In the complex project system, a four-way gripper (photos on left) performs removal of the injected parts and their further transport to the various finishing stations (photo below). The finished pistons are used in a clutch system.

Thermoset replaces steel

In a clutch system produced for ZF Sachs, a piston made from thermoset is used which is produced on a project system built around an ALLROUNDER 420 C 1000-250 with a MULTILIFT V robotic system at KE in the Black Forest town of Mönchweiler. In the production cell, the piston is not only injection moulded, but also completely finished and visually checked, rendering it immediately ready for installation.

Owing to the fact that a magnetic sensor for precise positional detection is integrated in this particular clutch system, conventional steel piston could not be used. The Managing Director of Kunststoff- und Elektrotechnik GmbH (KE), Arnold Klausmann, explains: "Comprehensive tests have shown that the thermoset pistons have no disadvantages compared to those made from steel or aluminium. A direct comparison even revealed that thermoset had benefits: The thermoset piston achieved a higher degree of efficiency, the material is also lighter, reducing the overall weight of the assembly." Thanks to the high-quality moulds made by KE in an in-house mould making shop, the thermoset piston produced is completely dimensionally stable and features a smooth, highly polished surface due to its material properties.

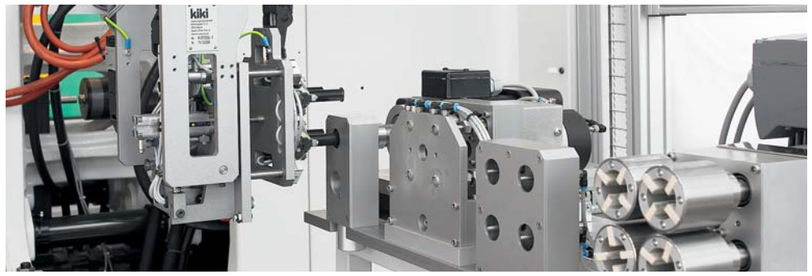
However, the thermoset piston does have to be finished, in order to remove burrs and irregularities resulting from overfeed. In order to nevertheless ensure economic volume production, the entire production process has been automated within a project system in cooperation with ARBURG.

The high-grade surface finish, dimensional stability and durability of the piston require a high compression of the thermoset material. Targeted venting is ensured by means of a precisely-defined overfeed. This injection moulding technique requires a few additional finishing stations. Following part removal, the sprues are separated, a bevel is provided on the moulded parts and overfeed irregularities are simultaneously removed. Subsequently, the burrs on the internal thread are removed and the parts are finally cleaned. In order to prevent damage to the sensitive surface of the piston, the gripper of the robotic system can only hold the item in a precisely defined edge zone. The gripper must also be able to compensate for the high torques generated during finishing by means of high holding forces. In addition to the ALLROUNDER and the MULTILIFT V with the relevant gripper configuration, ARBURG also integrated all the finishing stations into the production cell. In addition to the four-cavity mould, KE contributed to the overall setup by providing the camera-monitored inspection station and the magazining facility.

The ALLROUNDER 420 C operates with dual-pump technology for regulated machine processes and features extended tie bars, a special thermoset cylinder, injection pressure increased to 2,500 bar, an air blast unit and additional equipment for compression injection moulding and venting, as well as the ARBURG unscrewing unit. The MULTILIFT V, in a transverse overhead design, can support a maximum load of 15 kilograms.

The production sequence is as follows: Initially, the gripper moves into the mould and removes the four moulded parts. During the demoulding process, a picker removes the sprue and drops it into a container. The mould halves are simultaneously blown out via several nozzles on the gripper.

At the milling station, the parts are consecutively provided with a bevel. Simultaneously, the outer overfeed material is removed. The electric motor of the milling tool runs permanently, the chippings are removed via a connected industrial vacuum.



The burrs on the internal thread of the finished parts are removed simultaneously. Here too, the finished parts are first centred via the mountings. Four pneumatically-moved grinding heads remove the burrs. The insides of the parts are cleaned on a pneumatic station. The lift plate of the gripper in turn positions the finished parts precisely onto the pins of this station. Once again, the industrial vacuum is connected in order to remove the chippings.

In order to prepare for the 100% camera inspection at the last station of the system, the surface of the pistons is cleaned by means of rotating felt bands on a further station. The robotic system then transfers the finished parts to the inspection station. Good parts are picked up by the robotic system and ejected according to cavity via tubes. Detected reject parts are separated beforehand.

During the development and construction of the production cells, the cooperation between KE and ARBURG was so satisfactory that a change of suppliers on the part of KE is virtually excluded.

INFOBOX

Founded: 1978, member of the Siedle Group
Employees: around 90
Products: Technical parts, system components and assemblies made from thermoplastics and thermosets for the electro-technical, automotive, semiconductor, consumer goods and medical technology sectors.
Production cells: Currently, five systems for the production of thermoset pistons; 34 injection moulding machines, of which eight are for thermoset processing
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