Nagel Technologies GmbH

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Nagel is the leading expert in machines and tools for honing and superfinishing. The company, headquartered in Nürtingen and with seven international subsidiaries, primarily manufactures for the automotive industry and its suppliers. Large parts of the business were previously devoted to components for combustion engines. With the brake disk coating machine, Nagel is now intentionally offering a product that is not linked to drive systems.

INDUSTRY
Mechanical engineering

NUMBER OF EMPLOYEES
1,800 worldwide

LOCATION
Nürtingen (Germany)

TRUMPF PRODUCTS

- TruDisk Laser
- HS-LMD

APPLICATIONS

- High speed laser metal deposition (HS-LMD)

Challenges

The new Euro 7 standard requires a significant reduction in the formation of particulate matter – for the first time not only in the exhaust gases from combustion engine cars, but also in the abrasion of tyres and brakes. All manufacturers who still want to sell cars in the European Union after 2026 need a solution for both components quickly. Dr Claus-Ulrich Lott is CEO of Nagel Technologies GmbH in Nürtingen. As he walks through the older, brightly lit area of the main building, he ponders: "What does the ideal solution look like? Firstly, it must comply with the standard. Which means virtually no abrasion. That is indisputable. Secondly, it must be affordable. Brakes are a mass-produced product, so the unit price is a matter of cents. And thirdly, it has to fit into the established production sequence with as little disruption as possible." Lott pauses in front of the brake disk production testing facility. "That's why we decided to build a machine that applies an ultra-hard coating to brake disks."

"The cost-effectiveness of coating relies on obtaining the desired outcome while keeping powder use to a minimum."

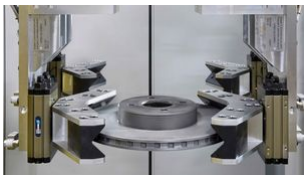
CLAUS-ULRICH LOTT
CEO OF NAGEL TECHNOLOGIES GMBH

Solution: High-speed laser metal deposition

Three coating processes were quickly ruled out: Electrochemical coating – too dirty. Thermal coating – too slow. Cold spraying – too expensive. Lott opted for the high-speed laser metal deposition (HS-LMD) variant because of its clean procedure and short processing time. Nozzles blow metal powder onto the surface layer, where it is melted by a laser beam to create a coating. Specifically, a cast-iron car brake disk rotates under a laser optic and seven powder feed nozzles. The high-speed laser metal deposition cell, called NaCoat, applies two layers. First of all, a 0.1-millimeter-thick adhesive layer made of stainless steel, which is then topped with a 0.2-millimeter-thick functional layer studded with ultra-hard particles of carbide. "But cast iron is a tricky surface for coatings." They adhere very strongly, requiring a lot of powder. "Ultimately, the powder accounts for 60 to 70% of the manufacturing costs in the brake disk production process. So our machine has to achieve a high level of powder utilisation, in other words, use as much of the powder supplied as possible."

Use of beam shaping for improved powder efficiency

Lott explains: "We worked closely with the development team at TRUMPF. And they use a two-pronged approach to beam shaping to maximise powder utilization." The BrightLine Weld beam-shaping technology divides the laser power into a core zone and a ring zone that can be controlled independently of each other. It is similar to a showerhead with a core and ring jet; this design allows for optimal adjustment of energy and heat application. On one hand, this means the brake disk hardly warps at all. On the other hand, the coating is much thinner, requiring less powder. The second essential step in reducing powder consumption is TRUMPF's bifocal technology – part of the laser beam gently preheats the casting just before the powder spray is applied. This means that the powder adheres immediately without any problems, instead of bouncing off and being wasted. The machine utilises up to 94% of the powder during the coating process. As a result, Nagel now has an economical production method for abrasion-resistant brake disks compliant with Euro 7.



Outlook: Commercial success and a useful contribution

Lott took over as CEO of Nagel two and a half years ago, and has fully committed to transform the company and focus on brake disks. "Our previous business was heavily dependent on the combustion engine, which is noticeably declining. With our solution for Euro 7-compliant brake disks, we aim to

deliver a product that is independent of the drive system, while staying within the industry we know best." The order book confirms his approach – in the first six months, Nagel has delivered a double-digit number of brake disk systems for series production. Lott is proud of the success, but he quickly turns serious: "There's another crucial aspect, which is that our systems will help reduce people's exposure to particulate matter, keeping them healthier. For me, it's a truly rewarding feeling."

Find out more about our products

TruDisk

The TruDisk is a high-power solid-state laser for the welding, cutting and surface processing of metals. It is perfect for jobs which require the combination of high power and maximum beam quality.

Zum Produkt

High speed laser metal deposition (HS-LMD)

High-speed laser metal deposition is suitable for applying thin, large-area coatings to rotationally symmetrical components.

Zum Produkt

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