



Ohio Department of Development

Toledo Museum of Art Installs Microturbines for Efficiency Gains

Since 1901, The Toledo Museum of Art (TMA) has served Northwest Ohio by exhibiting world-renowned works of art. Now, behind the scenes, a masterpiece of modern engineering is in residence at the museum providing for the facility a new level of energy efficiency. In 2004, four 60-kW natural gas-fired microturbines were installed, thanks in part to a grant from the Ohio Department of Development's Office of Energy Efficiency (OEE).

Project Goals

TMA Plant Manager Paul Bernard expressed the circumstances that led him to look into combined heat and power (CHP) technology: "We had a desire to use energy as efficiently as possible because our electrical rates are on the higher end for the Midwest Region."

At the same time, controlling indoor air quality was of utmost importance. Preservation of the artwork in the museum's permanent collection as well as traveling exhibitions that are displayed in the feature

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**-Paul Bernard,
Plant Director**

gallery require temperature and humidity to be strictly regulated to specific conditions: 70 degrees Fahrenheit and 50% relative humidity year-round. This reasonably stable thermal load that the museum has throughout the year suggested combined heat and power as a solution. Not only would they generate electricity but their waste heat could work to offset the cost of conditioning indoor air.



Toledo Museum of Art

Results

Four natural gas fired microturbine units generate a peak capacity of 240kW. The microturbines' waste heat supplies 100% of the museum's domestic water heating needs, or about 60% of total heat.

When asked how the performance of the microturbines has measured up to his expectations, Bernard says that the only problem he ran into was "what to do with all of the waste heat that the system captured". Since the installation, he has made adjustments to the heating system in order to harness the abundance of waste heat.

Bernard was the man who oversaw the implementation of the combined heat and power project. As a 14-year veteran of the position, Bernard sees the addition of the microturbines as part of the ongoing effort to provide the museum with reliable sources of energy. Toledo Edison is still the primary source for electricity, but Bernard can also power the museum with gas from a utility company, with oil, or with electricity from the

microturbines. The CHP system gives the museum the ability to island itself from Toledo Edison in the event of a power outage by way of a turnkey control. This affords them a degree of independence. However, Bernard is quick to point out that wasn't the primary motivation behind going to CHP, saying, "It's not to beat the electric company. There's a bigger reason. It's more efficient and that's better for the environment."

The CHP plant works in conjunction with the existing infrastructure to meet the unique needs of the building. The museum consists of three buildings: a center building, an east wing, and a west wing. Because it was built in three phases, there are multiple duct loops that move hot water and air throughout the museum. The four microturbines are used essentially as boilers that create electricity as a bi-product. Each of the four turbines has a heat exchanger on top of it to capture waste heat, which is distributed throughout the three buildings via the loops of pipes and ducts.



Two of TMA's four 60-kW microturbines

How They Did it

The cost of the project was \$521,571. Funding in the amount of \$75,000 was secured through OEE's Energy Loan Fund - Distributed Energy Resources grant program in 2004. The museum learned about this grant incentive from BHP Energy Solutions, the engineering firm that was contracted to install the microturbines. The portion of project costs that was not granted was secured through Huntington National Bank using OEE's low-interest loan program for institutions implementing energy-efficiency technologies. The loan program reduced the interest rate on the loan by about 50%.

What They Learned

Bernard says that involving the relevant utilities and city inspectors in the planning process helped the project proceed smoothly.

How You Can Do It

If you are interested in using microturbines to generate power and heat for your institution or organization, learn about incentives offered by the Office of Energy Efficiency and other information at www.odod.state.oh.us/cdd/oee/elfgrant.htm or call us at 1-866-SAV-NRGY.



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Office of Energy Efficiency

The Office of Energy Efficiency (OEE) works with individuals, communities, non-profit organizations, businesses large and small, industry, and other government agencies to achieve its

VISION:

A robust economy supported by multiple energy sources, energy efficiency, and advanced technology with added value for the quality of life for all Ohioans.