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*** PLEASE NOTE THAT ENTRY REQUIREMENTS HAVE CHANGED ***

Application Checklist: (Please make sure the following items are included in your submittal packet)

- Completed release statement (this page), to be scanned and included in digital submission
- Check (made payable to SWANA) or credit card payment for nomination fee (in U.S. dollars) via Excellence Award Nominations
- At least 2 pictures of your operation (may be included in nomination text)
- One copy of your award submittal uploaded using your purchased 2012 SWANA Excellence Awards Application Uploading Instructions
- If you would like to mail your submission, please contact Jesse Maxwell, Program Coordinator, at jmaxwell@swana.org or (240) 494-2237.

Release Statement: I certify that the information provided in this application is accurate and correct to the best of my knowledge. SWANA reserves the right to publish the enclosed information. Nominations become the property of SWANA. My signature gives SWANA the right to reprint or make available for purchase any portion of this submittal.

Signature: [Signature]    Date: 4/12/12
AN APPLICATION FOR:
SWANA
2012 LANDFILL GAS UTILIZATION EXCELLENCE AWARD
PRINCE WILLIAM COUNTY SANITARY LANDFILL

Submitted By:

SOLID WASTE DIVISION
DEPARTMENT OF PUBLIC WORKS
PRINCE WILLIAM COUNTY
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INTRODUCTION

Prince William County (PWC) Landfill has served the refuse disposal needs of the community for 45 years and has the capacity to serve beyond 2050. Citizens of the County consider the landfill to be an important asset which needs to be preserved for future generations.

In 1998, the County constructed an active gas extraction system and is operating a 1.9 megawatt (MW) power plant.

In 2009, the County implemented a Capital Improvement Program (CIP) project to replace propane gas with renewal landfill gas (LFG) to fuel the heaters at two onsite maintenance buildings and the incinerator at the County animal shelter.

The project included installation of a LFG compression treatment system; a one-mile long LFG transmission pipeline; LFG-fueled radiant tube heaters in the landfill’s fleet and maintenance buildings; and, a retrofit that allows the existing incinerator at the animal shelter to operate on LFG or propane.

In November 2010, the landfill’s fleet and maintenance building heaters were put into operation using LFG. In May 2011, the incinerator at the animal shelter began operation using LFG. We believe the use of LFG in an animal incinerator to be the first of its kind in the U.S.

The use of LFG to heat the maintenance buildings and animal incinerator will save the County an estimated 42% on energy costs.

The landfill has been accepted as an Extraordinary Environmental Enterprise (E4) participant in the Virginia Environmental Excellence Program. This recognition, as well as other awards and acknowledgements, is an indication of the quality and excellence that exists at the landfill.

Thomas J. Smith, P.E.
Public Works, Solid Waste Division Chief
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EXECUTIVE SUMMARY

It is well known that the United States reliance on fossil fuels is a potential threat to our energy security. In 2010, about 83 percent of the U.S. total energy demand is met by fossil fuels, according to estimates by the United States Energy Information Administration. Recognizing this, in 2009 the PWC Landfill implemented a CIP project to replace its propane use with LFG to fuel the incinerator at the PWC animal shelter and heat onsite buildings.

The project included installation of a LFG compression treatment system, over one-mile long LFG transmission pipeline, and LFG-fired radiant tube heaters serving the landfill’s fleet and maintenance buildings, and a retrofit to run the existing incinerator at the animal shelter on LFG or propane. The incinerator is also used to destroy sensitive PWC documents.

In November 2010, the landfill’s fleet and maintenance buildings heaters were put into operation. In May 2011, the primary lower burner, rated at 1.36 million Btu (MMBtu)/hour, was replaced with dual fuel burner to run on LFG or propane and the animal incinerator began using LFG. In April 2012, the two secondary upper burners rated at 1.2 MMBtu/hour were replaced with a dual fuel burner rated at 2.4 MMBtu/hour to run on LFG or propane.

We believe that the use of LFG in an animal incinerator to be the first of its kind in the U.S.

This project, besides protecting the environment, potentially saves an approximately 42% cost on energy bills. The 42% energy savings is calculated from the average historical propane cost of $24/MMBtu versus LFG cost of $14/MMBtu billed to the users.

Section 1: Design & Construction

Background
NEO Prince William, a private LFG developer, installed a LFG collection facility and a 1.9 megawatt (MW) energy recovery facility that became operational in November 1998. Currently, 2,700 standard cubic feet per minute (scfm) of LFG is generated at PWC Landfill. Fortistar (formerly NEO) has obtained a permit from VDEQ to install 4 additional engines increasing the existing capacity from 2 to 8 MW LFG Generation. This expansion will begin this year once a Power Purchase Agreement is finalized with the local utility company.

Approximately 200 scfm of excess LFG will be available even after the additional engines are operational. PWC and its consultant, SCS Engineers, strived to find a new beneficial use of LFG and decided to look into the possibility of providing fuel to the animal shelter incinerator and to heat the fleet maintenance building. This project was determined to be economically viable and PWC implemented a CIP project to replace propane use with LFG to heat onsite PWC buildings and fuel the incinerator at the animal shelter.
Prince William County Sanitary Landfill
Swana 2012 Landfill Gas Utilization excellence award

Objectives
The major objectives of the project were as follows:

- Find new beneficial use of LFG to provide fuel to the animal incinerator;
- Obtain permit modification from the Virginia Department of Environmental Quality (VDEQ) in order to fuel and operate the animal incinerator with LFG and meet all State Regulations;
- Find other uses for excess LFG that includes to heat the PWC onsite fleet building and heavy equipment shop at the PWC landfill;
- Replace use of propane with LFG as a renewal energy source to fuel above facilities.

The County and SCS designed this project that meets these objectives. It also accommodated the County’s desire for the project to be a showcase/model. Various pictures of the project and major components are provided interspersed throughout this application.

Site Preparation and Design

The initial LFG collection system was designed in accordance with NSPS criteria and Virginia Rule 4-43 to collect gas from the existing landfill and Phase I, Part 1. It has expanded to Parts 2 through 4 of Phase I. In general, the LFG system was designed to handle the maximum expected flow, minimize off-site migration and keep surface methane concentration below 500 ppm. To date, the facility has 90 extraction wells and five horizontal collectors.
The project design includes/uses the following:

- Inlet-scrubbers scrub moisture from wet LFG to improve performance of the gas compressors.
- Gas compressors compress gas to raise relative humidity of the gas for better moisture removal and for transportation of LFG.
- The air-cooled gas after-cooler cools LFG by using ambient air to reduce chiller energy demand.
- The glycol-gas heat exchanger cools gas by using chilled glycol from an energy efficient glycol chiller.
- Coalescing filter technology is used to remove moisture and particulate matter of ten micro or bigger from LFG.
- The gas-gas heat exchanger is used to reheat cold gas from coalescing filter before it leaves the skid and cool hot LFG from the air-cooled gas after-cooler before it enters the glycol-gas heat exchanger. Thus, it reduces chiller energy demand.
- Redundant compressor and coalescing filter is provided to increase system reliability.

**Design Issues Encountered and Addressed**

The use of LFG at the animal incinerator required that the LFG be compatible with the existing incinerator equipment. Because the incinerator was originally designed to be fueled with propane, the equipment manufacturer had concerns with the composition and quality of the available LFG. A major concern was whether the original valves and piping could stand up to the corrosive effects of the chlorine and hydrogen sulfide present in LFG. The other potential concern was that the heat from the flame may not be sufficient for proper burning of animal carcasses due to the low Btu content of methane.

In order to address potential concerns raised by the manufacturer during initial phases of project development, an initial testing (1st test) of the solenoid controlled gas valve was done to assess corrosiveness of the LFG. After a month of continuous use on raw LFG, no signs of visible corrosion were observed. This is a major success in the development of this project.
To address another potential concern of the flame stability, a second test was performed to determine flame stability in November 2010. This was done by piping the LFG to the existing primary burner and running it on LFG. The burner ran successfully on LFG without flame failure. The readout on the burner for the flame signal was 5.0 volts DC. The burner ran for two hour with a stable flame signal at 5.0 volts DC. Visually the flame was bright intense stable blue all the time. It was thought that this new technology can successfully be used run incinerator on LFG.

**New Technology Implementation**

Based on the results of these tests, PWC replaced the existing primary propane lower burner with an equivalent dual fuel burner in May 2011 that is operating successfully. The upper burner and incinerator stack also have been replaced this week. Presently, PWC is seeing savings of approximately 42% on energy (fuel) costs with replacing the primary lower burner and savings will increase with replacement of the second upper burner.

**Overall Planning and End-Use Planning**

In August 2009, a purchase and sale agreement was signed between PWC and a private company, Prince William Energy LLC (Fortistar), in order to use excess LFG for a variety of beneficial purposes.

Recognizing this, the PWC Landfill implemented a CIP project to heat onsite buildings and fuel the incinerator at the animal shelter in 2009. The idea was to replace propane gas with the renewal energy i.e., LFG to fuel the incinerator and heaters at the fleet and maintenance buildings. PWC developed, designed and installed LFG compression and treatment skid to provide LFG to run radiant tube heaters in the fleet and maintenance buildings and animal incinerator.
SECTION 2: Environmental Controls

Overall Impact to Human Health and the Environment
PWC’s LFG collection and control system, including the 1.9 MW Energy Recovery Facility (ERF), excess gas use to fuel the incinerator and heat the fleet buildings, combine to provide effective management of LFG emissions. Green house gas emissions are also reduced through the destruction of methane either in the flare, engine generators or heaters/incinerator. The control of offsite LFG migration is also achieved with this system.

This project also serves as a showcase for visitors to the landfill facility and preserves the health of the community.

Compatibility with the Environment
The new beneficial use of LFG to heat fleet building and fuel the animal incinerator has been designed to be compatible with existing onsite facilities. Existing areas within the landfill property were used to site the facility and the alignment of the LFG transmission pipeline. No new land or offsite areas were required to be cleared to construct the facility. The facility was designed with attractive design features of the treatment skid and a new stack for the incinerator.

The major benefit to the environment is that the new beneficial use of LFG reduces the use of non-renewable fossil fuels. The new use of LFG is to fuel the incinerator and heat the building for removal of greenhouses gases (i.e., methane) which are a contributing factor to global warming.

Environmental and Economic Benefits
The project, besides protecting the environment, potentially saves approximately 42% on energy bills by replacing propane costing $24/MMBtu versus LFG cost of $14/MMBtu being billed to the users.

In November 2010, the 15 LFG fired radiant tube heaters became operational. PWC has seen savings on propane bills by 42% due to the replacement of propane by LFG to run these radiant tube heaters. It will provide a financial payback period for the project in approximately 10-12 years.

Siloxane Treatment
SCS designed the system in order to treat the LFG to remove siloxane. A silica gel based pre-treatment system has been installed ahead of the fleet building heaters. LFG is passed through two, 3,000 pound capacity silica gel vessels prior to input into the heaters. The fleet heaters have been operational since November 2010.
SECTION 3: Regulatory Compliance

Role in the Community's Integrated Solid Waste Management System
Federal and state regulations require that LFG be captured and treated at the landfill. In order to meet federal regulations, PWC issued a Request for Proposal to select a private developer to collect, treat, and convert LFG for beneficial use. NEO Prince William, LLC (Fortistar), was selected in 1996 to install an active gas extraction system for NEO to collect, treat and convert LFG into energy at the landfill. The collection system started-up in June 1998. The current collected LFG is about 2,700 scfm. Two onsite engines currently in operation use approximately 25% of the collected LFG and produce approximately 1.9 MW of electricity.

Approximately 75% of unused LFG is flared through one enclosed flare and one utility flare, both of which are located onsite at the landfill. This unused LFG is available for the proposed expansion of the ERF and other beneficial uses.

LFG Collection and Control System (GCCS)
The GCCS has been installed to control offsite migration of LFG from the unlined areas of the landfill and to control emissions pursuant to New Source Performance Standards. The landfill operates its GCCS pursuant to Title V permit for the facility, and is in full environmental compliance with the provisions of that permit and the NSPS.

Clean Air Action Compliance for LFGE Facility
Sulfur dioxide emissions from existing ERF likely will not be an issue. A raw LFG sample was tested and the total reduced sulfur concentration was found to be 26.7 ppmv. As long as the total reduced sulfur level is below about 420 ppmv, the air emission limit is not an issue. Particulate also will not be an issue since the LFG compression and treatment system will remove significant particulate matter.
LFG Monitoring & Management System
For subsurface monitoring of LFG, PWC monitors 18 permanent methane monitoring probes (compliance wells) installed along the facility property boundary and on-site structures to monitor off-site migration. These wells are monitored quarterly or more often as warranted. Buildings are monitored by permanently installed gas detectors. Surface emission monitoring is performed quarterly to ensure that surface methane concentrations are below 500 ppm.

Awards

The landfill has been accepted as an Extraordinary Environmental Enterprise (E4) participant in the Virginia Environmental Excellence Program. This recognition, as well as other awards such as the SWANA 2008 Silver Landfill Management Award and acknowledgements, is an indication of the quality and excellence that exists at the landfill.
Section 4: Planning, Operations & Financial Management

Planning Used to Meet Design & Operational Objectives
The use of LFG for the animal incinerator required that the LFG be compatible with the existing incinerator equipment. Because the incinerator was originally designed to be fueled with propane, the equipment manufacturer had concerns with the composition and quality of the available LFG.

Major concerns were investigated/studied and have been addressed during initial phase of the project design. The purpose was to ensure the operational objective and concerns from VDEQ to meet all requirements.

Construction and Operation Energy Cost
After conducting tests during preliminary design, the systems including LFG treatment skid, transmission line to incinerator and heaters was completed. The new dual fuel burner has been successfully operating since that change was made in May 2011. Presently, PWC runs the animal incinerator once a week and the County has seen savings of approximately 42% on energy/fuel costs of the primary burner.

In March-April 2012, the County replaced the two upper burners with one equivalent dual fuel burner of 2.4 million Btu. The incinerator will entirely run on LFG and the savings will increase.

Estimated Operating Budget/Year
The total cost of the LFG project was approximately $1.2 million. The cost breakdown includes construction and equipment, which totaled about $1.1 million, and design and project management, which totaled about $100,000.

A critical component of the cost is that the LFG developer who owns the rights to the LFG generated at the landfill agreed to sell excess LFG back to the County at an avoided cost. The avoided cost is $1/MMBtu as compared to $14/MMBtu the County is charging from the end users to recover its cost of the project within 10-12 years.

A Purchase and sale agreement between PWC and the onsite, private-sector LFG developer was signed in 2009 to purchase excess LFG currently flared. PWC processes the excess LFG into useable fuel and sells it to the fleet and maintenance facilities and the animal shelter.

The cost that PWC charges for the processed LFG is approximately 42% below the cost of the equivalent amount of propane that would otherwise be purchased to fuel the incinerator and onsite buildings.

Potential to Expand and Create New Programs for Future
Presently, PWC is in the process of creating the Prince William Renewable Energy Park (PWREP) at the landfill to take advantage of emerging renewal energy technologies, such as solar, wind, LFG recovery and solid waste conversion.
Employee Health & Safety Training
PWC’s operational personnel are trained to operate equipment safely and in accordance with the manufacturer’s recommendations. The manufacturers of the LFG compression and treatment skid and LFG radiant tube heaters conducted training sessions on operation and maintenance of the system. About ten employees from Buildings and Grounds Department, Police Department Animal Shelter and Fleet attended the training program. Employee health and safety is paramount to the PWC and weekly in-house health and safety meetings are held to emphasize employee’s health and safety programs. Further, the onsite contractors conduct weekly health and safety meetings for their employees.

Season 5: Utilization of Equipment/Systems and Technologies

LFG Equipment Types, Efficiency & Effectiveness
The project consists of five components:
- LFG treatment system,
- LFG transmission pipeline(s),
- LFG-fired radiant heaters, and
- LFG-fired retrofit of animal incinerator
- LFG to fuel the incinerator burners to run on LFG as primary fuel and propane as standby fuel.

LFG Treatment System
The LFG treatment system is rated at 300 scfm which is more than the estimated peak LFG demand of the radiant tube heaters and animal incinerator. This is done to provide spare capacity for future LFG utilization projects such as fueling boilers at the PWC Animal Shelter and for fueling of a future electric generator(s) at other adjacent PWC facilities (e.g. school administration facility and future high school).

The LFG treatment system incorporates filtering, compression, and dewatering. The system design parameters include a minimum discharge pressure of 8 psig and a gas dew point of 40°F or below. The LFG treatment system is sited on-site at the ERF.
LFG Transmission Pipeline
To move treated LFG from the LFG Treatment System (Skid) to fleet and maintenance buildings and the animal shelter, a 6,400 feet long HDPE underground pipeline has been installed. The pipeline is laid outside the waste foot-print of the landfill.

LFG Fired Radiant Heaters
Six (6) 100-MBtu/hr and five (5) 80-MBtu/hr LFG fired radiant heaters have been installed in the fleet building. The maintenance building has four (4) 80-MBtu/hr LFG fired radiant heaters.

LFG Retrofitting of Animal Incinerator
The animal incinerator has one (1) 1.36-MMBtu/hr primary lower burner and two (2) 1.2 MMBtu/hr secondary upper burners. The fuel supply pipeline layout is modified to supply LFG and propane to primary and secondary burners. The modification included installing pressure regulator and flame arrestor to independently supply LFG to primary and secondary burners of the animal incinerator.

In May 2011, the primary lower burner, rated at 1.36 million Btu (MMBtu) per hour, was replaced with dual fuel burner to run on LFG or propane and the animal incinerator began using LFG. In April 2012, the two secondary upper burners rated at 1.2 MMBtu per hour were replaced with a dual fuel burner rated at 2.4 MMBtu per hour to run on LFG or propane.
The clientele ultimately served by the LFG project are the citizens of PWC. At this time, the immediate end-users of the LFG project are the PWC Animal Shelter and Fleet buildings. On July 21, 2011, an agreement for purchase and sale of LFG was signed between Solid Waste Division and Property Management Group of Public Works.

Day-to-day operation of PWC facilities is funded by general fund paid by taxpayer money. Therefore, any energy savings realized through the use of LFG in place of propane will directly reduce operational costs and require less tax money to fund the project. PWC is also replacing secondary burners by the equivalent dual fuel fired burners to run on either LFG or propane and exploring other users to use excess LFG. PWC will see additional savings once the secondary burners are replaced and other uses or users are found.

PWC Solid Waste Division personnel played vital role in exploring, designing, developing and implementing the use of LFG as a renewal energy source to fuel the incinerator and the heaters at Fleet’s buildings. PWC also engaged the services of a private-sector engineer to assist in the development and design of this LFG project. A private-sector contractor was hired to install the LFG system including LFG compressor and treatment skid.

**Routine Maintenance**

During project construction, equipment vendors provided training to the equipment operator and other County employees who may be required to operate the equipment. As stated previously, four employees attended the equipment training. PWC also prepared a manual for Operation and Maintenance Plan for the meeting the requirements of CFR Title 49, Part 192, Subpart I. All operations and maintenance manuals are kept onsite for the benefit of the equipment operators.

PWC employees do routine maintenance on the LFG compression and treatment skid, LFG fired radiant heaters, and LFG transmission pipeline in accordance with the manufacturer’s recommendation. Routine maintenance on the animal incinerator has been contracted out to the incinerator manufacturer, ThermTec representative.
Section 6: Public Acceptance, Appearance & Aesthetics

Neatness, Cleanliness & Overall Appearance

The final installation of the LFG heaters and animal shelter incinerator are virtually unnoticeable to the end-users and general public. The maintenance building heaters are located in high overhead bay ceilings, along with other piping and utility equipment commonly found in such buildings. The only significant feature visible to the general public is the smoke stack at the animal shelter incinerator. The PWC recently installed a stainless steel stack that blends in well with the wooded and landscaped animal shelter property.

Community Education & Customer Service

Installation and operation of the gas heaters and animal incinerator was an excellent example of different County agencies working together for a common goal. The landfill supplied the LFG, but a wide variety of PWC and state agencies were involved in the project, especially Public Works, the Police Department, and VDEQ. The County’s Solid Waste Citizen Advisory Group provided input and support for this project throughout the planning and construction phases.
Section 7: Innovation and Creativity

We believe that the use of LFG in an animal incinerator to be the first of its kind in the U.S.

PWC operates a municipal solid waste landfill and collects LFG from the landfill and uses about 25% of the collected LFG in existing engines generators and the remaining 75% is flared.

We strongly believe that this project fits perfectly and is worthy of receiving the LFG Utilization Excellence Award because:

- of the innovative technology use of fueling the incinerator with LFG as a renewal source of energy;
- it is an innovative use of technology that takes the available LFG that would otherwise be flared;
- there is potential to use the 75% flared gas;
- this project supplies LFG to 15 radiant tube heaters at the PWC’s fleet and maintenance buildings and 3.76 MMBtu/hour burners of the animal incinerator at PWC’s animal shelter;
- the new beneficial use converts this renewal energy source into an inexpensive, sustainable energy source for animal incinerator and radiant tube heaters and displaces propane;
- use of LFG to fuel an animal incinerator is the first of its kind in the United States or perhaps, the world;
- it saves about 42% on the energy bill for heating fleet and maintenance facilities and animal incinerator;
- it serves as a showcase for visitors to the landfill facility;
- The project is a win-win for all stakeholders.