Water and Wastewater System Energy Audits

Flagstaff, Arizona — A Case Study

Significant Savings. Green Initiatives.

TATA & HOWARD

Unsurpassed Solutions
in the Water Environment

Tata & Howard, Inc. conducted an energy audit of the City of Flagstaff's Water System. The purpose of this energy audit was to identify energy conservation opportunities that would provide annual and life cycle power cost savings for the City. The City serves 66,660 people.

This project was funded by a grant from the State of Arizona Water Infrastructure Finance Authority (WIFA) as a green project. WIFA's green criteria are based on the United States Environmental Protection Agency's (EPA) findings in regard to the 60,000+ water systems in operation in the United States, and these systems' exceedingly high cost to municipalities and consumers:

- Three to four percent of national electricity consumption, equivalent to approximately 56 billion kilowatts (kW), or $4 billion, is used in providing drinking water and wastewater services each year;
- Water and wastewater utilities are typically the largest consumers of energy in municipalities, often accounting for 30-40 percent of total energy consumed;
- 60 to 70 percent of all pumps have tested below industry standards or need changes in operations.

Many states and power companies have reviewed the energy used by water related utilities and found a very low efficiency in the Industry. Although Flagstaff compared favorably with utilities nationally, there was a clear need for improved efficiency. Municipalities are facing a difficult challenge: to improve systems to lessen the environmental burden and to reduce energy costs.

Tata & Howard's findings for the City of Flagstaff focused on energy efficient equipment replacement, operational modifications, and process control that would lead to improved efficiency and cost savings with less than ten years of payback. The findings were gathered from on-site observations, testing of the pumping systems of several of the wells, and discussions with utility operations and maintenance personnel. Tata & Howard recommended a comprehensive plan that would result in greener energy consumption and significant cost savings, all with a very short payback period. In fact, most improvements had a payback period of less than three years.

- Replace pumps and equipment that tested low in efficiency
- Review operations to best match flow requirements to use pumping equipment at best efficiency points
- Establish a required minimum efficiency for new installations and a "pay for performance" standard
- Monitor power usage, costs, efficiency, and horsepower requirements in real time or on a schedule to maintain lowest possible costs
- Develop strategies to limit demand charges, and provide training to understand power rates structures
- Institute employee training and incentives for power saved, improve communication to establish efficiency standards, develop an understanding of efficiency
- Institute a leak detection program
- Determine equipment energy usage
- Understand pump intake conditions and effects
- Develop an understanding of Pump Industry Standards
- Develop rates of return on efficiency improvements to improve on capital improvement decisions
- Review system piping for efficiency
- Monitor specific capacity of wells to check for screen plugging
- Design-Monitor-Analyze to check designed parameters; recognize changes due to modified equipment usage, new technologies, wellfield performance, and water usage.
- Review pressure zones to limit pumping, and determine if micro-turbines are feasible

Costs, Rebates, and Rate of Return

Tata & Howard found that repairing or replacing wells, pumps, blowers, and boosters at five separate locations throughout the City of Flagstaff would be highly beneficial. These upgrades would raise efficiency from an average of 49% to an average of 71%, and would provide significant cost savings, with an abbreviated payback period:

Estimated Cost for All Upgrades*	**$1.5 million**
Estimated APS Rebate	**$500,000**
Annual Savings After Upgrades	**$350,000**
Average Number of Payback Years for All Upgrades	**2.45**

*For a detailed breakdown of upgrades and savings, please see next page.

Tata & Howard is a certified trade ally with Arizona Public Service (APS). We assist in obtaining incentives through APS in the form of cash reimbursement or reduction in rates.

Detail of Upgrades and Savings

Location	Tested % Efficiency	Excellent % Efficiency	Annual Savings	Payback Years	Estimated APS Rebate	Estimated Upgrade Costs
Well A1	73%	72%	$10,000	0.65	$5000	$11,500
Pump Station A	60%	72%	$10,000	0.44	$6,250	$10,625
Well A2	42%	69%	$40,588	0.77	$61,500	$82,000
Well B	49%	65%	$14,322	6.7	$14,512	$110,000
Booster B	46%	70%	$3,264	1.7	NA	$8,750
Well C	60%	66%	$31,820	3.2	$33,302	$150,000
Booster C	58%	72%	$8,950	0.9	$9,383	$17,500
Blowers D	26-27%	69%	$103,311	3	$144,805	$454,738
Reclaim Pump D	64%	75%	$4,924	3	$16,257	$31,029
Primary E	20-45%	72%	$10,296	3	$15,983	$46,641
Blowers E	35-40%	69%	$113,963	3	$188,466	$530,325
Pumps F	35-55%	75%	$4,812	3	$10,502	$24,939
TOTALS			**$347,230**		**$496,527**	**$1,478,047**

Flagstaff, Arizona is a prime example of Tata & Howard's thoughtful and well-executed energy audits benefiting municipalities on multiple levels. By implementing these justifiably affordable changes, Flagstaff will significantly reduce energy costs, increase employee satisfaction, and provide for a greener environment.

For more information on our Water and Wastewater Energy Audits, or for any other question, please contact us at contact@tataandhoward.com or 800-366-5760.

Founded in 1992, Tata & Howard, Inc. is a specialized water, wastewater, stormwater, and environmental services consulting engineering firm. We have a reputation for consistently delivering cost-effective, innovative project solutions by working as a cohesive team with our clients.

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