

Energy-efficient LEVELING

Installing an e-Drive leveler can reduce companies' power expenses by 50 percent and provide completely flat material for secondary processing

BY LAUREN DUENSING

In the August 2009 issue, *Modern Metals* covered a recently introduced technology from The Bradbury Co. Inc., Moundridge, Kan. These patent-pending technologies, trade-named and registered e-Drive, have the ability to produce predictably flat or Process Flat material by using separate entry and exit motors.

"The entry motor powers the rolls within the 'plunge' region of the leveler where yielding of the material occurs, reaching plastification," says Brownie Cox, senior sales adviser, flat products for The Bradbury Co. "A second exit motor is employed at a slightly greater speed, and the material is pulled out of the leveler. This pulling action provides concentrated tension to the strip at the point of plastification."

Cox says the traditional view of leveling is that it reduces internal stress. "However, it is the equalization of residual stress that reduces the effect of twist or bow in a finished part," he points out. "If the stress on the top of the sheet is equal to the stress on the bottom of the sheet, the memory is neutralized and the parts cut from that sheet will remain flat."

Additional testing

For the past year, Bradbury has continued to test the e-Drive technology and has partnered with Lambda Research Laboratories, Cincinnati, to verify the results.

A 0.135-inch-by-60-inch, 40,000-pound coil of hot band with 60,000 pounds per square inch yield strength was used for testing. “The outer half of the coil was temper passed and separated, leaving two individual coils from the same master coil,” Cox says. “The intention of the test was to evaluate various leveling processes and their effect on residual stress on the material with and without additional leveling processes. After separating the coil into halves, the material was shipped around the country, and samples were collected from a conventional roller leveler, a stretcher leveler, a stretcher together with a roller leveler and the Bradbury e-Drive leveling system.”

The samples were then sent to Lambda Research to test the residual stress using Lambda’s custom-built X-ray diffraction measurement devices.

Using a single coil to test the different leveling processes “eliminated material from the equation and allowed each type of system to be judged on its own merits,” Cox says. “The internal tension applied by the e-Drive reduced the spring-back of the strip more than conventional leveling or stretcher leveling. Only when both of those leveling types were combined was the test slightly better than the e-Drive.”

In addition, for the testing to be effective, “we had to develop a way to measure the stress that is in a strip of material,” says Greg Smith, senior manager of engineering for Bradbury. “We established a test procedure to measure residual stress to prove that we could supply ‘laser flat’ material and to understand why it remains flat. We found that flat sheets had equal stress on both the top and bottom of the sheet in all directions. When the stress on both top and bottom are equal, the sheets remain flat after being post processed.”



Saving energy saves money

The testing of the increased efficiency of the motor and drives compared with a conventional leveler also proved that e-Drive provides companies with a significant reduction in power consumption.

“We knew we’d have a reduction in power usage, but not to the extent our testing has shown,” Smith says. “This has been

an added benefit of this green system.”

“Our research has proven that in the past, almost half of the energy used in leveling was consumed in the gearbox,” Cox says. “Our e-Drive is easily 50 percent more efficient than old levelers, and it is producing better-quality steel.

“Using two motors requires the exit motor to pull faster than the entry motor,”



The e-Drive technology provides consistently flat sheets for high-quality laser cuts.

he continues. “In principle, the entry motor is a brake. The braking action has a generating effect, and we are producing about 40 percent of the energy required. This energy is fed back into the motor doing the work. The payback is long-term energy savings and being a good environmental partner.”

“The ability to distribute power where it

is needed through independent motors and a specially designed drive train allowed for control of the entry and exit speed of the material,” Smith adds. “Being able to control the entry and exit speed independently compensates for the dynamics that take place in the leveling process. For example, the distance the material travels at the entry end varies from the exit end; the harder the material is worked, the greater this difference becomes.

“Additionally, this control is used to induce tension leveling in the material, further reducing the internal stresses,” he continues. “During our testing, we realized by inducing tension, we also created excess energy that needed to either be dissipated as heat by use of dynamic brakes, or use it to power the system—a renewable energy source. From our testing, we have seen energy savings as high as 50 percent after the installation of the system. This holds true for new leveling systems as well as retrofits.”

This discovery can make a difference in a company’s bottom line. The savings start when an e-Drive is retrofitted to an existing line. “It’s a system that does not require a change in a customer’s existing footprint, so all other pieces of equipment can stay in the same place on the shop floor,” Smith says. “It is also a retrofit that can typically be done in a week, which reduces the downtime of the line.”

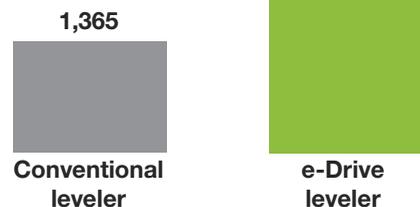
Once installed, the energy savings can be substantial. “Depending on [a company’s] location, there may be local or state incentives available for a reduction in energy consumption of an established plant,” he continues.

Northern Plains Steel, Fargo, N.D., a division of Owen Industries, recently installed an e-Drive on its existing Bradbury leveling line and has been monitoring the energy use. According to test results, the e-Drive produces 4,094 pounds of leveled steel per kilowatt hour, running three times the material for the same energy cost before the retrofit.

Another customer with a new e-Drive

e-Drive ENERGY EFFICIENCY

LEVELED POUNDS OF STEEL / KILOWATT HOUR



Source: The Bradbury Co. Inc.

received a \$5,000 refund from the power company for its reduced power usage. Later, the company’s cost per kilowatt hour was re-evaluated by the power company, and it lowered rates for the entire plant saving thousands of dollars per year.

Processing flat parts

A stack of cut steel sheets may look flat to the naked eye, but hidden stresses can cause the material to bow when plasma cutting or laser cutting parts.

“Like every market, there is a lot of competition, and you have to adapt to your customers’ needs as they change,” Smith says. “Service centers are requiring more than steel that simply will lay flat on a pallet. They require material that will continue to lay flat after it has been processed through a torch or laser.”

Northern Plains Steel was interested in “any new developments that could help with our customers’ requests for flatter, more consistent, laser-quality sheets,” says Mark Radke, vice president and general manager of Northern Plains Steel. “Bradbury’s suggestion was to look at the e-Drive. After testing sheets from an existing e-Drive, there was no question that Bradbury was on to something. When comparing the reduced cost of upgrading our current machine to purchasing new equipment, the decision was simple.”

Radke says Northern Plains Steel saw an immediate improvement in processed ma-



TO LEARN MORE

about the e-Drive process and view a full explanation of test results, visit www.modernmetals.com/leveling.

terial. “We were very impressed with the ease of operation, even with minimal operator training. The new material was ultra-flat, and the parts stayed that way after processing, even with very long, narrow parts cut the length of the sheet.”

Relying less on operator experience makes the e-Drive easy to use, as well as enables worry-free, lights-out operation.

“The e-Drive system is taking a lot of the guesswork out of the leveling process,” Smith says. “Our customers with e-Drive are relying less on the experience of the operator for effectively adjusting the leveler and more on the controller. You cannot replace the value of an experienced operator, but the technology is now available to make any operator more effective based on the material type being run versus the condition of the incoming material.”

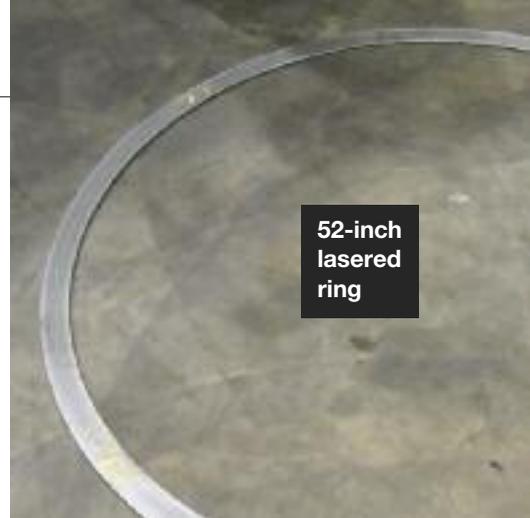
Reducing reliance on the operator ensures Bradbury’s customers can run lights out without worrying about the system. “We have had feedback from a customer that productivity on their laser has increased ap-

proximately 30 percent with the material being supplied off an e-Drive leveler,” Smith continues. “This has allowed them to run lights out with confidence.”

“The majority of our customers are laser houses,” Radke says. “In addition, we have six in-house lasers, and the e-Drive feeds these machines, also. Material flatness is a major issue when running lasers either on shift, lights out or if they are fed by a tower. Press brake variance is all but eliminated with the e-Drive material. Basically, if the material is not laser-quality flat, the material or the parts that are cut from it are not saleable.”

Radke’s external customers are “thrilled” with the flatness and shape of the material coming off the e-Drive. “Internally, we are greatly impressed with the flatness, increased laser speeds and increased press brake accuracy,” he says.

Increased accuracy means better pro-



52-inch lasered ring

ductivity, less scrap and the ability to reallocate resources within a company because of a decrease in customer complaints. One of the comments Cox continues to hear from e-Drive customers is that the phone no longer rings off the hook with regard to rejected material. ■

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Northern Plains Steel, Fargo, N.D., 800/342-4543, www.npsteel.com.

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