Highly productive transfer forming automatic presses of the PAUST series (Presse Automat Umformen in Stufen) with nominal forces of 160 to 5,000 kN are among the heavyweights in the portfolio of Thuringia’s Raster-Zeulenroda Werkzeugmaschinen GmbH. A well-known supplier placed an order for a transfer forming automatic press for manufacturing filters for the automotive industry. With a stroke of 630 mm, this order exceeded all previously built dimensions by far. The required nominal pressing force was 260 t. Except for the large crankshaft, the machine manufacturer implemented the two-piston-rod press with an external cutting stage and eight forming stages in-house – including a modern control and drive solution from Siemens.

A forming process with a high cycle rate
For the manufacture of drawn parts on the transfer forming automatic press, a 600- to 800-mm-wide metal strip is straightened from the coil and cut into blanks. These are placed onto the transport belt using a vacuum suction device moved vertically by means of a pneumatic cylinder. The transport belt moves the blanks into the work room, where they are taken over by a gripper and transfer system that is mechanically coupled to the crank movement of the machine. It transports the blanks by one forming station in each press cycle. Ejectors ensure that the blanks are pushed out of the dies. The large press stroke allows drawn parts with a length of up to 300 mm to be manufactured. At the end of the forming process, these parts are transferred to the lattice box pallets in a controlled fashion using two-axis handling. At a cycle rate of 40 strokes per minute, the automatic press delivers a finished drawn part every 1.5 seconds.

Safety included
The complex forming process is precisely controlled, driven, and monitored with automation technology.
from Siemens that is already standard on the smaller presses of the Thuringian company and that was in this case specified by the operator. The use of a fail-safe Simatic S7-300F, with the CPU S7-317F-2 DP in this case, was a first for the machine manufacturer and automotive supplier. This controller controls the entire process sequence, including the safety-oriented functions, making a separate safety controller unnecessary.

“The main advantage is the greatly reduced wiring effort, which saves several days of work on machines of this size,” declares Dipl.-Ing. (FH) Holger Schwab, electrical planner and application developer at Raster-Zeulenroda. Standard and fail-safe periphery modules from the ET 200S product line communicate with the fail-safe CPU using the same Profibus cable and Profisafe profile.

The prefabricated Simatic press safety modules make the engineering easier. They are certified according to EN 954-1 category 4, EN 61508 SIL3 (Safety Integrity Level), DIN EN 62061, and EN ISO 13849-1 PL e. They can also be easily combined with each other and quickly lead to an executable and clear safety program – saving time, effort, and cost.

The planning procedure was further simplified by the safety functions implemented directly in the Sinamics S120 drive system. This also saves on safety hardware and contributes to very short reaction times, creating the highest possible degree of safety. The modular drives with servomotors on the main drive, transport, and ejectors are also new. The generational change is made clear by a 142 kW compact asynchronous servomotor from the 1PH7 series on the main drive with high speed stability. It ensures constant conditions during the entire forming process. The precise and dynamic drive control via Sinamics S120 makes a significant contribution to this. The drive assembly consists of four CU320 control units, a common power supply, and power modules that are connected to each other using the Drive-Cliq digital system bus. The motors are automatically recognized by the associated control unit based on their electronic rating plates.

Process transparency in all stages

For setting up, operating, and monitoring the automatic forming presses, the Thuringian company developed an interface for a Simatic Multi Panel MP377 with button operation, based on the Simatic WinCC flexible visualization system.

A great deal of importance was attached to extensive diagnostic options. Thus, there are 1,400 messages that lead the operator as quickly as possible to the source of the problem in the event of a fault. This keeps downtime to a minimum and helps maintain high productivity. In especially tricky or urgent situations, a specialist from the machine manufacturer can dial in from the office and provide support to the operator: a CP343-1 Lean communication processor from the Simatic Net product line creates a secure tunnel using a virtual private network and the higher-level host computer. During ordinary operation, the press and host computer exchange order specifications and current production data over the CP.

“Getting everything from one source ensured that all control and drive components would be optimally tailored to each other,” explains Schwab. “Siemens has given us comprehensive support in the handling of new products and processes, allowing us to implement this large project on time and with the required quality.”

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