EMCOR Government Services

Reclaiming Liquid Gold

EMCOR's design of a water reclamation system is helping the environment and saving the government bucketloads on water consumption.

Unlike the natural environment, where the water cycle is perpetually at work, the journey of water within the built environment tends to be linear—clean water in, dirty water out. Depending upon the size and function of the facility, vast amounts of water are wasted every year, to the detriment of bottom lines and the surrounding ecosystems.

Taking a cue from Mother Nature, EMCOR interrupted this rain drain and turned the process into a more sustainable one at the Central Heating and Refrigeration Plant in Washington, D.C. The facility is listed in the National Register of Historic Places, but its purpose is still critical today. It provides 17,000 tons of cooling and 1 million pounds of steam per hour to roughly 80 government buildings that total 55 million square feet.

As the maintenance provider for the plant's mechanical equipment, EMCOR was already familiar with where the site could optimize water usage. EMCOR's professional engineers from its Facilities Solutions Group then worked closely with the site-based team of steamfitters to complete a design-build of a high-performance water reclamation system, under the 8(a) prime contractor Hi-End/Pinkney. The system recycles about 80 million gallons of water per year by diverting 110 million gallons of wastewater and rooftop runoff away from the city's sewage system. This diversion in of itself has a positive impact on D.C.'s rivers, which suffer from more than a billion gallons of stormwater and sewage overflow each year.

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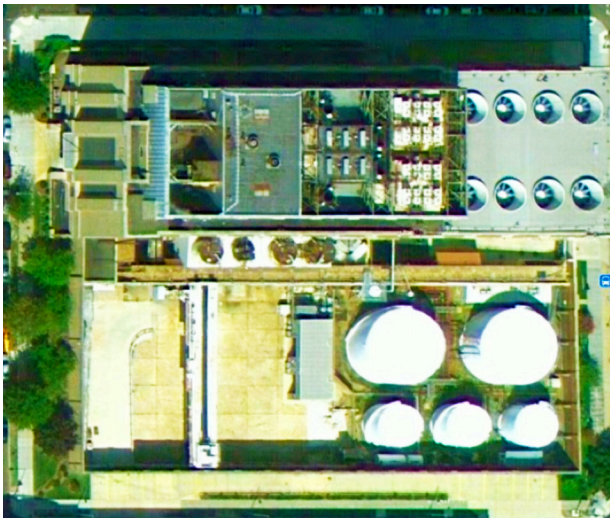
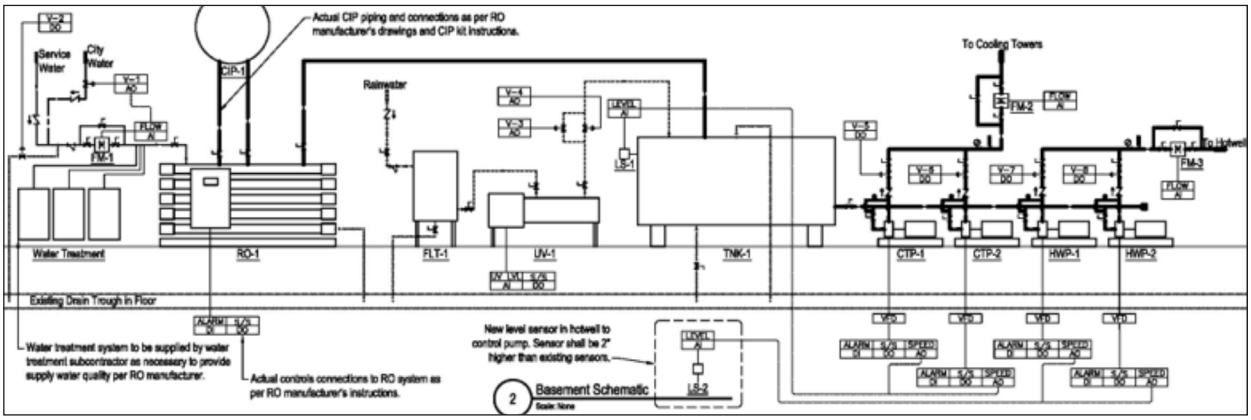


Aerial view of the Central Water Plant



Reverse osmosis filter system schematic

Through a mix of reverse osmosis filtration and ultraviolet treatment, 75 to 80 percent of the wastewater and runoff collected in the reclamation system is cleaned and stored in a holding tank before being reused for purposes like boiler and cooling tower make-up water. The remaining 20 to 25 percent of wastewater collects and consolidates impurities from the incoming water source, enabling the very high recovery rate.

The General Services Administration (GSA), which owns the plant, is also finding productive uses for the wastewater, which is cleaner than some of the other water sources in the facility. The cleaner water from both filtered waste and stormwater sources naturally extends the life of the equipment it passes through, enhancing heat transfer and resulting in increased efficiencies. Water consumption is further reduced by decreasing the necessity to blowdown boilers, since there is substantially less impurity buildup. As an added benefit, fewer chemicals are necessary to pretreat makeup water sources prior to use in the boilers.

Due to the size of the plant and its current water usage, the project is designed to reduce annual water consumption by 70 to 90 million gallons. This equates to a reduction rate between 37 percent and 48 percent, which continues to grow as GSA discovers more uses for the system's wastewater.

With a total project cost of approximately $750,000, GSA realized a one-year payback from its investment. GSA is heralding the project as such a success, it is now investigating an expansion of the system to handle other city water systems.

The plant's water usage, approximately 300,000,000 gallons per year prior to the installation of the water reclamation system, has been reduced by 70 to 90 million gallons per year.

These two Reverse Osmosis (RO) systems were installed in 2014 and 2015. The second system doubled the rate at which storm water runoff and wastewater is filtered; both systems together produce 320 gallons of filtered water per minute. The second system also provides redundancy during maintenance or downtime.

This custom-built Clean-in-Place (CIP) System enables on-site cleaning of the Reverse Osmosis (RO) system membranes without needing to ship them out. The membranes perform filtration of dirty water and therefore require cleaning about every six months. They are put inside of the CIP System, and chemicals are circulated to clean them.