HIGH SCHOOL BENEFITS FROM LANDFILL GAS RECOVERY

SOURCE: BioCycle April 2004, Vol. 45, No. 4, p. 72

BECAUSE the Antioch, Illinois Community High School was the first one in the United States to have its heat and electrical production powered by landfill gas, the EPA Region 5 office in Chicago recently awarded the school and its consultants — RMT, Inc. — an Engineering Excellence recognition. The Antioch school is located one-half mile from a closed landfill where methane gas is recovered. The RMT project team — which is based in Madison, Wisconsin — designed a system that ties into the gas collection units.

A gas cleaning and compression system was then installed along with a way to transfer the gas to the school for combustion in twelve 30-kilowatt Capstone microturbines. The equipment generates 360 kilowatts of energy to heat and

power the 262,000 sq ft school, saving more than $100,000 in annual energy costs. All unused power is sold to Commonwealth Edison, the local utility.

Both EPA and local officials are highly pleased with the project. When announcing the award, administrator Thomas Skinner of EPA Region 5 pointed out that besides the energy, the high school district also got a number of playing fields on the former landfill's 40 acres which had been classified as a Superfund site. "It took some foresight to look at a landfill and see athletic fields. There was even more foresight for the cogeneration plant."

According to local newspaper reports, the equipment costs about $1.5 million — paid for by a $500,000 grant and secured by revenue bonds to be paid off from the energy savings. "We'd love to see more of these projects across the country," summed up Skinner.

In their report on how the Antioch project was developed, two RMT engineers — Mark Torresani and Ben Peotter — provided these details: After receiving a grant from the Illinois Department of Commerce and Community Affairs' Renewable Energy Resources Program to construct a cogeneration system to produce electricity and heat at the high school, construction began in December, 2002. "Design and construction of the energy system posed a number of challenges, including resolving local easement issues, meeting local utility requirements, connecting to the existing school heating system, crossing under a railroad, 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 12 Capstone Microturbines are located in a separate building. The system began operating in September 2003."

Each microturbine produces exhaust energy of around 290,000 Btu/hr at 550°F. The exhaust from the microturbines is routed through heat exchangers that heat the liquid, which then circulates through underground insulated steel pipes running beneath a parking lot to the school's boiler system. Because heat is being transferred to the school through insulated 4 inch-diameter pipes, locating the turbines next to the school was critical in preventing excess heat loss. When waste heat recovery is not required by the Antioch school, the microturbine exhaust is automatically diverted around the exchanger, allowing continued electrical output. During extremely cold weather, the school boiler system automatically uses natural gas to supplement the heat output of the microturbines.

As explained by the engineers, the project serves as a model of how a landfill with relatively small quantities of LFG can be used to produce clean efficient energy. By using the electricity and heat created during power production, microturbines become more practical for landfill gas utilization. The main advantages of microturbine technology over other more traditional internal combustion engines are the clean, quiet operation and the ability to add and remove microturbines as gas flow increases or decreases.

Benefits cited included the following: Low energy costs for the high school; Use of waste heat; Decreased emissions through reduced need for traditional electrical generation sources; Reduction in greenhouse gas emissions; and Educational opportunities for students in physics, chemistry, economics and environmental management.