THE TOWER COMPANIES: APPLYING ENERGY MANAGEMENT BEST PRACTICES TO WATER MONITORING

SOLUTION OVERVIEW
The Tower Companies (“Tower”) has made great strides in energy efficiency across their commercial and residential portfolio since the implementation of an energy management system in 2012. The energy management system allowed Tower to improve goal-setting, progress-tracking, and to better understand overall building operations in real time, resulting in over $3.5 million in savings and an overall 21 percent reduction in energy use over six years. Tower recognized the opportunity to reach comparable savings in water. Using a similar approach to energy management to overcome barriers like a lack of access to data and real-time monitoring, Tower partnered with Aquicore to implement a water monitoring program.

Prior to the real-time monitoring program, Tower’s approach to water management included using ENERGY STAR® Portfolio Manager® for benchmarking data, following guidelines such as LEED and green leasing, regular preventive maintenance, using a work ticket system for tenant requests, and repairing leaks upon detection. Aquicore’s monitoring system would allow Tower to take water management to the next level with daily reporting, 15-minute interval data, real-time alerts, advanced data analytics, setpoint modifications, internal water audits, and more.

ORGANIZATION TYPE
Commercial Office and Residential Real Estate

BARRIER
Lack of visibility into water consumption data trends and inability to identify operational issues without real-time monitoring

SOLUTION
Implemented a real-time monitoring system for water usage to optimize water management measures

OUTCOME
Ability to troubleshoot systematic issues as they arise and better control water use to reduce consumption between 10 and 45%
POLICIES
Through participation in the Better Buildings Challenge, Tower has committed to reduce water usage across its portfolio 20 percent by 2020 with a 2010 baseline, and successfully achieved that goal in 2018. To record usage and help set goals for the future, Tower benchmarked for water in ENERGY STAR® Portfolio Manager®. Several measures and building policies are in place to ensure The Tower Companies water reduction goal is reached:

- **LEED Guidelines**: 90 percent of the Tower portfolio holds a LEED certification of either Gold or Platinum. In earning credits in the LEED Water Efficiency categories, the building teams use LEED requirements as key guidelines for indoor and outdoor water use reduction strategies.
- **Preventative Maintenance**: As a part of each building’s preventative maintenance policies, the building teams inspect all currently-installed plumbing fixtures at least semi-annually and use an online work ticket system to track inspections and leaks detected.
- **Leak Repairs**: The building team will repair leaks upon detection. The cleaning staff have also been trained to notify the building engineers of any equipment leaks.
- **Green Lease Requirements**: Tower and its clients enter into a green lease, under which, where feasible, clients are required during a buildout to install water efficient fixtures to reduce water use and conserve resources. At the building level, when plumbing renovations are considered, the property teams will work to install water-efficient fixtures and conduct an economic assessment to ensure the feasibility of doing so.
- **Cooling Tower Management Plans**: The building teams have developed cooling tower management plans with the intention of reducing potable water consumption by cooling tower equipment. Through this plan, the teams work with a third-party contractor that conducts on-site visits to ensure that a quality control program is in place and that the cooling towers are maintained in a way that optimizes the performance of the equipment as well as reduces their potable water usage.

PROCESS
In early 2015, Tower piloted a real-time water monitoring program at a multi-tenant commercial office building in Rockville, Maryland, The Tower Building. The 280,000-square-foot building consumes an average of 4 million gallons of water per year, costing approximately $45,000. Following a year of water monitoring at the Rockville office building, Tower decided to expand the program to a 243,000-square-foot multi-tenant office building in Washington, D.C., The Millennium Building. The Millennium Building uses about 3.5 million gallons of water per year, costing approximately $42,000.

A primary reason for choosing to implement this program was Tower’s inability to retrieve consistent and current data on water consumption for these buildings. Prior to the real-time water monitoring system, water consumption data was provided through quarterly utility bills from the City of Rockville and through monthly bills from D.C. Water for the two different buildings. This delayed information delivery prevented the engineering team from identifying and addressing water management efficiencies due to lack of timely and useful metrics.
Hardware installation: In Rockville, Tower chose to focus on the cooling tower’s operations, which consumed over 65 percent of the building’s water during summer months. The building’s existing utility meter was unable to capture the necessary data so they installed a separate submeter.

In the D.C. office building, Tower chose to install three meters; one to act as a “parent” meter and measure the building’s total water use, and two others act as “child” meters. One measures the cooling tower’s usage, and the other measures the water used by a retail restaurant client on the building’s first floor. This restaurant operates outside of normal office leasing hours with a higher demand on weekends and evenings, so it was important to isolate its use apart from the rest of the building.

Reporting capabilities: The engineering teams receive daily reports on the previous day’s water consumption and temperature for all of the real-time water meters. The reports also show any increases or decreases compared to the same day’s performance from the prior week. After a few months of tracking, data trends for consumption were established for normal working and non-working hours.

Establishing thresholds for alerts: Using data trends, Tower receives email alerts for when usage hits a certain threshold based on normal consumption. The alert informs the engineering team if consumption is over a certain gallons-per-minute (GPM) threshold and by how much. Sample alert levels for the main building meter at The Millennium Building are:

- > 7.96 GPM during non-working hours (6pm – 6am Monday - Friday; Saturday, Sunday, and holidays)
- > 18.00 GPM during working hours (6am – 6pm Monday - Friday)

The email alert system allows engineers to be aware of major faults in equipment and handle the issue promptly, preventing water waste and excess costs as well as possible property damage and disruptions for building tenants. In September 2016, water use at The Millennium Building spiked to nearly double its usual level for a week outside of normal leasing hours. After being notified through reports and alerts, the property’s engineers and evening cleaning team were able to identify multiple leaks occurring on bathroom fixtures. Because of the building’s multiple meters, the team was able to identify the locations of the leaks more easily and address the issues that week, rather than after receiving a utility bill.

System optimization: With visibility into their office buildings’ and cooling towers’ consumption, Tower building teams can identify opportunities to improve the system and create efficiencies. Comparing working and non-working hour consumption rates allows Tower to see a consistent off-hour usage trend. The engineering team has altered operations with low- to no-cost technical adjustments to better align with the building’s schedule, reducing consumption by over 10 percent in the first year of the water pilot at The Millennium Building, and by over 45 percent in just the first six months of the program at The Tower Building.

Some of the technical no-cost adjustments that have been made include:

- Improved fault detection for equipment

For more information, visit https://betterbuildingssolutioncenter.energy.gov
- Changed float assembly
- Lowered high water levels
- Relocated water sensors
- Cooling tower system setpoint modifications

**TOOLS AND RESOURCES**

The real-time metering for Tower’s water use at The Tower Building and The Millennium Building has been helpful in identifying anomalies, greatly improving response times to major building events, and identifying behavioral changes that can be made to the building’s operations.

For example, over a holiday weekend in April 2015, Tower’s engineering team identified an overflowing cooling tower at The Tower Building. If this event had occurred prior to the water management program, there would have been a great deal of money lost as well as potential damage to the building space; however, thanks to the new program’s alerts the engineers were able to respond that weekend instead of the following Monday.

In addition to anomaly detection, the water monitoring software has allowed the Tower team to identify systematic issues. In both The Millennium Building and The Tower Building, there was more off-hour usage than what the building’s occupants and clients needed for operations. After an investigation and some technical adjustments, the building teams worked to tighten up operations to align better with lease hours, which reduced consumption by over 10 percent compared to the previous year.

[Image of a graph showing daily energy report]

For more information, visit [https://betterbuildingssolutioncenter.energy.gov](https://betterbuildingssolutioncenter.energy.gov)
The Tower Building has saved 1.5 million gallons and $14,000 in utility costs since the implementation of the real time water monitoring program in early 2015. Tower experienced a 33 percent reduction in overall consumption and a 45 percent reduction in cooling tower consumption as compared to a similar six-month period earlier in the year. Tower achieved an ROI less than six
months after implementing the monitoring program.

After the first year of implementation at The Millennium Building, the results were not similar in scale to those at The Tower Building, largely because the program did not detect a major anomaly similar to the overflowing cooling tower issue. The program still led to 10 percent water savings from the previous year, as well as improved operations, especially at times outside of the building’s normal operating hours.

Another added benefit to the program is the ability to compare the real-time water monitoring data to utility bills to ensure the utility meter is correct. The D.C. Water utility meter at The Millennium Building did not record daily readings for four billing cycles in 2016, and the meter needed to be replaced. During this time, The Millennium Building was only billed based off estimated usage rather than real numbers determined by the utility meter. Without accurate readings from the utility, there was no source comparison for the real-time water meter and no way to ensure data quality.

While energy monitoring platforms have been in use for a few years, water metering is a newer practice, and there are still some errors in the recording of water interval data. At The Millennium Building, during the first year of the program, 5 percent of interval readings were not reported on the main building meter due to data interruptions that were later corrected by their third-party partner company. Missed readings can prevent the team from understanding the full potential of water savings, or cause potentially missed alerts. After a few months of closely monitoring the data streams, the data readings are now much more accurate and reliable, and match the monthly usage on Tower’s utility bills.

Water management programs may not be adopted as widely as energy management programs because they may not always produce the same level of financial savings. A large portion of expenses on each water bill are associated with local taxes and fees and these types of costs can't be controlled by the building owner. There are also fewer options to consider for water conservation measures, with a primary focus on cooling tower management and water fixtures, as compared to various HVAC equipment types on each floor. However, these water programs are extremely helpful for detecting major anomalies and preventing large building or equipment failure, as well as tracking usage that can’t be captured from a utility bill. As water costs continue to increase, it is likely that these efforts will pay off in the long term.

Currently, the real-time water management program is only underway at The Millennium Building and The Tower Building. Tower is considering extending the program to additional office and multifamily properties.

MEASURING SUCCESS
Tower considers this program successful as it has identified multiple anomalies, preventing building damage and saving the company money. Additionally, the program has helped the building team understand its equipment and water use demands both during and outside of building leasing hours, something that would not have been possible just from reviewing the utility bills. The building staff has found this program helpful especially because of the real-time alerts they receive when usage has spiked above normal GPM thresholds. By reviewing the daily reports and responding in real-time, the building teams have been able to make technical no-cost adjustments that can both
improve the life of the building’s equipment and lower water usage during times when the buildings’ demands may not be as high.

Tower has a goal through the Better Buildings Challenge to reduce water usage 20 percent by 2020, and reached that goal in 2018. The team looks forward to continuing its water conservation efforts, including water monitoring in real time.