

## PUMPING EFFICIENCIES: MWRA

### Boston, Massachusetts



*Pump #9 was operating inefficiently and was refurbished, including an epoxy resin coating on the inner shell of the pump*

### PROJECT DESCRIPTION

The Massachusetts Water Resources Authority (MWRA) provides wholesale water and sewer services to 3.1 million people and more than 5,500 large industrial users in 61 communities in eastern and central Massachusetts. MWRA has made a number of pump efficiency improvements, including the three specific projects described below.

- At the Deer Island Treatment Plant, the second largest wastewater treatment plant in the United States, MWRA staff refurbished Pump #9 in the North Main Pump Station in December 2019. Pump #9 is one of ten 3500 horsepower (HP) centrifugal pumps that lift wastewater from two underground tunnels to the plant's grit facility. It was found to be operating inefficiently during an energy efficiency audit and in need of refurbishment. As part of the overhaul, MWRA coated the inner shell of the pump with an epoxy resin to reduce frictional losses and improve pump efficiency. After collecting a year's worth of data, the Pump #9 overhaul was estimated to reduce electricity consumption by 133,000 kwh/year, which results in about \$12,000/year in savings.
- In another case, MWRA will be installing two 60 HP "jockey pumps" – smaller pumps to operate more efficiently under low flow conditions – in a wastewater pump station to complement two existing larger 150 HP pumps. The two larger pumps are designed to pump up to 28 million gallons per day (MGD) combined. However, 85% of the time the flow is significantly lower – median flow is 6 MGD – and the oversized 150 HP pumps run inefficiently. The two 60 HP jockey pumps with VFDs will handle up to 90-95% of the facility flow while requiring significantly less energy to run. Under high water demand scenarios, operators will switch back to the larger pumps. MWRA estimates that the jockey pumps will save about 81,000 kWh per year or \$12,000 per year.
- Additionally, in 2009, MWRA installed VFDs on pump motors at four drinking water pumping stations to better meet flow variations. The total calculated annual energy savings from these VFDs was 1,066,285 kWh and the total incentive received from the energy utility was \$189,714.

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## MAKING THE PROJECT HAPPEN

MWRA has a long-standing commitment to sustainability embodied by the 50 Giga-Watt-hours renewable electricity per year (accounting for 25% of MWRA electricity demand) generated through on-site wind turbines, hydro turbines, solar panels, and digester gas fueled combined heat and power. Some of the keys to project success at MWRA have proven to be:

- **Gaining Top-Down Commitment.** An energy group meets quarterly with the MWRA's Executive Director and senior management team to discuss upcoming projects to ensure buy-in from all of MWRA's divisions – operations, finance, law, and administration.
- **Complying with State Initiatives.** With Governor Baker signing Executive Order 594 (*Decarbonizing and Minimizing Environmental Impacts of State Government*) on Earth Day 2021, MWRA was provided with a set of goals and requirements that can help sustainability projects receive attention and funding.
- **Taking Advantage of Utility Programs.** MWRA works with utility-funded commercial and industrial energy efficiency experts to explore innovative energy efficiency projects, develop "custom" incentive applications, and participate in generous demand response programs.

## FINANCES



The pumping projects had the following paybacks, savings and expenses:

- For the Pump #9 refurbishment, MWRA paid \$126,000 and received an energy-efficiency incentive from Eversource of \$59,000 for a total cost to MWRA of \$67,000. With no incentive, the project payback was 10 years. With the incentive, the project payback was 6 years.
- For the jockey pump project, the MWRA will receive an energy efficient incentive from NGRID of \$24,300 and a project payback of 10 years.
- For the drinking water pumping stations VFD installations, MWRA received a total incentive amount from Eversource of \$189,714. As these VFDs were installed as part of a more comprehensive pumping station rehab, the cost to install the VFD could not be separated out from the total cost of the entire project.



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## IMPLEMENTATION

These projects were spearheaded by the MWRA energy group that coordinates with staff across the agency. Utility energy efficiency programs play a major role by offering on-site energy efficiency audits, detailed feasibility studies, and custom incentives for the projects.

## CHALLENGES

A few issues became apparent during these projects:

- For the Pump #9 refurbishment, MWRA staff could not determine performance improvements solely due to the epoxy coating. Ideally, a quantification of epoxy coating effectiveness would have required MWRA running the refurbished (but not epoxy coated) pump for a time to gather baseline performance data and comparing that data to pump performance after epoxy coating. However, a two-stage installation would have driven project costs too high.
- For the water pumping station VFDs, MWRA operational staff had to be trained on the benefits of VFDs and how to best take advantage of their features.



## ADVICE AND LESSONS LEARNED

Pump upgrades are often difficult at wastewater and water facilities because real-time metering data (e.g., pump efficiency, speed, suction/discharge pressure, flow, etc.) to determine pump performance is often lacking. To deal with these limitations, MWRA has used utility-funded energy efficiency consultants to provide short-term but comprehensive metering of pump stations to examine the relative health of each station pump. The resulting data allows MWRA to determine which pumps should be used more and which pumps need to be refurbished or replaced.

## LEARN MORE

For more information about MWRA and this project, contact:

Denise Breiteneicher  
Denise.Breiteneicher@mwra.com

Robert Huang  
Robert.Huang@mwra.com

