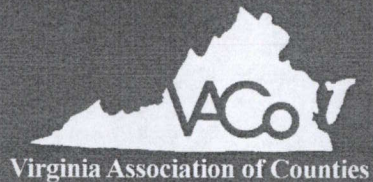


Recognizing the Best in County Government Programs!



2014 Achievement Awards

Call for Entries



2014 VACo Achievement Awards

Deadline: June 2, 2014

Application Form

All applications must include the following information. Separate applications must be submitted for each eligible program. **Deadline: June 2, 2014.**

Program Information

Locality Chesterfield County

Program Title Methane Optimization Program

Program Category Environmental

Contact Information

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Department Department of Utilities

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Signature of county administrator or chief administrative officer

Name Mr. James J.L. Stegmaier

Title County Administrator

Signature _____

A handwritten signature in black ink that reads "James J.L. Stegmaier". The signature is written in a cursive style with a large, stylized "J" and "S".

2014 VACo Achievement Awards

Methane Optimization Program

1. Overview of the Program

As with all municipal wastewater treatment facilities, it is a continuous challenge to provide safe, environmentally-friendly and cost-effective treatment of the solids removed from the treatment process. Due to the economic downturn, wastewater treatment facilities continue to be challenged to operate with little to no funding increases. Compounding the limited funding challenge are the volatile energy and fuel costs that are due in part to the rising global energy demand. Although natural gas prices have been historically more stable than other fossil fuels, recent increases in natural gas demands, caused natural gas prices to escalate to prices not seen since the 2008 economic collapse. The massive fluctuations in natural gas prices over the past year underscore the need to optimize our treatment processes and to reduce our reliance on purchased fuel and energy.

The Methane Optimization Program is an alternate means to help keep operational cost down thereby allowing Chesterfield County to continue to keep utility rates as low as possible for our customers. Utilities that can effectively maneuver through these periods of economic turbulence and increased regulatory requirements through process optimization create opportunities to emerge as leaders in the wastewater treatment industry. Chesterfield County currently owns and operates two wastewater treatment facilities with a combined permitted capacity to treat 39 million gallons of wastewater per day. The wastewater facilities treat solids through a process called anaerobic digestion that utilizes a combination of methane gas generated in the treatment process and purchased natural gas to maintain optimum temperatures in the digestion tanks. The Methane Optimization Program developed a systematic approach to optimize the production and utilization of self generated methane gas while significantly reducing the need to purchase natural gas. The Methane Optimization Program also provided safe and cost effective treatment of the solid waste while significantly reducing operational costs, the reliance on purchased natural gas and reduced the facilities air emissions. Most importantly, the program is optimizing the conversion of waste to energy while preserving our existing natural resources for future generations.

2. The Problem/Need for the Program

Similar to other wastewater treatment plants in the Chesapeake Bay watershed, Chesterfield County also is faced with additional challenges related to nutrient removal requirements. Chesterfield County owns and operates two wastewater treatment facilities, the Proctors Creek and Falling Creek Wastewater Treatment Plants that have a combined permitted capacity to treat 39 million gallons of wastewater per day. Both plants discharge treated effluent to the James River, which is a tributary to the Chesapeake Bay. In the last five years, Chesterfield was required to construct nutrient removal treatment technologies at both plants to be in compliance with the Chesapeake Bay nutrient reduction regulations. In addition to the approximately \$130 million in capital expenditures to construct these upgrades, there are significant operational costs for energy and chemicals to operate these new treatment systems. In order to continue to provide the current level of water and wastewater treatment, while keeping utility rates as low as possible for our customers, alternative means of reducing operation costs need to be identified and implemented by Chesterfield County's wastewater treatment plants.

The Department of Utilities' mission is to provide the highest quality of water and wastewater services that meet or exceeds the needs and expectations of our present and future customers. Due to the economic downturn, wastewater treatment facilities continue to be challenged to operate with little to no funding increases. Compounding the limited funding challenge are the volatile energy and fuel costs that are due in part to the rising global energy demand. Traditionally natural gas prices have been historically more stable than other fossil fuels but recent increases in natural gas demands caused natural gas prices to escalate to prices not seen since the 2008 economic collapse. The massive fluctuations in natural gas prices over the past year underscore the need to optimize our treatment processes and to reduce our reliance on purchased fuel and energy. The Methane Optimization Program is an alternate means to help keep operational costs down thereby allowing Chesterfield County to continue to keep utility rates as low as possible for our customers. Utilities that can effectively maneuver through these periods of economic turbulence and increased regulatory requirements through process optimization create opportunities to emerge as leaders in the wastewater treatment industry.

3. Description of the Program

In this period of economic turbulence, increased regulatory requirements and no funding increases, Chesterfield Utilities reviewed our operating expenditures and readily identified energy as a significant component of our expenditures. The department implemented an energy management program, EnergyCap, used to track and analyze energy usage and cost for each division. Through this data collection and analysis, the Falling Creek and Proctors Creek Wastewater Treatment Facilities were identified as large consumers of purchased natural gas. Management at the wastewater facilities were tasked with reviewing purchased gas usage, reviewing system processes, identifying potential process improvements and presenting their findings to the assistant director of utilities. Once the recommendations were approved and implemented, management at the wastewater facilities were tasked with tracking the system performance to document improvements and utilizing the data for future-system-modification recommendations.

The vast majority of the purchased natural gas was used in the process to treat solids removed from the wastewater treatment process. The treatment of solids is through a process called anaerobic digestion that utilizes a combination of methane gas and purchased natural gas to use in boilers to maintain optimum temperatures in the digestion tanks for the conversion of the solids to biosolids. Biosolids are a beneficial resource that contain nutrient-rich organic materials and can be used as a fertilizer and soil amendment. Methane gas is a natural byproduct of the digestion process and is used in the heating process during treatment. When there is not enough methane gas being produced to meet the digestion heating requirements, natural gas needs to be purchased to feed the boilers and the excess methane gas is flared. Converting the digesters to be self sufficient on methane gas generated from the waste treatment process would represent a significant annual cost avoidance of the purchase of natural gas. Additionally, converting the heating systems of both facilities to run predominantly on methane gas would result in a reduction on natural gas consumption, which in turn, will conserve our natural resources and reduce air emissions by decreasing the amount of excessive methane that is currently being flared.

The management at the wastewater facilities reviewed several factors which contributed to the high consumption of natural gas at both facilities. The Falling Creek Wastewater Treatment Facility had been converted to natural gas from fuel oil and all existing fuel oil piping had never been rehabilitated to utilize methane gas. There also was no methane gas flow meter or historic methane gas production data for the Falling Creek Wastewater Treatment Facility. The Proctors Creek Wastewater Treatment Facility has both purchased natural gas and methane gas meters so the usage history was reviewed. Large peaks in gas demand were identified at the Proctors Creek Wastewater Treatment Facility, which at times triggered purchased natural gas to supplement the methane gas.

After a thorough analysis of all available data, plant management made the following process-improvement recommendations to the assistant director of utilities. At the Falling Creek Wastewater Treatment Facility, it was recommended that improvements be phased into three stages. The first stage involved hiring a contractor to clean out the digesters and replace corroded internal methane pipes in an effort to optimize the production of methane gas. The second phase involved the complete cleaning of all the heat exchangers to optimize heat transfer in the digesters which would minimize the need for methane or natural gas. The third phase was the installation of a methane gas meter that would allow the tracking of methane gas production to be used in future data analysis. The recommendations to implement these improvements were approved by the assistant director of utilities. The production of methane gas and the usage of methane and natural gas is now tracked monthly through invoices and the energy management software.

At the Proctors Creek Wastewater Treatment Facility, there are four boilers that utilize methane and purchased natural gas to heat the digesters. The production of methane gas was reviewed and it was determined to be sufficient to sustain two of the four boilers at the same time. If a third boiler was needed for a prolonged period of time to maintain the temperature set points for the digester, there was not sufficient methane gas being produced and the drop in gas pressure triggered the switch to purchased natural gas. After review of the system process and program for the digester, the management at the wastewater facility recommended modifications to the control programming, as well as an increase in the high temperature set points on the digesters.

The modification to the control programming allowed an additional control mechanism to heat the digesters on a timed sequence once the original program met set point parameters. The increase in the high temperature set points on the digesters increased the operating temperature range of the digester and reduced the cycling frequency of the boilers. This programming modification stabilized the demand for gas and minimized the peaks in the gas demand. Similar to the Falling Creek Wastewater Treatment Facility, the usage of methane and natural gas is now tracked monthly through invoices and the energy management software.

4. The Cost of the Program

Through this innovative resource optimization program, Chesterfield County has invested capital costs totaling \$79,016. This total includes \$74,416 for the Falling Creek Wastewater Treatment Facility and \$4,600 for the Proctors Creek Wastewater Treatment Facility. Chesterfield County utilized an additional project that was in progress to integrate the methane flow into the Falling Creek Wastewater Treatment Facilities Computerized Supervisory Control and Data Acquisition for no additional cost. The monetary benefits of the Methane Optimization Program will far overshadow the initial capital investment as the return on investment is anticipated to be approximately one year. Optimizing the conversion of a waste to energy has allowed us to preserve our existing natural resources for future generations, which is truly invaluable.

5. The Results/Success of the Program

The Methane Optimization Program began in June 2013 and purchased natural gas consumption has been on a decline at both facilities since the initial phase of implementation. The daily average natural gas use at the Falling Creek Wastewater Treatment Facility is down 34.5 percent from last fiscal year and is expected to reach closer to 50 percent by the end of this fiscal year. The total actual cost avoidance for purchased natural gas in the nine months since the project began compared to last year is \$57,410.80, which is anticipated to be approximately \$93,000 annually. The cost avoidance includes \$35,125.71 over nine months for the Falling Creek Wastewater Treatment Facility and \$22,285.09 for the Proctors Creek Wastewater Treatment Facility. During the months of January, February, and March, the Proctors Creek Wastewater Treatment Facility has been completely self sufficient on the process generated methane gas and

has used no purchased natural gas for digester heating, a remarkable accomplishment. In addition, not only have the digesters at both facilities been self sufficient during some of the coldest months in the year, the average digester temperature has been able to be maintained two degrees higher than previously maintained. Chesterfield County will continue to benefit from the Methane Optimization Program for years to come. This project along with the increased methane gas production has initiated the investigation into the potential for a future cogeneration project that would utilize any excess methane gas for the production of electricity to be utilized at the wastewater treatment facilities. Most importantly, this optimization program helps to protect Virginia's natural resources by reducing natural gas consumption and reducing air emissions, thereby conserving these resources for future generations.

6. Worthiness of an Award

The Methane Optimization Program meets many of the outlined criteria for 2014 VACo Achievement Awards. Moreover, this innovative solution will provide Chesterfield County with additional means to keep utility rates low for future customers, conserve natural resources and reduce air emissions. Chesterfield County's innovative approach to addressing increasing operational cost can be utilized as a model for other localities throughout the commonwealth of Virginia and the country.