



Becoming more energy productive within the industrial sector

can spur job creation and cost savings. Midwestern companies are not just leaders in utilizing cutting-edge solutions and technology, but they are also the manufacturers of the new, efficient equipment that firms around the world are demanding in their efforts to be more energy productive.

This series will highlight those initiatives and companies that are leading the nation in energy productivity.

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Midwestern Governors Association
2025 M Street, NW, Suite 800
Washington, DC 20036



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REVITALIZING THE MIDWEST THROUGH
INDUSTRIAL ENERGY PRODUCTIVITY

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Adkins Energy: Combining Ethanol and Efficiency

EXPLORING NEW METHODS OF ETHANOL PRODUCTION

Producing ethanol involves a two-pronged energy challenge. First, producers need high-pressure steam in order to cook the ground corn. Second, producers need large amounts of electricity to operate a plant's pumps, motors and fans.

Many ethanol producers are turning to combined heat and power (CHP) to meet both sides of this challenge. "CHP is basically simultaneous generation of electricity and useful heat from the same fuel source," says Steffen Mueller, principal research economist at the Energy Resources Center at the University of Illinois at Chicago. "For facilities that have constant high electricity and steam needs — like ethanol plants — CHP can be a very efficient source of energy."

A CHP system involves a motor or turbine operated by fuel. The motor generates electricity to serve the plant's electrical needs. A portion of the excess heat produced by the motor is captured by heat exchangers and generators to meet a plant's need for steam. The result: less reliance on the electrical grid, less waste of valuable heat, and more savings. Industries where CHP is used include agriculture, such as dairy farms that capture methane from manure to provide energy; manufacturing facilities with high steam loads like breweries, pulp mills, and refineries; and service facilities like universities, hospitals, data centers, and schools, which need high steam and electricity for their long operating hours.

ADKINS ENERGY: A CHP SYSTEM AT WORK

Adkins Energy operates an ethanol plant in Lena, Illinois, a small town near the border of Wisconsin. Created by agricultural cooperatives, Adkins' plant produces approximately 45 million gallons of corn ethanol each year. In 2002, Adkins installed a CHP system. "We are very happy with the system," says Adkins general manager, Ray Baker. "It has provided us significant cost savings, allowed us to reduce emissions and has given us a reliable and consistent electrical source for operations."

Adkins' five-megawatt combustion turbine provides approximately 99 percent of the plant's electrical requirements, and the heat recovery steam generator captures nearly 26,000 pounds per hour of steam, supplying about one-third of Adkins' steam needs. The steam is used in cooking the ground corn and drying the animal feed produced as a byproduct of the ethanol process. Ethanol plants, such as Adkins, are increasingly using the grain residues to produce distillers' grains, which are sold as livestock feed. Mueller

estimates that a 100 million gallon-per-year ethanol plant might derive up to 13 percent of its revenues from selling the feed.

The \$3 million system is estimated to pay for itself in three to four years. "We estimate that we use approximately 15 percent less fuel to run the plant than typical onsite thermal generation and purchased electricity," explains Baker. Adkins maintains an electrical hookup to the grid, allowing for uninterrupted ethanol production should the CHP system be down for maintenance. The CHP system allows production to continue during electricity outages.



ETHANOL'S EFFICIENCY HORIZONS

Ethanol production can use CHP very effectively, Mueller says. He estimates that 15 percent of ethanol plants nationwide use a CHP system. "You have to size it right," he cautions. "It's not a good fit for every ethanol plant." Mueller notes that between 2001 and 2008, efficiency improvements in the ethanol industry—including CHP—have reduced the heat needed to produce a gallon of corn ethanol by 28 percent and reduced the electricity needed by 32 percent.

He believes that companies like Adkins will continue this efficiency trend. "I think the ethanol industry is very green," he explains. With new technologies—including efficient heat exchangers, waste heat recovery and highly efficient motors, pumps, and fans—on the horizon, there's a lot of room for improvement. "Ethanol is a relatively young industry, meaning that there is a natural tendency to try out new technologies," Mueller adds. "Producers are really striving to optimize the technology."

For more information, contact Ray Baker at (815) 369-9173 x 223 or rbaker@adkinsenergy.com.