Case Study Aqua S8 Production Well

Using a DPO to improve efficiency, increase capacity and extend pump life

KEY METRICS

- 28% energy reduction ($10,200/year savings)
- At least 4x increase in pump life (pump has been in service since 2012)
- 63% increase in capacity (700gpm increase)

OVERVIEW

Aqua Water Supply Corporation is the second largest water supply corporation in Texas. Its service area covers approximately 1,200 square miles, delivering retail water to customers outside the greater Austin-area. The corporation uses water supplied from 41 production wells, including the S8 well site.

The S8 well produces up to 1,800 gallons per minute (gpm) from the Carrizo-Wilcox aquifer. The well is powered by a 250 HP submersible pump with a variable frequency drive.

Aqua WSC is an innovative utility, always looking to improve operational efficiencies by implementing effective technologies and applying sound asset management practices. As an early adopter of technology, Aqua has established itself as a pioneer of efficiency in the water space.

CHALLENGES

In-well pumps are significant consumers of energy. Several of these wells have variable frequency drives (VFD) that allow pumps to operate over a range of speeds in response to varying demands and aquifer levels.

Aqua WSC wanted to operate their pump properly by adjusting speeds to minimize energy consumption while still meeting volume demands. Aqua WSC also wanted to identify a cost-effective way to increase production at the S8 well site that would not require drilling a secondary well to meet demand.

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SOLUTIONS

Aqua partnered with Specific Energy to install Dynamic Pump Optimizer (DPO) at the S8 well site to optimize pumping and improve production. Immediately after the DPO edge device was commissioned, energy consumption dropped by 28%, while maintaining production to meet demand.

Specific Energy's DPO delivered energy savings using a physics-based model, which uses live sensor data to adjust pump speed to achieve peak energy efficiency while accounting for varying system conditions.

Data received from the DPO concluded that instead of running the pump for six hours each day at full speed, the pump could run at reduced speed for ~13 hours per day and accomplish the same volume while achieving an annual saving of 81 MWh (megawatt-hours) or $10,200/year.

REDUCING OPERATING AND MAINTENANCE COSTS

The DPO ensures that the well pump always operates within its "sweet spot" or Preferred Operating Range (POR), thereby minimizing impeller wear and reducing operation and maintenance (O&M) costs. By dynamically adjusting speed in response to varying system conditions, the pump always operates at peak energy efficiency, leading to longer pump life by reducing wear and tear.

Prior to DPO, the mode of operation for this well pump, and one of the industry norms, was to run the pump at full speed for shorter durations of time. DPO adjusts pump speed in real-time based upon the changing level of the aquifer and demand from the system. In the case of S8, this meant the pump typically runs twice as long at lower speeds, resulting in significant energy savings (28%). Using a higher aquifer level to the advantage of pump operation allows for a lower chance of failure due to cavitation.

The S8 well has seen significant decreases to required maintenance since DPO operation began in 2012. The pump has run for over 44,000 hours and pumped over 2.5 billion gallons of water without once being pulled out of service for maintenance.

Pump curves generated by DPO show that the pump has and continues to operate at near-factory conditions after 13 years of operation. If the pump had been run at higher speeds (outside of POR) for fewer hours and produced the same total output, it would most likely have been rebuilt three to four times in the last 13 years.

> **DPO has reduced our energy and maintenance costs well beyond the cost of DPO service. This pump has been in the ground for almost 15 years, and we have never had to pull it. Normally we would expect to pull a pump every 5 to 10 years. This is a great example of the many ways Aqua WSC benefits from DPO**
>
> Dacy Cameron
> General Manager
> Aqua WSC

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TRACKING PUMP HEALTH INDEX

All pumps wear over time. Knowing when to schedule repairs or replacement is critical to maintaining pump efficiency and capacity. Specific Energy's DPO gives operators the ability to initiate pump tests to generate updated in-situ pump curves. These curves accurately represent the pump's current capability and will inform a Pump Health Index (PHI). By tracking PHI of pumps across their water system, Aqua WSC's operations staff can pre-emptively schedule pump asset maintenance before pumps become excessively inefficient.

MONITORING THE AQUIFER

Collecting data and computing well metrics is key to monitoring an aquifer's condition. The DPO collects well pumping levels and produces well recovery curves to extrapolate static aquifer levels. The S8 well's specific capacity is computed and permanently logged after each pump run. These aquifer metrics give operators and engineers greater insight into aquifer conditions over time.

WELL PRODUCTION INCREASE

Aqua WSC needed to increase well production and was able to achieve this without drilling a new well using DPO as a guide.

The corporation's engineering firm was able to recommend cost-effective replacements for portions of the pump column, a new motor, and a new VFD. As a result of these changes, combined with the DPO operation, Aqua WSC was able to achieve a new maximum flow of 1,800 gpm (an increase of 700 gpm over the original design flow).

The full project was completed at a very economical cost of $150,000, compared to a new well cost of over $2,000,000

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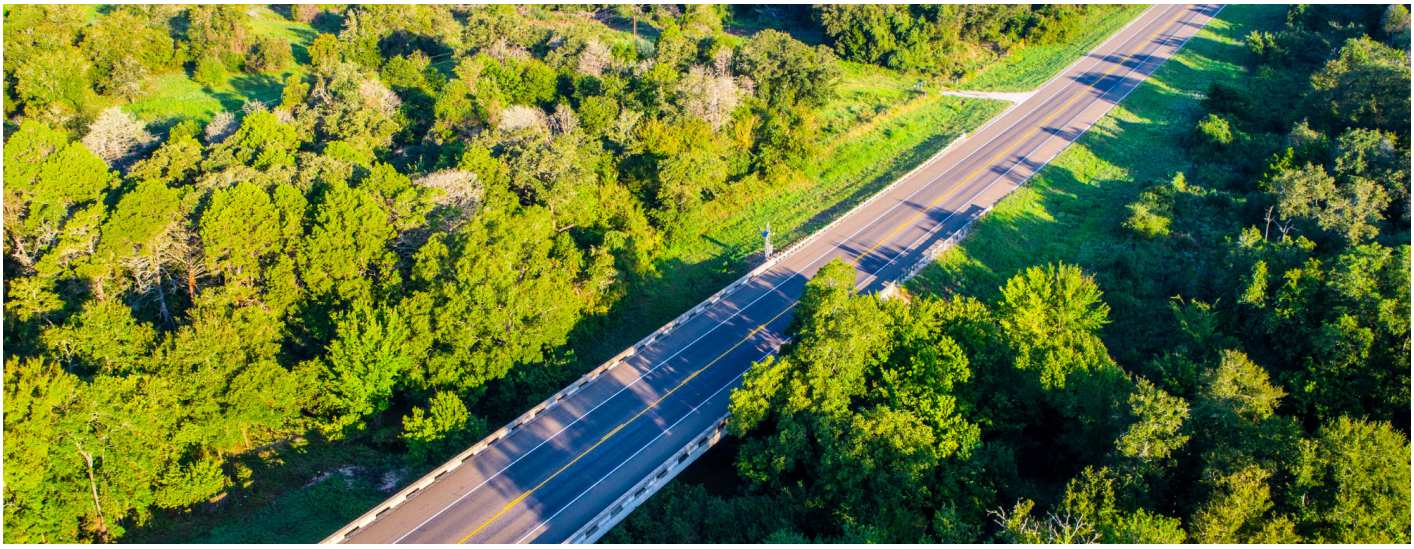

OUTCOMES

In addition to S8, Aqua WSC has 66 other sites using Specific Energy to optimize operation and provide visibility to assets. The benefits of this strategy for Aqua WSC include:

- Operating pumps at the lowest speed/energy usage to keep pumps within POR and meet demand using real-time information
- Maximizing aquifer level, thereby operating at the lowest specific energy and significantly increasing the life of the pump
- Dashboarding from Specific Energy that lets them know where pumps are operating on current pump curve and allows intelligent data gathering and infrastructure planning
- Dispensing with accommodating the gradual de-rating of their wells at design, active tracking instead gives relevant, actionable information to keep wells operating at peak efficiency
- Tracking the historical performance of its aquifer and the impact it has on pump operation.