Workpieces and processes in the automotive industry

New machining solutions for that extra productivity and cost-effectiveness
MAPAL technology:
Tap the potential savings during the machining of car components

New machining solutions for that extra productivity and cost-effectiveness

If every second counts, major specialists are required. Specialists who are familiar with the machining processes down into the detail and who from this detailed knowledge develop innovations for real progress in machining. For this purpose we offer our experience from many individual solutions for specific tasks in the automotive industry. And a willingness to take new and perhaps also unusual paths in the dialogue with the customer.
Cylinder heads for two to twelve-cylinder engines

New developments for lower cutting costs

The complete machining of a cylinder head is a demanding task. The challenge is to meet high tolerance and quality requirements using precise tools that are as easy as possible to use, and that with low unit costs. The MAPAL tool package for the cylinder head includes many innovative solutions that satisfy the current development trends in engine manufacture.

**Tool highlights on the cylinder head**

1. **Reaming the valve guide and grooving the valve seat**
   Coupled tools with high stiffness make complete machining possible in one step. The optimum exploitation of the cutting data minimise the cutting material costs.

2. **Fine boring of the camshaft bearings**
   Best position accuracy and concentricity are guaranteed by the pilot tool and the fine machining tool.

3. **Boring the core plug bores**
   The special chip removal prevents chips in the workpiece cavities.

4. **Deep hole drilling for the oil channel**
   High position accuracy is achieved by the special drill geometry. Triple feed rate compared to single-lip drill. Reliable chip removal via optimised chip flutes.

**Advantages:**

- Modern tool concepts matched to the related manufacturing concept
- Usage of exactly matched cutting materials – for example during the machining of the valve seat
- Special solutions for small production runs and prototypes
- Comprehensive range of services including tool management

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Clutch and gearbox housing for automatic gearbox and manual gearbox

High productivity due to MAPAL technology

MAPAL tool specialists draw on particularly extensive experience during the design of complete processes for clutch and gearbox housings. The optimum machining of the large and often thin-walled parts requires a large amount of know-how, starting from the design of complex combination tools to the definition of housing clamping. The shaft bearing bores place special requirements in the μ range on shape, position, surface finish and diameter.

Tool highlights in clutch and gearbox housings

1. Fine boring of the selector shaft cylinder
   A diameter tolerance of IT6 is achieved from the cored state.

2. Forward and backward machining of bearing bores
   The outer and inner surfaces as well as the bore are machined in one clamping position.

3. Drilling/countersinking combinations for oil filler bores
   The multi-blade configuration permits high machining values and stable cutting behaviour. The tool is designed as a combination with a thread milling cutter.

4. Face milling the joint face
   Due to specially matched cutting edge geometries, the defined surface roughness and surface structures can be achieved exactly.

Advantages:

- Reduction in the machining time due to combination tools
- Highly reliable manufacturing due to many years of process experience
- Optimum concepts for all processes – drilling, reaming, fine boring, circular/face milling and thread cutting
- Complete support from planning to the breaking-in of the tools
Complete machining of turbochargers

MAPAL with leading tool technology

Downsizing and turbochargers are now indispensable in modern engine development. In the past machining centres and lathes were often necessary for the production of the turbine and compressor housing for turbochargers. MAPAL has developed a manufacturing method that makes complete machining possible on one machine. Contours and recesses are machined using the mechatronic tool system TOOLTRONIC® and interpolation turning. Complete machining tools also combine a large number of machining steps.

Tool highlights for turbocharger housing

1. TOOLTRONIC® for machining the contour
   MAPAL TOOLTRONIC®, the interchangeable U axis, machines the inner contour, the diameter and various flat surfaces.

2. Interpolation turning of recesses
   The cycle time is reduced by 35% compared to milling. It was possible to improve the tool life due to a continuous cut and shorter cutting time.

3. ISO tangential tool for complete machining
   One tool reliably, cost-effectively and precisely machines six machining features.

Advantages:

- Machining of the main bore in the turbine housing in only four steps
- TOOLTRONIC® instead of the lathe
- Combination of a large number of machining steps due to tangential technology
- Innovative machining method for all machining tasks on parts for turbochargers
Brake calipers made of spheroidal graphite cast iron
Potential for savings due to the latest manufacturing technology

The quality of the manufacture of this safety-related part defines the braking forces via braking performance, stability under load and exact control. The MAPAL tool package for machining the brake caliper guarantees reliable manufacture with low manufacturing costs. These advantages are provided, for example, by combination tools with which it is possible to drill, mill and deburr at various positions. In total up to 40 % of machining time can be saved using the MAPAL process.

Tool highlights on the brake caliper

1. Control cut for the fist hole, pre-machining of the front of the area for the piston, pilot bore for the piston bore
   The combination of several machining steps reduces the cycle time and increases the machining quality.

2. Interpolation recessing of sealing ring groove and base profile
   The MAPAL tool reduces the machining time by 50 % compared to circular milling and improves the surface quality.

3. Fine machining of the piston bore
   The higher feed rate reduces the machining time by approx. 30 %. There is no setting effort, as re-grinding is possible the tool costs are reduced.

4. Fine machining of the rear of the brake housing
   A MAPAL actuating tool for machining centres combines diameter turning, milling and external grooving. In comparison to the previous process, the machine time is reduced by 12.5 sec. per workpiece.

Advantages:

- Increased process reliability
- Reduction in the manufacturing costs per unit due to reduced machining times
- Cost guarantee due to cost per part
- Competent planning and reliable supply of tools with MAPAL

Complete Process Management
Steering knuckles made of grey cast iron or steel

Tangential technology for fast machining and low unit costs

Steering knuckles must withstand high loads. For this reason high tolerances on shape and position must be achieved during the manufacture of the part, predominantly manufactured from grey cast iron and less frequently from steel. Despite the demanding machining, low costs are still required, as this is a mass produced part.

By using multifunctional combination tools from MAPAL, tools and magazine stations are saved and therefore machining time and costs significantly reduced. Particularly advantageous for complete machining is the use of tangential indexable inserts. These inserts have a soft cut due to their positive rake angle and, due to the compact mounting, are very suitable for use on multi-insert tools with high feed rates.

Tool highlights for steering knuckle machining

1. Milling and drilling shock absorber mounting
   A combination of a disc-type milling cutter and insertion drill reduces the number of tool changes.

2. Main bore, internal machining
   Using the multi-stage tangential combination tool, semi-machining is saved.

3. Main bore, external machining
   The multi-stage combination tool with fixed insert pockets without pre-adjustment manufactures tolerances of less than ±0.1 mm.

4. External machining of journal
   Pre-machining, semi-machining and fine machining from one source permits the highest accuracies with the lowest scrap rate.
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