Fabricating Equipment News

So Long Hard Tooling, Hello Laser Blanking

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Ever think a laser would be fast enough to be fed by a coil? Alabama Laser, Detroit-based systems integrator DCT and other collaborators are trying to make this happen in the automotive industry with their Laser Blanking Central initiative (www.LaserBlankingCentral.com). The name was coined from Alabama Laser's high-speed laser cutting process that has created a new industry buzzword: laser blanking.

"We believe that laser blanking is needed in the automotive industry," says Wayne Penn, president of Alabama Laser, based in Munford, Ala. "Short production cycles and customer auto products have forced the OEMs and their suppliers to find ways to cost-effectively design, test and modify parts, and eliminate the need for costly blanking dies whenever possible."

Potentially, laser blanking could be extremely helpful with so-called "problem" dies, which need redesigning or reconfiguring quickly and inexpensively. Lasers allow the manufacturer to experiment with new designs without the expense and time involved if traditional hard tools were used. The laser becomes a virtual die, so to speak.

And an automotive manufacturer is now considering whether to bring the virtual die into its operations -- not just with complex problem dies, but for relatively simple aluminum panels. In October 2000, representatives from a North American automotive manufacturer visited Alabama Laser's Munford facility to witness a laser system that could potentially eliminate die operations for right-hand and left-hand fender panels (the manufacturer did not disclose the vehicle model). Working with 6000-series aluminum, the collaborators are using Gen-Systems' Herr-Voss coil processor, which DCT is to integrate with Alabama Laser's extremely high-powered CO_2 laser.

Responsibilities

For the Laser Blanking Central initiative, Alabama's laser cutting system, called the LaserBlankerä, will be integrated with components from other companies to fit exact customer specifications. Gen-System's Herr-Voss will supply the coil feeder with a high-precision leveler. GE Fanuc is providing the laser blanking controls and the CO_2 laser. DCT is responsible for the automated material handling systems and overall system integration. And finally, Frank DiPetro's L.A.S.E. Inc., West Bloomfield, Mich., will provide system and automotive industry consultation.

GE Fanuc provides the basic kernal in software, which will be combined with Alabama Laser's knowledge and experience in material-processing software. Why so many participants? There is strength in numbers.

The Laser Machine

The automotive industry historically hasn't given much attention to laser cutting.

"It's a way to prototype blanks," says Penn. "But [the industry has] never seriously looked at [the process] because of speed," along with some edge quality problems.

This is changing, however. Alabama Laser's high-speed laser system is yielding a smooth, dross-free edge -- even cleaner than a die blanked edge.

"We can do linear cuts of 0.9-mm aluminum at up to 65 meters per minute, and contour cuts at typically up to 37.5 meters per minute [on 1-mm-thick aluminum]," says Penn. "As you go really fast, on the order of 60 meters per minute, [the cut] picks up a little strayed edge to it,

but it's still not bad."

He says the system is probably most effective at around 35 to 40 meters per minute, working with thin-gauge aluminum.

Penn reports no problems between the aluminum and the laser, either.

"The aluminum likes [the laser]," he says. "Traditionally, lasers have had a hard time with aluminum, but we've overcome those issues. We're operating at power levels and beam levels that traditional laser cutters have not had available to them. At lower power levels, the reflectivity of aluminum becomes an issue. At higher power levels, once you establish the keyhole, then the keyhole absorption dominates the process."

The company's 6-kW CO_2 laser, with pure high-pressure nitrogen assist gas, helps make these high speeds possible. The system also has a special beam conditioner that keeps the laser collimated over the entire cutting area. That, combined with the entire optical beam delivery path -- which includes benders, mirrors, mirror mounts, the cell and the cutting head itself -- along with high-pressure nitrogen assist gas, makes fast cuts possible. The cutting heads are also customized "to optimize spot size and gas dynamics issues," says Penn.

The nitrogen assist gas is key. Cutting with oxygen at the required pressure for such high wattage yields oxidation. The nitrogen, though, causes no exothermic reaction, so the beam power can be jacked up to 6 kW. No oxidation is also better for secondary operations, such as painting.

In 1997, Alabama Laser developed its first commercial high-speed laser cutting system based on a prototype created by Dr. Norio Karube and a team of researchers at Fanuc, Ltd., Oshino-mura, Japan. At 2 kW, it's still in operation. Today's 6-kW LaserBlankerä, the system considered for the Laser Blanking Central initiative, represents the company's fifth generation of the product.

To perform high-speed laser blanking, the machine-tool gantry must be held extremely stable because of the laser's extremely tight cutting tolerances. The machine's tolerance is typically +/-0.002 inch per foot; part tolerances are typically +/- 0.005 inch per foot, combined with the laser beam cut width and other variables.

Deflections need to remain within performance specs while the drive motor zips the cutting head over flat sheet at multiple Gs. The base of the whole system is a Meehanite casting, specifically designed with dampening characteristics in mind.

Integrating the Coil

The Laser Blanking Central group has not integrated the Herr-Voss coil feeder yet. Issues include engineering problems stemming from the camber that can develop in the coil; but, according to the group, the problems are solvable. In October 2000, Michael Schoeneich, project manager for DCT, said the group was eight to 10 months away from integrating the coil feeder into the system.

Key reasons for integrating a coil instead of a typical pallet-delivery system is to "reduce scrap and simplify material handling, and maximize throughput," says Schoeneich, who is coordinating the coil-integration effort with Gen-Systems and other group members.

Schoeneich forecasts a 20% to 30% reduction in throughput time compared to traditional systems. However, "the high-speed laser blanking technology is not intended to compete with [traditional] high-speed blanking technology based on throughput," he says. "[Laser blanking] is an alternative to traditional blanking for the benefits of die tooling elimination and increasing material utilization."

Another key benefit: the system will allow wide coil stock with reduced slitting requirements, which lowers the material cost per pound.

From Stamping to Drawing to More Potential

Schoeneich has high hopes for high-speed laser blanking.

"I estimate that [in 10 years] 20% to 40% of metal stamped parts will be manufactured using high-speed laser blanking technology," he says. "I also believe the part geometry will evolve from traditional die stamping to improve the drawing proponent of metal fabrication."

Automotive manufacturers, may share these high hopes. At 2000's ICALEO, a laser solutions conference held in Dearborn, Mich., a number of representatives from automakers approached DCT and Alabama Laser with a keen interest on laser blanking's potential.

Indeed, within the next decade, some die operations, at least in the automotive industry, may ... well ... die.

For more information on laser blanking, log on to www.alabamalaser.com.