Des Moines WRF

CASE SUMMARY 4

DES MOINES METRO WASTEWATER RECLAMATION FACILITY

Des Moines, Iowa
Polk County

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The Company

The Des Moines Metro Wastewater Reclamation Facility (WRF), with 96 employees, serves the metropolitan Des Moines area and its surrounding areas, treating an average of 50 million gallons per day of residential, commercial, and industrial waste. Nearly 99 percent of wastewater that enters the WRF is recycled to the Des Moines River as treated effluent or to nearby farmland where biosolids are applied.

Project Background

At Des Moines WRF, approximately 70 percent of the electricity consumed is used on motors, and around 10 percent is for lighting. Also, the WRF is using biogas, the by-product of wastewater treatment, to generate 48 percent of the total electricity requirement and reduce the amount of natural gas used for heating.

Incentives to Change

Des Moines WRF would like to reduce the amount of electricity used by increasing motor efficiency and decreasing lighting operating hours in order to reduce their energy costs. Moreover, alternate ways to use biogas in different seasons would be able to reduce the overall operation costs

Results

Five opportunities for potential annual savings are:

1. Motors Efficiency Study (exclude 2000HP air blower motors): $11,500/$12,200. All the motors in the facility without variable speed control and horsepower bigger than or equal to 1HP, and operating more than 2,000 hours per year have been studied. Switching the motors to higher energy efficient models would save 202,219 kWh and $11,500 per year; rewinding the motors would see a shorter payback period and save 215,161 kWh and $12,200 per year. However, the motors should be replaced with new energy efficient models when the motor is less than 40HP in size and more than 15 years old (especially previously rewound motors), and rewind cost exceeds 50 to 65 percent of a new energy efficient motor price. Increased reliability and efficiency should quickly recover the price premium.

2. 2000HP Air Blower Motors Study: $173,000. Four air blower motors are used to provide oxygen for the aeration tanks. Due to water flow rates, only one motor is needed at a time,

operating at 60 percent capacity. As a result, different control methods have been investigated by the WRF. The initial cost and the maintenance cost of medium voltage variable frequency drives (VFDs) is high and the life span around 10 years. The cost saving of the V-port Ball valve control is low. Therefore, MagnaDrive ASD is the recommended control method. By using MagnaDrive ASD, motor speed could be reduced by 12 percent with a savings of $173,000 and 3,836,880 kWh per year.

3. Lighting Improvement: $15,500. The facility is using T8 and T12 fluorescent lights and High Pressure Sodium (HPS) lights, which are already energy efficient; however, some of the lights are turned on all the time. Therefore, occupancy sensors and timer switches are recommended for the areas with fluorescent lights. For the areas with HPS lights, fluorescent lights and timer switches are recommended. The simple payback of the recommendation would be 1 to 3 years, depending on the location, and the savings would be $15,000 and 326,087 kWh annually. In addition, only buildings 91, 92 and 97 are using LED exit signs. Replacing the incandescent and fluorescent exit signs with LED exit signs would generate around $500 annual savings, and the payback would be around 3 years for the whole facility.

4. Alternate Use of Biogas: $150,000. Biogas is the by-products of the wastewater treatment. The WRF doesn't have adequate generation capacity to generate all the biogas into electricity and heat; thus, the WRF is selling the extra to a local industry. However, the benefits are not equal in different seasons, so software was built in order to optimize the biogas marketing program and save about $110,000 per year.

5. Replacing CRT Monitors: $720. The WRF has 37 CRT monitors, roughly running 12 hours in work mode, and 12 hours in sleep mode daily. By recycling the CRT monitors and replacing them with LCD monitors, 70 percent less energy would be required and the annually saving would be $720 and 15,652 kWh. The payback is a bit longer, 11 to 13 years, but the cost of space and the employees' health (electromagnetic emissions, etc.) were not included in the simple payback calculation.

Project Summary Table

Project Description	Environmental Impact	Economic Cost Savings	Status
Motor Efficiency Study	202,219kWh	$11,500	Recommended
2000HP Motor Control Study	3,836,880kWh	$173,000	Recommended
Lighting Improvement	336,957kWh	$15,500	Recommended
Alternate Use of Biogas		$110,000	Recommended
CRT to LCD Monitors	15,652kWh	$720	Recommended