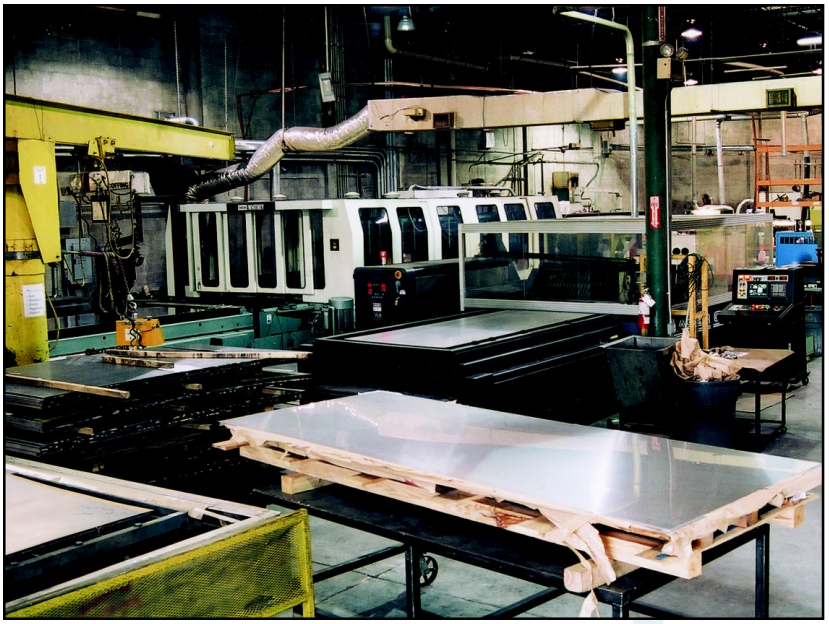
# Improved Controls Key To Thick-To-Thin Laser Cutting

**To meet the challenge of developing a laser cutting machine capable of cutting 1-¼ " stainless down to 22 ga. aluminum with a position accuracy of ±0.001" with speeds up to 7,000 ipm, the control was the critical element.**



**Whitney PlateLASER cuts up to 1-1/4" stainless steel at Lasertron, where it replaced two older lasers.**

When W.A. Whitney (Rockford, IL) embarked on the development of its PlateLASER, they sought to respond to an emerging market for a thick-to-thin laser cutter.

According to Whitney's Marketing Manager for Lasers, Rick Kosmala, "We had considerable plate experience with our laser and plasma technologies, but we saw an opportunity to develop a machine which could run the broader material gamut, in the downward direction."

But, rather than simply engineer a lower-powered laser, the company wanted to investigate ways to take a 6 kW cutter into the thinner material range, without creating the proverbial bull in a china shop. "We already had plate customers who were either passing up thin gauge jobs or immediately thinking they needed a different machine," notes Kosmala.

Some of the challenges Whitney faced included the need to vary assist gases, the wide speed ranges encountered, residual heat and "crater eruption" when piercing thick plate, automatic lens focal adjustment to accommodate the wide variety of materials processed and, of course, cost factors. "No machine then on the market had the ability to cut 1-1/4" down to 22 ga. aluminum with position accuracy to ±0.001" plus speeds to 7,000 ipm and we set these as our goals," added Kosmala.

### 7,000 ipm to 8 ipm

Software Engineers Jimmy Gay and Bill Long worked on the control challenges for Whitney. As Gay explained, "After we selected our laser/resonator supplier, we needed a third party with independent PC-based controls, capable of handling the linear motor drives, all the cutting and machine speeds from 7000 ipm down to 8 or 9 ipm with satisfactory accuracy and a flexible laser compile cycle to allow us a lot of different scenarios. We wanted, for example, the ability to create a control cycle for walk-away thin cuts, synchronous actions on contour cutting, varied laser power for cornering and piercing on a wide thickness range and more. These requirements left all but a handful of suppliers out of the running.

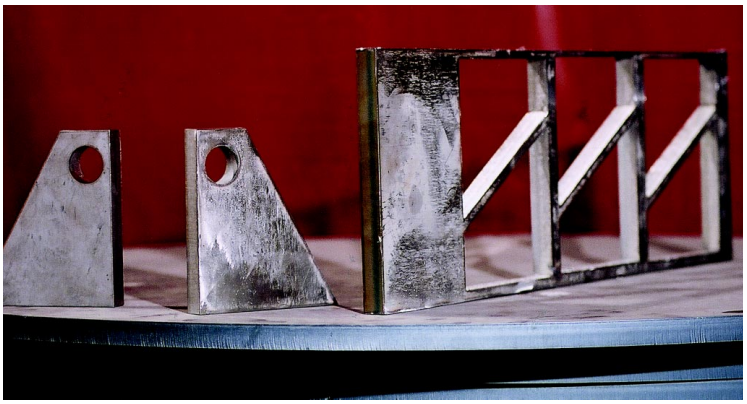
"When we added the 6-axis movement, a 7th-axis option, plus all the application engineering, service and next-day replacement part provisions, the field narrowed even further. In the end, only two were considered," said Gay.

After an intensive review, the decision was made to implement a Siemens Sinumerik 840D control package, as well as the company's direct drive linear motors on the PlateLASER.

"The PROFIBUS-DP interface allowed us to program the I/O schemes on the fly, making adjustments as our remaining curve dictated. This was only one of the Siemens features we found appealing," Gay noted, also citing the linear motor package as a deal-maker for this vendor.

One of Whitney's PlateLASER customers agreed with the control package upsides. Gary Geller, president of Lasertron (Sunrise, FL) observed, "The machine control takes a huge load off the operator, plus the program is simple, presented in plain language and features a terrific job parameter library. Focal length, nozzle and gas-assist pressures, contour and corner retrace, even frequency and duty cycles are all there in plain English form, for pre-production or in-process set-up and adjustment."

The PlateLASER control operates in Windows NT with a Pentium processor and 20 GB hard drive.



Holes "on the fly" and tight corners in thick plate are now possible by combining higher power with improved controls.

### Piercing Thick Stainless

"When you're piercing such a wide variety of materials and material thicknesses (Lasertron does 22 ga. carbon up to 1-1/4" stainless), you encounter myriad pierce point speeds and cutting conditions," Geller added. The adjustments we need to make on the fly are pretty incredible sometimes and the PlateLASER control handles them easily. We'll often go at 400 ipm on a straight cut, then ramp down to 75 ipm for an .050" dia. hole with no problem. Likewise, the holes in thick and especially stainless materials were always problematic for our older laser, which had less power and motion control."

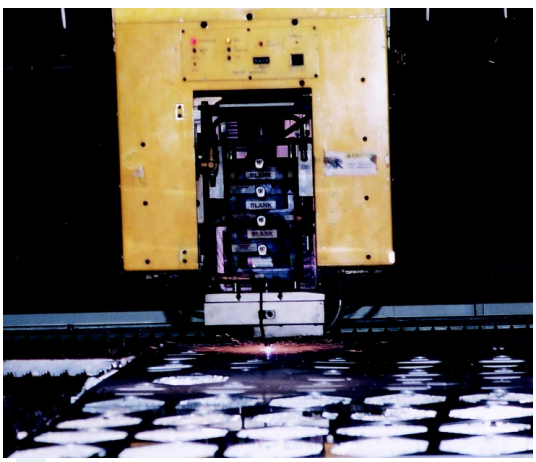
Lasertron also specializes in prototypes and some very large stainless pieces, made for Disney World amusement park. Though his PlateLASER was purchased for production cutting, the unique combination of power, size and speed were beneficial for Geller's overall product throughput. "The PlateLASER accommodates workpieces up to 80" x 160" and 4,600 lb., plus the dual shuttle tables are a real time saver.

At the heart of the machine, however, are the Whitney ILC (Intelligent Laser Control, featuring the Siemens CNC) and MPL (Material Parameter Library), according to Geller. "Our operators love the PlateLASER, because the precision results are so predictable. You get the same thing, time after time."

"With linear motor drives onboard, the machine motion keeps up with cutting speed, especially on thin materials, and that's critical to the use of this machine for such a broad spectrum of jobs," observed Kosmala.

Geller agreed. "We added the PlateLASER to our shop floor specifically to cut thick plate and large parts, which it does quite well. But, it also consistently cuts thin gauge parts we formerly processed on lower-powered lasers. Today, we use this machine for everything thicker than 1/4" carbon or 3/16" stainless. Everything," Geller emphasized.

"Thick and thin cut machines historically couldn't co-exist, because of the many differences in aperture, lens axis, focal point and beam delivery characteristics," elaborated Gay. "So, we needed to rely on a CNC supplier, who had expertise and the manufacturing flexibility to get us where we needed to go with the PlateLASER."



Linear drives make PlateLASER ideal for cutting thin sheet.

### One Master Module

"Our reputation for quality plate processing in the market has been established for years. We know there would be challenges because the size of the PlateLASER raises attendant stability issues, especially when the machine included our PlateHANDLER," Kosmala added. "The overall Siemens control and drives package was a real plus for the integration of all these components onto one master module. Customers have been most impressed."

Another practical advantage on big workpieces was made possible by the additional control afforded by the Siemens Sinumerik 840D, according to Gay.

"A retrace block search over a short section allows us to provide more precision in the cutting path, without always returning to the pierce point, as was the case with most previous machines. This results in a lot of auto start/stop functions, but the open architecture and controller power made it easy," Gay said.

"The combination of Siemens control and our in-house engineering resulted in a machine which can be entirely programmed off-line, then run with no operator on-screen editing," added Kosmala.

On the linear motion drives, he noted, "They have a real upside over a rack & pinion system, which wears faster and loses a lot of accuracy, resulting in downtime. And, in this arena of machines, downtime can have a severe impact on a company's profit picture. By partnering with Siemens, we've heightened reliability tremendously."

"Think of it this way," noted Gay, "We're talking about reductions in the pulsing in terms of microseconds, instead of milliseconds. The difference these controls can make are far beyond what anybody cutting plate could have envisioned, just a few years ago. Best of all, we maintain weekly contact with our control supplier, because the technology is moving just that fast."

Kosmala concluded, "There are new doors opening for us every day, because of this machine." *Siemens Energy & Automation Inc.*

**Reprinted from *Modern Applications News*, August 2002**