

# WASHING OUT ENERGY COSTS

One integrated pulp and paper manufacturer was able to reap big energy savings by applying multivariable control technology to its pulp washing process. **By Wes Iversen, Managing Editor**

**The pulp and paper industry is one of the nation's most energy-intensive manufacturing sectors**—accounting for more than 15 percent of all U.S. manufacturing energy use, according to U.S. Department of Energy reports. So when a pulp and paper manufacturer finds a way to reap significant energy cost savings, while at the same time increasing the overall sophistication of its automation and control systems, that's a noteworthy achievement.

"This is a big deal for us," confirms Matt Hinck, regarding his company's recent \$150,000 investment in a new multivariable controls application for its pulp mill. The investment produced savings of more than \$500,000 per year in energy costs, says Hinck, who is fiber processing manager at Simpson Tacoma Kraft Co. LLC, a Tacoma, Wash.-based subsidiary of Simpson Paper Co., an integrated pulp and paper manufacturer. Further, the new application also provided "a huge leap forward" in the stability of Simpson Tacoma's pulp washing process, Hinck adds, thanks to the sophistication of the new controls technology—which was provided by Phoenix-based Honeywell Process Solutions.

Simpson Tacoma is now planning to apply the same kind of technology to other portions of its plant. "You're not going to hit a home run like that every time, but if you can get even half the savings, you'd still have a very successful project," Hinck observes.

## PULP AND LIQUOR

For Simpson Tacoma, the opportunity to make dramatic improvements in its pulp washing process came early last year, after the company expanded the capacity of its washer line to accommodate new tonnage transferred from an old line that was being shut down. As part of the project, Simpson Tacoma boosted the size of its Chemi-Washer, a pulp washing machine supplied by Kadant Black Clawson, based in Mason, Ohio.

In the pulp-making process, the Chemi-Washer's function is the separation of the wood fiber material that is used to make paper, from the so-called "black liquor" produced when wood chips are "digested" under high temperature and pressure using chemicals. The digestion process separates the lignin—which functions as a binding agent in wood—from the useful fiber.

"Approximately half of the weight of the wood is composed of lignin compounds. The other half is useful pulp fiber," says Hinck. "So as the pulp comes out of the digester, now you've dissolved the lignin into this cooking liquor, and you have to separate and wash the lignin, or liquor, away from the wood pulp. And that's what the Chemi-Washer does."

Within the Chemi-Washer, the pulp and black liquor mixture from the digester is spread atop a screen called a deck, says Hinck, which is moved underneath a series of five recirculating washing stages. Each washing stage encompasses a pipe, or "shower bar," he explains, that pours water evenly across the sheet of material, pushing the lignin and spent organic chemicals down through the screen, with a vacuum assist from beneath the deck.

Clean, recycled water is added to the last washing stage, and is recirculated through the four earlier wash stages.

At the end of the washing process, the cleaned pulp is collected from the deck for use in paper making. The black liquor is collected from underneath the deck, and is shipped to another area where it is concentrated and burned to produce energy. "The lignin has a lot of energy in it, so if you concentrate it by driving off the water, then you can burn it to produce steam and energy that you can use to keep the plant going," says Hinck.

rate a nine-by-20 meter deck, up from six-by-20 meters previously. But by March, it was evident that the company was not achieving its efficiency goal for the newly expanded washer, in terms of the ratio of wash water used to the amount of pulp fiber processed, Hinck relates.

That's when Simpson Tacoma turned to Honeywell for help. The mill was already using a Honeywell TDC 3000 distributed control system for the Chemi-Washer. But control was highly operator dependent.

Operators were required to manually regulate a number of variables. By watch-

counting on the operators to watch seven or eight things and make changes to keep the process under control," says Hinck. The result was not only higher-than-desirable water usage rates, but also "a lot of instability in our process induced by decisions that the operators were making."

Honeywell engineers attacked the problem with an application known as Profit Controller, a multivariable control and optimization application used for complex and highly interactive industrial processes. "The nice thing about multivariable control is that it can look at not just one variable and make a



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The Chemi-Washer (shown here) uses large volumes of water to separate useful wood fiber from the "black liquor" produced when wood chips are cooked or "digested." By using multivariable controls from Honeywell, Simpson Tacoma was able to reduce water usage from 1,220 gallons per minute to about 1,100 gallons per minute.



There are two primary goals for the washing process, says Hinck. "You want to get all of the liquor out, because the more liquor you recover, the more energy you can get out of the recovery boiler." The second goal is to use the least amount of water possible during the washing process, while still cleaning the pulp. "The more water you use, the more water that has to be evaporated out of the liquor before it can be burned in the boiler," Hinck explains. And that means more money must be spent on oil, natural gas or other fuels to produce the steam that is used to drive the evaporation process.

In January last year, Simpson Tacoma expanded its Chemi-Washer to incorpo-

ing a meter indicating the cleanliness of the pulp stock coming off the machine, for example, an operator could tell when more wash water was needed. "But the problem was that the operator can't always watch it, because we want him to go and do other things," says Hinck. "So human nature takes hold. If I know I need 1,000 gallons a minute, I'll add 1,100 gallons so I know that it will work right while I'm out of the room," Hinck explains. "And that's what was happening a lot."

Other operator-controlled variables included the washer production rate, vacuum levels for each wash stage and selection of different valves and water sources based on operating conditions. "We were

response, but it can look at 10 variables and make three responses at the same time," as Hinck puts it. "So it's a multiple input, multiple output controller."

The results were dramatic. By using the Honeywell Profit Controller application to automate control of the many variables in the Chemi-Washer process, Simpson Tacoma was able to reduce water usage by nearly 11 percent, from about 1,220 gallons per minute to an average of about 1,100 gallons per minute, says Hinck. That translates to an energy cost savings of "well over a half million dollars a year," Hinck notes, by reducing the amount of water that must later be evaporated, and therefore reducing the amount of steam production needed to make the evaporation happen.

"The energy savings are great for us," Hinck says. But he is quick to add that another big benefit is the ability of the Profit Controller application to truly automate the Chemi-Washer operation. "It took a process that was very operator-dependent and somewhat unstable, and made it a very operator-independent process, and a very stable one."

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