Lightweight and upright: By using state-of-the-art pneumatic components, the special machine's weight was limited to 270 kg.

Safely releasing the bedplate for Aston Martin V8 engines

Shaken, not stirred

The innovative quartermaster "Q" from the James Bond films would have loved this new special machine in the Aston Martin Engine Plant. Skilfully crafted, it quickly, efficiently, and safely releases the bedplate for Aston Martin V8 engines.

James, when reading the word bedplate, would most likely have imagined something completely different to Q's dry operating instructions. Of course he would have tried out the special machine, because its control elements bear a remarkable resemblance to those of a motorbike. In contrast to the film version though, James, in his overeager testing, might have been somewhat disappointed. The latest development from the "Engineering task force" based in Cologne, at the Aston Martin Engine Plant, comprising Wilfried Bäumler, Ralf Michels and Oliver Naumann, is easy to use and doesn't explode or fire any shots. The semi-automatic technology for separating the bedplate from the engine block, then rotating it and setting it down is designed to provide people and

The bedplate and engine block of the Aston Martin V8 are still connected to each other, but the vibrations of the pneumatic muscles will soon separate them (left).

The decisive moment: The bedplate has been released, the inner machine unit is lifted away from the engine block with the weight compensated by a standard cylinder (top).

Elegant swing: After being rotated 180 degrees, the bedplate is ready to be set down on the workpiece carrier (bottom).

materials with the greatest protection possible, giving this technology the licence to let go!

Playful tour de force

By simultaneously pressing the start lever, the operator gently but forcefully sets the system in motion. It lowers and attaches itself to the bedplate using technology for which the developers from Cologne have applied for a patent. The operator then switches the lever pair, the inner machine unit lifts up slightly and a uniform vibration releases the bedplate with a resonant sound. Within less than a second, it floats unattached above the massive Aston Martin V8 engine block. The bedplate is automatically rotated 180° and reveals its interior. At this point, the operator presses the start lever again and, with just a little pressure, moves the machine – which weighs 270 kg – sideways, where he sets the bedplate down on a workpiece carrier. This ends the tour de force, which is now child's play since the machine's power has been tamed by engineering skill.

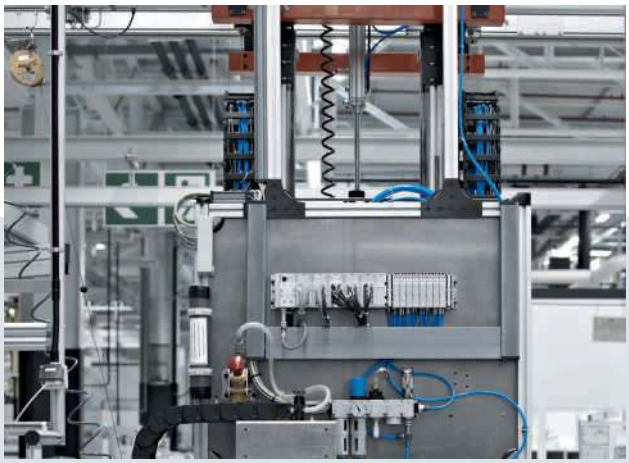
Power needs precision

Let's take a look at the technical details of the system to understand why this latest development is so special. The so-called bedplate lies under the engine block of the Aston Martin V8 and together they encompass the crankshaft. It is called a bedplate because the crankshaft "rests" inside it – at least when the British powerhouse is in the garage. During driving, it transmits a maximum power of 430 hp at 7,300 rpm to the transmission system of the V8 Vantage S. This is sufficient for a top speed of 305 km/h and a brutish pulling power of 490 Nm at 5,000 rpm.

Precision is essential in manufacturing. That is why the bedplate and engine block must be tightly connected during machining of the crankshaft bearing channel. However, subsequent processing requires the workpieces to be separated again. Coolant residue could pose a problem if it were to leak into the two aluminium workpieces, causing unwanted adhesion in addition to the mechanical guide sleeves.

Fluidic muscles

The previous system mechanically pulled the bedplate from the engine block on →



Pneumatic muscular power: Four Festo fluidic muscles shortly before contracting (left).

Pneumatics are on board: The valve terminal CPX/MPA is attached to the system's rear side; only the Profibus cable is connected to the control cabinet (top).

Directly to the application: The pressure booster DPA with the air reservoir CRVZS increases the 5-bar hall pressure to 6 bar in the system by coupling (bottom).

➔ the linear axis. This then had to be manually rotated 180° and set down sideways on the workpiece carrier. This was no small feat since the load-bearing crankshaft bed weighs 14 kg. When rotating and setting down, there was a risk of injury from the sharp outer edges of the cast aluminium part; even wearing gloves couldn't provide sufficient protection. The new system makes it all much easier. It does not pull the bedplate off; instead it shakes it free. Festo fast-switching valves oscillate a total of four Festo fluidic muscles with 2 Hz, thereby gently but forcefully releasing the bedplate.

The fluidic muscle is a diaphragm contraction system; in other words, it is a tube that shortens under pressure. It consists mainly of a hollow elastomer cylinder with embedded aramid fibres. When the fluidic muscle is pressurised, its diameter increases and its length contracts in a defined manner. This enables a flowing, elastic movement. Using the fluidic muscle enables motion sequences that approximate human movements in terms of kinematics, speed, force, as well as finesse. It can exert ten times the force of a comparably sized cylinder, is very robust, and can also be used under extreme conditions.

Control system on board

Another important function is fulfilled by a Festo standard cylinder for weight compensation. It supports operators when lifting and lowering loads and ensures that they can always operate the semi-automatic machine with the same low level of force. A valve terminal CPX/MPA safely and swiftly controls a total of 22 pneumatic and electric actuators for the system. The valve terminal is attached to the rear side of the special machine and travels along with the system during all the work steps. As the pneumatic control could be attached directly to the machine, only one slim Profibus cable is connected to the control cabinet.

Models save time

Developing this innovative, special machine took about 18 months. Following the brainstorming and basic design phases, Festo was included early on in the development phase as a partner providing advice on pneumatic solutions. The aim was to create a small, compact and especially lightweight design that is suited to quick motion sequences. The virtual 2D and 3D models from Festo made the development phase shorter and easier. In just a few clicks, the development team was able to download these models from the Internet and integrate them into their

The team of developers: Oliver Naumann, Wilfried Bäumler and Ralf Michels together with the consulting sales engineer from Festo, Martin Schlieter (from left to right).

own design plans. A significant role was played by the Festo FluidDraw software, which was used to create the circuit diagrams straight away.

This allowed the team to create a system that impresses both because of its technical finesse, as well as its ease of use, while it also meets a high level of acceptance among operators. Working on numerous projects has taught the team of experts that new machines with improved safety systems are only successful if the actual operators are also convinced that the improvements are beneficial. This required an ergonomic adaptation to the operators' needs, as with the special machine for releasing the Aston Martin V8 bedplate. It was possible to make this precise adaptation by using the sophisticated pneumatics software from Festo in the run-up to the system's production. ■

430 bhp under the bonnet: the Aston Martin V8 Vantage S.

Photo: Aston Martin 2011