GE Energy

case study

Poet Drives Conversion

Engineers at POET, one of the leading biorefiners in the country, determined that the rate of flow through heat exchangers during a critical stage of the ethanol production process was too high, reducing the efficiency of the exchangers and wasting energy. As part of the company's "Ingreenuity" program, POET worked with Malloy Electric to replace the soft starters with GE AF-6 variable frequency drives at its Jewell, Iowa, refinery. After running the numbers, POET determined that payback on their investment was exceptional. Sixteen other plants in their system have upgraded or are in the process of upgrading their pumping systems

Building the Biorefinery of the Future

POET is one of the top two leading ethanol companies in the United States. It produces more than 1.6 billion gallons of ethanol a year at 27 ethanol plants it owns or manages across the Midwest. It is also a pioneering biorefiner, finding new and more effective ways to transform corn and other plants into fuel and chemicals that until now have come exclusively from refining petroleum. In addition to ethanol, POET's refineries now generate high-protein animal feed, oils that can be used for biodiesel and feed ingredients, and proteins for films, adhesives, and coatings.

Photo courtesy of POET

The AF-600 FP™ Fan & Pump Drive

The AF-600 FP drive has been optimized for the range of variable torque applications, including fans, compressors, and pumps. Its size makes it easy to mount in a control panel, and its dedicated features include sophisticated controls that make it a perfect match for HVAC and pumping solutions.

AF-600 FP™ Fan & Pump Drive Features

- Built-in Communication Networks for ModBus RTU, Metasys N2 and Apogee FLN P1
- Field Installed Network Options: BACnet, LonWorks, Profibus DP, Profinet, Modbus TCP/IP, EtherNet/IP and DeviceNet
- Self protecting features
- 110% current overload for 1 minute
- Flying start (catch a spinning motor)
- Precise stop function
- Electronic thermal overload
- Easy to use PC software
- Energy monitoring feature
- Flow compensation
- Pump cascade controller
- Sleep mode
- Automated resonance monitoring
- Fan belt monitoring
- Stairwell pressurization
- Fire override mode
- Standards: CE, UL, cUL, C-Tick

imagination at work

At the same time, POET is determined to produce ethanol and these other biorefined products in ways that have the smallest possible environmental footprint. It has made a priority of further reducing water use per gallon of ethanol produced and lowering the greenhouse gas intensity of its biorefinery operations. The company calls this initiative 'Ingreenuity."

In short, POET is a company that focuses on process as well as product excellence. "Unlike other ethanol producers, who mostly operate plants, we are deeply involved all along the value chain," says Nathan Schock, POET's director of public affairs and corporate responsibility. "We typically find a location, design the plant, and act as the general contractor. Because we will operate the plant, we have an incentive to make it as efficient as possible."

Even after a refinery goes online, POET engineers continually reexamine it, looking to wring ever greater efficiencies and cost savings from the process. "We collect thousands of data points each day across all of our ethanol plants," Schock says. "As a result, we have a good idea where energy is being used and where the opportunities lie to reduce consumption."

The Challenge: Matching the Equipment to the Process

One area that POET zeroed in on was their heat exchangers. Fermentation is at the heart of the ethanol refining process—and fermentation produces heat. POET grinds corn kernels into a fine powder and adds enzymes and water to convert the starch into simple sugars. When yeast is added to the mash, fermentation begins. The yeast converts these sugars to ethanol and carbon dioxide, a process that generates heat. To ensure proper temperature, the mash is cooled by pumping it though heat exchangers.

When fermentation is complete, it is critical to pump the mash from the containers as quickly as possible, and so the pumps were set for high flow. The problem that Alan Marsh, a POET engineer, and his colleagues noted was that there was no way to adjust the flow to conform to the lower flow rating of the heat exchangers and then increase the flow when time came to empty the tanks.

As a result, heat transfer at the heat exchangers was less than optimal, and running the pumps at higher-than-needed flow was wasting significant energy.

The Solution: GE AF-6 Series Variable Frequency Drives

Marsh conferred with Bob Jacobson, the general manager of Malloy Electric in Sioux Falls, South Dakota. Jacobson has worked with POET for more than 14 years, and Malloy is a GE distributor. "Alan had calculated that running the pumps at the correct speed for the exchangers would reduce energy consumption by 30 percent," Jacobson says. "When you figure that fermentation lasts for 60-to-70 hours, you can see that the savings would be considerable." Jacobson worked with Marsh to figure out how they could modify their motor control centers and to select replacement equipment.

The obvious choice for Jacobson was GE's AF-6 variable frequency drives. Because POET already had GE drives and motors in place, going with a GE solution made good sense, but as Jacobson notes, "These are compact drives that are easy to mount and that come with a sophisticated feature set."

POET started with its refinery in Jewell, Iowa. After running the numbers, POET determined that payback on their investment was exceptional. Currently 16 of POET's refineries have either replaced their existing soft starters with AF-6 variable frequency drives or are in the process of doing so. Malloy installs the drives during the refineries' scheduled downtime, replacing as many as five soft starters with drives in a day.

The drop in energy use has been dramatic. When the new drives were installed at the Jewell refinery, amperage on the motors used to pump the mash through the heat exchangers dropped from 210A to 145A, inadvertently setting off alarms on POET's DCS system. "If current on a pump drops, the system automatically assumes the impeller or the shaft broke, though in this case everything was working perfectly," Jacobson says. "We now advise POET to reset the trigger point on the system before we begin work."

The Takeaway: When the Numbers Add Up, Don't Wait to Act

The GE soft starters that POET was using to drive its pump motors were in perfect working order and still under warranty when POET retired them. The company might have chosen to wait for their existing equipment to fail before capitalizing on the energy savings from the variable frequency drives—but as Jacobson observes, upgrades during an emergency almost never happen. When equipment fails, companies look for a quick fix to minimize down-time—and that usually means a simple replacement.

And this kind of fire drill is not in the POET playbook. "From our perspective, waiting for failure is never an option," Schock says. "We simply can't afford the downtime. We've always got to be a step ahead." POET decided that as long as it had the necessary cash flow, the sooner it acted the better. Thanks to the new drives, the company is already saving hundreds of thousands of dollars in energy costs each year.

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