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Targeting zero: How water and wastewater utilities can achieve net-zero carbon emissions

Drinking water and wastewater treatment are inextricably connected to environmental responsibility. For example, water treatment plants (WTPs) concern themselves with providing clean safe drinking water and reducing leaks. Similarly, wastewater treatment plants (WWTPs) strive to meet nutrient permit limits to avoid eutrophication, which can harm aquatic life.

Despite this clear connection, many WTPs and WWTPs do not consider the environmental impact of direct and indirect greenhouse gas (GHG) emissions caused by their operations. Drinking water and wastewater treatment is estimated to comprise between 1% and 4% of the total energy consumption in the U.S. Energy is the one of the highest expenses for WTPs and WWTPs, second only to labor.

With energy consumption such an inherent aspect of water and wastewater treatment, reducing GHGs may seem like a daunting challenge. Yet not only is it possible for utilities to reduce GHGs, but some are also striving to become carbon neutral – in other words, to produce net zero carbon emissions.

Fighting carbon with data

The battle to reduce GHGs in water operations begins with data. The sensor technology needed to observe and analyze the performance of assets, from pumps to blowers to pipes and more, is well established and readily available. Air quality, water quality, energy consumption, pressure, temperature, and more can all be detected in real time. In addition, the software needed to store, organize, analyze, and visualize this volume of data has been refined over many years.

These technologies combined can be leveraged to find operational inefficiencies and eliminate them, potentially reducing both manpower and energy consumption, which in turn both cuts GHGs and saves money.

Several years ago, Great Lakes Water Authority (GLWA) undertook a project to analyze its pump operations with a mind on reducing GHGs and moving toward net-zero emissions. GWLA serves 3.8 million people and manages five treatment plants, 19 pumping stations, and 819 miles of transmission pipes. The utility spends $20 million each year on energy alone. So, their sustainability mission began with a practical question: how can they reduce their energy consumption?

They started by looking at things like pump throttling, as well as how often pumps turn on and off. Each of these wastes energy and adds unnecessary wear and tear to the pump. Using the data, GLWA reduced throttling by 50% and increased pump efficiency by more than 12%, cutting its energy usage by 6% overall.

Going further

A 6% reduction in energy usage and thusly GHGs is a great start, but it's a long way from net-zero emissions. To get there, WTPs and WWTPs will have to go much further, employing a variety of resources to ensure sustainability of operations. This may include:

- Leveraging water as energy. Just as energy can be stored for later use, so too can water. Using data and demand forecasting, WTPs can fill reservoirs during off-peak periods and access those resources during peak demand hours to reduce the strain on the treatment system and distribution system, and trim energy consumption during peak demand.
- Accessing clean energy. Even the most energy-efficient treatment plant will consume tremendous amounts of electricity. Utilizing clean energy therefore becomes critical to reaching net-zero carbon emissions. Plants can do this either by purchasing renewable power directly from power utilities or buying renewable energy credits. Depending on the area, it may be worthwhile for plant managers to install solar panels or heat pumps.
- Reuse existing energy sources. WWTPs with anaerobic digesters can capture the biogas which can be reused by the plant to power blowers or other plant operations instead of flaring off the gas and releasing GHGs. A similar though less effective solution could involve using heat exchangers in select areas of the plant.

Starting small

Achieving net-zero carbon emissions will not happen overnight. As such, WTPs and WWTPs can start small, measuring just a few key assets. In addition, plants can leverage cloud-based analytics software on a subscription model, paying à la carte for only those features that are needed at first. As the short-term savings are realized from each small-scale project, additional funds can be allocated to expanding the scope, further reducing GHG and accelerating the path to net-zero emissions.

Sustainability and security

The world's consumption of electricity is accelerating, particularly as technologies such as electric vehicles proliferate. This is putting a strain on the electric grid, which, combined with unpredictable weather and rising global temperatures, adds risk to energy-heavy users such as WTPs and WWTPs. Thus, striving to achieve net-zero emissions is as much about sustainability of the environment as it is about sustainability – and security – of the plant and its operations.

For more information about water and wastewater, please visit: aveva.com/water-wastewater