The Constantine Group worked closely with Greenville Water to design and construct a solution to meet the requirements at the reservoir.

"As part of the overall design for the project, we evaluated multiple flow control devices, including actuated and nonactuated valves that could efficiently operate within all the flow ranges stipulated in the design conditions," says Joey Crews, The Constantine Group's senior project engineer.

The valves were evaluated for ease of operation, long-term maintenance, and hydraulics, including cavitation and cost. Due to the extreme inlet and outlet pressure differential, cavitation was the most critical concern for the valve's selection. The large flow range of 2 mgd to 25 mgd, as well as the high static head at the discharge location, put the control operation of the valve near or in the critical cavitation zone.

A Cla-Val (www.cla-val.com) flow control valve with added anticavitation trim was selected for its ability to operate within the required flow range without experiencing potential damaging cavitation. The valve could be maintained without being removed. In addition, the valve allowed for a below-grade vault installation. The valve could also be monitored and changed as needed from the Stovall WTP. To address Greenville Water's preference for remote and more precise control, a Cla-Val VC-22D electronic valve controller was specified to manage the installation's varying flows while measuring and communicating flow data to the supervisory control and data acquisition (SCADA) system using a customized app developed by Cla-Val.



The project was commissioned in July 2020, in the midst of the COVID-19 pandemic. Standard precautions and preventive measures were instituted for Greenville Water employees and contractors, including daily temperature checks, social distancing, and mask wearing. Constantine Constructors performed all aspects of construction except for electrical and SCADA, which were installed by Paul Young Electric and Howard Engineers, respectively.

This collaborative effort culminated in a practical solution that met Greenville Water's operational requirements. The innovative project also prevented weather-related overflow, further ensuring a reliable and sustainable water supply for the people and businesses in the utility's service area.

Whether a municipality gets its water from an aquifer, man-made reservoir, river, or lake, effectively managing raw water is an important first step in the water treatment process. Automatic control valves with remote control and metering capabilities have proved to be an efficient and reliable choice for the utility's diversion efforts, blending water from different sources, and flow- and level-control applications.