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Ever-increasing laser power enables faster cutting rates and processing of thicker-gauge materials.

Fabricators seeking a higher power for their laser cutting operations can rejoice. Recently, fiber-laser technology has powered up from 12 to 26 kW and greater, empowering faster cutting rates and the cutting of even thicker-gauge material. In addition, progress continues on expanding opportunities to use shop air and nitrogen gas.

Advances in mode technology enable the cutting of thin and thick-gauge materials using the same lens, as well as refinement of cutting profiles. In addition, laser cutting tables with larger beds are expanding the capacity for cutting thick and very large metal-alloy components.

Higher Power



Laser cutting machines have been developed with improved machine stability to result in greater performance consistency at higher powers.

Demand for higher wattage has resulted in the recent introduction of laser cutting machines with more than twice the power of 12-kW machines that, until fairly recently, boasted the upper wattage limit.

- **Consistency at higher power.** As work material thickens, achieving a consistent cut becomes more challenging because it's more

important to accurately set the nozzle type, feed rate, power, frequency and duty. Plus, impurities and irregularities tend to creep into thicker-gauge work.

Laser machine OEMs have been working on improving machine stability to result in greater performance consistency. They want the machines to perform as specified. If the specs state that a machine cut 11/4-in.-thick steel, fabricators should be able to put it on the table and get good parts every time, even with different material types, without their having to make many parameter adjustments. The machine must be able to perform repetitive motions with good results each time, regardless of the material type.

- **High-powered speed.** Often, fabricators don't necessarily need to cut thicker material than they already are. Instead, they need the speed that a higher-power laser provides so that they can cut thick material faster.
- **Shop air, nitrogen.** Oxygen cutting has been the norm for CO₂ lasers for decades. However, oxygen typically yields an oxide layer on the surface that's not paintable or weldable, and requires a secondary deburring or polishing operation to remove it.



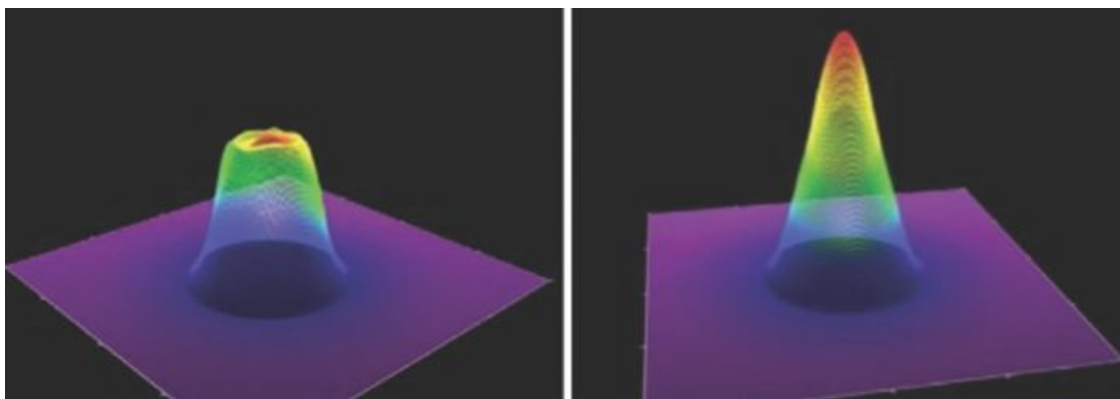
Nitrogen cutting results in faster cutting speeds—as much as 4.5 times faster than with oxygen.

Fiber-laser technology exhibits more potential for using nitrogen as the

assist gas, and every wattage upgrade expands that ability. The major advantage of using nitrogen for laser cutting is that it offers a faster, cleaner process, readying the part for the next process in its path—forming, painting or welding.

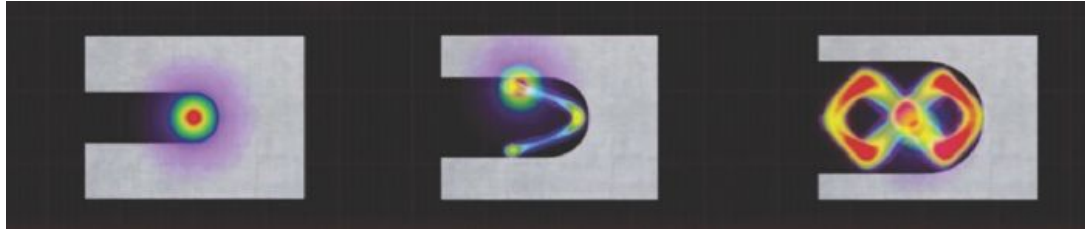
The higher the wattage the thicker the material that fabricators can cut with nitrogen. They can use a 12-kW laser unit, for example, to cut materials to ½ in. thick using nitrogen gas without a problem. A 26-kW laser machine using nitrogen gas cuts thicker—to 1 in.; above that thickness requires a switch to oxygen. In this case, a structural, non-aesthetic part may not need paint or welding, though only a few parts fall into that category. If a part only needs welding, it still must be deburred to remove the oxide layer.

At the initial expenditure stage, laser cutting with nitrogen gas proves an expensive process because it involves high nitrogen-gas consumption. However, at the bottom line, nitrogen-gas cutting saves money because it eliminates the need for the secondary oxide-layer-removal process, and the associated time delay. Also, faster cut speeds are achieved with nitrogen cutting—as much as 4.5 times faster than with oxygen. Cost-cutting discussions long have revolved around the use of different gases. Some metal formers concerned about the cost of nitrogen and oxygen choose to substitute shop air.



When shop air fits the type of workpiece material, it works as long as shops use an appropriate compressor, and drying and cleaning system, so that the assist gas is clean and dry. Then they can use that shop air in

place of oxygen or nitrogen to generate a good quality cut for less cost. Shop air when cutting aluminum yields optimal speed and cut results, but shop air is not always a good option. For example, a 12-kW laser easily can cut 16-gauge aluminum to ½ in. thick without a problem, but shop-air cutting inhibits weldability and paint adhesion. It also might sacrifice cut-edge quality; the thicker the material, the greater the sacrifice. Yes, shop air saves money, but a nitrogen gas might generate a better-quality part.



Advanced fiber-laser technology using variable beam control automatically adjusts the laser's beam shape and focus for different material types and thicknesses, eliminating lens changes and optimizing speed, quality and efficiency across thin to thick cutting. Locus beam-control technology can freely manipulate the laser beam to create an infinite number of locus patterns and greatly enhance cutting performance.

So, the choice comes down to answering this question: What does your customer want—high-end, bright, shiny edge quality, or lesser edge quality at a lower cost because it's not cosmetically needed?

Large Bed + Automation

Having the ability to cut thicker material, usually on larger parts, would be useless without the space in the machine to cut the larger parts. Bed sizes for fiber-laser cutting machines have expanded, with 8 by 20-ft. beds now available. The advantage of such a large bed is that the large surface area allows a shop to process a greater number of blanks—or larger blanks—before the shift ends.

Parts requiring a very large bed include trailer and truck-body panels, storage-tank wraps and cylinder shells, agriculture-equipment panels, and large elevator/escalator skirting panels.

Admittedly, large parts needing a large bed reside in a niche market. Previously, fabricators with that need typically would use plasma-cutting machines to cut seamless, unwelded shapes, but with today's larger beds, they now can use a laser cutting machine as well.

Automation on a large-bed laser cutting machine works a bit differently than on smaller bed machines. These systems use cutting pallets loaded with raw material, processed, and then cleared of the cut skeleton and finished parts. Fabricators often load multiple pallets—as many as six—so that the machine can run unattended overnight, with parts remaining on their respective pallets. Then operators can remove the cut parts the following morning.

Mode Versatility, Innovative Beam Delivery

Recent advancements have enhanced a fabricator's ability to achieve superior cut results with beam manipulation. Such beam-mode manipulation allows fabricators to "weave" the beam; another beam technology allows them to adjust the beam shape.

One beam mode does not cover the full material-thickness range very easily. An analogy: Driving a car in first gear is great for driving from 0 to 10 mph, but not for the freeway. Fabricators must use the right beam mode for the types of material that they're cutting.

These advancements also allow fabricators to cut thin and thick materials without a lens change or manual setup, just by changing the beam mode. This proves especially beneficial for cutting mild steel.

Advancements in beam-oscillation technology allow fabricators to change the cut characteristics. The machine control directs the spinning of the beam in a very precise pattern. Rapidly weaving this beam during cutting alters the characteristics of the cut. An example: Manipulating the beam in a circular, figure-eight or sawtooth pattern will result in a wider beam and yield different quality results. As a result, fabricators can achieve high-quality, fast cuts with precise edge quality, especially on aluminum and stainless steel.

Advanced Motion: Linear Drive

Two different types of motion controllers are available for laser cutting machines, with a helical rack the most common. Linear-drive systems, in which the motors are part of the machine—have no moving parts. Energized magnets push and pull the gantry across the bed while linear scales accurately read machine position—an extremely fast and accurate process.

Because there's no gear with linear-drive systems, to create backlash, wear on these machines is nonexistent. Machine accuracy after 10 yr. will be as it was on day one, as long as a fabricator maintains the machine, greases the lubrication points and periodically cleans the scales.

New technology obsoletes older machines out of the marketplace. Running operations on dated laser cutting machinery becomes unfeasible because such machinery runs slower, costs more to operate and maintain, doesn't produce as much, and has more limitations. Given the rapid advancement of technology and limited floor space, it's usually more advantageous to let go of that older machine and start new again to produce significantly more product at a higher quality within the same footprint. **MF**

Industry-Related Terms: Bed, Case, Edge, LASER, Layer, Polishing, Run, Surface, Thickness, Weldability, Laser Cutting, Welding

[View Glossary of Metalforming Terms](#)

See also: *AMADA NORTH AMERICA, INC*

Technologies: *CUTTING*