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RECONDITIONING



INSIDE STORY: As ethanol plants reach the 10-year mark, the ceramic media inside the regenerative thermal oxidizer can become plugged and need replacement.

PHOTO: DURR

The Inside Story

Examining the state of affairs with repairs for three critical pieces of equipment in the back end of the ethanol process.

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Flottweg
Separation Technology

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Keeping plants running with minimal downtime is no small feat. Maintenance teams work hard to keep ahead of bearing wear and other routine upkeep, looking for indications of systems that may need more extensive reconditioning. Most plants schedule downtime in the spring and fall for cleaning and repairs, with one eye on keeping equipment in top condition and the other on keeping costs down. *Ethanol Producer Magazine* looks at three critical systems—centrifuges, dryers and RTOs (regenerative thermal oxidizers)—to learn about the challenge of keeping ethanol plants up and running. Each system has unique challenges in the types of needed repairs and in how the companies doing the rebuilds work with plants.

The centrifuges that separate whole stillage into liquids and solids ahead of the dryers get a workout. Hundreds or even thousands of gallons a minute of hot stillage, typically 185 degrees Fahrenheit, move through the centrifuges for dewatering. “The rotating assemblies weigh between 5,000 and 10,000 pounds and can spin at 3,000 to 4,000 RPM,” says Dan Ellis, president of Flottweg Separation Technology Inc. “You have high solids and high temperatures—it’s a high-demand application in all aspects.”

“We tell customers, if you want the maximum availability and reliability, it has to be a two-way working relationship. We look at their facility and how they have to

run it, and they work with us on our recommendations on how to best run the machine,” Ellis says. Startup and shutdown procedures are important to do correctly. Timely cleaning and close attention to how the unit sounds while running are important and, at least once a shift, operating data should be recorded. “Over the years, we’ve trended critical variables so you can predict when the unit should be rebuilt,” he says. Flottweg recommends rebuilds be planned every 12 to 18 months due to the demanding operating conditions. Most plants run multiple units and keep a spare on hand so one centrifuge can be taken down and switched out while the plant is running.

Ellis is a firm believer that plants should work with the original equipment manufacturer (OEM) for repairs. “Nobody knows the equipment as well as the OEM,” he says. Going with other shops may save money on the initial repair, he admits, but unsatisfactory repairs begin to multiply problems. “You never bring it back up to full OEM operating specs, so each time you do the repair it gets progressively worse. If it gets to a certain condition, you have to get a very expensive repair to get all the machine components back to OEM specs.” Maintaining proper tolerances is especially important, for example, and somewhat tricky as the metal components in the high-speed rotating equipment expand with the hot stillage flows.

Flottweg may be unusual in setting a goal of retaining 80 percent of the after

service for the equipment it sells, Ellis says. And, in an age where many companies trim inventories to the minimum, he is committed to keeping replacement parts on hand for all machines. “A big thing with us is making sure that regardless of the part size or cost, if somebody does have a failure, a quality repair can be done as quickly as possible.”

The average lifespan of a centrifuge is 20 to 25 years, and it’s not uncommon to service machines that are more than 30 years old, Ellis says. Working with the OEM helps with reaching the maximum lifespan. Another advantage of working with OEMs, he adds, is that new features can be incorporated. His company, for instance, has developed a Recuvane system that recovers energy from the liquid discharge to reduce power consumption in each machine by 13 to 18 percent and a new scroll design is coming out that increases performance capacity while minimizing vibration issues to increase mechanical viability.

Dryers

The situation for major dryer repairs is very different from centrifuges. For one, there aren’t multiple units, with a spare kept on hand. Some plants do have two dryers, but if one is shut down for unplanned repairs, the plant has to cut production, says Bill O’Connor, president of O’Connor Kiln & Dryer Inc. As plants reach the 10-year mark, the big challenge is reconditioning dryers in the time allotted. “Typically an ethanol plant has a yearly shut-down for

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five to 10 days, but the refurbishing can't be completed on the big dryers in that amount of time," O'Connor says. "We do the best we can with the time they allow us and come back in another year to do a little more, to keep them running the best we can. It's very challenging. Sometimes I make a bid and we've got five days, then we run into all sorts of unseen stuff. Then I go confront them about it and we decide let's do this and this. At the end of five days, we pull everything out and start up, whether we're finished or not."

The pressure to keep the plant running can be detrimental, O'Connor says. The internal flighting, for example, can break loose and start flopping around. If plants don't shut down to investigate, the loose parts not only damage the inside of the dryer drum, but can seriously damage the screw. The worst cases, though, are when plants experience dryer fires. "A fire inside is hard to put out," he says, "and when the fire fighters come, they start hosing down the outside." The result can be severely warped metal.

Over the years, he's seen a variety of issues with DDGS dryers when it comes time for major repairs. When some plants were built, the dryer was put in place and the building constructed around it with minimal working space inside. He has seen poorly designed pier mounts and improperly aligned systems. With a rotating drum that's large enough for a man to stand inside, major issues can develop as the system begins to wear. "With a rotary dryer



REBUILDERS: Ethanol plants send their centrifuges in to the shop for refurbishment. Given the demanding conditions in plants, Flottweg recommends it be done every 12 to 18 months.

PHOTOS: FLOTTWEG

you have a big steel ring that goes around the outside of drum, which I call the tire. Then to run your tire on, you've got rollers underneath called the trunnions." Whenever the trunnions are changed out, the slope of the drum must be correctly maintained. "The alignment of these things is real crucial," O'Connor says.

"Most plants do pretty dang good watching [their dryers]," he says, although he adds most also don't totally understand how to properly set them. "Everything they do is in a big, mad hurry. If they lose a bearing or got to change a trunnion, they

want it done in five minutes, which is impossible. You have to jack it up, take the old one out and put the new one in." Then there's the temptation to start it up again without properly checking everything. "As soon as they get the base bolts in and the bearings tightened down, they start it up and run. Sometimes it can run too hard up or down against the thrush rollers and you can start tearing the thrush rollers or the tire, and you've got to replace it—it's a big challenge out there."

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RTO

A system next in line behind the dryers presents an equally big challenge to refurbish when the time comes. The regenerative thermal oxidizer burns off the volatile organic compounds (VOCs) contained in the exhaust air coming off the dryers. A primary air pollution abatement system, the RTO insures the exhaust coming out of the plant's stack is virtually pure steam. RTOs are huge systems that can tower five-stories high with a footprint of 30 by 100 feet in a large plant.

As many plants approach the decade mark in operations, the ceramic media inside the RTO is plugging, explains David Sorensen, senior key account manager at Durr Systems Inc.' Clean Technology Systems. "The purpose of the media is to store energy," he explains. Combustion burners start the reaction, heating the air stream coming off the dryer to temperatures of 1,500 to 1,600 degrees Fahrenheit needed to oxidize the VOCs. The heated airstream passes through the media which stores the energy, regenerating the reaction to continue VOC destruction.

Most RTOs have the ability to bake-out, much like a self-cleaning household oven burns up deposits leaving a residual ash. "In the RTO, over time, that residual ash gets built up in the media and can't be baked out," Sorensen says. "The material has already been oxidized and that's where the plugging begins to occur over years of operation."

While changing out the media is a big expense, there are advantages to installing the new media that has been developed since the days when most RTOs in the ethanol industry were installed. "Right now there are more efficient media that have better heat transfer rates," Sorensen says. While an improvement from 92 percent to 95 percent or better may not seem like much, he says, "With Thermal efficiency, the percentage isn't linear to cost savings—two points could be a 15 percent operational cost savings."

As with dryer refurbishments, the big challenge is accomplishing the RTO reconditioning during the allotted time. "It's always a challenge. Once you've removed all the old media, there's usually a surprise or

two that you find. It puts additional pressure on us to resolve the issue and have an engineered fix and still maintain the schedule. No one wants to go to a plant manager and tell them I need two more days. It's just not acceptable."

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