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Constant velocity joints for electro mobility

Neapco, an internationally operating supplier to the automotive industry, is receiving an increasing number of enquiries about components for electric vehicles. A current project – a drive shaft that Neapco manufactures – is also used in such vehicles. The company, which is located in Düren, relies on ball nose milling cutters from MAPAL for hard machining the outer race of the constant velocity joint of the drive shaft.

“The trend towards electro mobility is becoming visible at Neapco, too,” says Ahmet Simsek, who is in charge of tool management at the Neapco location in Düren. The company location, which specialises mainly in the production of drive shafts, has already received a number of enquiries regarding components for electric vehicles. This is hardly surprising, given that Neapco supplies many renowned automotive manufacturers with drive shafts from the plant in Düren and has positioned itself optimally for this task. “We were recently certified according to IATF standard 16949 (quality management in the automotive industry), as a high level of flexibility, efficiency and quality is required in such a highly competitive environment.” Simsek is pleased: “We are not just fulfilling customer expectations, we are exceeding them.

Neapco and MAPAL started working together long before Industry 4.0 and connected systems became part of the production shops. “It must have been at the end of the 1980s when we started working on our first joint projects,” Ahmet Simsek and Klaus Schwamborn, Area Sales Manager at MAPAL, try to reconstruct their history of collaboration. “We have also been working together successfully in the area of ball nose milling of constant velocity joints (CV joints) for a few years now,” says Ahmet Simsek. This is why the precision tool manufacturer was the first choice when it came to the hard machining of the CV joints in the current project, a drive shaft for an electric vehicle. “Due to our many years of experience with MAPAL, they were our first choice,” says Ahmet Simsek.

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Contact angle within $\pm 5^\circ$

The production of the drive shaft started successfully at the beginning of 2018, and the production volume will be as high as 35,000 units in 2019. "We use the ball nose milling cutters from MAPAL to machine the ball raceways of what is known as the bell or axle spindle, for which strict tolerances are specified," says Ahmet Simsek. It is important that this drive shaft joint transmits the torque with as little influence on the steering as possible, even in the case of large working angles on the drive gears of front-wheel drive vehicles. This is why all requirements regarding quality, dimensions and surface qualities must be observed in a process-consistent manner. For example, the contact angle must be within a tolerance of $\pm 5^\circ$.

The machining of the forged axle spindles on a machining centre of model EMAG VSC 250 Twin makes high demands on the machine as well as the machining technology. The C50 mod. material exhibits a hardness between 58 and 63 HRC after induction hardening. "Our ball nose milling cutters are used for the final hard machining of the raceways," explains Klaus Schwamborn, who has been working with Neapco for many years. The tool, which has four soldered-in PcBN blades, removes between 0.2 and 0.4 mm of material.

MAPAL's own high-precision connection

The tool is connected to the tool holder via MAPAL's own HFS connection (Head Fitting System). The milling cutterhead is pulled into the holder with a high-strength clamping screw. The cutterhead is aligned via the short taper such that it is accurate to the micrometre and clamped against the face surface to ensure that the length dimensions in relation to the HSK face surface are observed. This highly stable connection also enables a high feed rate.

"The biggest challenge when designing the tool was to observe the tolerances in terms of a symmetrical contact angle and surface quality," Schwamborn recollects. In the interest of cost-effective production, Neapco also places value on a long tool life. "On the basis of the profound knowledge we have gathered over many years, we tailored the tool to exactly fit Neapco's application and requirements," says

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Schwaborn. The tool geometry was adjusted precisely to the required values in terms of raceway clearance and the osculation of the balls that later lie between the inner and outer races.

Optimum technical support

Within just a few days, the machining process was completely broken in at the start of 2018, and Neapco's requirements were all met. Process-reliable production was ensured in no time at all. "MAPAL provided optimal technical support and assistance during the start of production," confirms Ahmet Simsek. "Cooperative, open and trusting collaboration with our partners is incredibly important to us, and this is exactly the kind of relationship we have with MAPAL." To maintain this relationship, Klaus Schwaborn as well as application engineers and product specialists from the precision tool manufacturer often visit Neapco at their location in Düren. Neapco has also set up a consignment warehouse with the MAPAL tools.

So it is not surprising that Neapco uses numerous other MAPAL tools for its manufacturing – mainly fine boring tools as well as drills and milling cutters made of solid carbide. "We also use the regrinding service and send our tools to the precision tool manufacturer for reconditioning," Ahmet Simsek concludes.

Captions:



Neapco operates its own tool management – including the wear and tear analysis of the individual tools.

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For hard machining the ball nose tracks of the ball shell, Neapco relies on ball nose milling cutters from MAPAL. Experts from MAPAL have tailored the tool geometry precisely to the application and the requirements of Neapco.



Roughly 750 employees work for automotive supplier Neapco in Düren. Image: Neapco

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Working together to design the optimum machining concept, from left to right: Tool Manager Ahmet Simsek, Machine Operator Yilmaz Aydin, Tool Expert Armin Jossen (all Neapco) and MAPAL Area Sales Manager Klaus Schwamborn.



At the Düren location, Neapco has specialised in the production of drive shafts. Image:
Neapco

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The raceways of the forged axle spindles are hard milled on the twin-spindle machining centre EMAG VSC 250 Twin.

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Neapco relies on ball nose milling cutters from MAPAL for the hard machining of the ball raceways of the axle shafts. The MAPAL experts tailored the tool geometry to fit Neapco's application and requirements exactly.

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