MIDWEST CHP APPLICATION CENTER

In Partnership with the US DOE

combined heat & power in laboratories

National Animal Disease Center
1.2 MW CHP Application

Project Profile

Quick Facts

Location:
Ames, Iowa
Facility Size:
450,000 ft^2
Generation Capacity:
1.2 MW
Prime Mover:
Solar Saturn 20™ Combustion Turbine
Fuel Utilized:
Natural Gas
Heat Recovery:
Steam for labs and space heating
8,300 lbs/hr unfired
29,000 lbs/hr with duct firing
Annual Cost Savings:
$335,000/yr
CHP Project Cost:
$3.1 Million
Simple Payback:
9.3 years
Began Operation:
2002
Funding Mechanism:
Energy Savings Performance Contract

Project Overview

Located in Ames, Iowa, the National Animal Disease Center (NADC) is the largest federal animal disease center in the U.S. The Center conducts research to solve animal health and food safety problems faced by livestock producers and the public. Opened in 1961, the center today includes approximately 250,000 square feet of building space devoted to housing of animals. An additional 200,000 square feet is dedicated to laboratories and offices.

NADC Cogeneration Facility

In 2002, Johnson Controls company under an Energy Savings Performance Contract (ESPC), installed a 1.2 MW combined heat and power (CHP) plant. The system utilizes a Solar Saturn 20™ natural gas fueled combustion turbine with heat recovery of the turbine exhaust gases. The heat from the exhaust gases is recycled through a heat recovery steam generator (HRSG) to produce 8,300 lbs/hr of process steam for use in the facility laboratories. The HRSG is also equipped with additional natural gas fired duct burners that can boost the thermal output to 29,000 lbs/hr of steam to satisfy both the process and space heating requirements of the center. This thermal capability allows the facility to completely avoid operating the existing 40-year-old 70% energy efficient boiler (now used strictly as a backup boiler for added reliability).

In addition to improving the thermal reliability of the plant, the CHP system has increased the reliability of the electric service to the center. Should the base loaded CHP system become inoperative, the local electric utility grid provides power to the facility. Should the local utility experience an electrical outage, the CHP system continues to carry the electric load of the facility. The CHP system is also a dual fuel system, capable of operating on natural gas or number 2 fuel oil.

Reasons for CHP

The most economically favorable time for a company to consider investing in a CHP system is either during new facility construction or during a major facility/boiler room upgrade. The NADC was in such a situation. Its existing boiler plant was 40 years old and the maintenance and fuel costs on the 70% efficient boiler were becoming an issue. An analysis of the total facility's energy requirements revealed several conditions favorable for consideration of a CHP system:

- Simultaneous and balanced electric and thermal loads
- Concerns over electric reliability and rising energy costs
- Aging power plant (boilers and chillers)

With limited capital improvement project funds available to make a multi-million dollar investment, the NADC turned to Johnson Controls (an energy services company) and a funding mechanism called energy service performance contracting (ESPC) to consider a CHP system.

Energy Savings Performance Contracts fund CHP Projects:

By utilizing an ESPC as the funding mechanism to finance the CHP project, the host facility (NADC) shifts the initial first cost investment risk to a third party energy services company (Johnson Controls). The energy services company, which normally owns the equipment, receives a long term contract to operate the system and shares in the cost savings realized by the installed CHP system. In this case, the Federal Government through the Department of Agriculture owns the equipment and has a contract with Johnson Controls to maintain and operate. The contract with Johnson Controls lasts 17 years

In addition to avoiding the first cost investment, the host facility realizes immediate cost benefits from the energy savings (reduced utility bills). However, in return for shifting the financial risk, the amount of energy cost savings is shared with the Energy Service Company (ESCO) to allow the ESCO to realize a reasonable return on their investment in the plant. Many times at the end of the contract (with the equipment fully depreciated) the CHP system is sold to the host facility.

CHP Helps Improve Indoor Air-Quality (IAQ):

Many of the animal research areas need to meet animal care standards and require High Efficiency Particle Air (HEPA) and other air filtration methods. This amounts to 250,000 square feet of space that requires 10 to 15 air changes per hour to meet standards. As a result, all of the ventilation air to animal housing areas is 100% single pass outside air. In addition to maintaining high levels of IAQ for the animals, the NADC wanted to improve the air quality for its 270 employees. Increasing the IAQ throughout the center increases employee productivity, increases employee safety and health, and lowers employee absenteeism and turnover rates.

The penalty associated with such a high number of air changes per hour throughout the center is the energy requirements to thermally treat the outside air (heating, cooling, dehumidifying). This is where a CHP system becomes most beneficial. The high and relatively constant thermal requirements allow for maximum use of the recycled heat from the CHP system. When utilizing the recycled heat from the turbine exhaust gases and the supplemental duct burners, the CHP steam generation efficiency is 92%. This is significantly greater and more cost effective than utilizing the 70% efficient boiler.

For further information contact:

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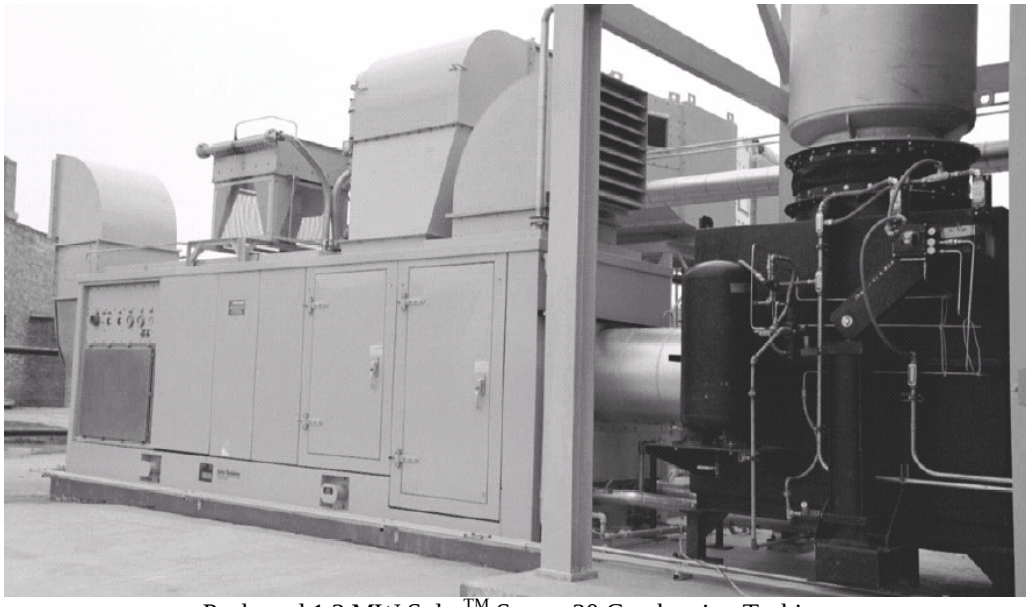

Packaged 1.2 MW Solar™ Saturn 20 Combustion Turbine

"Our tremendous energy savings is accompanied by improvements in operation and maintenance designed to keep the NADC running smoothly and meeting its goals for years to come."

Dennis Jones –
NADC Facility Engineer