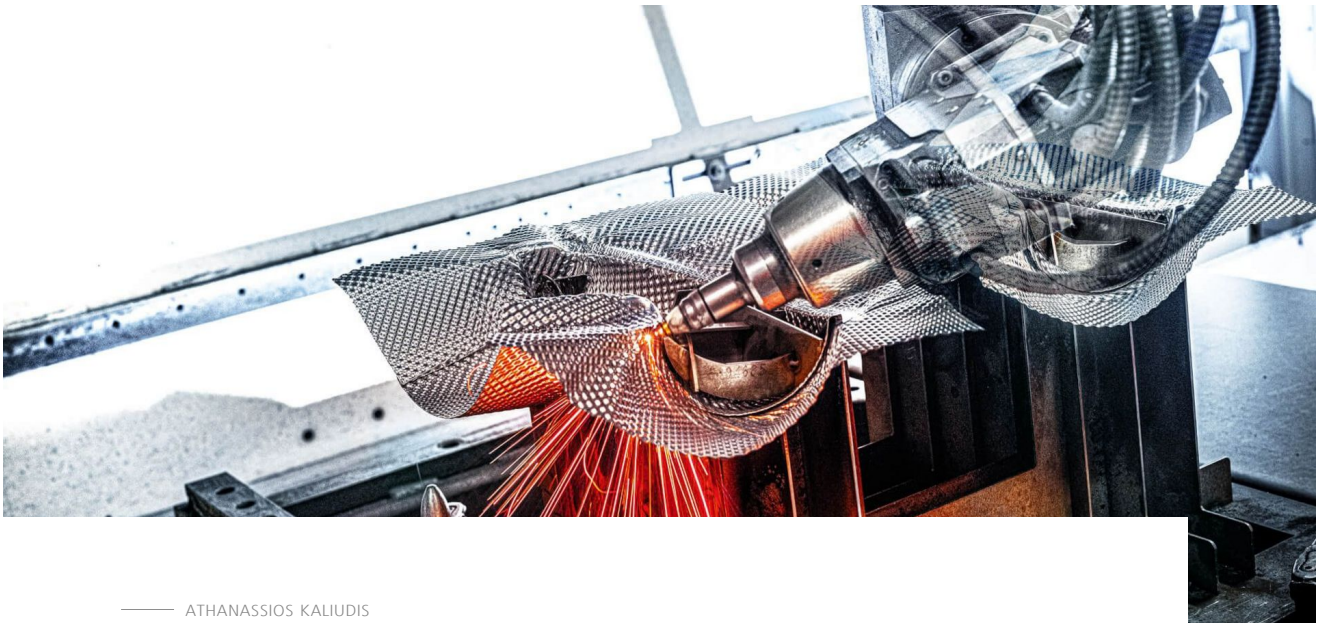


ATHANASSIOS KALIUDIS

Of emission standards and 3D laser cutting

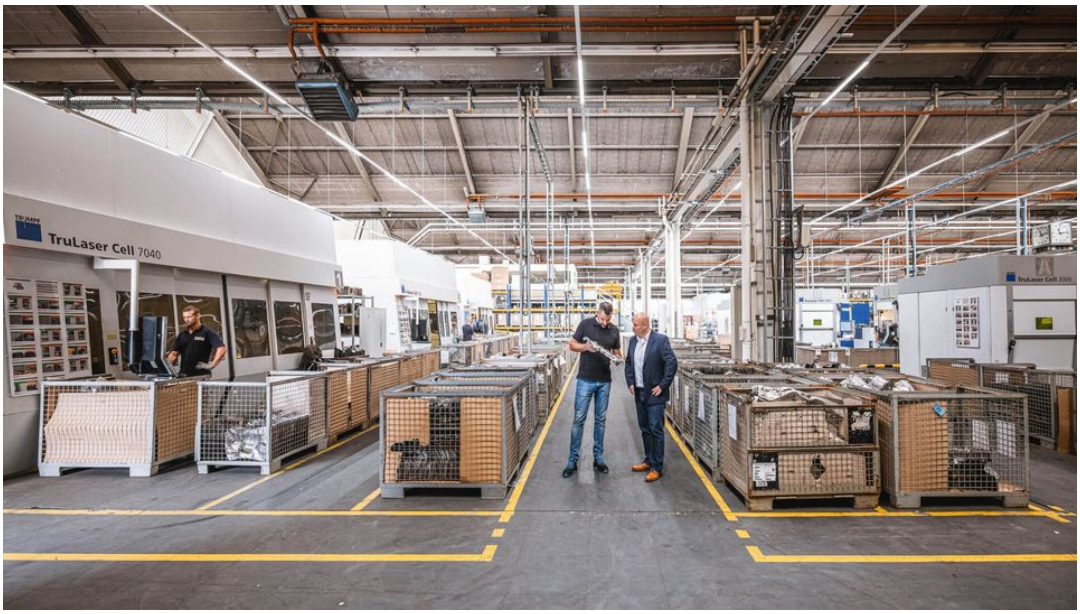
Stricter emission standards were the best thing that could have happened to Isolite. Now all automotive manufacturers are looking to insulate their exhaust systems - and are beating a path to Isolite's door. The company is managing the surge in demand with 3D laser cutting on a huge scale - combined with a touch of genius.

There is a simple rule of thumb for exhaust aftertreatment: "the hotter it is, the cleaner it is." And that's why business is booming at Isolite – an SME headquartered in Ludwigshafen that employs some 500 people world-wide. The firm has tripled its revenue in just a few years. Its speciality: high-temperature insulation systems.

The company's actual expertise is concentrated within the layers of insulating materials that line the red-to white-hot components. Thin stainless steel shells compress the insulating materials to form a tightly sealed blanket that is precisely tailored to the shape of the components involved, which are found within machines and technical systems, turbines, engines and exhaust systems. To keep the insulation as lightweight as possible, the sheet metal shells are ultrathin.

Better emissions figures thanks to laser technology

"The hotter it is, the cleaner it is" reiterates Jonas Boettcher, Business Development Manager at Isolite, who is holding one of the firm's stainless steel shells – made of thin sheet metal and measuring almost a meter in length – in his hands. "The exhaust temperature plays a crucial role when it comes to the performance of particle filters and catalytic converters. Once the automotive industry understood this, heat within the exhaust system became a blessing rather than a nuisance." This is why manufacturers now enclose almost every component – from the manifold to just before the exhaust pipe – in insulating material and stainless steel. "Ever since the focus has been on better emissions figures, we have been absolutely inundated," explains Boettcher.



Twenty 3D laser cutting cells operate in the Isolite "laser palace."
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3D laser cutting means mass production, flexibility and precision

There is a specially shaped stainless steel shell for every insulation option. This is where the laser comes in. Speed is of the essence at all stages of the manufacturing process, which is why Isolite has built a veritable palace of 3D laser cutting systems: there are 20 double-cabin cells on one fac-tory floor in Ludwigshafen alone, cutting up to 28,000 shells a day. Boettcher: "3D laser cutting is the only process that meets our three core requirements: mass production, flexibility and precision."

Flexibility is essential, as Isolite not only makes prototypes, but also medium-sized batches and large-scale production runs. The component forms are alternated frequently; Isolite produces some 2,000 varieties in order to meet customer requirements. What's more, the range is growing all the time. Some half-shells are six centimeters long, whereas others measure almost one-and-a-half meters. "We have two full-time programmers who program the 3D laser machines."

Deep-drawn form for a stainless steel outer shell (left), the 3D laser-cut final form (center) and overhang following removal (right).
© Fotogloria / Jan Hosan

Precision is imperative for half-shells

Once the half-shells have been punched or deep-drawn, they are placed inside the laser cell, where the overhang is cut away. Precision is imperative here, as there is a tolerance of just half a milli-meter. After all, the fiber mats have to fit precisely within the form, with the half-shells closing with pinpoint accuracy.

> **Ever since the focus has been on better emissions figures, we have been absolutely inundated.**
>
> Jonas Boettcher, Business Development at Isolite

In order to clamp such varied components, Isolite would ordinarily need a traditional multipoint clamping apparatus. This grips the sheet metal at various points using adjustable clamps. But as the sheet metal at Isolite is often barely thicker than 0.15 millimeters, the half-shells begin to vibrate. "As the overhang gradually falls away, the component springs back slightly. Over the course of the entire cut, more and more vibrations enter the workpiece." This even makes it hard for the precision-guided laser beam to observe the tolerance.

"You can either accept these inaccuracies – or you can try to compensate for the vibrations. But it would actually be better to avoid them in the first place." In order to cut in a vibration-free manner, however, the entire workpiece would have to lie on as extensive a surface as possible and pressed down. While this is no doubt economically viable for a few parts in large batches, how does it work with up to 2,000 variations?

Boettcher is tight-lipped on this point: "All I can say is that we have managed it. Isolite is now able to clamp and hold each workpiece in its entirety and thus cut at maximum speed and with the utmost precision." However, Boettcher is not willing to go into detail about how this has been achieved.

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