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Reduce electricity costs by putting more energy into data analysis

With electricity consumption being a primary operating cost in water treatment plants (WTPs) and wastewater treatment plants (WWTPs), taking steps to optimize energy use is critical. Saving energy is more than just an on-off decision. Monitoring and managing energy use – from analyzing pump curves, to reducing non-revenue-water leaks, to scheduling operations around premium-rate windows – is essential. Fortunately, the payback potential can be impressive.

Understanding data correlations is key to controlling costs

Energy typically represents 30 percent or more of water-utility operating expense (OPEX) and often more during peaks of increased wastewater aeration demand. That means the incentives for reducing energy consumption are significant. As two of the largest power consumers on a local grid, WTPs and WWTPs with appropriate decision-support data and infrastructure can benefit financially by partnering with power utilities that want to flatten out peak demand.

An operational intelligence system that does a better job of connecting data from the physical infrastructure to the people who drive operation decisions can transform WTP and WWTP operations. With ready access to real-time plant operating conditions and historical trend analysis, key decision-makers in a water utility or consulting firm can identify better options for reducing stresses on physical operations and OPEX. Once that is achieved, subsequent modeling and analysis of long-term opportunities can aid in better capital expense (CAPEX) decisions as well (Figure 1).

Figure 1: Collecting key data directly from field-installed sensors and instrumentation, ready for analysis in a water-centric real-time operational intelligence system, makes it easier to formulate decisions based on overall cost-effectiveness.

A modest step to get started

Choosing an affordable, scalable analytics solution can start with as few as 1,000 data tags – i.e., sensors, instrument inputs, existing in-house or in-the-cloud data resources, etc. – and start paying for itself in a matter of days. Here are just some of the energy-related decisions that can be improved with the right information:

- **Identifying leaks:** Non-revenue water caused by leaks wastes energy, wastes treatment chemicals, and wastes plant capacity – all of which cut into the bottom line. Identifying leaks as quickly as this **90,000-customer utility** was able to do impacted OPEX to the tune of a prorated $300,000 annual saving in the first week, $900,000 over two years, and a deferred long-term CAPEX expense of $20 million over a two-decade span.
- **Tracking pump efficiency:** Any water utility can monitor pump efficiency by metering the amount of energy required to move a given volume of water – e.g., to fill a specific tank. With an **integrated analytical solution**, they can automate the process to go a step further by loading specific pump curves into the system and monitoring how much actual performance deviates from that curve. Such a digital solution can prioritize which pumps are in greatest need of maintenance attention based on how much they deviate from the ideal. It can also be set to trigger an alarm when performance deviates beyond an acceptable percentage.
- **Modeling process improvement:** One of the biggest challenges facing internal and consulting engineers tasked with designing or refining energy-efficient WTP and WWTP operations is having real-world operating data to model and test alternate design approaches. A good analytical solution can bridge that gap. With direct access to such operating data, consulting engineers can also provide their own analytical services to utility customers.

Multifaceted energy-saving strategies Responding to potable water demand or wastewater influx without regard to energy costs can be expensive. Having a historical sense of flow trends and energy demands can give WTPs and WWTPs the ability to adopt more energy-efficient scheduling without disrupting treatment processes.

- **Time-of-use rates:** Balancing water movement needs versus electricity costs during daily periods of higher electric rates is perhaps the simplest way to reduce overall WTP energy costs. For example, making appropriate decisions on how to manage reservoirs and water-tower replenishment based on electricity rates and analysis of historical consumption is the best way to maximize those savings opportunities.
- **Demand-response contracts:** Having the insight and flexibility to shift electrical consumption based on extensive analytics can allow a water/wastewater utility to take advantage of lucrative electric rates as part of a demand-response contract with their electric utility. Having infrastructure flexibility and a good database or analytical resource that enables a water utility to satisfy treatment demands, even while idling large motors to shave peak energy demand, can yield significant energy cost savings.
- **Cogeneration control:** Wastewater treatment plants that use anaerobic digesters can create and store biogas that can be used for supplemental energy generation. In that type of scenario, having the ability to compare energy costs versus treatment demands can help energy managers and plant managers make the best real-time decisions to optimize cogeneration scheduling.

About the author

Gary Wong is the global industry principal of infrastructure and water at AVEVA, a leader in real-time industrial performance intelligence. He leads their global data centers, facilities, smart cities, and water businesses. He has 25 years of extensive international experience providing sustainable, strategic, and cost-effective digital solutions. Prior to joining AVEVA, he has held positions with OSIsoft, Metro Vancouver and as a consultant directing both public and private sectors on operations, digital transformation, planning, sustainability, and engineering. Mr. Wong is also the chairman of the Smart Water Networks Forum (SWAN) Americas Alliance and holds a bachelor's degree in chemical engineering, is registered as a professional engineer in computer engineering, holds an M.B.A. from the Queen's School of Business, and is also a chartered professional accountant.