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Caldwell Energy Holds Power  
Louisville company helps generators produce more

By Bill Wolfe  
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Caldwell Energy Company has a cool recipe for getting more electricity out of generators: just add ice.

The 7-year-old Louisville company has chiseled out a market for itself with technology that can make turbine generators crank out a quarter more electric power on hot days.

The basic formula – chilling the air used in combustion – isn't really a secret. Every runner knows that it's harder to catch your breath on a muggy summer day than on a brisk fall morning. Turbines face the same problem.

“On a hot day, there's not as much oxygen in the air,” says John Kraft, president of Caldwell. “You can lose as much as 25 percent of your output.”

Heading into the winter months, generating plants aren't facing the problems that they did last summer. But it's on those sultry, summer days when electric use peaks that any drop-off in production can pose a problem.

“When you are in that situation where you are nearing peak load, every megawatt is valuable to you,” said Doug Bennett, spokesman for LG&E Energy Corp., which uses Caldwell Energy coolers at the Kentucky Utilities E.W. Brown Generating Station in Burgin, KY.

The E.W. Brown turbine generators are natural gas-fueled peakers, used only when temperatures hit 87 degrees, energy demand is high and the coal-fired generators need a helping hand.

The “thermal energy storage” units chill the intake air using 4.5 million gallons of ice – enough to last about four hours serving five of the six turbines there. In the evening, when the temperature and demand fall, the water is refrozen for the next use.

The tanks are so well insulated that “you get virtually no melting,” when not in use, Kraft said. “You might lose 1 percent of your ice in a month.”

The ice units work well for plants like E.W. Brown, Kraft said, but some utilities use turbine generators constantly, and they need nearly fulltime cooling. When that's the case, Caldwell can design cooling systems that operate like large air conditioners, as well as fogging systems that cool by spraying an atomized mist of water into the turbine air intake.

The company's latest technology involves “wet compression” – injecting a heavier spray of mist directly into the engine. Caldwell Energy got its start in 1995 as an offshoot of Caldwell Tanks,

the Louisville company that has been in business since 1887, designing and building elevated and ground storage tanks. Kraft went to work for Caldwell Tanks after graduating from Purdue University as a design engineer in 1990. His interest in intake cooling rose from work to develop an ice tank for a cooling system in Texas. Some engineers from the Henry Vogt Machine Co., which was manufacturing the ice-making machinery, and engineers from Caldwell Tanks saw a potential for a company that would employ both lines of expertise.

“We spent our first six months – five of us on the phone – calling power plants...just educating people on this technology,” Kraft said.

Now with 11 employees, Caldwell Energy doesn’t manufacture the cooling equipment. Instead, it designs, engineers and sells systems made up of equipment made by others. Construction and installation are handled mostly by subcontractors.

“We can run high volume – tens of millions of dollars – with a small staff,” Kraft said.

Caldwell Energy was founded as a subsidiary of the Caldwell Group and was a sister company to Caldwell Tanks. In August, it split off as a separate company but still shares a building with Caldwell Tanks at 4020 Tower Road.

Most of Caldwell Energy’s work has been with gas turbine engines, but it also developed a fogging system for a coal-fired plant owned by American Engine Power in Virginia, Kraft said.

“It worked well, and we’ll probably be offering that in the future to the coal industry,” he said.

The company’s future is bright, Kraft believes, partly because it can help companies increase available power without building new plants – or importing power from other regions. That, he said, could help prevent another blackout like the one that briefly crippled the Northeast last summer. With more local power, he said, “Maybe you don’t need to strain the lines that much.”

Retrofitting an existing plant with an intake-cooling system is a lot cheaper and faster than building new generating plants, Kraft said. “You can’t build a power plant in a six-month period, but I can provide equipment to get you 10 to 25 percent more power output from your existing equipment” in that period.

Building a new coal-fired plant can cost up to \$1,000 for each kilowatt of power it will produce, Kraft said. Caldwell Energy can boost production with a capital outlay of as little as \$70 per kilowatt, Kraft said.

The cost of the cooling units depends on the size of the power plant and the type of cooling needed. A fogging unit might go for \$75,000, while large thermal-storage systems have gone for as much as \$25 million.

So far, Kraft said, “We have provided over 1,200 megawatts of additional power generation on 150 combustion turbines.” The company plans to bring three chiller units online soon at a plant near Hilton Head, S.C. he said.

Inlet cooling technology has been around since 1985, said Dharam Punwani, president of Naperville, Ill., and a founding member of the Turbine Inlet Cooling Association. Interest picked up in the mid-1990s, as prices for electricity rose and power companies began boosting generating capacity. Opposition to inlet cooling has come mainly from companies that build and sell generating turbines, he said. "They would rather sell higher capacity turbines that are not cooled. But then you have a lot of capital that is not being productive," he said.

The inlet-cooling business has cooled considerably since the collapse of Enron, Kraft said. At that time, power companies were enjoying high peak-demand prices for electricity, and were snapping up new generating turbines to increase their output.

Toward the end of 2001, "the market crashed," he said. "Over the past two years, we have seen a very significant slide on our product."

Caldwell Energy trimmed its staff by five late last year, but has been working to expand overseas. Its systems are operating in Australia, Switzerland, Thailand and Mexico.

"We really started that focus," Kraft said, "fortunately, before the collapse of the market here."