Details for follow-up activities for Sub-metering Cooling Tower Recommendation

Installation Schedule & Labour

The following assumptions were made on a conservative basis. Meter installation will require one worker, working three hours, for a total of two installations for the inlet and outlet. The hourly rate per worker is $150, therefore the total cost for Labour will be:

$$Labour\ Cost = \$150 * 1\ [worker] * 3\ [hrs] = \mathbf{\$450}$$

An additional $250 may be required for plumbing equipment, additional piping, and weather protective enclosures for the meters. Extreme weather might require the meter to be placed indoors to prevent damage.

Item	Cost
Labour	$450
Piping and Casing	$450
Permit/Inspection	$200
Total	$1,100

It should be noted that since the installation, conducted by a local utility authority, consumes approximately three hours, the installation may take place during the work day, possibly creating machine downtime.

Maintenance Cost

The following basic maintenance check-ups should be conducted monthly, or as needed:

- Pipe corrosion
- Pipe blockage
- Leakage

Water Saving Cost

Water Evaporated per Month = water evaporated per hour X daily operation hours X days worked per month

$$WE_m = WE_h * DOT * DPM = 215[\ gal] * 9[hrs] * 180[hrs]$$

$$\mathbf{WE_m = 38,700\ [gal]}$$

Where, WE_m= Water Evaporated per month

WE_h= water evaporated per hour in gallons

DOT= Daily operation time in hours

DPM= days worked per month

$$S_m = SRS * \frac{WE_m}{1{,}000\ [gal]} = \frac{\$5.60}{1{,}000\ [gal]}$$

Therefore, monthly savings due to submetering equal $217.00, and

$$S_y = S_{m,sm} * 12\ [months]\ = \mathbf{\$2{,}604.00}$$

Where, S_m = monthly savings in USD

SRS= Sewer rate structure in USD/gallon

$S_{m,sm}$ = monthly savings due to sub-metering in USD

S_y= yearly savings in USD

Department of Energy Recommendations [1]

- Determine the expected range of water flow and pipe sizes
- Determine the accuracy requirements over the flow range
- Identify any physical installation requirements for meter location, straight lengths of pipe, available communications, and any other applicable requirements

Success Stories

According to the Environmental Protection Agency (EPA), national studies indicate that, on average, 14% of the water treated by water systems is wasted due to leaks. Some water systems have reported water losses exceeding 60%. Accounting for water and minimizing water loss are critical functions for any water utility that wants to be sustainable [2].

Suppliers

The Centre of Sustainable Energy and Environmental Engineering has no affiliation with the following vendors. The following suggestions are simply a recommendation

Digital Flow Meter	Price	Link
Tuthill Fr1118a10 28 Gpm In Line	$152.40	Here
Neptune T-10 1" Potable Water Meter	$250.00	Here
Alicat Scientific M Series Mass Flow Meters	$925.00	Here
Rosemount 405 Compact Orifice Flow Element	$1,024.61	Here

FLOMEC G2A20N09GMB, 2-Inch, 20-200 GPM	$1,213.60	Here
FLOMEC G2S20N09GMB,2-Inch, 20-200 GPM	$1,871.00	Here

Flow meters may be selected based on operational requirements and machinery constraints. The models listed above are simple examples of digital flow meters. Various other types of flow meters can be found here.

Technicians

Technician Name	Location	Website	Phone
Benjamin Franklin Plumbing	Wilmington, NC	Here	(910)-802-9127
Coastal Plumbing	Coastal NC Region	Here	(910) 330-0857

References

[1] "Technical Water Meter Selection Guidelines," *Office of Energy Efficiency and Renewable Energy*. [Online]. Available: https://www.energy.gov/eere/femp/technical-water-meter-selection-guidelines.

[2] "Water and Energy Efficiency at Utilities and in the Home," *United States Enviornmental Protection Agency*, 2019. [Online]. Available: https://www.epa.gov/sustainable-water-infrastructure/water-and-energy-efficiency-utilities-and-home.