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Increased sustainability through additive manufacturing and laser hardening of emission free tool steel – a case study.

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Additive manufacturing techniques such as Laser - Powder Bed Fusion (L-PBF) has great potential in reducing the CO2 footprint of many tooling solutions. By enabling complex internal cooling systems, and often a higher material hardness, increased tooling speeds and longer tool life is possible. Moreover, L-PBF enables in-house production, allowing for a more agile spare parts management. This reduces lead times and eliminates storing and shipping of spare parts.
Nevertheless, L-PBF parts often have larger CO2 footprints than traditionally manufactured parts due to the material used in the process. By combining the possible benefits of L-PBF with a material based on high-quality recycled scraps, a zero-emission component with longer service life can be produced.
Herein, the in-house production of a spare tool part for coil strapping illustrates the potential of increasing sustainability by L-PBF processing and laser hardening of a zero-emission steel. The tool is crucial in SSABs internal steel production. It is highly exposed to wear, resulting in a relatively short tool life. Moreover, SSAB has been suffering from supply issues with the original equipment manufacturer part. To resolve these issues, a copy of the tool was created by 3D-scanning, and parts were produced by L-PBF. The printed material is a low alloyed steel with tempered martensitic structure, having an as-built hardness of 450HV. Through laser hardening, a higher hardness was obtained in key areas of the tool.
Consequently, the tool life was increased by 3 times in comparison with original spare part, while also cutting the lead times in half. Moreover, the as-built hardness, combined with laser hardening, makes other heat treatments redundant, further reducing CO2 emissions. In conclusion, by using L-PBF and laser hardening, an increase in tool life was obtained, and a more agile spare parts management possible, resulting in a more sustainable tooling solution.

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