

Converting Academy food waste to energy

by Amber Baillie

U.S. Air Force Academy

New research reveals trash might be a treasure at the U.S. Air Force Academy in Colorado Springs, Colo.

Last August, the Department of Defense Environmental Security Technology Certification Program funded CDM Smith, a national engineering and construction firm, to test how the Academy can reduce energy use and cost at its wastewater treatment plant, and convert food waste from its dining hall into energy.

Academy professors and engineers toured the Mitchell Hall kitchen and the wastewater treatment plant in late July to learn more about the processes and results of the year-long project.

“About 2-3 percent of the nation’s energy goes to treating wastewater and water,” said Pat Evans, CDM Smith vice president. “Most of the



Mitchell Hall facility manager Glen Loyche shows Academy professors how dining hall food waste is converted into pulp at Mitchell Hall July 21, 2014. (U.S. Air Force photo/Jason Gutierrez)

energy that’s used is for pumping the water and aerating it. We’re trying to get wastewater treatment plants to become energy neutral or energy producers instead of energy consumers. One step toward that goal is capturing energy from food waste through anaerobic digestion.”

Two-to-three semi-trucks haul food to the Academy every day to feed 4,000 cadets, said Glen Loyche, Mitchell Hall facility manager.

“Each trailer carries 20-40 pallets of food,” he said.

Leftover food at the dining hall is run through large grinders, turned into pulp and transferred into dump trucks.

“Waste management picks up four and a half tons of pulp product here every week,” Loyche said.

CDM Smith collects food waste from Mitchell Hall three days a week and converts it into methane and carbon dioxide.

“We’re testing on a very small, pilot scale,” Evans said. “We transfer the food waste into anaerobic digesters, about 350 gallons in size that hold about 250 gallons of sludge and food waste. We convert the waste into methane for beneficial uses such as heating boilers, generating electricity and vehicle fuel once it’s purified.”

Greenhouse gases emitted from food waste takes a toll on the environment, Evans said. “Some

STORY CONTINUED ON PAGE 4

in this issue:

- FEMP Award Winners
- Robins Solar
- Watts Happening

Air Force wins majority of energy awards

by Jennifer McCabe
AFCEC Public Affairs

It's a banner year for the Air Force with the Department of Energy recently announcing that the service won a lion's share of 2014 Federal Energy Management Program awards.

The Air Force won its most ever: eight of the 25 projects or programs selected as deserving of this year's coveted FEMP awards. In total, 10 government agencies won awards including the Navy with four and the Army with one.

The Air Force Civil Engineer Center received 29 nomination packages from across the Air Force and culled them down to 15, the maximum accepted by DOE.

"The Air Force is doing great things to save energy, water and money," said AFCEC Director Joe Sciabica. "Work by Airmen, civilians and contractors over the past two decades has created a cost avoidance of \$626 million, money that can be better spent executing the Air Force mission."

Program Award Winners

The Air Force Space Command Energy Program team of Jim Jacobsen, Monte McVay, Randall Pieper, Tim Pugh and Fox Theriault at Peterson Air Force Base, Colo., focused on its top two energy intensive installations, high-

efficiency exterior lighting and fleet fuel. AFSPC made upgrades to a power plant at Thule Air Base, Greenland; saving 636,265 gallons of jet fuel and \$2.6 million annually; and saved \$1 million annually by installing 6,600 light emitting diode, or LED, street and parking lot fixtures across the command. AFSPC also implemented biodiesel throughout its fleet, the first command to do so, and will connect Clear Air Force Station, Alaska, to the electric grid, saving \$1.5 million annually.

The Office of the Secretary of the Air Force Installations, Environment and Logistics Energy Analysis Task Force in Washington, D.C., made up of Chip Bulger, Jeffrey Havlicek, Mark

Lyons, Alan Sims and Michael Smith leveraged the expertise of 18 Air Force Reserve members to incorporate industry best practices. Policy and procedural changes increased the amount of cargo moved on a gallon of fuel by 9.5 percent and reduced costs 8.6 percent. They also partnered with Air Mobility Command to enhance cargo load processes, eliminate 1,044 sorties and save \$12.6 million in fuel.

Steve Perry, energy manager at Royal Air Force Mildenhall, England, won for his holistic energy plan. The plan includes best energy stewardship practices in aviation, vehicle and facility energy, which saved \$760,000 in 2013. He empowered facility



Solar panels collect sunlight at Davis-Monthan Air Force Base, Ariz. The Davis-Monthan solar array project is placed on 170 acres of underutilized land, making it the largest of its kind currently on any U.S. Department of Defense installation. The Department of Energy chose it as a 2014 Federal Energy Management Program award winner. (U.S. Air Force photo/Released)



Engineers at Hurlburt Field, Fla., expanded and improved the installation's graywater distribution system to reduce demand on the local water supply. Forty-thousand feet of new piping and a 500,000 gallon storage tank help the base save 13 million gallons of potable water a year formerly used for industrial and irrigation needs. The Department of Energy chose it as a 2014 Federal Energy Management Program award winner. (U.S. Air Force photo/Released)

managers with the tools to benchmark usage and identify low-cost improvements. Perry also created the "Energy Saver of the Quarter Award" and a comic strip known as "The ReSOURCERS" to raise awareness across the Air Force via social media.

Project Award Winners

Jeffrey DeVore, Stephen Grimes, Gerry Mitchell and Alfonso Sanchez at Wright-Patterson AFB, Ohio, worked together to rehabilitate an underutilized, historic 52,000 square foot, three-story hangar, consolidating the Air Force Research Lab's Power Control Division from multiple locations. These efforts earned the building the Leadership in Energy and Environmental Design, or LEED, gold certification. It now

uses 31.5 percent less energy with occupancy sensors for heating and cooling systems, and glazing on the outside of the building.

Joint Base Elmendorf-Richardson's Richard Hiatt and Griffith Turpin worked with the city of Anchorage, Alaska, and Doyon Utilities to build a landfill gas waste-to-energy plant on the installation. For years, the city had collected and burned landfill gas, primarily methane, next to the base. Now it's used to generate more than 26 percent of JBER's yearly electric load and is projected to save the Air Force \$73.6 million over its 46-year lifecycle.

A team of engineers at Hurlburt Field, Fla., expanded and improved the installation's graywater

distribution system to reduce demand on the local water supply. In the past, Hurlburt pumped and treated 500,000 gallons per day from the local water supply in order to meet industrial and irrigation requirements. Lt. Col. Mark Donnithorne and Capt. Eric Morgan led the project to add more than 40,000 feet of piping and a 500,000 gallon storage tank. Hurlburt now supplies reuse water for irrigation, aircraft and vehicle wash racks, a fire training facility, and cooling towers along with providing excess water to the local community for reuse. As a result, Hurlburt reduced potable water consumption by 13 million gallons.

In Arizona, the Davis-Monthan AFB Energy Team worked with

STORY CONTINUED ON PAGE 5

Food Waste to Energy

CONTINUED FROM PAGE 1

landfills capture the methane released but a lot do not,” Evans said. “Methane is a potent greenhouse gas, much more potent than carbon dioxide. The environmental impact is that it takes up space, emits greenhouse gases and water can go through the waste and generate leaching, which can contaminate ground water.”

CDM Smith removes hydrogen sulfide, carbon dioxide and water when converting the waste into methane.

“We purify it,” Evans said.

“Hydrogen sulfide, or rotten egg gas, is very toxic and can result in corrosion of a lot of equipment. At the end of the process we have pure

methane, or natural gas, that can be compressed into vehicle fuel.”

Overall, the project has been successful, Evans said.

“We found you get a lot more gas and energy out of fat and protein than you do out of carbohydrates,” he said. “We can’t control the amount of carbs, fat and protein cadets eat or waste, but now we have a better understanding of how much gas we can get for a given food waste.”

One-to-two percent of the solid waste generated in the U.S. is food waste, Evans said.

“The Academy’s food waste is an energy-rich resource that in going to landfills ends up having

an environmental impact,” he said. “By converting food waste to methane through anaerobic digestion, we can decrease the impact to the environment, recover energy and help the Defense Department reach its net zero goals.”

Russell Hume, a mechanical engineer with the Academy’s Directorate of Installations, said converting waste to make energy is a phenomenal step in the right direction for the Academy and world.

“I think it has been a great demonstration of the art of the possible,” he said. “I would like to see this technology further developed and perfected to the point that it becomes widely

Robins Solar EUL

The Air Force has signed an agreement with New Generation Power to lease real property at Robins AFB, Ga., for a renewable energy-focused Enhanced Use Lease, or EUL.

The agreement is a major step in securing land for a photovoltaic facility that would be owned and operated by New Generation Power. In turn, New Generation Power has signed a power purchase agreement with Georgia Power for the energy produced by the 10-megawatt facility.

Under the proposed agreement, Robins AFB can expect to receive cash consideration to fund reinvestment in renewable facility energy or energy conservation measures from lease payments

throughout the duration of the 20-year lease.

Managed by the Air Force Civil Engineer Center Installations Directorate’s Strategic Asset Utilization Division, EULs are long-term agreements between the Air Force and public or private developers to lease non-excess Air Force property in exchange for cash or in-kind consideration. EUL projects cover a broad range, from renewable energy development to commercial use of real estate.

AFCEC Installations Directorate acquires, manages and disposes of Air Force-controlled real property worldwide. To date, AFCEC has closed eight EUL projects with considerations worth more than \$250 million.



The Air Force selected New Generation Power for the Enhanced Use Lease of a 50-acre site on Robins AFB, in Warner Robins, Ga. New Generation Power will construct a 10-megawatt solar photovoltaic array that is scheduled to be operational mid-2015. Lease term is 20 years. New Generation Power and Georgia Power have a Power Purchase Agreement for power generated that will go to the grid. (U.S. Air Force photo)

FEMP Awards

CONTINUED FROM PAGE 3

numerous agencies and programs, including the utility company, to upgrade 580 taxiway lights to LEDs, and 53 boilers and lights in 14 hangars and warehouses. Angela Flores, Gustavo Gonzalez, Greg Noble and Richard Whitaker worked together to add a new electric chiller plant and distribution loop. These energy projects around the base last year are expected to save \$253,000 annually.

A team from Air Mobility Command and Air Force Materiel Command, made up of Stefan Bieniawski, William Blake, Keith

Boone, David Dupnick and Donald Erbschloe, created a program called Surfing Aircraft Vortices for Energy, or SAVE. The program utilizes formation flight principles derived from flocks of migrating birds and uses the energy created in the draft of the formation leader. Using newly developed software, a C-17 formation with two planes saved more than 10,000 pounds of fuel during a round-trip mission from California to Hawaii in the summer of 2013. The trail aircraft used 10,800 pounds less fuel and saved \$7,500.

The DOE is planning an awards ceremony in Washington, D.C., later this year.



ESCOs visit Edwards

Six energy service companies under the Department of Energy - Energy Savings Performance Contract attended a site visit at Edwards AFB, Calif., July 17, 2014. This is a major milestone in the development of the Department of Defense's first ESPC to consolidate data centers on an installation. The goal of this ESPC opportunity is to consolidate 16 data centers and optimize the base telephone switch. Contractor preliminary assessments are due Sept. 14. This is a combined A6/A7 effort.

Photovoltaic panels on roofs

The AFCEC Operations Directorate has awarded a contract to AMEC to investigate consequences of installing photovoltaic panels on rooftops of Air Force buildings. The contract will provide an Engineering Technical Letter that includes maintenance and safety issues for workers in the vicinity of rooftop PV panels. Delivery of the ETL is scheduled for February 2015.



Greg Mitchell checks the pressure on the landfill gas processing module at the Anchorage Landfill in Alaska. The module cleans and dries landfill gas before it is sent to the Joint Base Elmendorf-Richardson landfill gas waste-to-energy plant. The project is one of eight Air Force projects selected as 2014 Federal Energy Management Program award winners. (U.S. Air Force photo/Tech. Sgt. Brian Ferguson/Released)



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