

Motor Management Solves Water District's Pump Reliability Problem



Application Profile — Water Pumps

Maintaining and delivering a constant supply of water to rural communities can be a challenging task for many water districts. Power fluctuations, seasonal changes, population growth or unusual geographic conditions can hamper a rural pumping station's effort to provide necessary water for a community's consumption and fire protection.

Such was the situation for the Elsinore Valley Municipal Water District in Southern California. Its Sky Meadows Booster Station — one of 36 stations within the district's 260-square-kilometer service area — was experiencing frequent motor and pump shut downs, each time requiring a technician to manually re-set the pumps which are located on a remote site alongside a mountain. The pump delays threatened the water supply of Rancho Capistrano, a small community located 490 meter above the station.

To eliminate the motor/pump shut downs and secure a constant water supply to Rancho Capistrano, the



Elsinore Valley Municipal Water District's Sky Meadows Booster Station is remotely located alongside an area of mountains known as the Cleveland National Forest in Southern California. Each day, the Sky Meadows Station pumps approximately 190 m³ of water to Rancho Capistrano, a small community located on a plateau 490 m above the station.

Elsinore Valley Municipal Water District worked with the local power utility and electrical distributor to find a relatively simple solution to a serious motor management problem.

Identifying the cause.

The quality of the incoming electric power was immediately suspected as the cause of the shut downs. The pumping station's distant location

from the local power utility was a key contributor to the problem.

“We're at the very end of the power grid, so we receive power last,” said Wally Borchard, utility systems manager, Elsinore Valley Municipal Water District. “It's typical in this type of distribution scenario to receive unbalanced power because it is essentially being pulled off the line before it even reaches us.”

Southern California Edison, the local power utility, tested the station for voltage unbalances but found them near two percent — figures that were well within the specifications for utility power. But on the Sky Meadows end, these minor voltage unbalances were causing a 15 to 20 percent current unbalance. As a result, the incoming three-phase currents drawn by the motors were unbalanced.

The frequent phase unbalances caused the pumps to shut down five to seven times each week. Each shut down threatened the pumps from meeting the 190 m³ of water needed in Rancho Capistrano each day, and cost the Elsinore Valley District nearly three hours of unnecessary labor each time a pump controller needed to be manually re-set.

Considering short- vs. long-term solutions.

The Elsinore Valley District found short-term solutions for the pump shut downs, but concerns about preserving the long-term use of the motors called for more than just a temporary fix.

“We could always get the motors up and running,” said Scott Smith, electrical control

technician, Elsinore Valley Municipal Water District. “But keeping them running against the phase unbalances meant physically bypassing the existing control system, which put unnecessary stress on the motors.”

For Southern California Edison, options to solve the Sky Meadows problem were confined to moves that would affect the station, as well as negatively affect all other customers on the line.

“When we didn’t find evidence of extreme voltage unbalances on our end, we began investigating ways to solve the phasing problem on the Sky Meadows end,” said Eugene Sedano, customer solutions field engineer, Southern California Edison. “We considered adding capacitors to the line to increase voltage to the Sky Meadows station. But this also would increase the electricity costs of all customers on the line.”

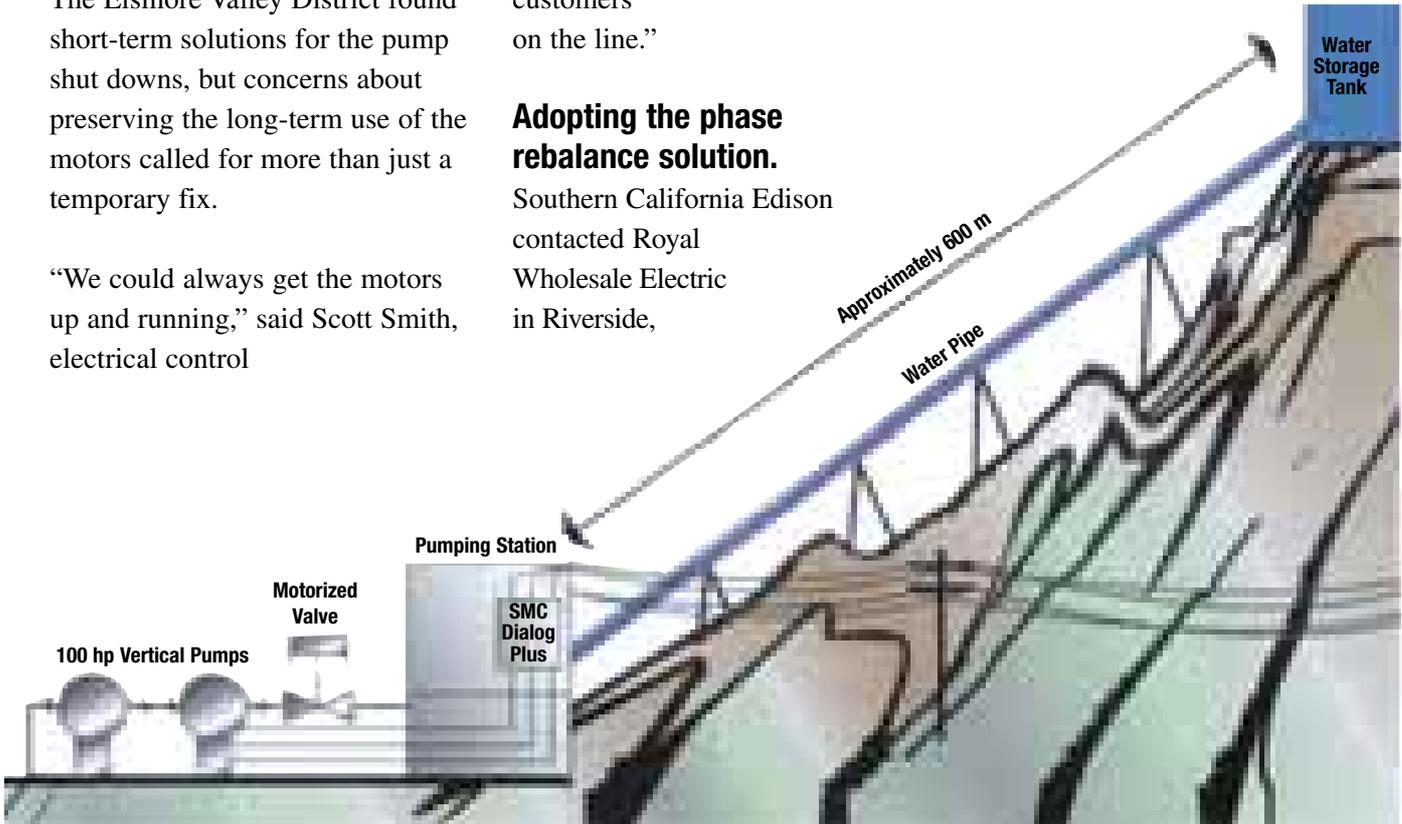
Adopting the phase rebalance solution.

Southern California Edison contacted Royal Wholesale Electric in Riverside,

Calif., to help find and install a motor management solution for Elsinore Valley District’s Sky Meadows station.

Royal Wholesale recommended installing an Allen-Bradley SMC Dialog Plus™ controller to the station’s main 100 Hp motor. This motor controller includes an automatic phase rebalancing feature that compensates for the negative effect of voltage unbalance. The controller automatically adjusts the voltage output to balance the three-phase currents drawn by the motor, helping to extend motor life and support operation without interruption.

After only a few days of operation, the SMC Dialog Plus eliminated all pump shut downs and significantly reduced the current unbalance from an average of 20 percent to an average of only three percent.



“Incorporating the SMC Dialog Plus into our system has been 100 percent effective in correcting our problem,” said Borchard. “I haven’t been out to re-set a pump controller since we installed the unit nearly nine months ago.”

“Pump Control” Option Reduces Water Hammer

The SMC Dialog Plus installed at the Sky Meadows station also features a pump control option that helps smooth motor acceleration and manage the transition from pump stopping to starting. Working in combination with the station’s valves which automatically open on a slow timed sequence, the pump control feature reduces motor torque, protecting pipes and valves from sudden water surges and hammering.

Sharing the solution.

For Southern California Edison, the solution offers a new option for other Edison customers as well. As in the Elsinore Valley District, populations are expanding above

and beyond the existing capacity, increasing the demand for electrical power.

“More users on the same line means a greater chance of phase unbalances, due to the differences in load at each customer’s site,” said Sedano. “No matter what the cause of the power problem, we’re confident the SMC Dialog Plus can compensate for them.”

The motor management solution installed at the Sky Meadows Booster Station has significantly improved pump reliability and minimized the threats to the water supply of the Rancho Capistrano community. The pumps now operate without interruption via a radio telemetry system at the Elsinore Valley



The Sky Meadows Booster Station was experiencing frequent shut downs on its two 100-Hp motors and pumps, caused by voltage unbalances and subsequent current unbalances reaching the pump station. Each time the station experienced a motor and pump shut down, a technician was needed to manually re-set the motor controller.

Municipal Water facility. Technicians are able to invest more time in troubleshooting and maintaining the other district stations, rather than responding to re-occurring pump failures.



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