



## Investor News & Views

# AEMETIS

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### Striving For Clean, Infection-Free Ethanol Production

*Ethanol Producer Magazine Excerpt*

By Susanne Retka Schill | December 23, 2015

In the ethanol industry, having a reputation as a clean plant goes far beyond clean floors and all-around tidiness. Clean means infection free—quite a feat for plants that have ideal conditions for microbial growth. The goal, of course, is to maximize the growth and output of ethanol-producing yeast and minimize bacteria growth. *Ethanol Producer Magazine* talked to Aemetis Advanced Fuels managers to learn what helped them accomplish that feat.

In California, the team at *Aemetis Advanced Fuels* took advantage of a prolonged shutdown to make several modifications shortly after the plant started up in 2008. That resulted in plant operations requiring minimal maintenance downtime and where infections are almost nonexistent.

#### California Clean

Aemetis is a unique plant—the first Praj Industries-designed plant to be built in the U.S. While Praj designed more than 300 plants worldwide, converting sugar to ethanol, this was the company's first grain-based plant in the U.S. Jarret Hollis, plant general manager, explains the distillation, dehydration and evaporation systems are quite robust. However, in the few months the plant ran after the original developers started it up in 2008, the operators decided several modifications would make the front end run more smoothly. Aemetis first leased, then purchased the plant. Hollis and senior engineering vice president, Mike Rosa, sat down to design the improvements completed over the next couple of years. It restarted in April 2011.

On the top of the list was a better clean in place (CIP) system for the fermenters. "Our fermenters are unusually large, 1.1 million gallons, each," Hollis explains. Rosa redesigned a CIP flushing system with 16 spray nozzles used to clean the fermenters with hot water. The vigorous cleaning leaves no residues, Hollis says. "One of the biggest problems I've experienced in the past is being able to get a fermenter completely clean. With those fermenters whisper clean every time, there is not an issue with infections."

Other changes included removing piping deadlegs, with a particular focus on the mash fill line, plus more powerful pumps to get the correct reverse flow for cleaning heat exchangers. "It has been very beneficial and worked very well," Hollis says.

The design tweaks went even further. “The next thing that was done to conserve chemical cost was an air purge. Every time we do a caustic wash or acid wash, we purge that line with air to push the liquids back to the reserve tank instead of flushing with water and diluting them,” he says. “We’ve gone from one tanker of caustic every seven to 10 days to one every six weeks.” Then, the company enlisted the aid of software developers to fully automate the CIP process, greatly reducing the chance for human error.

Finally, several changes were made to the process itself to simplify and reduce areas of potential contamination. Hollis explains they removed the hydroheater, cook tube and flash tank.

“We also discovered that the unique design of our plant and the size of our fermenters requires longer fill times,” he says. “Dry pitching the yeast worked as well or better for us than propagation. Cook to ferm is now a simple process—no hydroheater, no cook tube, no flash vessel and no propagation. Chances for contamination are greatly reduced.”

“It did create another issue because the plant runs in near aseptic mode due to an elevated pH,” Hollis adds. “There’s a little more chemistry occurring because we don’t have the low pH returning in the backset. We have to lower the pH of our mash so the yeast will ferment properly.” Eliminating infections has also meant the Aemetis team can focus on pinpointing and minimizing other stresses to yeast.

The modifications at Aemetis accomplished another goal—creating a process with minimal downtime for routine maintenance. Rosa, with 40 years of experience in the dairy industry, was accustomed to the idea that a facility needs to be cleaned and maintained without shutdowns. After all, cows do not handle missed milkings. Aemetis went 18 months after restarting in 2011 without a shutdown, but has since decided to plan one day a year to go offline for certain maintenance. This year’s shutdown in April lasted 12 hours.

One reason for the minimal downtime is the plant’s robust distillation, dehydration and evaporation system. “Our distillation system is all direct heat, there are no heat exchangers,” Hollis explains. The evaporators operate at around 32 psi steam pressure, thus minimizing the tendency for burn on. The evaporator system is designed so one or two units can be taken offline for CIP without losing production capacity. “We’re cleaning two to three units every week on a rolling basis,” Hollis says. “It’s been about a year and half since we’ve had to hydroblast any vessels.”

Another benefit of the redesigned process is the backset is recycled without any type of treatment. “It’s just a straight run back,” Hollis says. “It’s been a very successful move and has really simplified the system. We’ve discovered the cleaner it is, the more useable the byproducts of the yeast are—the amino acids, sterols and FAN [nitrogen] can be better utilized. We run a slightly higher backset because it’s beneficial to the yeast. And we have a very low salt content because of the reduction of chemicals being used in the plant.”

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