

PRESS RELEASE

The REVERSE CUBE from FOBOHA was a huge attraction at the 2019 “K” trade fair

The “magical cube” manufactures and installs multi-component parts on a single machine

Haslach, Germany, October 2019. The new REVERSE CUBE developed by FOBOHA in combination with an ARBURG ALLROUNDER CUBE 2900 injection molding machine manufactures single and multi-component parts from various materials and has an integrated handling robot for autonomous assembly of parts. The automated process improves quality, accelerates cycle times by 40 percent compared to separate injection molding and installation processes, and delivers tremendous cost savings.

First presented at the Barnes Molding Solutions booth during the 2019 “K” trade fair in Düsseldorf, the rotating cube mold process fascinated countless numbers of visitors. What had previously been manufactured on two injection molding machines is now carried out by the REVERSE CUBE system on a single machine. Two plastic parts, a socket and a roller, are manufactured using two different materials and assembled in a single operation.

The FOBOHA REVERSE CUBE uses separate tool areas to carry out simultaneous work operations for two cube halves arranged over each other. POM and PP plastics for the two roller and socket components are injected into the cavities of two closing levels using hot runner valve gate systems supplied by mÄnner. The cube halves rotate toward each other in 90° increments, and the next injection operation takes place after each rotation.

Finished components are simultaneously removed after each semi-rotation. A six-axis robot is integrated into the system for this purpose. Simultaneously with the injection cycle, it removes the rollers from the lower cube and inserts them into the sockets still in the cavities of the upper cube half.

The unique aspect of the process is that the two cube halves are thermally separated. This allows the simultaneous processing of varying materials with different temperature requirements. The cube concept with the counter-rotating halves allows the manufacture and assembly of the two components in a confined space and in the shortest possible cycle. The process is flexible, capable of processing a wide variety of component geometries, materials and colors, and can also be used for three components and in cleanroom production.

A valve hot runner system for narrow process windows

The valve gate hot runner systems from high-precision mold specialist männer were chosen to ensure that rigorous manufacturing process requirements such as narrow processing windows and short cycle times are met. The cylindrical valve gate systems from männer ensure superior surface quality, part-to-part consistency and process reliability. Gammaflux hot runner controls are used for precise temperature control of the hot runner molds and manifolds.

Higher production volume and lower unit costs

The entire Reverse Cube system is operated with an ARBURG ALLROUNDER CUBE injection molding machine further developed for this purpose. The automation technology of the CUBE machines was adapted to match the REVERSE CUBE system and a handling robot integrated within the process. This enables output per machine to be doubled and reduces cycle time, including assembly, by up to 40 percent.

In terms of quality assurance, the requirements are also defined by the manufacture of two individual parts, which are assembled into a finished part. Each of these individual parts passes through all four stations of the complete cube cycle. There is a complete set of parameters with distinct quality requirements (process parameters), which are separately monitored, logged across cycles and then allocated to a finished assembled component. This data is transferred to the robot system which can carry out a reliable pass/reject part separation.

Hermann Hauff GmbH & Co. KG was the first company to use the new technology of the ALLROUNDER CUBE 2900. The injection molding specialist manufactures the lower rack rollers for the dishwashers from BSH. The objective of the system is to streamline labor-intensive material logistics, eliminate intermediate storage of the prefabricated individual parts and reduce space requirements by up to 60%.

Automated monitoring and control of the manufacturing process

To achieve the required reliability and quality of finished work, two independent monitoring systems were installed as part of the REVERSE CUBE system. One regulates and monitors the quality of the parts. The other controls the condition of the injection molds and cavities. Consistent part quality is ensured using the automated, sensor-based FILLCONTROL monitoring and process control solution from PRIAMUS. Hot runner balancing, viscosity monitoring and compression control are the key areas of focus here.

Fill time differences are detected in real time near the end of the flow path in each cavity. The automated control minimizes this difference by specifying new setpoint values for the

nozzle temperatures in the hot runner control, ensuring all cavities are filled at the same time.

Cavity pressure and mold wall temperature sensors detect variations in viscosity and melt flow. By adjusting the cylinder temperature and the temperature in the hot runner manifold as well as adjusting the injection profile, shear stress and shear rate are automatically controlled and viscosity fluctuations compensated for.

Compression control ensures that solidification of the melt during the post-pressure phase always remains at an optimum reference value. After the FILLCONTROL monitoring and control system has been set up, autonomous 24/7 operation of the system with 100% quality control of parts is possible.

Monitoring the condition of injection molds

The second quality assurance system is moldMIND II from männer. This tamper-proof system intelligently monitors and documents relevant injection molding parameters. Data is measured directly in the mold. moldMIND II supports the planning of maintenance and servicing, spare parts management and refurbishing.

Conclusion

The manufacture of complex multi-component plastic products usually involves fabricating individual parts on several injection molding machines and then assembling them in an automated assembly unit. The separate process steps and the many intermediate steps done by hand make this process time-intensive and costly. The REVERSE CUBE from FOBOHA combined with the ALLROUNDER CUBE injection molding machine from ARBURG covers all the processes. This improves quality, is 40 percent faster, and reduces costs dramatically.

FoboHa, Männer, Priamus and Gammaflux are affiliated partner companies in the Barnes Molding Solutions strategic business unit.

About FOBOHA

FOBOHA is one of the leading manufacturers of high-performance molds in the plastic injection molding industry. With successful ongoing development and innovation and a wide range of patents, FOBOHA is asserting its global leadership role, in particular with stack-turning mold and cube technology. Founded in 1973, the company has locations in Europe, the US and Asia. FOBOHA exports its high-end technology to more than 30 countries around the world.

FOBOHA has been a Barnes Group Inc. company since 2016.

For more information, please visit www.foboha.com

About Barnes Molding Solutions

Barnes Molding Solutions is a strategic business unit within Barnes Group, which includes highly respected brands in plastic injection molding tooling, hot runners and controls, Synventive, männer, Thermoplay, Priamus, Gammaflux, and FOBOHA. Molding Solutions' comprehensive portfolio of advanced technologies and value-added services delivers premium tool-based solutions where demanding specifications are required by global customers in the plastic injection molding industry across a broad spectrum of applications. For more information, visit www.BGInc.com.

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Barnes Group Inc. (NYSE: B) is a global provider of highly engineered products, differentiated industrial technologies, and innovative solutions, serving a wide range of end markets and customers. Its specialized products and services are used in far-reaching applications including aerospace, transportation, manufacturing, healthcare, and packaging. Barnes Group's skilled and dedicated employees around the globe are committed to the highest performance standards and achieving consistent, sustainable profitable growth.

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