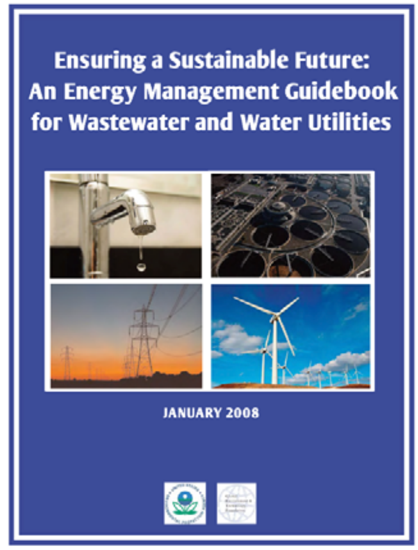
EPA United States Environmental Protection Agency

2011 U.S. EPA Region 9 Energy Management Initiative For Public Wastewater and Drinking Water Utilities Facilitating Utilities toward Sustainable Energy Management

Background



Since 2008 U.S. EPA Region 9 (EPA) has been committed to helping water and wastewater utilities improve their energy management and decrease their operating budgets. From 2008 to 2010 EPA developed and conducted free, open-invitation, energy management workshops (based on *EPA's Ensuring a Sustainable Future: An Energy Management Guidebook for Wastewater and Water Utilities* released in January 2008) to over 500 water and wastewater utilities associates in AZ, CA, HI, and NV. In 2011, EPA completed a more comprehensive one-year pilot program of monthly energy management webinars with eight utilities to help them decrease operating costs, reduce energy or water use, and/or develop alternative energy sources by implementing projects using Environmental Management Systems approaches. The program focused on two approaches: 1) development and implementation of specific on-the-ground projects, and 2) development and initiation of Energy Management System components. Participants were asked to commit to attending a two-hour monthly webinar and to completing "homework" assignments as required to identify and implement energy management goals.

Results

The following table identifies the utilities that participated in the program and provides a summary of their results. Many of the projects required no additional resources outside of existing staff time and minor equipment purchases made within existing expense accounts. Some facilities focused on collecting and using renewable energy (specifically energy generated from the force of water dropping in elevation while traveling through pipes). Other sites concentrated on reducing energy consumption by increasing energy efficiency. Some utilities reduced energy use during the day when energy costs more and increased energy use during times of the day when energy costs less. At several of the facilities, optimizing operations resulted in significant savings without requiring a large capital outlay. More details on the specific projects can be found on the attached case studies developed by the utilities.

Summary of On-the-Ground Accomplishments

Facility	Project Description	Energy Saved Annually (MWh)	Energy Costs Reduced Annually ($)	Greenhouse Gas Emissions Reduced Annually (metric tons as CO_2 equivalent)
1. Chandler Municipal Water Utilities, Arizona	Optimize Water Operations	1,450	$130,000	996
2. City of Prescott, Arizona Water Treatment Facility	In-Conduit Hydro Generation	125	12,000	86
3. City of Somerton, Arizona Municipal Water System	Repair Pumps and Wells	225	27,000	172
4. County of Hawaii Department of Water Supply, Hawaii	Automate Water Reading	1,965 gallons of gasoline saved annually	17,670	18
5. Eastern Municipal Water District – Perris Water Filtration Plant, California	In-Conduit Hydro Generation	290 .	36,000	200
6. Lake Havasu Port Drive Water Treatment Plant, Arizona	Optimize Water Operations	130	36,765	90
7. Truckee Meadows Water Authority, Nevada – Chalk Bluff Water Treatment Plant and Highland Canal	• Optimize Time-of-use Capacity	450	225,000	310
	• Water Supply Capital Improvements	500	60,000	345
8. Tucson Water, Arizona	Reduce Peak Energy Demand	0	9,000	0
9. City of Prescott, Arizona Wastewater Treatment Facility	Reduce Peak Energy Demand	0	15,120	0
10. City of Somerton, Arizona Wastewater Treatment Plant	Replace Blowers & Diffuser System	74	29,328	51
TOTAL:		**3,244** (plus gasoline)	**$597,883**	**2,268**

Structure of Monthly Webinars and Commitment of Participation

The goal of the program was to move water and wastewater utilities toward sustainable energy management (energy efficiency, conservation, development and independence). We planned to recruit approximately 10 utilities with at least one represenative from each of the Region 9 states (Arizona, California, Hawaii, and Nevada). Given the geographic distance between participants we used a webinar format, keeping each session to two hours and scheduling them once a month over a one year period. We required a letter of commitment from the general manager of each utility to (1) ensure their commitment to consider projects that were developed during the webinars and (2) authorize staff time to participate in the webinars and develop the projects. The program content used in the training was based on the PDCA (Plan, Do, Check, and Act) systems approach detailed in the EPA Energy Management Guidebook, sharing of ideas and project accomplishments, and guest speakers on energy topics.

Webinar Content

After a brief introduction, the timing of the content was arranged so priority projects could be identified first to allow most of the year for project implementation. Basic information about each facility was collected prior to beginning of the first session. Priority setting, scope and fenceline of projects, and ranking criteria were presented early in the program so utilities could develop Energy Improvement Management Plans and get buy-in from management. Presentations on energy policies, team infrastructure, energy audits, targets and objectives, performance metrics, accountability, monitoring, training, operational controls, communication, project challenges and successes, progress reporting, and special guest speakers kept participants engaged and focused. Homework assignments were given between the monthly webinars as highlighted below.

Facility Assessments and Planning Assignments

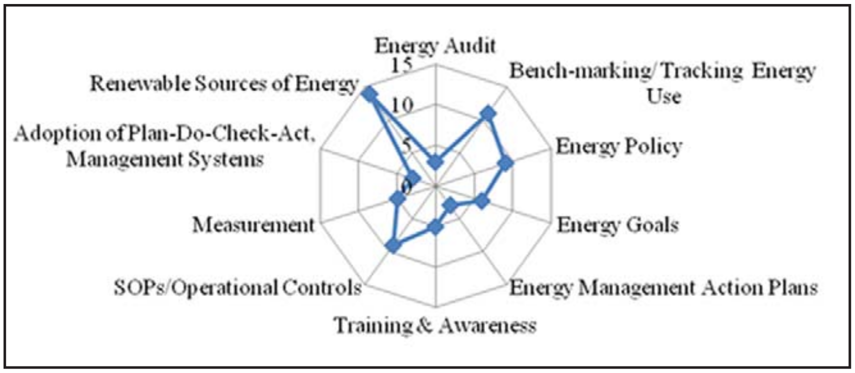
<u>Profiles:</u> Pre-webinar questionnaire profile forms were required to be completed by each facility so baseline information was available. Information about the size of the facility, the type of treatment processes, amount of energy used, etc. helped provide a platform upon which the facility would begin its evaluation assessment.

<u>Energy Priority Ranking:</u> To help facilities determine which energy project would be best to implement during the program, each facility developed and completed an energy priority rank sheet. This included an identification of criteria specific to their facility to use for determining the overall feasibility and benefits of each energy project. Each project was assigned a score for each criterion and the individual scores were totaled for each project. The project with the highest score was typically selected for action. Each facility was encouraged to choose a project or projects that would achieve at least a five percent energy reduction.

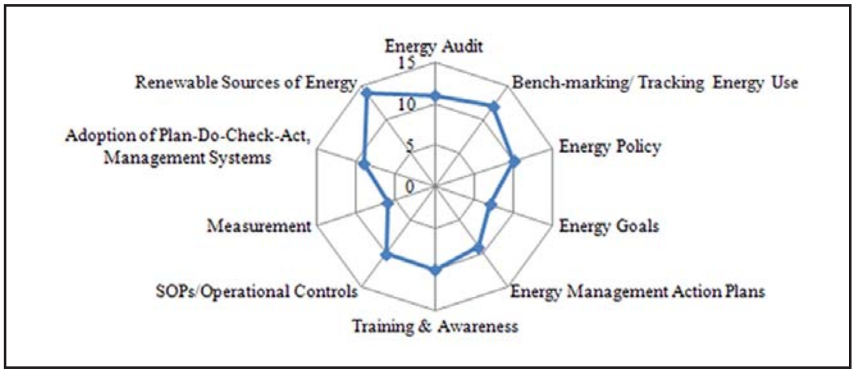
<u>Energy Improvement Management Plan (EIMP):</u> Once the project(s) were selected, facilities then prepared an implementation plan using the EIMP format provided from the previously mentioned EPA guidebook. The focus of the EIMP process was to encourage facilities to work through an energy team and secure management buy-in to ensure all necessary steps and people were included in the plan.

<u>Summary of Energy Improvement Goals:</u> Participants were asked to complete a template that summarized the energy improvement goals they hoped to achieve through the program. Simple metrics and a table format were developed to help ensure consistency and to reduce the burden of duplicate and/or excessive reporting.

<u>Pre and Post Radar Graph Assessment:</u> Finally, several aspects of each facility's energy management system were assessed at the beginning and again near the end of the program. The results of the assessments were depicted using radar graphs to illustrate improvements made during the program. In these diagrams, higher scores represent a stronger energy management system (see examples on the next page).



Example Pre Webinar Assessment



Example Post Webinar Assessment

Chandler Municipal Utilities, Arizona

February 21, 2012

Facility Profile

Chandler Municipal Utilities is located in the City of Chandler, Arizona within Maricopa County. The Municipal Utilities Department oversees wastewater treatment, reclaimed water, and the drinking water supply for the city. The utility selected their potable water system for the Energy Management Initiative. The Chandler potable water system serves 255,000 customers. The system treats an average 52 million gallons per day (MGD) of ground water and surface water at two treatment facilities. The use of ground water, from 31 wells, requires more energy than surface water from the Salt River Project and Central AZ Project. Additional energy is needed to bring ground water to the surface for treatment and distribution.

Baseline Data

Chandler spent $2.9 million on electricity last year treating potable water. The annual electricity used at the water treatment facilities is 33,880,000 kilowatt hours (kWh). In 2010 the plant's energy consumption generated 22,268 metric tons of carbon dioxide equivalent ($MTCO_2$) of greenhouse gas (GHG) emissions.

Energy Improvement Management Plan

Chandler Municipal Utilities chose to reduce energy consumption by optimizing the potable water system. They did this in two ways. First, they revised tank management practices based on hydraulic modeling and master planning to find the best configuration and operating program to reduce ground water pumping. Second, the utility staff upgraded pumps and revised pressure zones to operate more efficiently under the new operating program. Based on this energy management approach, Chandler's goal was to reduce the number of kilowatt hours used to produce and distribute one million gallons of potable water by 5% from 2010 levels.

Chandler chose to develop a strong team as an area of focus for the Energy Management System.

Challenges

One of the biggest challenges Chandler faced was changing staff attitudes and long established habits associated with operating a small ground water based system – to the practicality of operating a large surface water dominated system. A series of small victories led to a staff driven team approach to system optimization.

The City of Chandler's potable water production and distribution system expanded rapidly to meet the growth of the 1990s and early 2000s. Wells and mains were added so the system was able to meet all its demands. The recent economic slow down gave Chandler staff the opportunity to analyze the system as a whole, rather than a collection of separate parts. Complicating factors included a lack of consistent historic design philosophy and evolution of the system from a small groundwater based utility to a surface water dominated system serving a population of 250,000 and several major industrial and commercial customers.

Surface water is the most cost effective source of water for Chandler, but due to a lack of dedicated transmission infrastructure, staff had a difficult time filing tanks with surface water. Facing budget constraints, staff revisited all aspects of the system. The result was: 1) an expanded second pressure zone; 2) consistent hydraulic grade lines for the pressure zones; 3) focused rehabilitation of key facilities; and 4) a new tank management strategy.

During this time the programmable logic controllers the system used were no longer being supported by the manufacturer, so they were replaced by controllers with much better information collection capabilities. The new technology gave the operators much better information and control of the system. Given the new tools, the operators developed and tested new operation strategies which have resulted in a more robust system that produces better quality water, while using fewer resources.

Accomplishments

- Chandler fell a bit short of the 5% goal, but was able to achieve a reduction of 4.2%. They also produced 4.7% more potable water in 2011 than they did in 2010. Had Chandler not reduced the energy necessary to produce and distribute one million gallons they would have used an additional 1,445,000 more kilowatt hours. Using the average cost per kilowatt hour Chandler paid for power in 2011, this amounts to an energy savings of almost $130,000 and avoiding the generation of 950 $MTCO_2$ of GHG emissions.

- One aspect of Chandler's potable water system optimization approach involved using a higher percentage of surface water than in previous years. This resulted in substantial savings in water resource costs, and a significant reduction in chlorine use.

- Chandler adopted a team approach to optimization that resulted in a high level of understanding of system dynamics throughout the organization, an involved staff that continually identifies ways to improve the efficiency and operation of the system, improvements in data acquisition and management, and multiple open channels of communication.

- Annual Energy Savings: 1,445,000 kWh

- Annual Cost Savings: $130,000

- Annual GHG Reductions: 996 $MTCO_2$, equal to the removal of 195 passenger vehicles from the road

- Project Cost: No additional funds required

- Payback Period: Immediate

Next Steps

Staff are continuing to evaluate system performance and seek additional opportunities for optimization.

Some lighting has been upgraded; more lighting upgrades are planned in the future.

Staff are investigating the feasibility of on-site power generation using solar panels and in-pipe hydraulic power generation.

Contact

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2011 U.S. EPA Region 9 Energy Management Initiative
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Facilitating Utilities toward Sustainable Energy Management

Airport Water Reclamation Facility, Prescott, Arizona

February 21, 2012

Facility Profile

The Airport Water Reclamation Facility (AWRF) is one of two facilities owned and operated by the City of Prescott, within Yavapai County. Prescott is positioned close to the center of Arizona between Phoenix and Flagstaff, just outside the Prescott National Forest. The original wastewater treatment plant was built in 1978 and received a major facility upgrade in 1999. The next major upgrade begins in 2012. The City of Prescott also operates another wastewater treatment plant called Sundog.

Baseline Data

AWRF treats 1.1 million gallons of wastewater per day for approximately 18,000 residents. The facility spends $160,000 annually on electricity costs and uses 1.8 million kilowatt hours (kWh). Greenhouse gas (GHG) emissions from the AWTF are 1,023 metric tons of carbon dioxide equivalent ($MTCO_2$).

Energy Improvement Management Plan

The City of Prescott elected to construct a hydro turbine electric generation unit as part of the Energy Improvement Management Plan at the Airport Water Reclamation Facility to conserve energy and better manage resources. The turbine will be placed at the discharge point of the recharge water pipeline to convert the potential energy in the flowing water to electricity. This hydro turbine has the potential to produce 125,000 kWh per year, which would save the City approximately $12,000 per year.

Challenges

The greatest challenge so far has been the time commitment required to accomplish the project concurrent with the design of the facility expansion. Initially, there was also some difficulty connecting with the appropriate staff at the power company; however, that has since been resolved.

Accomplishments

Energy and cost savings will result with the new hydro turbine electric generation unit installation at the Airport Water Reclamation Facility. This project is estimated to produce 125,000 kWh and save $12,000 in electrical costs per year. The Energy Management Program has promoted an awareness of energy uses and potential savings associated with minor and major changes to operations. The program also highlighted many other programs/ projects that improved the City's knowledge of energy saving considerations. The City was successful in developing and adopting an Energy Conservation Policy.

Annual Projected GHG Reductions: 86 $MTCO_2$, equal to the removal of 17 passenger vehicles from the road

Project Cost: $25,000

Payback Period: 25 months

Next Steps

Going out to bid with the hydro turbine project when the major upgrade project is ready to bid as well.

Contact

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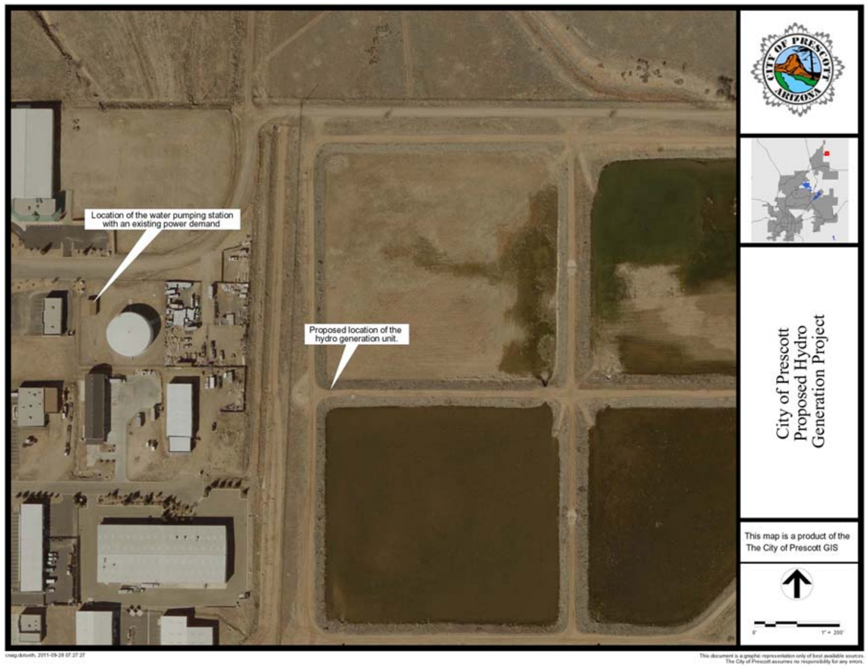

1970s

1978 Built Airport Wastewater Treatment Plant

1979 Built Sundog Wastewater Treatment Plant

1980s

1989 Last major facility upgrade of Sundog Facility

1990s

1999 Last major facility upgrade of Airport Facility

2000s

2007 Energy Audit

2010s

2012 Airport expansion planned

2016 Sundog expansion planned

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Somerton Municipal Water, Arizona

February 21, 2012

Facility Profile

Somerton Municipal Water is located in the City of Somerton, Arizona within Yuma County. Yuma County is situated in the southwest corner of Arizona close to the California and Mexico borders. The water treatment facility was built in 1985. In 1998 the facility carried out a major facility upgrade by installing a new 1.2 million gallon storage tank and a new 100 horsepower booster pump. The drinking water treatment facility is called the Somerton Municipal Water System (System) and it sources water from 3 – 300 ft. deep wells.

Well

Storage Tanks

Green Sand Filter Tanks

Baseline Data

The System serves a population of 14,267 residents and treats 2 million gallons of water per day (MGD). Approximately 907,000 kilowatt hours (kWh) is used to run the System and it costs an average of $85,000 per year for electricity. The plant generated 512.79 metric tons of carbon dioxide equivalent ($MTCO_2$) of greenhouse gas (GHG) emissions.

Energy Improvement Management Plan

Water treatment plant staff started the energy improvement process by first evaluating the energy efficiency of existing wells and pumps. Upon inspection, repairs were made to two wells and three pumps. By fixing the wells and pumps, Somerton Municipal Water Systems will save $27,000 each year on their electricity bill. Moreover, they will save on average 250,000 kWh annually which will result in a reduction in CO_2 emissions by an estimated 172 $MTCO_2$.

Challenges

It was difficult to find the time to participate in the Energy Management Webinar sessions. No additional staff resources were available to complete the project.

Accomplishments

Somerton staff gained a better understanding of how projects are selected and increased their effectiveness in working with management.

By upgrading wells and booster pumps they were able to save approximately $27,000 per year per pump on energy costs.

Annual Projected GHG Reductions: 172 $MTCO_2$, equal to the removal of 34 passenger vehicles from the road

Project Cost: $131,203, with $33,500 covered by incentives

Payback Period: 4 years

Next Steps

Complete; begin solar project that will produce 1.5 million kWh.

Contact

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1985
Plant #1 and #2 built.

1998
Added 1.2 mg storage tank and one 100 HP booster pump.

2015
Future expansion planned.

1980s	1990s	2000s	2010s

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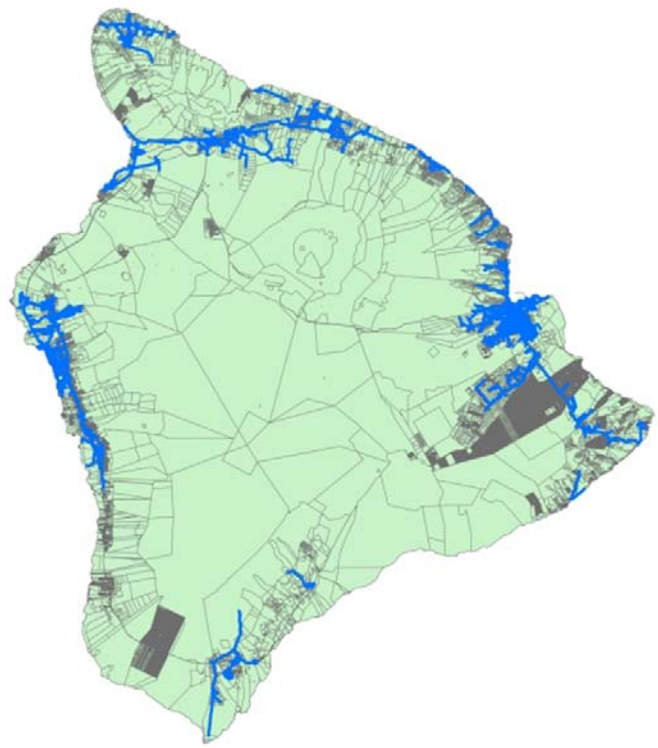
Hawaii County Department of Water Supply

February 21, 2012

Facility Profile

The Hawaii County Department of Water Supply (DWS) is one of 21 departments within the County of Hawai'i. The County encompasses the entire Island of Hawai'i , and the administrative offices are located in Hilo, Hawai'i. The DWS is the public potable water distribution utility; however, the Island of Hawai'i also has several other water systems that are not owned and operated by DWS. Hawai'i, the largest island in the Hawaiian chain, is 93 miles long and 76 miles wide with a land area of approximately 4,030 square miles. The DWS operates and maintains 67 water sources and almost 2,000 miles of water distribution pipeline. Over 90 percent of the water served is from a groundwater source that requires minimal treatment with chlorine for disinfection.



Baseline Data

The DWS serves 41,507 customers and produces 31.1 million gallons per day. Because of the vast area, mountainous terrain of the Island, and the many separate water sources, the energy needed to pump water to the surface is significant and facility employees drive a significant distance to operate the water distribution system. In 2010, the facility spent $16.5 million on energy costs, used 54,781,373 kilowatt hours (kWh) of electricity and 95,100 gallons of gas and diesel. Hawai'i County DWS emits an estimated 31,784.35 metric tons of carbon dioxide equivalent ($MTCO_2$) of greenhouse gas (GHG) emissions.

Energy Improvement Management Plan

Hawai'i County DWS energy reduction strategy's main goal is to reduce gas and diesel consumption. The performance target was to reduce fuel purchases by 200 gallons per month or 2,400 gallons annually. The target was met by establishing more efficient operators' routes around Hilo, using an automated SCADA system, and installing GPS equipment in 30 vehicles. A new automated SCADA system replaced the manual system. By reducing fuel consumption and increasing efficiency, DWS will reduce CO_2 emissions by an estimated 17.3 TCO_2 per year. This project was fully implemented December 31, 2011.

DWS also chose to develop an Energy Policy.

Challenges

- Introducing a new automated SCADA system (to replace the old manual system) required programming time, and duplicate systems until the new system was proven.
- The data being collected was all manual until the new vehicle equipment was installed.
- DWS decided to purchase vehicle GPS units so a new vehicle policy was needed.

- The pilot project modified city of Hilo operators' routes. The pilot project covers about one third of the island. Implementing route changes met resistance because operators lost overtime.
- Establishing an Energy Management Team was unsuccessful so the project was implemented by one person, but there were many moving parts.

Accomplishments

- Created an Energy Policy
- Annual Projected Energy Savings: 1,965 gallons of gasoline
- Annual Overtime Savings: $9,780
- Annual Projected Cost Savings: $17,670
- Annual Projected GHG Reductions: 18 $MTCO_2$, equal to the removal of 3.4 passenger vehicles from the road
- Project Cost: $25,300
- Payback Period: 1.5 years

Next Steps

- Complete purchase of vehicle GPS systems.
- Fully implement project thoughout island which will include 100 vehicles.
- Begin wind power project to generate renewable energy.

Contact

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1900s **1940s** **1950s** **1960s** **1970s** **1980s** **1990s** **2000s** **2010s**

1905 – 1950's Surface/spring/tunnel water development for agriculture (sugar plantation)

1949 Department of Water Supply established as a governmental agency

1959 Hawai'i Territory became the 50th State of the U.S.

1969–Present High Elevation Well development throughout the Island of Hawai'i

1970–1980 Plantation Water Systems turned over to DWS

1985 Wind Farm constructed to power four deep wells

1990s Plantation era ended

2003 DWS Energy Management position established

2006 Water and Energy Audits

2007– 08 Hydro generators installed

2012 Install Vehicle Monitoring on all DWS vehicles, replace with fuel efficient vehicles

2013 & Beyond Repower 1980's era Wind Farm; expand renewable energy use

Eastern Municipal Water District, California

February 21, 2012

Facility Profile

Eastern Municipal Water District (EMWD) has over 250 operating facilities that have been constructed over the last 60 years. EMWD selected a drinking water filtration plant for the Energy Management Initiative. Perris Water Filtration Plant is located in Perris, California within Riverside County. Perris is situated southeast of Los Angeles along the Escondido Freeway. The plant treats water pumped from the Colorado River and/or from the CA State Water Project.

Baseline Data

Perris Water Filtration Plant:

Water Treatment Design Capacity: 24 million gallons per day (MGD)

Annual Energy Consumption: 5.6 million kilowatt hours (kWh)

Annual Cost of Energy: $695,000

Greenhouse Gas (GHG) Emissions: 3,862 metric tons of carbon dioxide equivalent ($MTCO_2$)

Design Average Flow (FY 2011): 10.2 MGD

Energy Improvement Management Plan

EMWD chose to reduce their energy consumption and greenhouse gas emissions by producing renewable energy on site. The municipality will install a Renewable Power Generator (In-Conduit Hydro Generation) at the Perris Water Filtration Plant. The renewable power generator will produce up to 290,000 kWh of energy each year. The project will take one year to complete once funding is secure and will cost approximately $350,000.

Challenges

Challenges associated with the proposed project include identifying hydro-generation technology capable of meeting the low head pressure and varying flow conditions existing at the Perris Water Filtration Plant. These were technical challenges that were eventually overcome.

Also, a grant application for funding from the U.S. Bureau of Reclamation was not funded, but EMWD obtained feedback on the proposal and will fund the project without a grant.

Accomplishments

- Raw water supply to EMWD's Perris Valley Water Filtration Plant is controlled through an existing valve which requires frequent, and costly, replacement. The benefits of this project are that it will eliminate the need for this replacement, and provide the necessary flow control capabilities combined with energy generation.

  EMWD has contracted with, and completed a feasibility study which shows the viability of the proposed project. The project which is capable of producing nearly 300,000 kWh's of electricity has now completed the design phase. Included in the design are revised cost estimates and inclusion of hydro-turbine technology that meets the unique challenges of this application (low head, with highly variable flow).

- Through participation in the energy Management Webinar series EMWD increased awareness of systematic processes for analyzing overall energy management efforts, and provided structure and a strategic approach to energy management as a whole.

- Annual Projected Energy Savings: 290,000 kWh

- Annual Projected Cost Savings: $36,000
- Annual Projected GHG Reductions: 200 $MTCO_2$, equal to the removal of 39 passenger vehicles from the road
- Project Cost: $350,000
- Payback Period: 5 years (factoring in the need to replace an existing, non-energy generating valve; 10 years (if valve didn't need to be replaced)

Next Steps

Board approval of funding, go out to bid.

Contact

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1952 – Present
EMWD has constructed and operates over 250 water, wastewater, and recycling water facilities over a 550 square mile service area of Western Riverside County

2005
Perris Water Filtration constructed (10 MGD)

2012
Expansion to 24 MGD

1950s	1960s	1970s	1980s	1990s	2000s	2010s

2009
Expansion completed to 20 MGD

2012
Hydro-turbine generator construction

2011 U.S. EPA Region 9 Energy Management Initiative
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Port Drive Water Treatment Plant, Lake Havasu, Arizona

February 21, 2012

Facility Profile

Port Drive Water Treatment Plant (PDWTP) is located in Mohave County, Arizona and serves the majority of the population of Lake Havasu City (City). The city is located along the Colorado River on the eastern shores of Lake Havasu. The water treatment plant was built between the years of 2002 and 2004 and has never received a major facility upgrade. Currently, an estimated 86% of the water treated is sourced from groundwater wells and a small percentage comes directly from Lake Havasu.

Baseline Data

PDWTP uses a natural biological process to remove iron and manganese from 11 million gallons of water per day. The treated drinking water is then distributed to 50,000 customers. Annually, the plant uses 6,636,960 kilowatt hours (kWh) of energy at a cost of $612,749 to the City each year. This equates to 4,577 metric tons of carbon dioxide equivalent ($MTCO_2$) of greenhouse gas (GHG) emissions.

Energy Improvement Management Plan

Lake Havasu City Water Treatment Plant staff, encouraged by the EPA Webinar series, completed a test "Change in Operations" of the North and South High Service Pump Station.

Challenges

Overall, since the 2009 recession, one major challlenge to any non-core activity – including this effort – has been a lack of personnel resources. Despite these challenges, the City was able to implement small incremental changes. A major benefit to the City was the realization that those changes can and will be valuable in the future. This was seen in the demonstration project described in more detail in the accomplishments section. The lack of staff hours prevented the City from moving forward with an Energy Improvement Plan. This also delayed the implementation of a pump study until November 2011 which should result in some energy savings in 2012.

Accomplishments

The City changed how much and when water would be released at each lead pump. The lead pump for each system was changed to operate at full water flow until it reached the turn off level setpoint. Prior to this, the variable frequency drive (VFD) controller was programmed to slow the lead pump at a nearly full tank level to provide continuous flow through the WTP process.

This change resulted in an average 8.7% energy reduction in pump stations for the months of March, April and May.

For the months of June, July and August, the average energy reduction was 6% for the North Pumps, and 6.7% for the South, compared to the same months in 2010. There was no change in the water quality or ability to supply water on demand with these changes.

All light fixtures were replaced.

In the last 10-12 years, increases in electric costs have not been passed on to users. Last year there was a 24% rate hike, but Lake Havasu reduced energy use by 30%.

In addition to the test project, Lake Havasu City qualified for an energy audit which was conducted for the North Regional Wastewater Treatment Plant by a consultant funded through the EPA. This resulted in a draft report submitted to Lake Havasu City in September 2011. The report identified 7 future projects that may be scheduled in the future. Many of the suggestions in the report may be relevant to Lake Havasu City's other treatment plants. Approximately 4 million gallons a day of wastewater is treated by these facilities.

The anticipated energy savings at the Lake Havasu City Water Treatment Plant should equate to approximately 130,000 kWh annually.

Annual Projected GHG Reductions: 90 $MTCO_2$, equal to the removal of 18 passenger vehicles from the road

Project Cost: Zero

Payback Period: Zero

Next Steps

Test savings of 6-8.7% during the next 6 months; implement energy audti recommendations. All parts of the plant are being examined for energy saving opportunities.

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Truckee Meadows Water Authority, Reno, Nevada

February 21, 2012

Facility Profile

Truckee Meadows Water Authority (TMWA) has chosen its drinking water facility, Chalk Bluff Water Treatment Plant, for the Energy Management Initiative. The plant was built in 1994 and serves more than 330,000 customers throughout 110 square miles within Washoe County, Nevada. The Chalk Bluff Plant treats water from the Truckee River, which flows from Lake Tahoe and the Sierra Nevada mountain range.

Baseline Data

TMWA serves 93,000 customer connections. In 2009 the water authority spent just under $7 million on electricity and $88,000 on natural gas. The Chalk Bluff Water Treatment Plant uses 13.5 gigawatt hours (GWh) and 74,452 therms per year, and spends $1.35 million for electricity. The total energy use results in estimated annual greenhouse gas (GHG) emissions of 9,309 metric tons of carbon dioxide equivalent ($MTCO_2$).

Energy Improvement Management Plan

While TMWA relies on gravity as much as possible, in a mountainous community, pumping water is a reality. The Chalk Bluff Plant is TMWA's largest water producer and highest energy use facility. The high energy use is due to the pumping of water uphill from the river into the plant. To reduce energy consumption at Chalk Bluff, the implementation plan consists of two parts: (1) optimizing the time-of-use operating procedures, and (2) water supply capital improvements.

1) The first strategy is to optimize time-of-use operating procedures by creating a mass flow/electric cost model of the treatment and effluent pumping processes. The model will be used to predict how changes to the operating procedure will affect electricity cost. In 2010, TMWA spent $938,000 on 7.8 GWh for non-water supply processes at the plant. This project intended to reduce non-supply electric costs by 15% or $141,000.

2) The second project involves water supply improvements to the Highland Canal which transports 90% of Chalk Bluff's water directly to the plant using gravity. The improvement plan will allow 100% of the water to be brought to the plant using the Highland Canal and meets multiple objectives. Improvements will be made during winter months when customer water demands are lowest to reduce the water supply pumping costs during construction. Currently, TMWA spends $60,000 on 0.5 GWh for water supply pumping at the Chalk Bluff Plant. Energy use will be zero when the project is complete. The design life of the new infrastructure is over 100 years and it will require no energy to operate.

Challenges

Originally scheduled to begin construction during the fall of 2011, delays in obtaining highway encroachment permits has postponed construction. To minimize water supply pumping costs during construction and therefore continue to reduce energy costs, this project has been delayed until the fall of 2012.

TMWA attempted to use a mass balance/electric cost model to optimize time-of-use operating procedures. However, the mass balance/electric cost model is not capable of the sophisticated decision making used by the experienced water plant operators. Therefore, the purpose of the model has shifted from generating decisions to being one of several techniques useful for improving time-of-use energy optimization at the Chalk Bluff Plant.

Accomplishments

1) TMWA began setting and tracking time-of-use electricity goals for the Chalk Bluff Plant in November of 2010. The goals depend on time of day (e.g., 200 kW On-Peak, 400 kW Mid-Peak, and 950 kW Off-Peak), and vary with season, based on the electric utility's tariffs. Water Plant operators have the ability to be innovative in order to meet electricity use goals and system demands. The mass balance/electric cost modeling effort was valuable to establish baseline energy usage by (1) formally inventorying energy intensive unit processes, (2) establishing kW draw of equipment, (3) establishing and ranking historic kWh usage of equipment, and (4) suggesting starting point kW targets for further optimization by operators.

   TMWA considers the time-of-use optimization project a great success due to its ability to save energy costs, and will continue to optimize and track the project's results. For the 12 months from November 2010 through October 2011 the time-of-use optimization has saved more than $225,000 (24.4%) compared to the same period the previous year. During this time electric energy usage was reduced by only 0.45 GWh (5.8%), indicating the savings was primarily due to improved time-of-use cost management.

   Going through the process of identifying energy needs of each process was eye opening. Talking to the operators and getting them to work toward the time of use goals was educational, engaging, and strengthened the team.

   Annual Projected GHG Reductions: 310 $MTCO_2$, equal to the removal of 61 passenger vehicles from the road

   Project Cost: Zero

   Payback Period: Zero

2) Design is substantially complete for the water supply improvement project, and highway encroachment permits are expected in time for the project to proceed in the fall of 2012.

   Annual Projected GHG Reductions: 345 $MTCO_2$, equal to the removal of 68 passenger vehicles from the road

   Project Cost: $3,000,000

   Payback Period: 50 years

Next Steps

1) Complete; continue to optimize and track project results.

2) Get permits; construction.

Contact

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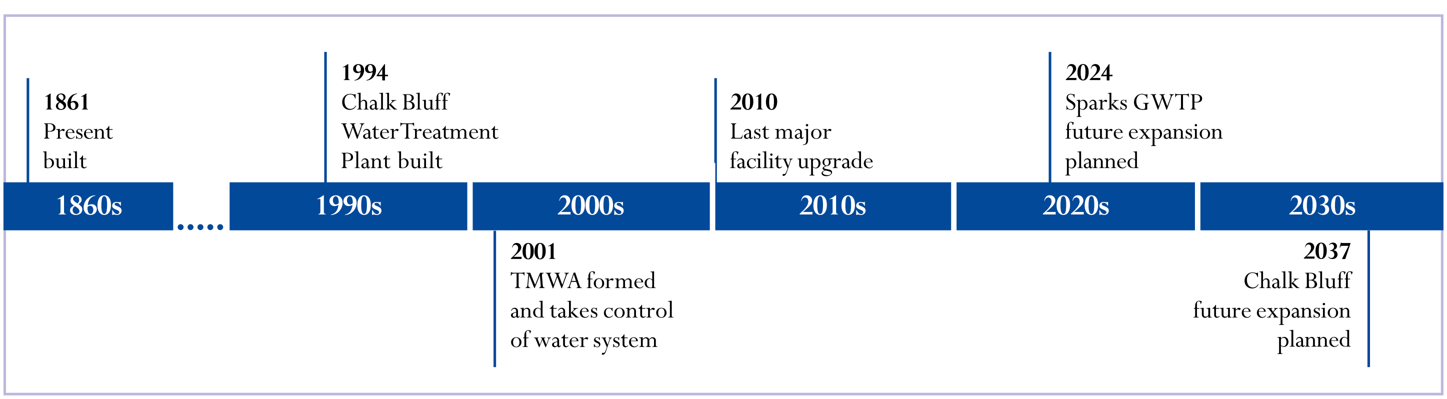


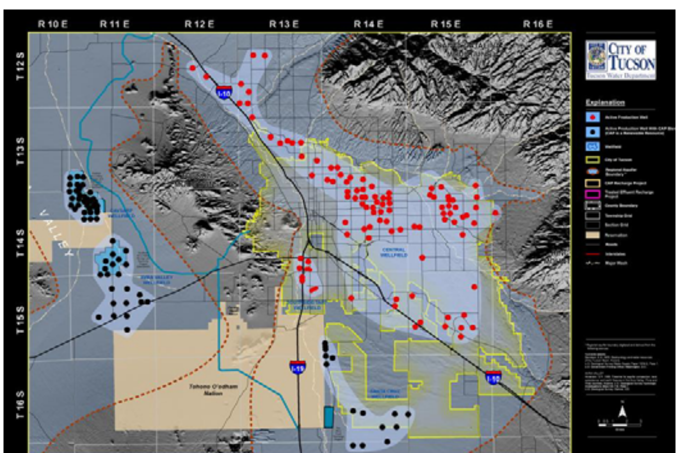
2011 U.S. EPA Region 9 Energy Management Initiative
For Public Wastewater and Drinking Water Utilities
Facilitating Utilities toward Sustainable Energy Management

Tucson Water, Arizona

February 21, 2012

Facility Profile

Tucson Water provides clean drinking water to a 330 square-mile service area in Tucson, Arizona. Located within Pima County, Tucson is positioned along highway 10 about 70 miles north of the U.S./Mexico border. The potable water system serves roughly 85% of the Tucson metropolitan area, serving 228,000 customers. The potable system includes 212 production wells, 65 water storage facilities and over 100 distribution pumps. A separate reclaimed water system serves parks, golf courses and other turf irrigation. Tucson Water sources drinking water through groundwater and the the Colorado River, by recharging and recovering river water delivered through the Central Arizona Project. Tucson Water uses recycled water for its reclaimed water system.



Tucson Water Potable Production

Baseline Data

Tucson Water spends on average $13.5 million on the energy to operate its potable system and produces approximately 110 million gallons per day of potable water per year. Annually, Tucson Water uses approximately 115,000,000 kilowatt hours (kWh) and 5,000,000 therms of energy to run the system. This energy use results in an estimated 83,367,43 metric tons of carbon dioxide equivalent ($MTCO_2$) of greenhouse gas (GHG) emissions.

Energy Improvement Management Plan

Tucson Water is partnering with Tucson Electric Power (TEP), a privately-held, regulated electric utility, to reduce peak demand. TEP contracted EnerNOC to facilitate a new demand management program to reduce the energy load during peak hours. EnerNOC will pay customers to shed the load. Tucson Water will participate by identifying sites that are appropriate for load shedding. It has been estimated that the program will save Tucson Water 24,000 kWh during peak energy use and create $9,000 in offsetting revenue to be put towards energy cost.

As part of the City of Tucson's award under the Department of Energy's Energy Efficiency and Conservation Block Grant (funded by the American Recovery and Reinvestment Act), Tucson Water is implementing a Water System Distribution Pump Efficiency Project. The project is designed to establish baseline data and data management tools for system booster pumps, provide energy savings recommendations for the distribution system, and implement prioritized energy-savings upgrades. In addition, training will be provided and results from the project will provide actionable information on the cost effectiveness of continuing a program without grant funding. Projected energy and cost savings for the project are 350,000 kWh and $30,000 (year one, post project). The project is scheduled to be completed in early fall of 2012.

Challenges

It was difficult to complete the project within one year. A two-year program would have given more time to implement the project in our Energy Management Plan.

Accomplishments

- In addition to the projected $9,000 cost savings of the EnerNOC program, energy data will inform any plans to expand real-time energy monitoring. At the end of the grant-funded booster pump project, the utility will realize energy and cost savings and have the information necessary to scope a more permanent pump efficiency program.

- Annual Projected Energy Savings: 24,000 kWh during peak energy use periods
- Annual Projected Cost Savings: $9,000
- Annual Projected GHG Reductions: None
- Project Cost: Zero
- Payback Period: Zero

Next Steps

The peak demand project is complete. Tucson will continue implementing an ARRA funded Pump Efficiency project that is estimated to save $30,000 and 350,000 kWh per year.

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Chino Water Production Facility, Prescott, Arizona

February 21, 2012

Facility Profile

The Prescott - Chino Water Production Facility (Facility) is located within Yavapai County in the town of Chino Valley, Arizona. Prescott is positioned close to the center of Arizona between Phoenix and Flagstaff just outside the Prescott National Forest. The Facility consists of a production well field, reservoir, and booster pump facility. The Facility was built in 1947 and received its last major facility upgrade in 2004.

Baseline Data

The Facility supplies 50,000 residents with drinking water. During the winter the plant treats 4.5 million gallons of water per day and peaks at 12 million gallons during the summer. The cost of electricity for the plant is $1,600,000 for 11,000,000 kilowatt hours (kWh) per year. Annual greenhouse gas (GHG) emissions are 7,581 metric tons of carbon dioxide equivalent ($MTCO_2$).

Energy Improvement Management Plan

The Facility has wells that are 15 miles north and lower in elevation than the treatment plant. The challenge was to reduce the $2,000/month demand charge. The Energy Management Plan for the Facility includes replacing the existing step voltage starts on three wells with soft start units. The soft start units will reduce the instantaneous demand on the power supply which will reduce the demand charge on the utility bill. It will also help to reduce the power surge on the power distribution system. In addition, soft starters help to extend the life of the well motors. Overall, the project will save money and electricity through reduced demand charge, energy use and maintenance. The estimated immediate cost savings associated with the reduced demand is $1,260/month, for a total savings of $15,120/year. The savings toward the maintenance and reduced strain on the electrical distribution system will be a long term progressive savings.

Challenges

The main challenge has been the loss of two members of the City's Energy Management Team, which reduced management support and buy-in from staff. This delayed the ultimate implementation and construction of the soft-start project.

Accomplishments

As the City neared the end of the program, the project gained acceptance. The City has completed a specification package and will soon advertise for construction.

The Energy Management Program has promoted an awareness of the City's energy use and potential savings associated with minor or major changes to operations. It has provided a good networking opportunity to learn, expand concepts, and consider new options. This project will reduce direct electrical costs, long term maintenance costs, and result in unseen benefits like improved safety due to reduced instantaneous electrical demands. The Energy Management Webinar program also highlighted many other programs/projects that improved the City's awareness of energy savings. The City has implemented a new Energy Conservation Policy.

Annual Projected GHG Reductions: None

Project Cost: $42,000

Payback Period: 34 months

Next Steps

Advertise for construction.

Begin 2 megawatt solar generation project to offset 30% of water booster costs.

Contact

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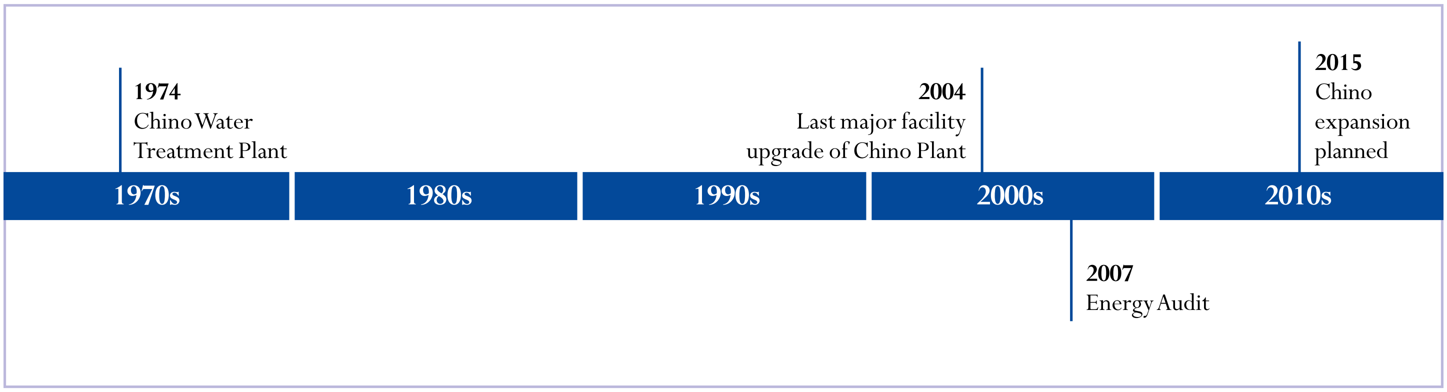

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Somerton Municipal Wastewater Treatment Plant, Arizona

February 21, 2012

Facility Profile

The Somerton Municipal Wastewater Treatment Plant is located in the city of Somerton within Yuma County, Arizona. Somerton is positioned along Highway 95, close to the border of California and Mexico. The wastewater treatment plant was built in 1985 and received its last major facility upgraded in 2011, when it was changed from a Sequenching Batch Reactor (SBR) facility with a capacity to treat .8 million gallons per day (MGD) to a MLE (Modified Ludzack-Ettinger) process with a capacity of 1.8 MGD.

Baseline Data

Somerton Municipal Wastewater Treatment Plant serves a population of 14,296 residents. The wastewater treatment plant treats a daily average of .750 MGD of wastewater each day, and uses approximately 744,480 kilowatt hours (kWh) per year, that generates 32 metric tons of carbon dioxide equivalent ($MTCO_2$) of greenhouse gas (GHG) emissions.

Energy Improvement Management Plan

The objective of Somerton Municipal Wastewater Treatment plant is to save energy by running a more efficient plant. The City achieved this by replacing four old blowers used to run the 4-tank aeration system with two new more efficient blowers. (Current system only needs 1 new blower). The City also replaced an old diffuser system with one high efficiency diffuser. In addition, two old blowers were replaced, one for the digester and one spare, with one high efficiency blower. Overall, the upgrades are expected to save the wastewater treatment plant 10% on their annual electricity bill and reduce their electricity use by 6%, while doubling the capacity of the facility.

New Diffusers

Old Blowers

New Blower

Challenges

Originally the Energy Improvement Management Plan called for doubling the number of tanks in the existing SBR system. It was later determined that by using more efficient diffusers and Turbo blowers, the same number of tanks could be kept by changing the process. This resulted in keeping the same footprint and more than doubling capacity while reducing energy use by 10%.

Accomplishments

Participating in the Energy Webinar Series increased the awareness of staff of the decision making process and the importance of their involvement. Even though the expansion is still not complete, the plant succeeded in reducing electricity usage by 12% and costs by 11.4%, while doubling treatment capacity.

Annual Projected Cost Savings: $29,328

Annual Projected GHG Reductions: 51 $MTCO_2$, equal to the removal of 10 passenger vehicles from the road

Project Cost: $146,640

Payback Period: 5 years

Next Steps

Begin a 1.5 million kWh solar project.

Contact

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1950s	1960s	1970s	1980s	1990s	2000s	2010s

1955
Wastewater facility started as a 3-pond lagoon system

1977
New aeration mixers added

2006
.8 MGD SBR facility in operation

2011
.8 MGD SBR upgraded to 1.8 MGD MLE facility