



COATING THROUGH HIGH-SPEED LASER MATERIAL DEPOSITION

Task

The wear and corrosion protection of large, high-quality components of the manufacturing industry is becoming more significant, not only from an economic but also an ecological perspective. In addition, this protection has become more and more important to the market as it constantly demands innovative products with increasing performance density and functional variety. To date, conventional laser material deposition (LMD) has been able to establish itself only for individual applications in this range of uses. With LMD, high-quality pore- and crack-free coatings can be produced with metallurgical bonding and low dilution from a large spectrum of working materials; however, typical coating thicknesses (> 500 µm) for the wear- and corrosion-protection are commonly too large and the surface rates attainable, in the range of 10 - 40 cm²/min for large-scale coatings, far too small.

Method

Against this backdrop, Fraunhofer ILT has been developing high-speed LMD as a new variation of LMD in the coating thickness range of 10 - 300 µm and at coating rates > 250 cm²/min. This approach consists of achieving a significant increase in the attainable process speed during LMD by guiding the powdered additives into the laser beam with a

coaxial powder nozzle above the melt pool generated by the laser radiation. The powder is then heated to a temperature as close as possible to the melting temperature before it enters the melt pool. Since the loss of the heat flow is reduced by the temperature equalization between powder particles and melt pool, the time necessary for a layer to form, in turn, decreases. The high feed speeds needed, in the range of 10 - 500 m/min are made possible by rotating the component.

Result

The high-speed LMD process was used to apply an approx. 100 µm thick wear- and corrosion-protection layer (WC/IN 625) successfully on a brake disc made out of cast iron with lamellar graphite.

Applications

The main focus is the further development of high-speed LMD for the coating of large, rotationally symmetrical components to protect them against corrosion, abrasive and adhesive wear, for example for hydraulic or oil field components.

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1 A brake disc coated for wear
and corrosion protection.

2 High-speed laser cladding of a shaft.