



MIDWEST  
**CHP**  
APPLICATION  
CENTER  
In Partnership with  
the US DOE

combined heat & power using landfill gas

# Antioch Community High School District 117 360 kW CHP Application

## Project Profile

### CHP Quick Facts

**School Location, Size, Population:**

Antioch, Illinois  
262,000 sq ft  
3000 students

**Primary Fuel:**

Landfill gas located ½ mile away in a closed landfill

**Design Engineering Firm:**

RMT, Inc., Madison WI

**CHP Plant Equipment:**

(12) 30 kW Capstone® Microturbines  
(2) Cain Heat Exchangers

**Total System Installed Costs (see page two):** (includes landfill gas cleanup, gas pipeline, CHP system, & 2 new buildings) - \$1,900,000

**CHP Maximum Thermal Output:**

290,000 Btu/hr @ 550°F / each microturbine

**School Energy Savings:**

\$165,000 / year

**System Online:**

September 2003

**Simple Payback:**

8.5 Years on school investment of 1.4 Million

### Project Overview

In the forefront of technology, a first-of-its-kind CHP system has been installed at Antioch Community High School utilizing biogas from a near by landfill.

The CHP system utilizes twelve 30 kW Capstone® micro turbine Generators with two Cain heat exchangers that recycle the exhaust heat from the turbines. The system runs 24/7 supplying as much of the electrical and thermal load as possible. When heat is not required, the exhaust can be automatically diverted around the heat exchanger, allowing for continued electrical output.



A gas clean-up and compression system was installed to transfer the gas from the landfill to the school for combustion in the microturbines. The equipment generates 360 kW of electric energy and 3.48 MMBTUs of thermal energy to heat and power the 262,000 sq ft school, saving more than \$165,000 in annual energy costs. The system is connected in parallel to the local electric utility grid, which provides power to the school when the electric demand exceeds 360 kW or when the CHP system is down for repairs. The twelve microturbines reduce the annual amount of pollution (greenhouse gasses) equivalent to removing nearly 3,400 cars from the road for a year, or planting 4,570 acres of trees. The electric energy generated is about the same as satisfying the energy demand of 120 homes. The installed equipment cost of \$1.9 million was offset by a \$500,000 grant. The remaining cost of \$1.4 million was secured through revenue bonds to be paid off through energy savings. The system began operation in September 2003.

### The Original Concept

The landfill currently generates enough methane to supply the twelve microturbines and the remaining gas is flared off. It has been predicted by RMT that the landfill's methane supply will last another 10 to 20 years. The original idea of using landfill gas as an energy source for the school came from Antioch school district's own business manager, Bill Ahlers. In addition to saving energy, reducing utility costs, and increasing reliability, this alternative energy source was envisioned as a teaching aide included in the biology, economic, and chemistry curricula.

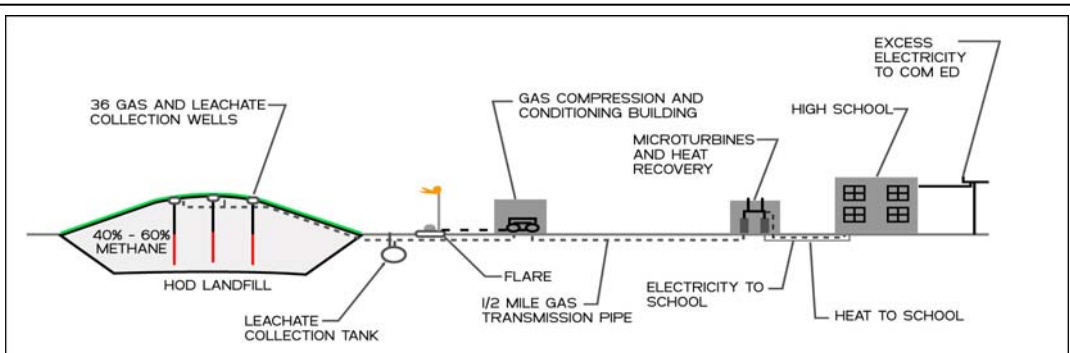
## A Challenging Solution

The engineering design firm, RMT, Inc., located in Madison, WI, was retained to design the energy system, which included collecting, cleaning, compressing, and transporting the landfill gas to the school. The design team then decided on a CHP system that would utilize multiple microturbines with heat recovery to maximize system flexibility and provide high reliability. The use of the landfill gas in low polluting microturbines makes this system exceptionally environmentally friendly.

Design and construction of the energy system posed a number of challenges:

- Resolving local easement issues,
- Meeting local utility requirements,
- Connecting to the existing school heating system,
- Crossing under railroad tracks, and
- Meeting the USEPA's operational requirements.

One-half mile of piping was installed to transfer approximately 200 cubic feet per minute of cleaned and compressed landfill gas to the school grounds where the microturbines are located in a separate building. RMT's idea was that as the amount of landfill gas decreased over time, the turbines could be taken offline one at a time or natural gas could be utilized to supplement the landfill gas.



### Installation Costs Include:

- 1/2 Mile Pipeline (installed)  
\$450,000
- (2) New Buildings  
\$120,000 (total)
- A Johnson Control System  
\$36,000
- Gas Compression & Contaminant Removal System  
\$200,000

## Awards

- The American Council of Engineering Companies (ACEC) has presented RMT with a National Honor Award for its innovative landfill gas-to-energy project with Antioch Community High School (ACHS) and the HOD landfill.
- ACEC-Wisconsin's Grand Award to RMT.
- USEPA Landfill Methane Outreach Program (LMOP), 2003 project of the year.

## For further information contact

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"This is a perfect example of a public-private partnership benefiting everyone. We are going to recycle, save money for the taxpayers, and help with the environment".

Bill Ahlers  
Business  
Manager,  
Antioch

