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Turning and grinding of balls in one clamping

Ball valves belong to the most used valves all over the world in various sectors of the process industry. Consequently the role that the balls play is quite a large one. In this article the author talks about how balls can be turned and ground in one process.

By Martin Schneider, HDC Huttelmaier

The manufacturing and repair of balls for modern industrial valves puts an ever increasing demand on methods of machining and on machine manufacturers. Increasingly smaller shape tolerances (roundness) and the constant optimisation of surface quality minimize the moving forces and improve the service life and sealing safety of the entire valve. HDC Huttelmaier from Schomdorf in Germany, a specialist for overhauling and modernizing of metal-cutting machine tools over more than 5 decades, also has an extensive history in developing highly productive quality ball machining systems for ball outer diameters of 76.5 (Picture 4) – 2.010 mm (Picture 1).

As far back as 1994, HDC designed and built its first ball turning machine (KDM). Soon after, the machine was extended



Picture 1: KDSM 1400 for balls with outer diameter 1.200 – 2.010 mm.

with a grinding unit, which was arranged opposite the turning unit on the rotary table. The oscillating rotary table principle was also ideal to handle the finishing of the ball with highest roundness requirements ($< 0.02\text{mm}$ for the above mentioned range of dimensions) on the same machine in one clamping (KDSM). This reduces added time and often makes an additional machine obsolete. The elaborate hydrostatic rotary table bearing not only provides exceptionally low bearing wear; it also absorbs finest grinding vibrations and thus guarantees, together with the highly rigid grinding device, best ball surfaces of approx. $Ra\ 0.4\ \mu\text{m}^*$ with a high metal removal rate.

*Depending on the combination of processing parameters and the grinding wheel specification.

The practical advantage

All quality and productivity features can be achieved with simple and inexpensively procurable turning tools and peripheral (OD) grinding wheels. Costly tool holders with individually mounted grinding segments and the corresponding problem of dressing and profiling of the grinding tool do not need to be stocked up. When turning and grinding on the KDSM all quality assurance devices are integrated in the machine. For example, the automatic measurement of shape tolerance and diameter of the ball in freely definable positions with an integrated measuring probe (Picture 3). Furthermore, the profiling and sharpening



Picture 2: Locality variable panel for manual operation and setup.



Picture 3: Integrated measuring of shape tolerance and outer diameter.

of the grinding wheel takes place on the machine.

With KDSM it is not the machine that sets the limits of productivity and quality but only the cutting tools. Due to the numerous variables in a combined machining of different ball sizes and materials HDC produces an individual time study at customers' request. Through the automated process KDSM ensures a ball production, which can be organized as a multi-machine operation. In addition to the use for precise repetitive production the machines are also increasingly used for repair jobs, since all automated processes can alternatively be controlled individually via locality variable control panels (Picture 2). With four different KDSM sizes there is always the right machine for practically the complete ball spectrum for customers in the HDC- program.

HDC also offers machines for polishing balls (KPM) as well as solutions for lapping of the ball-ring pairing and machining of the ball trunnion.



Picture 4: KDSM 300 for ball outer diameters of 76.5 – 500 mm.

About the author

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