

Water/Wastewater Case Study:

Central Contra Costa Sanitary District

Background

- Type of Agency: Wastewater
- Location: Martinez, Calif.
- Size: 240 employees
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Summary

Central Contra Costa Sanitary District (CCCSD) is an independent special district that collects, treats, disposes and reclaims wastewater for more than 420,000 residents of Contra Costa County. The CCCSD treatment plant contains the following treatment processes: primary sedimentation, fine-bubble diffused aeration, secondary clarification, ultraviolet disinfection, dual-media filtration for recycled water, solid bowl centrifugation for sludge dewatering and multiple-hearth incineration for solids reduction. The base electrical demand for the treatment plant is 3,300 kW and can reach 6,000 kW during wet weather.

CCCSD has a long history of implementing energy efficiency/conservation projects, such as the installation of a cogeneration system to produce 3,000 kW (90 percent) of the treatment plant's power requirements and the utilization of waste heat produced from cogeneration and sludge incinerators to drive a 2,500 horsepower aeration blower. This use of waste heat reduces the electrical demand by approximately 40 percent.

In response to Gov. Davis' request to reduce energy usage by 10 to 20 percent and to mitigate the impact of energy cost increases, CCCSD embarked on an energy program in 2001. The program included the installation of a modified air inlet to the cogeneration gas combustion turbine, which increased net power production by 200 kilowatts (kW). CCCSD also installed motion sensors, added more variable frequency drives (VFDs) and maximized use of alter-

native energy sources such as landfill gas. Although CCCSD had to replace an existing laboratory with a larger, new lab that requires an additional 100 to 200 kW, CCCSD was able to reduce imported electrical power by 58 percent in 2001 compared with 2000.

Referenced in Water/Wastewater Guides:

- #1, "Reduce Energy Use in Water and Wastewater Facilities Through Conservation and Efficiency Measures"

Plan

In response to California's energy crisis, CCCSD organized an eight-member "Energy Team" comprised of department managers and engineers to guide and promote energy efficiency and conservation within and outside the organization. The Energy Team proposed to the CCCSD board of directors a plan to reduce energy consumption, specifically on-peak energy use. The plan was adopted April 19, 2000. The Energy Team identified the following areas for energy projects:

- Cogeneration enhancements
- Optimization of operations to minimize on-peak power demand
- Maximization of use of landfill gas as alternative energy source
- Installation of new lighting

CCCSD set a timeline for each project. Some timelines had to take into account rebate application schedules.

Prior to the start of the lighting retrofit project, PG&E subcontractors performed energy audits. Another energy audit was conducted on the lighting system after installation to validate CCCSD's estimate of energy savings.

Programs: Conservation

✓ **Motion sensors:** Used the FastTrack Lighting Program and installed 75 motion-sensing devices in all offices, break rooms, restrooms, copy rooms and conference rooms in the headquarter office buildings. These areas were selected because of their high potential for energy savings. Spaces not included were workshops and open office spaces containing several cubicles.

✓ **Pump schedules:** Shifted as much power demand as possible to off-peak periods and removed from service nonessential unit processes and equipment to minimize power consumption and maintain prudent performance of the treatment plant. CCCSD also increased maintenance activities to reduce power consumption. For instance, CCCSD uses ultraviolet (UV) light for disinfection. In 2001, CCCSD increased its focus on maintenance (cleaning and replacement of UV bulbs), which enabled a reduction in the number of UV banks from nine to six. Each bank of lamps uses 35 kW, so the total power reduction was 105 kW.

✓ **Alternative and/or renewable energy sources:** Began using landfill gas in 1983, primarily in the multiple-hearth incinerators to convert sludge to ash to reduce residual hauling costs. CCCSD also uses landfill gas in two auxiliary boilers for supplemental steam production. In 2001, CCCSD ramped up the use of landfill gas in an effort to minimize the use of natural gas, which had skyrocketed in price.

Programs: Efficiency

✓ **Cogeneration enhancement:** Installed an modified air inlet on cogeneration gas combustion turbines to produce 200 kW more power.

Budget and Finance

CCCSD board of directors and management staff were very receptive to energy-savings projects. The district's programs in 2001 cost a total of \$141,500. CEC and

CPUC provided \$63,600 in rebates. The following are the costs of each program and the applicable rebates:

- Cogeneration enhancement: Cost \$80,000; received a \$60,000 CEC rebate; financed by CCCSD's capital improvements fund.
- Motion sensors: Cost \$15,100; received a \$3,600 CPUC rebate; financed by CCCSD's operating fund.
- Optimized operations: Cost \$50,000; no rebate.
- Maximized use of landfill gas: no cost; no rebate.

Results

CCCSD's 2001 programs successfully saved the wastewater treatment district an estimated 3 million kWh and \$1 million annually. The estimated annual energy and financial savings were as follows:

- Cogeneration enhancement: 325,000 kWh and \$36,000
- Motion sensors: 55,000 kWh and \$6,000 with a 2-year payback
- Optimized operations: 2.6M kWh and \$289,000
- Maximized use of landfill gas: \$700,000 in avoided natural gas costs

Lessons Learned

CCCSD tried to implement the use of landfill gas in the cogeneration turbine at a 50/50 natural gas to landfill gas blend, but operational instability, high carbon monoxide levels and restrictions by air-permit requirements caused CCCSD to scrap the project.