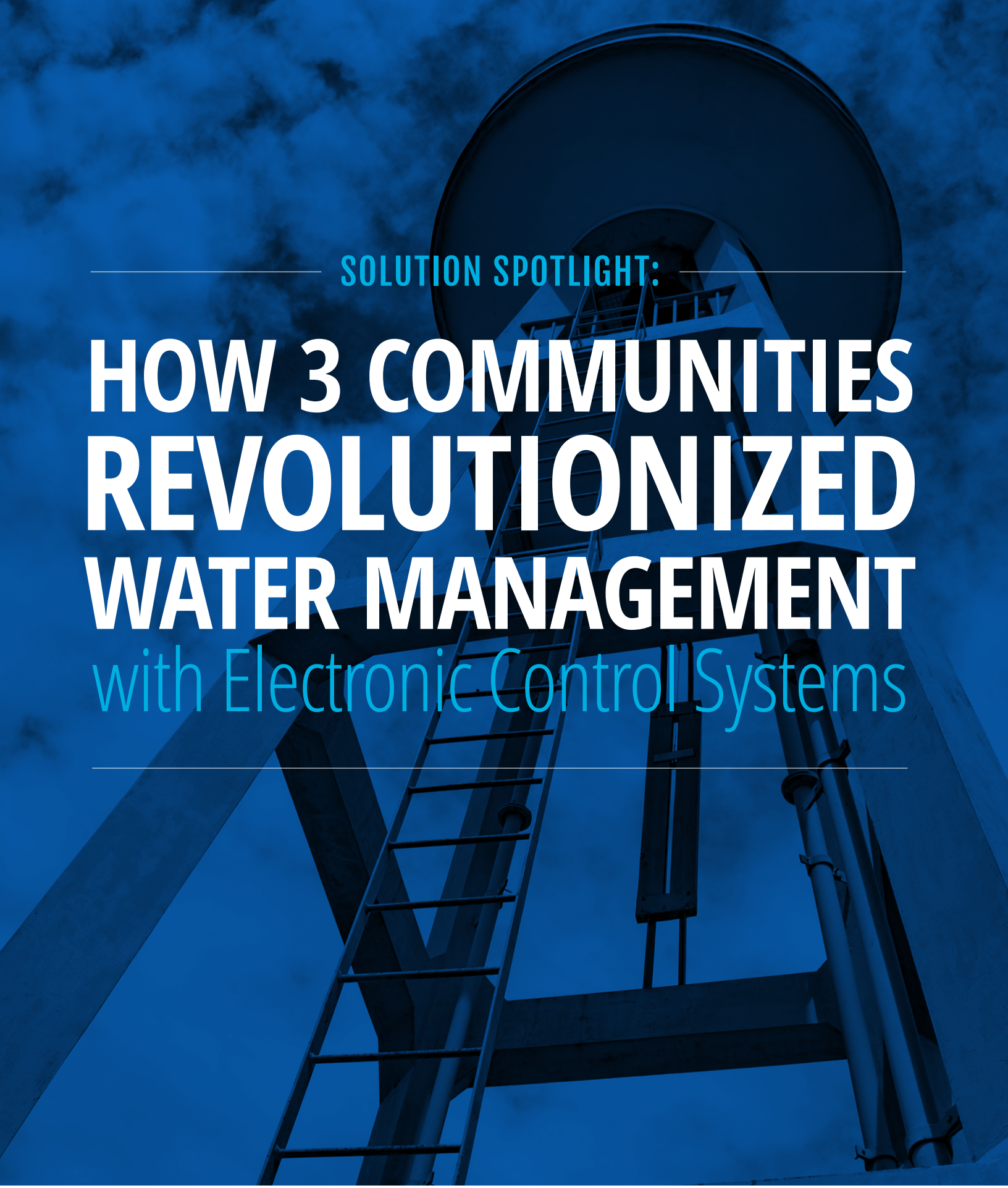

SOLUTION SPOTLIGHT:

HOW 3 COMMUNITIES REVOLUTIONIZED WATER MANAGEMENT

with Electronic Control Systems

SINGER VALVE
Result-Based Solutions. Globally.™

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Result-Based Solutions. Globally.™

There's no denying technology is evolving rapidly. While this progression means you may eventually be asking grade school children for assistance in using your latest smartphone, not every development will leave you feeling quite so helpless. In fact, when it comes to water management, technology is making great waves. (No pun intended.)

For example, electronic control systems allow water professionals to accurately measure and monitor water levels, pressure and more from an offsite location. Using remote controls, you can make changes in seconds and see results immediately. This reduction in manpower and water loss means substantial savings for your municipality.

IN THIS EBOOK, WE'RE GOING TO SHOW YOU HOW THREE COMMUNITIES WERE ABLE TO:

Solve water management needs using customized electronic solutions

Future-proof local water systems with leading edge technology

Seamlessly integrate electronic control solutions with SCADA

PROJECT 1:
SAN XAVIAR DISTRICT, TOHONO O'ODHAM NATION, ARIZONA

CHALLENGE

Just outside Tucson, Arizona, amidst the beautiful (yet arid) Sonoran desert, sits the San Xavier Reservation. Here, the Tohono O'odham Nation grows organic alfalfa for racehorses and other livestock, as well as fruits and vegetables. Until 2001, the 900 acre (364 hectare) farm depended on groundwater wells for irrigation. Unfortunately, due to nearby urban development, ground water demand increased and the supply was quickly depleted.

The farm needed a sophisticated underground irrigation system to keep its crops alive. Dave Buchwald, a fluid dynamics specialist for Pipestone Industrial, a Singer Valve representative based in Denver, had never encountered such a complicated project in his career.

"Water is piped to the first tank at 120 psi (8.3 bar)," he says. "But, it can't flow more than 10,300 gallons per minute (650 litres per second), which would exceed the limit, and, to feed the relatively small storage tank, pressure has to drop to about 5 psi (0.34 bar)."

He immediately set to work, determined to find the right solution.

SOLUTION

To get started, Singer Valve built a simulator that mimicked the behaviour of the San Xavier irrigation system. After testing a standard PID (proportional integral derivative) on the simulator, Singer Valve General Manager Kari Oksanen wrote a custom algorithm for the PLC (programmable logic controller). Previously, it took the PID two days to stabilize water levels. However, after revising the algorithm 11 times, Oksanen's program stabilized water levels within minutes.

"The low pressures in the underground irrigation distribution system offered a unique challenge," says Jeff Riley, supervisory civil engineer with the U.S. Bureau of Reclamation. "Singer Valve was extremely helpful during the design phase, and they even performed hydraulic modeling before receiving the contract."

The team ultimately decided to use Singer Valve's 2SC-PCO with a multi-process controller for level control. This solution offers an anti-cavitation trim that works at all flows and valve openings, as well as a customized proprietary algorithm that handles level control while limiting flow and preventing inlet surges.

PROJECT 1

RESULTS

Today, San Xavier is home to a sophisticated flood irrigation system consisting of one 16 inch (400 millimeter) globe style, eight 16 inch angle style valves and five storage tanks—each with its own control panel. The solution is able to control flow intake, high pressure and each tank's water level electronically and simultaneously throughout the entire system.

> “Controlling levels electronically is very difficult, but the beauty of PLC is that there is no limit to what you can tell it to do.”

KARI OKSANEN ,
SINGER VALVE GENERAL MANAGER

THE 2SC-PCO ALGORITHMS ARE DESIGNED TO SOLVE THE CHALLENGE OF VALVES UNABLE TO KEEP UP WITH THE STEP CHANGES THESE APPLICATIONS INVOLVE. THE PLC ANALYZES DEVIATION, AND RATE OF CHANGE OF THE FIRST DERIVATIVE, TO CALCULATE RATE OF CORRECTION. THERE ARE MORE THAN 30 IF CONDITIONAL STATEMENTS IN THE ALGORITHM, AND TIME DELAYS ARE USED EXTENSIVELY TO PREVENT POSITIVE FEEDBACK.

PROJECT 2:
BULL RUN WATERSHED, PORTLAND, OREGON

CHALLENGE

The Bull Run watershed has continuously provided water to the people of the Portland metropolitan area since 1895. It also plays an important role in supporting the large aquatic ecosystem of the Sandy and Lower Columbia rivers where some species of fish have significantly declined.

In an effort to save these species, the Portland Water Bureau (PWB) developed the Bull Run Water Supply Habitat Conservation Plan (HCP). This plan made necessary changes to the city's drinking water operations in order to help the aquatic environment rebound. Part of the HCP is a water temperature management plan designed to comply with the Clean Water Act. This is a critical component in the rehabilitation of the fish stock.

The river water was pulled from the top of the reservoir. Unfortunately, because this water was so much warmer, the water temperature of the Sandy River became too hot during summer months for the fish to spawn.

SOLUTION

The Portland Water Bureau consulted with an engineering firm to come up with a plan to regulate the river's temperature. PWB decided to supply the river with water from the bottom of the reservoir, which is significantly cooler. Using temperature readings at several points down the river, it could control the river water temperature by controlling the amount of cold water feeding the river.

For the project to be successful, PWB needed a distribution system capable of controlling the amount of cold water entering the system by setting a desired cold water flow rate. The control system needed to be able to measure flow as well as maintain the capacity to fluctuate from low flows to an upward of 83,000 gpm (5,236 litres per second).

Because the reservoir fill height has an inlet pressure of 45 psi (3.1 bar), and the water is entering the river at atmospheric pressure, the valve control system also needed to withstand a 45 to 0 psi pressure drop.

PROJECT 2

SOLUTION CONT...

CIMCO, suppliers of Waterworks products, brought in Singer Valve to design a control valve system capable of handling these stringent requirements.

After assessing the project, the team chose the S106-2SC-PCO-MV-C-AC valve and an MCP-TP Control Panel. This valve has dual solenoids in the pilot system, which allows the MCP-TP to electronically control and modulate the valve to the required set points. The product is also equipped with single rolling diaphragm (SRD) and anti-cavitation technology, as well as backflow check to ensure the valve closes in the event of reverse flow. Due to the maximum flow requirements, Singer Valve used a 24 inch (600 mm) and 36 inch (900 mm) inch valve to manage full flow variance.

The pressure drop of 45 psi to 0 would traditionally cause a valve to cavitate, creating a lot of noise, vibration and eventual deterioration to the internals of the valves. Usually this problem is solved by installing multiple pressure reducing valves in series. With Singer's anti-cavitation, that isn't necessary.

> "The beauty of Singer's anti-cav technology is that it is contained in the valve itself, so no additional valves are needed, saving money, time and future maintenance."

STEVE CAUSSEAUX,
SALES MANAGER FOR CIMCO

THE ANTI-CAVITATION SYSTEM IS COMPRISED OF TWO HEAVY STAINLESS STEEL SLIDING CAGES DESIGNED TO MAXIMIZE THE FULL FLOW CAPACITY. THE FIRST CAGE DIRECTS AND CONTAINS THE CAVITATION RECOVERY, ALLOWING IT TO DISSIPATE HARMLESSLY, WHILE THE SECOND CAGE ALLOWS FURTHER CONTROL TO A LEVEL AS LOW AS ATMOSPHERIC PRESSURE DOWNSTREAM. THE CAGES ARE INDIVIDUALLY ENGINEERED BY ENTERING DATA INTO A PROPRIETARY SOFTWARE THAT CALCULATES THE SIZE AND PLACEMENT OF THE ORIFICES ON BOTH INLET AND OUTLET CAGES. THE VALVE BODIES ARE SPECIFICALLY DESIGNED TO FIT A LARGER CAGE, ALLOWING HIGHER CV VALUES (INCREASED FLOW) WHILE ALSO ENSURING REASONABLE SPACE BETWEEN THE ANTI-CAVITATION TRIM AND THE BODY WALL. THIS SEPARATION PERMITS CONSISTENT UNIFORM ENTRY AROUND THE CAGE AREA, ENSURING THE VAPOR BUBBLES COLLAPSE SYMMETRICALLY TOWARD THE CENTER OF THE ANTI-CAVITATION CAGE.

PROJECT 2

SOLUTION CONT...

In most cases, a range of 83,000 gpm between high and low flows would require two sets of valves—a large valve for the high flows, and smaller valves to handle lower flows. Traditional valves become inefficient at low flows, and start to hunt and chatter. To overcome this challenge, the valves were equipped with the SRD technology. The SRD molded diaphragm provides a constant surface area regardless of valve position, and avoids injecting small pressure pulses into the piping. By doing this, the valve eliminates seat chatter at low flows, helping to prevent water loss and leakage while providing smooth, precisely controlled flow.

The 24 inch and 36 inch valves were set to run in parallel, and the controls were consolidated into one panel to save on space and costs. Singer electronics division designed and built a control panel to receive information from both valves and have the ability to control the valves individually. Using a differential transmitter and a valve position indicator from each valve, the MCP panel is able to calculate individual flows through each valve. This allows the PWB operators to control the valves to specific flow rates by entering a setpoint into the panel, or remotely via SCADA. The panel then sends signals to the opening or closing solenoid valves to open or close the main valves until they meet their desired flow rates.

The panel also needed to be able to handle a main power loss, so the team added a UPS battery backup. The panel has an outdoor rated enclosure with a heater and dehumidifier to keep the panel dry and withstand the outdoor environment. The customized panel fit seamlessly into the existing SCADA system, which ensure operators can easily manage flow rate remotely.

RESULTS

Today, the Bull Run Watershed maintains a temperature cool enough to satisfy the aquatic ecosystem while simultaneously complying with the Clean Water Act.

“The ingenuity in overall concept and design was matched with Singer’s ability to customize a valve to meet some difficult parameters, I am pleased to say that we have achieved what we set out to do with a failproof solution that is easy to manage and maintain.”

ANDREW DEGNER
PWB WATER TREATMENT
OPERATIONS MANAGER

PROJECT 3:
CITY OF MODESTO, CALIFORNIA

CHALLENGE

The city of Modesto, California, located 90 miles (145 KM) east of San Francisco, has a population of 200,000 residents who consume 55 million gallons (208 million litres) of potable water per day. For years, the city used motor operated butterfly valves and electric actuators for filling tanks. However, over time, it began to notice multiple challenges.

First, there was turbulence in the flow stream, which caused butterfly valves to rock back and forth and lead to stem seal leakage and bearing failure. Secondly, poor speed control caused mainline pressures to fluctuate when electric actuators were opened too quickly and pressure surges when they were closed.

In 2006, the city decided to upgrade three of its eight water storage tanks in an effort to modernize the booster pumps and automatic valve controls. The project was intended to provide immediate improvements in water pressure to customers of South Modesto.

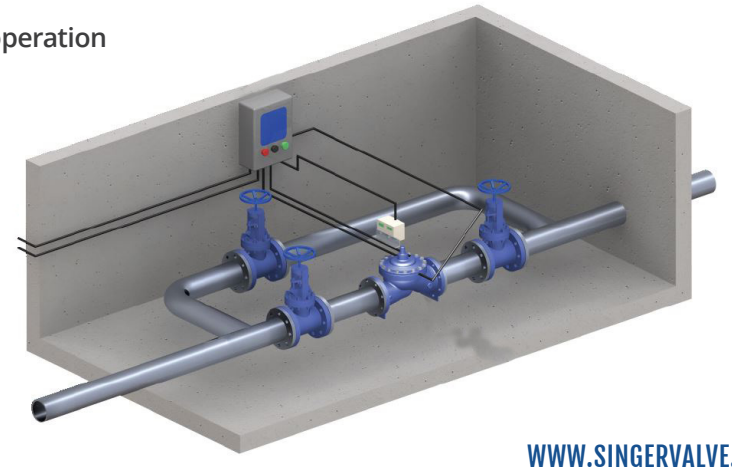
SOLUTION

Newer electronic actuators offered better speed control features, but the butterfly valves still offered limited flow control.

“For our application, motor operated butterfly valves were not the right choice,” says Steve Fassio, instrument technician for the city of Modesto. “It was time to look for alternative solutions.”

In order to improve the water distribution system to residential and industrial customers, the city needed automatic control valves with the following capabilities:

- **Adjustable flow control**
- **Adjustable opening and closing speeds (to minimize main line pressure fluctuations)**
- **Manual override for emergency operation**
- **An interface to the SCADA system for remote operation**



PROJECT 3

SOLUTION CONT...

After taking time to observe valve and panel operations, and simulating failures to ensure the system was performing to city specifications, Singer Valve decided to install the 2SCMV valve with MV1- TP electronic flow control and metering.

Additionally, the MV1-TP offers a user-friendly touch screen for local control.

Singer Valve easily connected and integrated a control panel into the city's SCADA system. The PLC based touch screen controller allows on-screen calibration of process signals, graphic trending displays for valve PID tuning, plus manual mode selection for testing and maintenance and easy-to-use screen control.

IN 2010, SINGER VALVE INSTALLED A FILL CONTROL VALVE ON A NEW 4 MILLION GALLON (15,141,647 LITER) STORAGE TANK. ANOTHER STORAGE TANK WAS IN CLOSE PROXIMITY AND CONNECTED ON THE SAME DISTRIBUTION PIPELINE, AND IT WAS CRUCIAL THE PIPELINE MAINTAIN NORMAL PRESSURE DURING FILLING CYCLES AS PRESSURE CAN DROP SUBSTANTIALLY IF BOTH TANKS ATTEMPT TO FILL AT THE SAME TIME.

TO SOLVE THIS CHALLENGE, SINGER VALVE ADDED AN INFLUENT PRESSURE TRANSMITTER TO A MCP-TP MULTI-PROCESS CONTROL PANEL. THIS MEANT, IF INLET PRESSURE DROPPED BELOW AN ADJUSTABLE SET-POINT DURING FILLING, THE PLC CONTROLLER WOULD SEND AN OVERRIDE SIGNAL TO REDUCE THE FLOW UNTIL THE INLET PRESSURE RETURNED TO NORMAL. THIS ENHANCED CONTROL PROGRAM INCLUDED ALL THE FUNCTIONS OF ORIGINAL FLOW CONTROL VALVES, PLUS THIS ESSENTIAL CUSTOMIZED FEATURE, WHICH ACHIEVED STABLE MAINLINE PRESSURES. IT ALSO ALLOWS THE CITY OF MODESTO TO FILL BOTH TANKS SIMULTANEOUSLY—EVEN DURING PEAK SUMMER DEMANDS.

PROJECT 3:

RESULTS

The city of Modesto now enjoys reliable water pressure and efficient distribution. The advanced controls ensure the city is able to better manage its water, regardless of demand. In fact, the project has been so successful, the city is beginning a Tier Two phase that encompasses another 11 locations.

“Our three original valves have been in operation for five years without one mechanical or electrical failure. We have been very pleased with Singer Valve. The product quality and service support have been outstanding. We continue to purchase Singer flow control and pressure reducing valves for many applications.”

STEVE FASSIO
INSTRUMENT TECHNICIAN FOR
THE CITY OF MODESTO

THE SINGER SOLUTION

From managing pressure and flow to exercising greater control over your system as a whole, Singer Valve electronic control solutions will help you save money and preserve vital resources. By monitoring and managing your municipality's water system remotely, you can reduce waste, better allocate manpower and keep your system running smoothly for many years to come. Whether you need to control a single process application or multiple processes, we offer customized solutions to meet your unique demands.

Ready to revolutionize your water management system? Check out our complete product guide and contact a Singer representative to discuss your water system challenges.

ABOUT SINGER VALVE

Singer Valve designs and manufactures automatic control valves for the global water industry. Since 1957, its pilot operated diaphragm control valves have been installed on virtually every continent around the world. Whether it is water loss management in Southeast Asia, water conservation concerns in Saudi Arabia or urban distribution demands in the United States, Singer provides water management solutions to governments, cities, companies and contractors around the world.