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Photo: LWB-Steinl

Lead picture / Fig. 1: The LWB-multi-station injection molding systems can be flexibly assembled from individual work modules, such as injection molding machines, handling robots, heating and processing stations, as well as cavity sets, which are passed on between the single work modules.

Costs down – Quality up through innovative multi-station-injection molding

LWB-Steinl, the German elastomer injection molding machine manufacturer and its subsidiary LWB-Automation, which focusses on automation projects, have developed a new and highly adaptable elastomer injection molding concept over a two-year period. There the injection molding machine no longer functions as a complex "all-in-one single-purpose production unit", but as just a part of a system made up of standard modules. The central idea is to separate the processes injection molding, vulcanization and manipulation, checking or post-processing and to make them flexibly combinable as required. This also includes the flexibility to go either for a fully automatic or a partially operated way of production. A new feature of this system are the change mold sets, which are transferred between the work stations by a robot. That enables to run the rubber curing in the machine periphery in parallel to the molding cycle, even with different times for different parts. All in all, the LWB multi-station concept, thanks to its adaptability, offers a maximum of opportunities to increase competitiveness, as is required for the upswing after the current crisis.

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With the corona pandemic the biggest economic slump since the global economic crisis of the 1930s is emerging. As in the past, business plans and sales forecasts became null and void within a few weeks. But "Corona" encountered an economy that already had suffered from individual "sick" sectors. In particular, the automotive industry and power generation, which are currently looking for alternatives to climate-damaging drive concepts. There is a lot of talk about system changes and so-called bridging technology, without a clear direction becoming apparent. All that is clear is, that traditional methods cannot offer solutions to redirect traditional industrial processes to sustainability. Therefore, new ideas and solutions are fundamentally required.

The German machine manufacturer LWB-Steinl in Altdorf-Landshut is proposing one of these new ideas in the form of its multi-station injection molding system. It roots back to fundamental developments already started two years before the Corona crisis. Their focus is, to offer a highly flexible production system that could grow with demand. In order to keep the complexity and the related costs of the injection molds low, the specifications stipulated to use the same mold size and cavity layout from initial sampling to large-scale production. The capacity adjustment should be by the number of mold sets. As a side-effect that concept offers the potential to compensate an under-utilization, through adding additional mold sets for different parts which can be produced within the same system but with different cycle times. In addition, there should be the potential to upgrade to multi-component production.

Such multi-station systems are already in use by a number of pilot users and have been further refined through the practical experience gained. Therefore they are a mature series in needs-based sizes available to all elastomer parts manufacturers.

Efficiency Source: Process Separation

The multi-station injection molding system breaks with the tradition of running all sub-processes in the injection molding machine geared towards a high-volume-capacity. Because the serious disadvantage is the inflexibility to react to fluctuations in demand, except by stopping production. As an alternative to this, the LWB concept divides the injection molding production into individual processes (plasticizing / injection molding, heating / vulcanizing, manipulation). Separate work stations (injection molding machine, heating station, assembly or demolding station) are assigned to each process and can be operated in parallel in a highly efficient manner.

Two central ideas determine the multi-station production concept:

> The basic idea was to use the injection molding machine exclusively for what it was designed for: the plasticizing and injection of rubber or plastics into a mold. But not for the inefficient standstill during the heating or cooling time. The LWB-alternative this is to work with interchangeable low-cavity mold sets. After the completion of the rubber injection each mold set is transferred by a robot to an external heating/clamping station to complete the curing process. The outsourced vulcanization time allows for additional injection cycles in the injection molding machine, which increases the overall system efficiency. (Fig.2).

> The second idea was to use the combination of a relatively small machine and matching mold sets with a low number of cavities to have a consistent system from sampling to large-scale production that can grow with the size of the order, in modular size and cost steps.

Flexible Multi-station Construction Kit instead of a Single-purpose Machine

Investments in production capacities are usually aimed at producing the target quantities on single-purpose machines with an optimized size/cavity-number-ratio. With this concept, which is geared towards the target unit costs of large-scale production, it must be accepted that production is uneconomical in the start-up phase until the series level is reached, unless higher unit prices have been agreed. If, due to a decline in demand, the large series capacity is not achievable, as we had to experience during the Corona crisis, economic problems are not far away. The answer to this is the LWB multi-station kit.

Its content is:

• Standard injection molding machines in the lower clamping force class.

• A 4-axis robot for transferring the mold sets between the injection molding machine and the external heating/clamping-stations. During the transfer the mold sets are held together under pressure by the robot.

• Heating/clamping-stations with a short stroke and a clamping force, tailored to the product range to be produced. Due to the modular system layout, the number of heating stations can grow according to the production specifications resp. the required production output. Each heating station can be opened or closed individually, even with different cycle times.

• System upgrades: For the production of composite parts, additional injection molding machines, also in thermoplastic versions, can be integrated (Fig.4).

• Separate inserting and demolding station - if required also with spread bar function. Robots are optionally available to automate the insert tasks or the demolding operation of the finished part (Fig. 5 and 6).

Outlook

Peter Radosai, LWB-sales manager, in an outlook anticipating the situation in elastomer parts production: *"In recent years we have been asked questions about the right production equipment for uncertain times. That prompted us to rethink injection molding and to leave some traditional points of view behind us. A major input came from our subsidiary "LWB Automation GmbH" in Weinheim, since 2017 part of our group. Their robot application expertise was able to bring new perspectives on rubber injection molding. And, the multi-station system in its current form is just the beginning of a series of other conceivable innovations."*

Figures:

Photo: LWB-Steinl

Fig. 2: Press modules for clamping the mold sets, transferred by a robot from the injection molding machine (center in the background) for outsourcing the rubber curing.

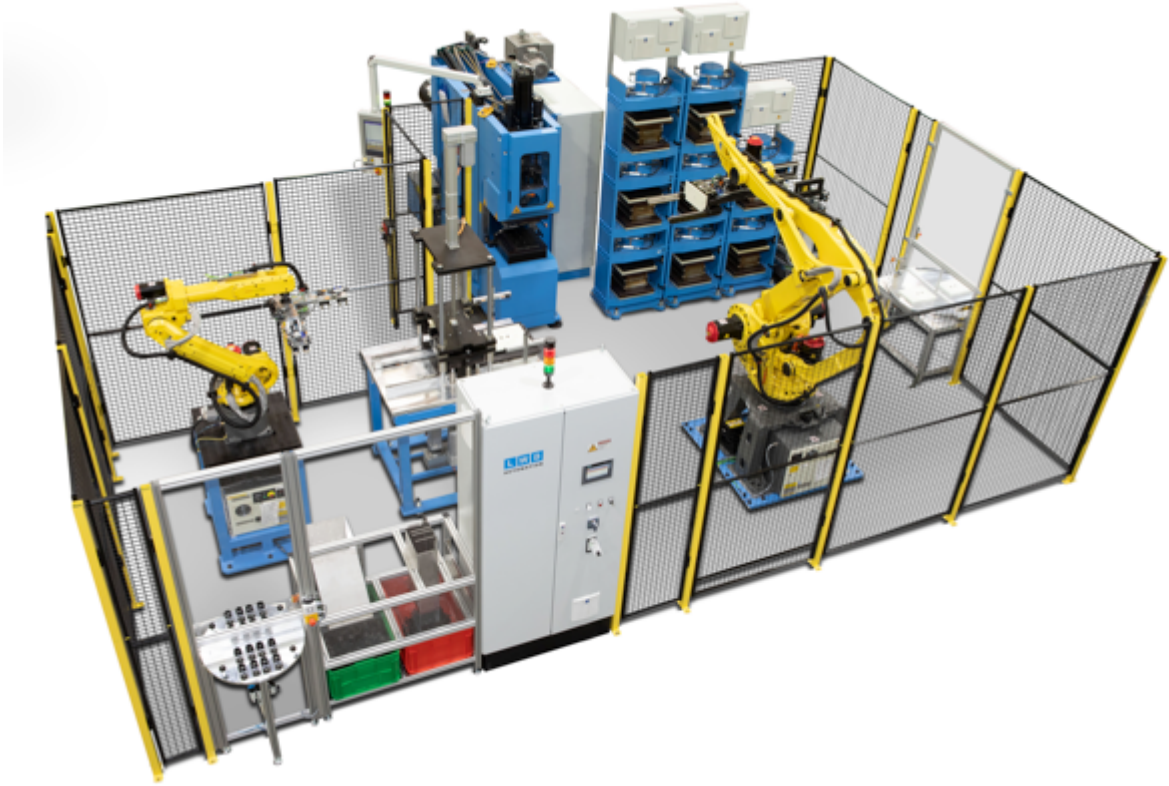

Fig. LWB-Steinl

Fig.3: The capacity potential of the LWB multi-station production cell is derived from the separation of the injection molding, heating, demolding and post-processing processes. The capacities of the individual workstations can be combined as required.

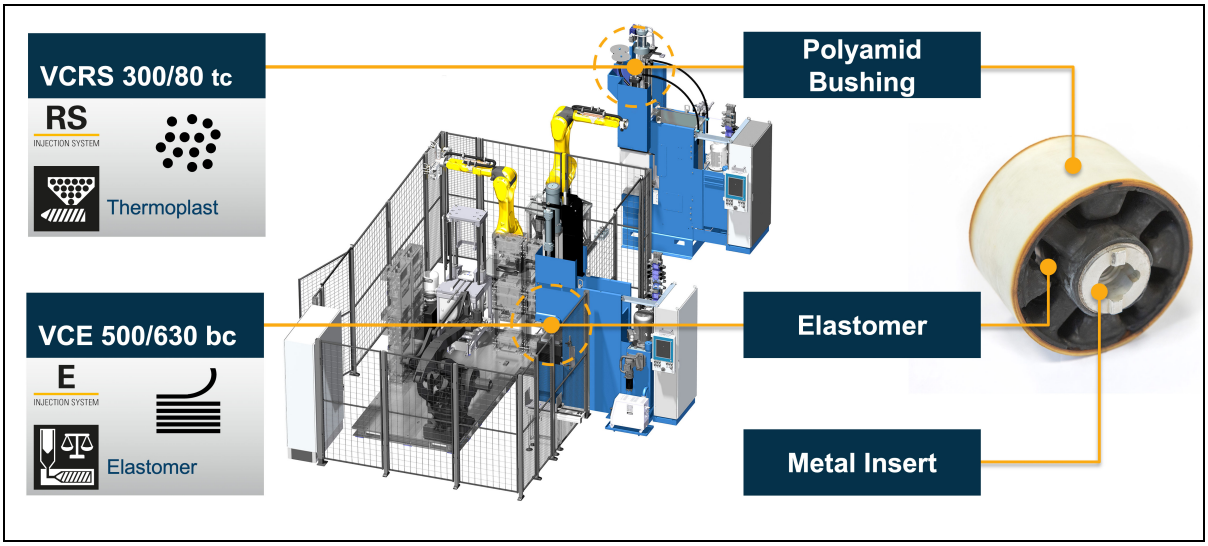

Photo: LWB-Steinl

Fig.4: Example of the production of a 3-component molding with a multi-station production cell

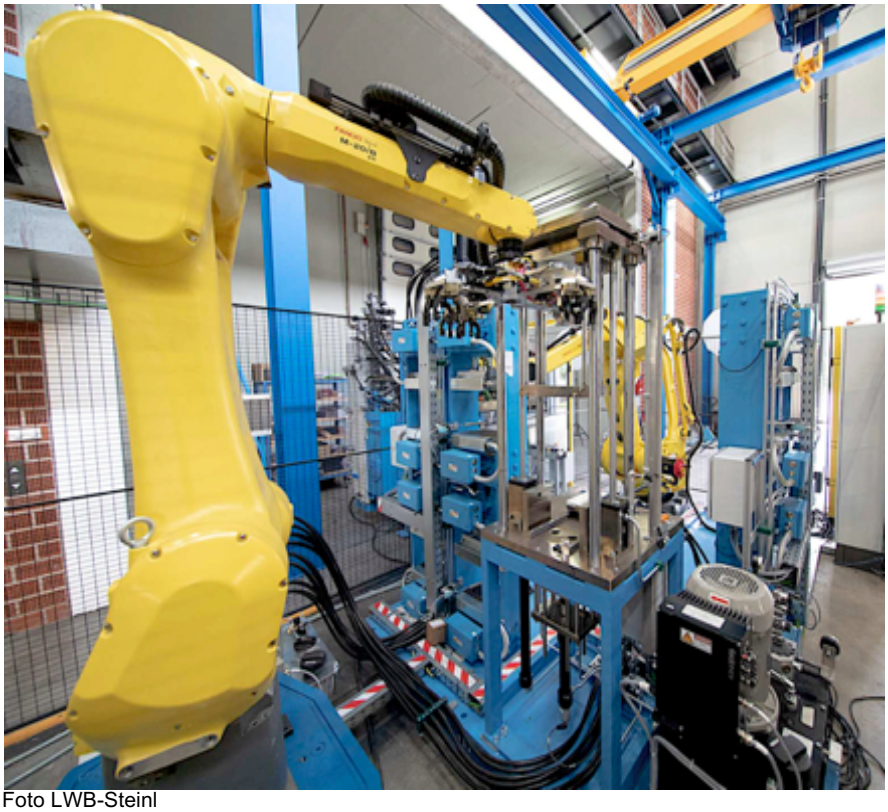

Foto LWB-Steinl

Fig. 5: Processing station, intended for the automated insertion of metal wheel hubs and removal of the finished parts by means of a robot.

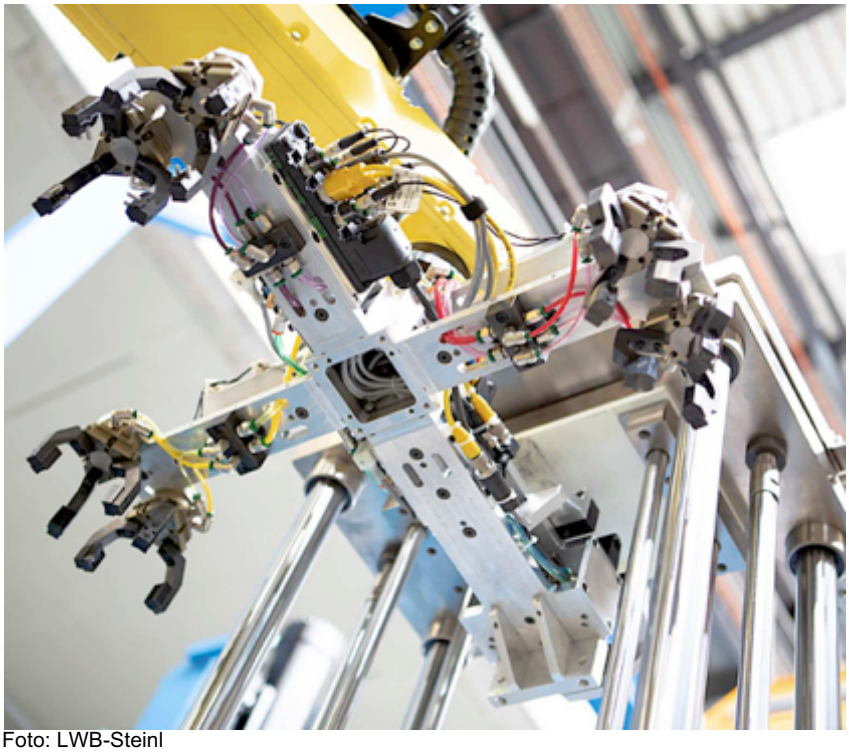

Foto: LWB-Steinl

Fig. 6: 3-station manipulation head for inserting a metal wheel hub and polyamide outer sleeve, as well as removing the finished part.

About the LWB-Steinl

Founded in 1962 by Alfred Steinl, the family-owned company is today one of the world's leading manufacturers of rubber injection molding machines. At the headquarters in Altdorf near Landshut approx. 250 machines are built each year by round-about 250 employees.

The product portfolio covers the comprehensive range of rubber and plastic injection molding machines, from vertical C-frame machines to vertical 4-column or plate-frame machines, to horizontal, tie-bar and C-frame machines. In addition, "batch-off systems" are also manufactured for production-compatible storage of rubber compounds.

Altogether, the Steinl Group currently consists of eight companies, which are clustered in four divisions. The largest division is mechanical engineering, consisting of the LWB elastomer injection molding machine construction, the conveyor belt vulcanizing machine manufacturer Vulctech, the LWB automation, the batch-off cooling line manufacturer Prodicon Ind. Srl and the injection molding machine manufacturer URP (United Rubber & Plastic Machinery Ltd in Langfang / China. In the stamping division STG-Carrier GmbH manufactures metal scaffolding strips for automobile door profiles. The third division is sealing and bonding technology with Dreibond GmbH, a manufacturer of adhesive systems and the consequent application technology. The fourth division is biomaterial production with the company Biofibre.

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