Process Safe and Cleanroom Suitable

**Männer Lands with the Needle-Operated E-Plate Unit in the Medical Project Business**

Due to its ability to produce high-precision plastic components, electrically driven pin actuation is increasingly being used in medical, pharmaceutical, and technical fields. For devices that need to be medically certified, component stability and accuracy are particularly crucial to ensuring the safety of drug delivery.

Drug delivery devices such as autoinjectors are manufactured in large quantities. For the production of such components, OEM and international approval authorities provide a strict set of rules. Recently, a world-leading solutions provider in this area reached out to Otto Männer GmbH, Bahlingen, Germany, with accordingly specified requirements to manufacturing. As part of the tooling specification, Männer’s e-plate system was chosen for the project as it met the company’s top three prerequisites: great process reliability, excellent component quality, and cleanroom-compatible manufacturing.

**Documented Process Safety**

The electric needle-operated e-plate (Fig. 1) allows precise control of all needle movements. It has the advantage that the direct, rigid connection from the drive to the hot runner pin is completely free of play. This means that all the pins are synchronously and very precisely positioned, resulting in optimal balancing and identical part weights. This design principle allows a very high degree of repetition accuracy for the individual cycles as well as high-cavitation molds.

Important process parameters such as temperature, lift length, travel speed, and timing of opening and closing for each cycle are continuously monitored and logged. Real time indication occurs when values achieved match the target values. Stepless readjustment and optimization of pin positions can arise during production, improving the overall molding process. In this way, flexible and controllable path profiles can be...
Precise Electric Drive

The electric drive train used in the Männer e-plate is patented. The direct, rigid connection from the servo motor drive to the valve pin enables operation with absolutely no play. Elements with recirculating ball units ensure movement deflection with linear guidance. All pins are controlled synchronously via the electrically driven pin actuation plate and stay in exactly the same position throughout the entire cycle. The motion elements are optimized for increased efficiency, reduced maintenance, and longer service life. Up to five electrical axes (such as slide valves, index plate, turntable, etc.) can be run by the Männer e-control software.

Accuracy is further improved by the electric drive (see Box) of the pin actuation plate because the stepless servo-motor drive allows the pins to be positioned to an accuracy of a hundredth of a millimeter. All pins open and close simultaneously and with high precision. The synchronous action of the pins is a prerequisite for high quality, particularly with very small shot weights.

Männer adapts the injection mold and hot runner system for optimal functionality and long service life with each customer application. According to their own statement the high quality of this coordinated system in addition to the manufacturers expertise were important factors in the choice of supplier made by the medical device company.

Cleanroom Quality due to Electric Power

As a further requirement, the medical device company was looking for a process that would be completely cleanroom-compatible. The air had to be free of impurities, and the drive of the injection molding machine, slide-valve movements, and pin actuation were not permitted to produce oily aerosols. The company uses electric injection molding machines as well as Männer’s precision molds, featuring pin valve systems and slide valves driven by electric power. The systems satisfy all cleanliness and hygiene standards for medical products.

When choosing the supplier, Männer benefited by its great experience in dealing with precision medical products, for example in the production of insulin pens where exact dosage must be guaranteed. This experience also includes qualifying

Precision of Parts is Prerequisite for Exact Dosage

In order to ensure precise drug dosing, the auxiliary instruments used to administer the drugs require an exceptionally high level of precision and part-to-part consistency. Tolerances down to approx. ±0.03 mm are maintained for the plastic products.

Injection molds from Männer are specifically designed for large-volume production of high-precision thin-wall plastic parts. Part-to-part consistency and reproducibility ensure reliable and fully automated assembly of injection-molded parts. All molds are equipped with valve gate hot runner systems for a hygienic and impeccable gate quality. Hot runner technology has a crucial impact on the cost-effectiveness and part quality of injection molding.

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is continuously recorded and saved using Männers e-control software. This data is kept for traceability purposes, for optimizing the manufacturing process, or for fault monitoring. The data from each individual cycle (such as torque, alternative force absorption, speed, stroke, and times) can be displayed graphically and used for static analysis.

With e-control, the plant operator can also monitor atypical changes in temperature or when limit values are exceeded. If a critical value is exceeded, production can be stopped via an interface to the machine to protect the tool or avoid rejects. In addition, changes in the torque curve are recorded because these may indicate wear and lead to the introduction of predictive maintenance.

Advantages in Ongoing Operations

In addition to these reasons favoring the e-plate, two further aspects were found to be significant in day-to-day operations: the longer service life and efficiency of the e-plate. The servo-motor drive enables stepless, torque-controlled opening and closing of the pins. The reduced speed protects the gate orifice and reduces tool wear, extending the useful life of the tool by up to 30%.

Due to the greater efficiency of the electric drive, energy costs can be about 80% lower than those required by pneumatic systems. As compressed air has to be continuously generated for pneumatic drives, energy is only consumed in electric drives when drive elements are in motion. In addition, compared with individual pneumatic actuation of the pins, the e-plate allows more flexibility for very tightly spaced cavities and the placement of more cavities in highly confined spaces.

Limits as Basis for Predictive Maintenance

When using the pin actuation with e-plate, the most important process data for process monitoring in injection molds, Männer also developed their own monitoring system called moldMind II (Fig. 4). It records all important process-relevant data in the tool and records it in a tamper-proof manner. In this way, errors can be detected early, downtimes shortened and quality defects avoided. The monitoring system also creates a planning basis for maintenance measures and provides the data for optimized production processes.

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