Dance of the Robots

NP Germany: Extraordinary Turnkey System for Automotive Products

A more impressive sight is scarcely imaginable: NP Germany's turnkey system around a vertical Arburg injection molding machine takes up a quarter of the production hall. During operation, six robotic systems dance a ballet to produce a pump impeller for the car coolant pump of an international automotive supplier – a level of fully automated production that was not an everyday occurrence.

Benedikt Niglis, head of project (left), and Plant Manager Mario von der Heyde are more than proud of their complex turnkey system © Arburg

Benedikt Niglis, head of project at NP Germany in Brilon, Germany, says he put several years of his professional engineering life into the project. And the result is really something to be proud of, he adds with conviction. The system is used to produce a pump impeller for a high-output car coolant pump, which can be used to cool vehicle components such as battery packs for hybrid vehicles.

One requirement for the turnkey system (**Title figure**) was to automate as many work steps as possible up to the finished product while maintaining a high level of autonomy through buffers. Another aspect of the system's great flexibility is its ability to run processing steps manually and to decouple the two aspects of injection molding and ultrasonic welding so that malfunctions in the welding cell do not lead to an interruption of the injection cycle.

Six Seconds Faster

NP Germany, founded in 1851 and member of the Clayens NP Group since 2012, and Arburg decided to integrate a vertical injection molding machine, type Allrounder 1500T, because the machine's vertical mode of operation ensures that the inserts remain precisely positioned in the mold. The cycle time also plays a major role and has been shortened by more than 6 s compared with the horizontal concept. Even with all the different inserts, the electric two-station rotary table, on which there are two identical ejector sides, each with four cavities, saves valuable time as loading takes place at the same time as the spraying cycle.

The vertical machine is the first machine of its kind to be integrated into the production process at NP Germany. Initial concerns due to the complex handling processes were quickly dispelled by working with the Selogica controller, whose user interface was also implemented on the controller of the three Kuka six-axis robots involved in the process. The gradual ramp-up phase is scheduled for the second half of 2021.

Filigree Pockets Filled by High Injection Flowrates

Two versions of the pump impeller made of PPS with 40% glass fiber content are produced on the line. They are differentiated by the length of the integrated magnets and punch packs. In this way, the product is divided into two performance classes. Two hot runner molds with needle-type shut-off nozzles and four cavities each stand ready for each version. Before the cycle actually begins, a bearing bush and a rotor pack are inserted

into each of the four cavities on the free side of the rotary table, into each of which six magnets have previously been automatically pressed. One special feature is the ejector side of the three-platen molds where, in addition to the mechanical slides, there are ejectors, which are used to precisely position the rotor packs to be overmolded using a core pull after the mold has been closed.

A six-axis robot removes these supply parts from a load carrier on a tray server, positions them correctly and transfers them to a preheating station. A linear robot system (Multilift V 30) collects the rotor packs from the heating station (**Fig. 1**). Prior to this, the bearing bushes had been received as bulk material. At the end of the cycle, the three-axis robot first removes the molded parts from the rotary table and then loads the cavities with the inserts. Since the punch packs have very filigree pockets through which the material must flow to fill the lower lid, this requires a high injection speed. After the injection molding process, the second handling unit removes the sprue tree.

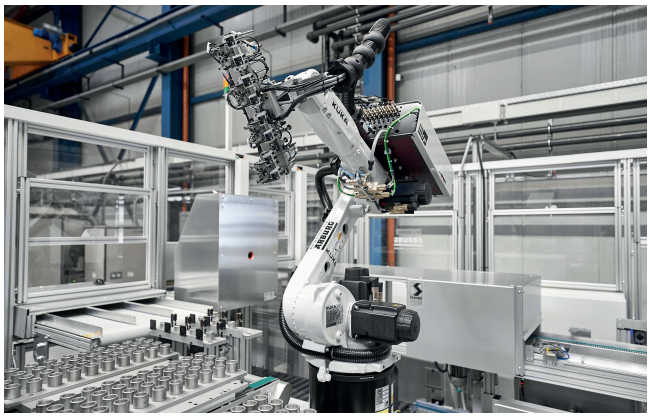

Fig. 2. A six-axis robot feeds the molded parts to the camera inspection (rear area) and sorting and deposits the good parts (front area) © Arburg

Fig. 3. The transfer points of the six-axis robots, e.g. on the ultrasonic welding system, can also be approached manually during set-up © Arburg

Double Camera Inspection

The molded parts that have been removed are transferred to a camera inspection station, which checks their top sides for molding defects. The second six-axis robot takes charge of the parts and guides them to another camera station where their under-sides are also checked (**Fig. 2**). The molded parts are then placed on a double sliding table and leave the system in the direction of the welding cell. Once there, they are removed from the double sliding table by the third Kuka robot. The robot then collects lids, which are provided as bulk material via a vibratory bowl.

The lids are also turned out in the correct welding position by the six-axis robotic system before collection by a third linear handling system. Before the molded parts are transferred to the welding station (**Fig. 3**), the finished parts are removed. The six-axis robot then loads the welding station again and packs the finished parts on a load carrier, which is likewise supplied by a tray server. These then go directly to the customer.

Besides the fact that Arburg was able to provide all the components required for the turnkey system in cooperation with proven partners, NP Germany also appreciates "Arburg's cooperative approach, the standardized operation of its systems including all peripheral equipment, plus the company's swift support, short communication channels and solution-oriented work," as Benedikt Niglis explains. ■

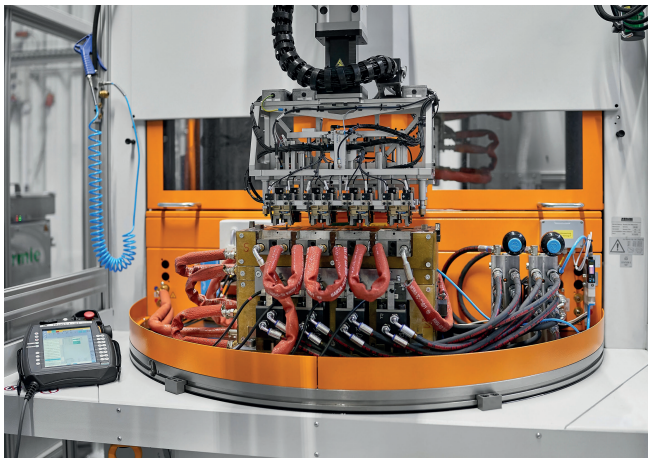

Fig. 1. A Multilift V picks them up, inserts them into the ejector side of the mold and removes the finished parts © Arburg

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Service

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