To guarantee perfect workmanship and the highest possible product quality, BMW uses five-axis machining centers equipped with Sinumerik 840D sl and a range of new user interfaces for machining operations in its Berlin motorcycle plant.

BMW motorcycles enjoy an outstanding reputation around the world for their reliability, quality, performance and safety. This is not achieved by chance, however. BMW’s motorcycle plant in Berlin uses around 50 machine tools to create numerous key components on-site, from frames and valve shafts to connecting rods and cylinder heads. Among these tools are Grob’s horizontal five-axis G550 machining centers equipped with Sinumerik 840D controllers, which are used in the manufacture of cylinder heads for flat and 4-cylinder engines. Prices are obtained from suppliers at regular intervals, especially when the company is investing in new machining centers. The aim is to ensure that BMW can manufacture its components more cost-effectively than external contractors, while at the same time comparing the prices offered by the various machine suppliers.
One of the major reasons for choosing the G550 was because it was equipped with a Siemens CNC. Thanks to previous positive experience with Siemens, the BMW manufacturing specialists in Berlin already employ technology from Europe’s market leader for 90 percent of their controllers. This allows both operators and tool setters the flexibility to work on almost all the machines in the plant. Other key requirements noted in the specification were adequate space for manufacturing all relevant components, the highest levels of precision and surface finish, compliance with pre-defined cycle times, and the ability to reuse all current tools and equipment.

**The highest levels of precision on even the hardest materials**

Before committing to the new investment, the responsible BMW production engineer worked with a colleague from process engineering to investigate the effectiveness of the Grob machines in cylinder head production. Initially, it was the G550’s near-identical sibling, the G350, that was under consideration. As a first traditional single-workplace machine tool, it already met almost all the main criteria, but the space available inside was deemed too small to accommodate all the required processing tasks. However, the G550 satisfied this requirement as well. Among other factors, the horizontal design of this five-axis machine, which has both rotary axes in the work area, contributes significantly to its outstanding rigidity. As a result, axial deviation remains process-compliant at values under 10 µm. The level of precision that can be achieved is correspondingly high, even when processing extremely hard materials, as with valve seat inserts, for example.

The machine also produces a high-quality surface finish, with roughness (Rz) of up to 2 µm. Christian Heiß, applications engineer at Grob, explains a further benefit of the horizontal design: “Tool life can be increased by approximately 30 percent compared with that of vertical machining centers. And the problem of jammed slivers is almost completely eliminated because they are not able to fall onto the workpiece in the first place, but instead fall right through to the ground.”

» Previously, it might have taken several hours to set up the machine and the workpiece, now it can be done in just a few minutes. «

Christian Heiß, Applications Engineer, Grob
One of the G550’s strengths is its compact size, at only 3800 mm x 6300 mm. However, despite its size, it still features an extremely long z-axis stroke of 1020 mm, meaning that tools up to 500 mm long can be retracted completely out of the work area and into the so-called spindle tunnel. The swivel-mounted shuttle table is another feature that helps deliver high levels of productivity. While one workpiece is being processed, the next can be clamped and set, thus minimizing costly downtime.

**Programmed and set in no time at all**

Employees find the new Sinumerik 840D sl CNC especially easy to operate because, in the production of BMW cylinder heads, only Siemens controllers are used. Despite this, the user interface presented on the Grob machines looks completely different from the others. Until now, operators and setters have been used to the DIN-based HMI Advanced user interface, but the new CNC on the G550 features the Sinumerik Operate animated graphical display. Siemens has integrated a new operation and programming structure, with practical functions such as copy and paste that are well known to users from their daily use of PCs. This allowed BMW employees to quickly adapt and master the new Sinumerik user interface in no time at all.

Thanks to its excellent usability and intuitive operation through various technology cycles, measurement cycles, and setting functionality, the new G550 machines can be set up for new batches much more quickly than before. As Heiß explains: “This means our customers are much faster than before. Previously, it might have taken several hours to set up the machine and the workpiece, now it can be done in just a few minutes.”

**Quick and reliable with remote maintenance**

Along with the tools and equipment from the current machines, the German motorcycle manufacturer was able to reuse all its existing programs as well. It took a single employee only two days to upgrade these programs to be compatible with the latest software, which can be loaded onto the relevant machine as required either over the network or from a USB stick. The modern Windows Explorer-style program manager means that complex programs can be managed either on the CF (Compact Flash) card or directly on the CNC.

If problems arise while the machine is operational, BMW production engineer Taner Ögretmen and his colleagues use the network-based remote maintenance functionality provided by Grob. This has rarely been required so far – but when it has, it proved to be extremely smooth and efficient, stresses Ögretmen. Grob can also perform minor optimizations together with Siemens using the teleservice. This is usually done automatically and without any disruption to ongoing production.

The Sinumerik-controlled Grob machines have met every expectation in full, which is why BMW has already ordered an additional four G550s.