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New trends in laser within the process chain of hotforming production.

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Abstract

The laser is an established tool in the process chain to produce hot stamped components. While the cutting is the most wide spread application, there are a variety of other laser applications which help to be more efficient. Continuous improvements in machine/laser performance and changing part trends, ask for accessory developments to prevent bottlenecks in production. A new trend in hot forming, is the use of tailor welded blanks, to further reduce weight, or to combine different material properties. The AlSi coating on the material, needs to be eliminated in an efficient way, to assure quality standards in the strength of the welding and corrosion prevention in the welding area.

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1. Lasers for AlSi ablation:

The use of tailor welded blanks to optimize weight reduction or to combine two different material properties in one blank is advancing more and more in the market for hot-stamped components. AlSi coated material is the most wide spread material in this industry. The aluminum content of the coating poses challenges to weld the blanks. When aluminum gets into the weld seam, the mechanical properties of the weld are weakened in comparison to welds without the aluminum content. The goal is therefore the efficient elimination of the AlSi coating. Mechanical processes cause significant wear on the grinding tool and leave significant amount of aluminum. Laser ablation is a solution for this process. The use of ultra short pulse lasers allow processing speeds with ablation rates of up to 5,7 cm²/s and processing speeds of more than 17m/min. These processing speeds make short pulse nano-second lasers the most efficient tool to remove the AlSi coating.

Trend: Tailored properties of hot-stamping parts

→ Tailor Welded blanks for different material thickness
→ Tailor welded blanks for different material properties (e.g. hard top, ductile bottom)

Solution: removal of the AlSi coating along the seam before the welding process

Source: Bachelor Thesis, Florian Kieser, TRUMPF
2. Automation for 3D cutting machines

Improvements in the performance of laser machines and the use of modern laser sources has resulted in a reduction of operating cost and therefore of less cost per part. The development of blanks, where contours with larger tolerances are cut in 2D, result at the end in a reduction of laser content for 3D parts. The reduced amount of laser cutting on certain parts and the higher performance of the laser processing centers lead to challenges for the operators to match the shorter cycle times and to keep up with feeding parts into the machine. As a consequence of the shorter processing times, the requirement to equip laser machines with automated loading devices to allow continuous feeding of parts is getting stronger. TRUMPF has worked on concepts which allow an automated process of loading. Addressing one major issues which is the accurate location of parts and to load them with grippers in a precise position of the machine.

References

[1] TRUMPF internal research at Laser Application Center LAC.