

— CATHARINA DAUM

Unite or divide?

“The laser is a versatile tool; it can divide or it can unite, it all depends on the angle you take,” said Berthold Leibinger when Erich Honecker asked him what a laser was at the Frühlingsmesse in Leipzig. That was back in 1989, but the statement holds true to this day. These days, the laser is an established cutting solution in sheet metal processing – and offers the opportunity to stand out when it comes to the joining of materials.

Constantly changing customer requirements. A pressurized competitive environment. These are challenges companies in the metal processing industry know all too well. The trend is towards more and more product variants, and this is forcing companies to rethink their approach. Production processes must be adapted and customized. After all, the only way to succeed in this business is to master costs and quality while negotiating the tendency towards smaller and smaller batch sizes. One important indicator of cost per part is the lead time – which helps forecast the eventual profit per job. Most crucially, it can be controlled, for instance by using new technologies that eliminate whole steps in the process chain.

Joining is one step in the process chain that harbors particular potential in this regard. Depending on the quality requirements, this process currently calls for several minutes of reworking to eliminate the disruptive deformations on weld seams produced by conventional welding processes. This can add up to hours of extra work, depending on the batch size. New, alternative technologies and production techniques, such as laser welding, promise a solution to the problem.

— The laser – a true all-rounder

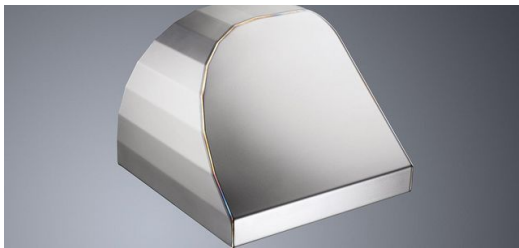
TRUMPF uses lasers for far more than cutting sheet metal. Lasers are also ideal for joining processes, and laser welding is long established, for instance in the automotive industry. It is high time that processors of sheet metal also benefited from the technology. While the laser might not be able to replace every MAG welding operation, where it is possible, it offers significant advantages. One benefit is that it provides greater design flexibility – particularly when it comes to complete assemblies.

Established joining technologies such as MIG, MAG and TIG welding, are significantly slower than laser welding, and bring their own disadvantages. Arc welding is conducted at high temperatures, often resulting in deformation of the component and time-consuming rework. Then there is the cost of optimizing the weld seam, which must often be polished or ground.



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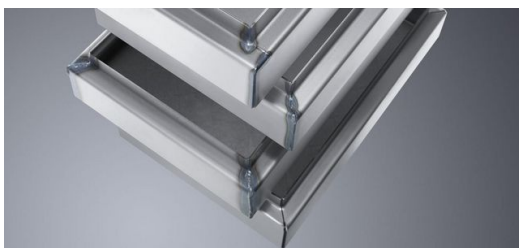
For those willing to invest and build up their expertise in laser welding technology, the quality of sheet metal processing enters a new dimension. First you have the exemplary quality of the weld seam. Heat induction welding creates weld seams with a very high quality finish, yielding visible seams that require minimal or no rework. And since laser welding ensures that less of the heat enters into the actual component, hardly any deformation occurs. In many cases, there is no need for any rework whatsoever.



A hood made out of 1.5 mm construction steel that must meet stringent optical requirements with a weld seam length of 122 cm. Based on a batch size of 10x50 units per year, the potential savings are 65 percent. Calculation based on the typical average values for Germany. (Picture: Oliver Graf Fotostudio GmbH)

Another advantage of the technique is the durability of the welding seam. This is where deep welding comes into its own, creating highly durable slim but deep seams. The laser also offers advantages when it comes to flexibility and speed. For deep welding operations in particular, it can achieve very fast throughput rates, and process several meters of sheet metal every minute. Lasers also allow for a range of joint types and geometries – even when the area to be welded is accessible only from a single side. The laser can weld overlapping seams, a concealed T-joint or even materials of varying thicknesses – opening up a wealth of new design possibilities.

What is more, the FusionLine function allows operators to join components that are not optimized for laser welding and, for instance, to uncover cracks. The results obtained with FusionLine far exceed conventional welding both in terms of the weld seam quality and the speed of execution.



Mild steel terminal box (from bottom to top): unwelded, manual MAG weld, FusionLine weld, and laser weld after redesigning for laser processing. (Picture: Oliver Graf Fotostudio GmbH)



The FusionLine joining technique can be used to join parts, even when this involves the bridging of gaps. It smooths out any unevenness during the welding process and closes gaps up to one millimeter wide. That makes it possible to use the laser on many parts that were originally designed for conventional welding methods. (Picture: Oliver Graf Fotostudio GmbH)

— **Exploiting the full potential of laser welding**

Laser welding pays for itself – many times over! For one thing, users save themselves substantial amounts of rework and can



