

It's all about the surface

Whether to reduce friction losses or improve hygiene, the surface quality of components is in the spotlight more than ever. As a result, superfinishing technologies have grown in significance. Nagel Maschinen- und Werkzeugfabrik GmbH in Nürtingen has responded to this trend by increasing capacities for process development and contract manufacturing in the area of superfinishing

The growing demand for high-quality surface finishes has far-reaching consequences for many metal processing companies: their process chain becomes longer due to the required superfinishing. Existing capacities no longer suffice, but expansion is associated with costs. In such a situation, contract manufacturing has become a viable alternative. More and more are going down this route, as confirmed by specialists.

"Contract manufacturing in the area of superfinishing has been growing for years now for us," explains Marcel Bosch, process development superfinishing at Nagel Maschinen- und Werkzeugfabrik in Nürtingen. "That is why we have expanded our capacities in process development as well as our machinery. We are equipped for all applications, from the smallest rolling elements all the way through to large crankshafts for utility vehicles. We are also always open to new materials and workpieces as well as any quantity desired."

Contract manufacturing at Nagel can have a lot size of just one, such as prototypes and samples, or involve complete series with several thousand items. If needed, two-shift operation is possible.

The Automotive application area has always been the most heavily represented at Nagel. However, the superfinishing specialist is also discovering that sectors such as the bearing industry, the aerospace sector and medical technology are growing. In medical technology, the main focus is surfaces for implants. Here, a complete lack of grooves is crucial so that germs have no way of establishing themselves. In vehicle technology, the demand is for a minimisation of CO₂ emissions, which requires tribological, friction-optimised surfaces for the cylinder linings, which are honed, but also for all bearings for crankshafts, camshafts and gear shafts. The magnitude of achievable emission reductions may be minute, but small amounts add up over the entire vehicle. So, if the objective is to reduce friction losses as



Examples of workpieces for centerless superfinishing (plunge-cut and throughfeed finishing)

far as is technologically possible, superfinishing becomes a key technology. Grinding as an upstream process cannot possibly contribute to this objective any further.

"The quality and design of surfaces for bearings is frequently a question of manufacturing philosophy," says Marcel Bosch. "Some manufacturers tend to produce reflecting surfaces, such as in medical technology, while others produce defined microstructures."

Microstructures support the possible formation of a lubrication film. In order to reduce friction or wear and tear when running in a bearing, the process of plateau finishing, for example, gains significance. During this process, the peaks of a rough profile are burnished to plateaus. If the peaks remained, they would be stripped relatively quickly during operation and the result would be the typical wear and tear associated with running in. This is a particular problem in the event of frequent start-stop cycles. Plateau finishing basically pre-empts the process of running in. Plateau structures are the perfect example of tribological surfaces. Diligent process

development is required so that the result is right in the end.

"We don't simply supply machines and tools, we also develop the processes," underlines Marcel Bosch. Rz values of around 0.5µm must be realised. The task becomes even more challenging if certain requirements with regard to dimensional accuracy are added to the mix. One example is spherical bearings. Nagel has a proven solution for this: the dFlex band finishing tool.

Marcel Bosch concludes: "We do not yet know what kind of challenges the future of superfinishing holds, but we do know that the demand for high-quality surfaces, tailored to their function, is growing continuously. All we can do is organise ourselves as flexibly as possible."

The superfinishing expert brings up another interesting aspect in this context: in-house abrasive development. Having the development skills for machines, tools, and cutting media in one place is a unique characteristic in superfinishing.

"This circumstance enables us to react promptly to future developments or special customer requests," adds Marcel Bosch.

Contract manufacturing orders at Nagel are certified according to: DIN EN ISO 9001: 2008, VDA 6.4.: 2011, VDA 5: 2011, VDI/VDE 2631.

Diverse machinery for contract manufacturing orders

Nagel Maschinen- und Werkzeugfabrik in Nürtingen has increased capacities for contract manufacturing in the area of superfinishing. Several machine concepts for a number of different applications are available:

Superfinishing technology	Machine concept	Tooling concept	Applications, workpieces, special features	Dimensions
Centerless plunge-cut machining	EcoFin	Tape, stone	Barrel rollers, cylindrical rollers, balance shafts, needles. Production of contours/profiles possible (profile rollers)	D = 3-80 mm
Centerless through-feed machining	VarioFin	Stone	Cylindrical rollers, tapered rollers. Production of profiles possible, high output	D = 1.5-150 mm
Surface and sphere processing in the jaw chuck (plunge-cut machining)	SPH	Stone	Planet gears, gear wheels, ball heads (and implants). Surfaces for highest requirements possible (medical technology).	Upon request
Machining between centres, in the jaw chuck, collet chuck and in component-specific devices	FinishModulFlex (FMFlex)	Tape, stone	Rotationally symmetrical and non-rotationally symmetrical components (camshafts, pistons, etc.). Various finishing modules, many applications possible	D ≤ 400 mm L ≤ 1,350 mm
Crankshaft processing between centres	UF (Universal Finish)	Tape	Crankshafts for passenger cars and utility vehicles, various crankshaft types without tool replacement, axial bearing processing	L tot. ≤ 1,300 mm, pin bearing circle of rotation ≤ 300 mm

Flexible band finishing tool

Nagel developed the dFlex flexible band finishing tool specifically for processing crankshafts. Its special feature: a spring-steel band forms the press tray for the finishing tape. The advantage: the band adjusts to the shaft diameter in a range of 20 mm. The user saves tool and retrofitting costs. If the bearing to be processed has a pre-ground spherical form, an increasingly frequent construction feature, it will remain fully intact thanks to the yielding spring-steel band. Surface quality and dimensional accuracy can be optimised in the simplest of ways using dFlex. In comparison, other tool concepts are much costlier.

NAGEL Maschinen- und Werkzeugfabrik GmbH
Tel: 0049 7022 6050
Email: info@nagel.com
www.nagel.com

Superior Free Cutting Honing Abrasives



Innovation in
honing
grinding
oils



A world leader in grinding and honing

Visit www.delapena.co.uk or call 01242 516341