AUTOMATED DUAL LINE PROVIDES BEST OF FIBER AND CO2 TECHNOLOGIES FOR WISCONSIN SHOP

While many fabricators wrestle with the fiber vs. CO2 laser decision, Neenah, Wis.-based Creative Metal Products has found that operating both styles within the same compact automated system offers a unique set of benefits for the broad range of materials it cuts for customers.

Founded in 1995 by owner Jeff Wolding, a mechanical engineer with experience designing trucks and heavy equipment for manufacturers in Northeastern Wisconsin, Creative has seen steady growth over the years; today the company fabricates and assembles metal components for a varied customer base out of its 85,000-square foot facility.

The shop operates three Mitsubishi lasers: a 6x12-foot 4kW CO2 style LV and a 5x10-foot MSCIII automated line consisting of an eX 4.5kW CO2 and an NXF-40 4kW fiber. The MSCIII system was installed three years ago with the eX. In January 2015, Creative sold a competitor's 4.5kW CO2 and its loader and added the NXF-40 fiber to the line. Creative's total number of lasers remained the same, but the company significantly reduced floor space by eliminating the standalone automated cell and having two lasers fed by one tower. The new setup has allowed Creative to take advantage of each technology's strength and increase output all at the same time.

The new fiber laser at Creative Metal Products

APPLICATION DETERMINES LASER SELECTION

According to Creative's Fabrication Manager, Santy Vongkhamsaeng, the eX handles 7g and heavier steel as well as stainless and aluminum over ¼-inch thick. Meanwhile, the NXF-40 fiber excels at nitrogen cutting steel from sheet metal to 10g, and aluminum and stainless to roughly ¼-inch thick. The difference in output compared to the eX can be dramatic, with the fiber capable of cranking out two to three times the volume of parts on lighter gauges.

Deciding whether a job goes to the CO2 or the fiber isn't as simple as referring to a feed-rate chart. In some materials the NXF-40 may cut a part faster, but the edge quality isn't as good as the eX. When you factor in a secondary operation to remove a hard burr, it may be that the eX is actually the faster choice. And with its wide power door, safe wavelength, and easy access to the cutting table, the eX is the go-to machine for hand-loaded prototypes, regardless of the thickness.

According to Vongkhamsaeng, assist gas selection is the main determinant for mild steel production. If nitrogen makes sense from a cost perspective, then it belongs on the fiber. This is why nearly all of the work going across the NXF-40 is cut with nitrogen. Conversely, the eX uses oxygen about 60 percent of the time, with nitrogen the remainder. It's not that the NXF-40 can't also oxygen cut steel, the eX just does a better job.

Vongkhamsaeng explained saying, "There is much more forgiveness when oxygen cutting thicker carbon on a CO2. With the fiber, the conditions have to be just right or you can start to get a bad cut in a hurry."

COMPARING ELECTRICAL AND GAS CONSUMPTION

Much has been made of the efficiency of fiber lasers in terms of gas and electrical consumption, the main cost components of operating lasers. But, considering they are constantly making decisions between CO2 and fiber, Creative wanted to see for itself, on its own installations. To get a better handle on real-world electrical consumption Creative had its electrician place meters on each laser (and its chiller) within the dual line to monitor cumulative draw over weeks of operation. As for gas consumption, the company turned to its supplier Praxair for a deeper look.

The electrical results weren't all that surprising. The NXF-40 used a lot less power, about a quarter of that of the eX. However, when it comes to gas, the eX demonstrates a lower consumption rate. According to Vongkhamsaeng, the eX can cut the same material with a smaller diameter nozzle, and consequently a lower flow. This is confirmed by Jerry Sackman, Regional Sales Manager at Praxair: "Fibers cut with a thinner kerf, and therefore need a higher pressure," he said.

Creative's nitrogen consumption jumped by 40 percent when it replaced the competitor's CO2 laser, despite the fact that this CO2 had largely been committed to N2 cutting. Sackman said Creative's increase is consistent with what he sees from his other customers who have switched to fiber. And while the eX requires laser gas (the fiber does not), the flow rate is so low on a Mitsubishi cross-flow CO2 resonator that in the end, the NXF-40 still consumes significantly more gas overall. But, owner Wolding is not complaining. "The volume of parts is so much higher coming off the fiber that it's well worth it," he said.

Sackman also pointed out, “On thin materials, a fiber outperforms with higher speeds and therefore the nitrogen usage will actually be less per part.”

But at some point, as mild steel gets thicker and the speed advantage over oxygen decreases, it becomes more economical to switch to oxygen, and this is where the eX CO2 takes over. “It’s a lot cheaper and easier to oxygen cut ¼-inch steel on the eX than to nitrogen cut it on the fiber,” said Holt.

A look at gas flows shows why. It takes about 42 cfh of oxygen to cut ¼-inch steel on a CO2, vs. more than 2,000 cfh if you were to nitrogen cut the same material on a fiber.

AUTOMATION AND SOFTWARE KEY TO THROUGHPUT

Given how fast the fiber cuts, Wolding said he is surprised how anyone could keep up without automation. In fact, some automation systems out there even struggle to keep pace. Thus, it’s rare to see a tower supporting more than just one fiber; but Mitsubishi’s speedy MSCIII automation is able to keep in step with a variety of work on both the NXF-40 and eX at Creative.

The shop-floor line control software, designed for Mitsubishi by Ncell Systems, is the “traffic cop” of the cell. There’s a lot to keep track of: a 12-shelf material tower with two load stations internal to the tower, two lasers, two shuttle tables per laser, four nest carts, and typically different materials running simultaneously on each laser. If the automation couldn’t keep up, then the speed of the fiber would be wasted. But Mitsubishi’s MSCIII automation, in tandem with the line control, can pull it off.

To simplify operation, only one nest program is generated by Creative’s Ncell offline programming system, regardless of if the job is destined for the eX or NXF-40. Cutting conditions specific to each laser are automatically assigned when a nest is posted to a machine, a capability unique to a Mitsubishi laser controls with a routine perfected by Ncell. This allows an operator to seamlessly switch a nest program to either laser if the need arises.

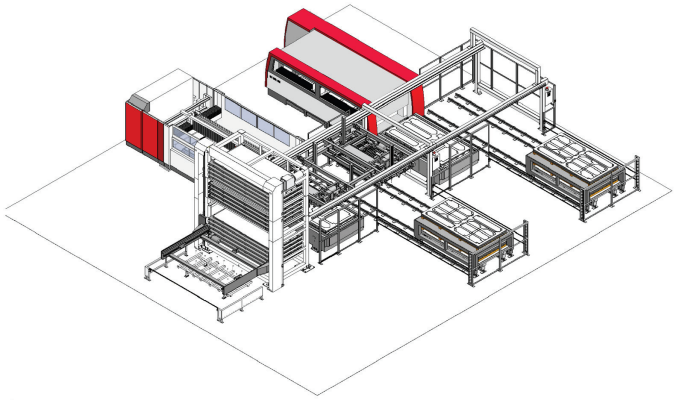

Illustration of Creative's laser cell with automation

The automation at Creative works with both a fiber and CO2 laser

SIMILARITIES BETWEEN THE LASERS

While the eX and NXF-40 each have their own niche in terms of production, they share a number of traits. Neither the Mitsubishi cross-flow CO2 resonator on the eX nor the NXF-40’s IPG fiber resonator contain turbine blowers or glassware. This means no expensive resonator refurbs down the road and a low cost of ownership. And while the eX requires laser gas, its three liters per-hour flow rate is one-tenth the requirement of some fast axial-flow CO2 lasers. In fact, it’s much closer to the zero liters per hour of a fiber than to its closest CO2 competitor in this department. And the laser gas pre-mix contains just 28 percent helium, unlike the traditional 2/3 helium of most CO2 laser gas mixes.

While some fabricators feel compelled to take sides in the fiber vs. CO2 debate, Creative has found that having both technologies in the same line allows it to provide a customer- or job-specific solution based on cost, edge quality, and finish tailored to each laser’s strengths.