

Automation. Fully integrated production cells with in-mold labeling, part removal grippers, quality control capabilities and packing units are sought more frequently than ever. The part handling system as heart of the entire manufacturing cell is required to be faster, more accurate and energy-efficient. To address these more demanding customer requirements, almost all equipment manufacturers are starting to offer complete systems.

Ready-to-Start Systems



Fig. 1. The linear robot loads the contact pins precisely, transfers the pre-shots and assembles three individual components to yield the finished part – see conveyor belt (photo: Arburg)

The euphoria at the K2010 also caught up manufacturers of automation equipment. Sales figures are slowly returning to the pre-financial crisis level; growth rates of up to 60 % are being reported in the industry. Companies are following the industry-wide trend, namely, offering energy-efficient and economical systems, often in reengineered series, to achieve greater efficiency, even when it means that speeds have to be pushed to their limits. In addition, one-stop system suppliers increasingly are becoming the preferred approach, since complex

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processes often require elaborate automation solutions. Furthermore, injection molding machine manufacturers are offering sophisticated products that sometimes have been developed in-house or supplied by partner companies.

All-encompassing Complete Systems

Arburg GmbH + Co KG, Lossburg, Germany, for instance, is expanding its own line of robotic systems under the name Multilift or as integral pickers. The latter are designed for fast removal of sprue and runner systems or small injection molded parts. The production system for a complex angular rotation sensor from three components that was demonstrated at the

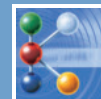
exhibition was an example of a challenging application. A linear robot from the Multilift V series handled precise loading of contact pins, transfer of pre-shots and final assembly of magnetic disk, carrier plate and protective cap to yield the finished part (Fig. 1, see also p. 18). In addition to the three injection units required to produce the molded part, the entire robot program could be set up through the Selogica machine controls. This means that the operator needs only one data file for the entire manufacturing process; after a mold change, the robot is immediately available. Even integrated six-axis Kuka robots can be operated through the machine controls. The Arburg Mobile Selogica (AMS) is a new feature of the control system. The portable operator panel with touchscreen offers practically the identical programming functions as the hardwired machine controls. This simplifies setup, the extent of which is not always known initially, and in this way reduces setup time.

To demonstrate loading of preheated products, **Engel Austria GmbH**, Schwertberg, Austria, presented an interesting application from the automotive industry. Production of a structural component that incorporates glass fiber-reinforced thermoplastic sheet involves a complete production cell with complex automation: The ar-

ticulated-arm Kuka robot transports the preheated thermoplastic sheet from the preheating station to the mold in a retaining frame. To linear robots from Engel's own Viper series accept the preheated thermoplastic sheet from the Kuka robot and preform the fiber-reinforced material. Upon completion of the backmolding



Fig. 2. The "CleanForm" cleanroom solution displayed eliminates the need for subsequent sterilization during production of syringe barrels (photo: KraussMaffei)



process, the molded part is trimmed by a laser (see also p. 16).

In the newly developed line of Viper robots, Engel devoted a great deal of attention to improving details; for instance, the reengineered mechanical components are made from laser-cut metal components for an extended service life, fewer cables in the cable carrier reduce the potential for problems, and integration of the robot controls into the actual injection molding machine controls simplifies programming. On the one hand, the user is aided by a virtual setup assistant, while on the other vibration control of the robot ensures more accurate molded part removal without the need for additional locating within the mold. Built-in identification of masses matches the speed of the robot system to the automation process. Starting in the summer of 2011, Engel will offer an integrated six-axis robot (Stäubli) as a system supplier.

With its LRX, IR and SR series, **KraussMaffei Technologies GmbH**, Munich, Germany, also offers linear and industrial robots for many applications. Prominently placed at its exhibit was a fully integrated automation system that was developed in-house and is typical of that used by manufacturers of medical products. Thanks to vacuum removal of the molded parts and belt-free drives, the entire automation system within the cleanroom guarantees compliance with cleanroom requirements as well as GMP (Class A). Just like the machine, all of the automation equipment featured smooth surfaces to simplify cleaning. Within the production cell, a robot deposited the molded parts (**Fig. 2**) in a specific orientation that permitted singulation, packaging and sealing. In this way, all previously required post-molding sterilization steps could be eliminated, reducing our costs by up to 25 %.

Fig. 3. Even the newly developed W828 linear robot with fixed x-axis features the new R8.2 Touch controls (photo: Wittmann)



Wittmann Robot Systeme GmbH, Gross-Umstadt, Germany, exhibited a new line of robot models with the designations

flexibility is achieved through use of further rotary axes and options: additional input/output cards, additional vacuum and grippers circuits as well as servonumeric auxiliary axes (e.g. B/C servo). Moreover, the new series comes standard with the new R8.2 Touch control system which is supposed to simplify programming of the operating sequence. This generation of controls features a comprehensive decentralized concept, where not only the main processor and external input/output modules, but also the servo drives are connected directly to the internal real-time network. This close coupling of

with medical applications often pose this question to automation specialists. A part removal robot for 96 cavities was exhibited at the booth of **Netstal-Maschinen AG**, Näfels, Switzerland. All 96 of the grippers used to remove parts were controlled individually in order to have the capability of responding flexibly to potential problems. If a single cavity must be blocked as part of ongoing quality control, the rest of the entire production cell can continue operating – the robot diverts unacceptable parts from the process.

Two new products targeted at quality and productivity improvements were the highlights at the booth of **Hekuma GmbH**, Eching, Germany. On the one hand, the supplier of complete automation solutions demonstrated in the form of a concept



Fig. 4. The production cell can be configured to manufacture Petri dishes under cleanroom conditions, for instance (photo: Hekuma)

W818, W828 (**Fig. 3**), W873 and W8VS2. These models are based largely on time-tested concepts, with improvements in the details; for instance, initialization of the units after switching on power is eliminated, because all axes are equipped with absolute position sensors. Integration into the company's own Power series injection molding machines is possible for all robot series. Use ranges from simple pick-and-place applications to complex production cells with complex automation modules. This high degree of

the controls and up to twelve drives ensures dynamic response and control of the axes. The result: increased reliability at high traversing speeds.

Automation Solutions Contribute to Reliability During Production

The participation of **Waldorf Technik GmbH & Co. KG**, Engen, Germany, in the exhibition emphatically underscored the reliability aspects that are often overlooked in the din surrounding speed. Customers

system on display the ability to increase productivity and product quality at the same time with freefalling products. At the same time, the new HekuCell showed a compact and flexible part handling cell for use with small and medium-sized injection molding machines. The cell, which features a six-axis robot and can be retrofitted easily, permits part removal from the side, making it ideal for molding operations with low ceiling heights and closely spaced machines. For medical applications, Hekuma offers →

systems that comply with EN-ISO Class 8 (DIN 14644-1) – and even higher upon request – (Fig. 4).

Hahn Automation GmbH, Rheinböllen, Germany, also exhibited a complete automation cell. The MasterCell offers a wide range of capabilities in terms of part removal and post-molding operations, including a variety of assembly tasks that can also be performed under cleanroom conditions. Reengineered versions of the well-known Smart, Flex and ProLine part handling robot product lines were exhibited as well.

Detail Improvements

Many improvements in the field of automation focus on details. **ASS Maschinenbau GmbH**, Overath, Germany, offers gripper components, robot hands, complete automation systems as well as a quality control approach that focuses on the parts manufactured. Certain au-



Fig. 6. The Visual 2 CNC controls permit remote access for service by specialists (photo: Sepro)

tomation applications would not be possible at all with advances in this segment of the market. For instance, ASS now offers the new GRZ 20 gripper with 95 N, i.e. 50 % more gripping force. The pneumatic ZTE 20 locating unit ensures exact positioning of the robot hand in the mold or for post-molding operations on the molded part. Both tasks, locating and securing the part in the desired position, are accomplished by the locating unit mounted on

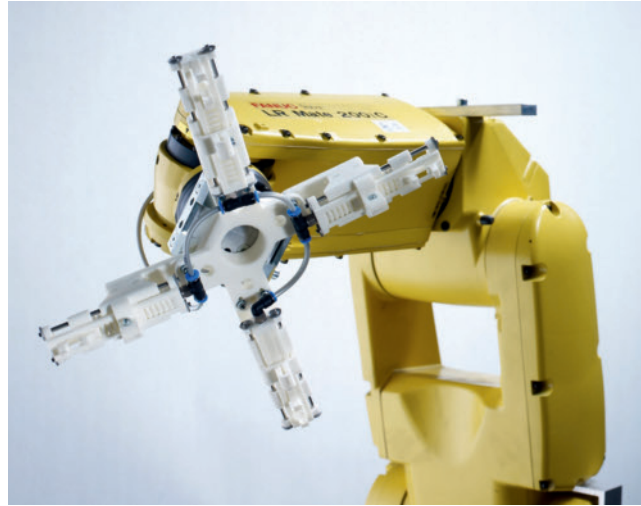


Fig. 5. By using the PA forming technique, grippers and robot hands can be manufactured using custom design data (photo: ASS)

the robot hand. Using the PA forming technique, a generative manufacturing method employing a CAD database, ASS can provide custom grippers and robot hands with short lead times and in small quantities (Fig. 5).

New gripper systems fabricated from Thermalon material are available from **Fipa GmbH**, Ismaning, Germany. The LABS and silicone-free flat and bellows suction cups with diameters ranging from 5 to 63 mm leave no residue on plastic parts, making them suitable for parts that need to be painted subsequently. Fipa also addressed the topic of energy consumption and optimized its ejectors, which now operate at lower pressures yet still assure reliable part handling.

Sepro Robotique GmbH, Rödermark, Germany, as replaced its well-known S4 series with the S5 linear robot, which is intended for use on injection molding machines with clamping forces between 1,200 and 8,000 kN. Built-in lubrication of the ways extends maintenance intervals, which translates into shorter production interruptions as the result of

machine downtime. A “heavy load” version permits automation operations with parts weighing up to 20 kg. The Visual 2 CNC was developed for the new series (Fig. 6) and also permits remote access by Sepro specialists. The robot controls can be integrated fully into the machine controls of machines from **Sumitomo (SHI) Demag Plastics Machinery GmbH**, Schwaig, Germany.

Ilsemann Automation, Bremen, Germany, automated one of the fastest cycles at this year’s exhibition. At the **Netstal** booth, the partners demonstrated an IML process for producing ice cream

cups at a cycle of just under 1.9 s on a 4-cavity mold. To ensure long-term stability, stationary components such as the base frame and ways are fabricated from solid stock. Ilsemann has optimized the performance of the drives employed by using carbon fiber-reinforced grippers.

Six Wins

Stäubli Tec-Systems GmbH, Bayreuth, Germany, offers a total of five “plastics” series with different payload capacities up to a maximum of 100 kg. The six-axis robots are based on the standard robots in the TX/RX series and are available with different arm lengths (Fig. 7). The standard version already complies with the ISO 5 cleanroom class; upon request, Stäubli can supply them for use in an ISO 3 cleanroom. Of interest to the plastics industry is use of the VALplast application software, which permits rapid setup through use of predefined modules and an intuitive operator interface.

After two years devoted to reengineering the individual series, **Reis GmbH**, Obernburg, Germany, presented its RV, RL and a combination of linear and six-axis robots (type: RVL) in



Fig. 7. Arm length, payload and cleanroom version of the six-axis robot can be matched to the requirements of the cell (photo: Stäubli)



Fig. 8. The KR C4 controls with touchpad integrate a wide variety of functions yet remain easy to operate (photo: Kuka)

several weight and size classes. The robots in all series are lighter and faster, and thus more energy-efficient and economical, as a result of the reengineering. As a supplier of complete systems, Reis supplies ready-to-start automation solutions for every sector of the plastics industry.

An interesting combination could be seen at the booth of **Robotec Solutions AG**, Seon, Switzerland, the system partner of **Fanuc Robotics**, Neuhausen, Germany: a combined system with six-axis and linear robots that permits a wide range of motion for universal and flexible use. All axes can move simultaneously for highly dynamic operation and precise stopping at different positions.

Kuka Roboter GmbH, Augsburg, Germany, exhibited the two robot models KR 240 R3100 K ultra and KR 90 R3700 K prime as examples of its new Quantec robot series. The series includes eleven models in two product lines offering a range of payloads and arm lengths for the specific application. With masses reduced by up to 12 % compared to the predecessor series (corresponding to about 160 kg),

these robots are faster and more energy-efficient.

The KR C4 control system exhibited by Kuka integrates not only the robot, motion, sequencing and process control functions, but also all safety features (**Fig. 8**). In the new control system, Kuka has eliminated constraining hardware and replaced it with “intelligent” software functions.

Conclusions

Part handling devices, robots and assembly equipment are indispensable in plastics processing today. The numerous systems available differ in their details in order to provide optimal solutions for the individual tasks required. New developments and improvements in details are making automation

solutions faster, more efficient and easier to operate and set up while reducing maintenance requirements. This will lead to increased use of part handling systems in the plastics industry. ■

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