Retrofit Delivers New Maximum Output

A fast loader, user-programmable transfer systems, and shuttles form the basis of a completely reautomated press line for automotive structural components. The advantages are higher output, greater flexibility, and an assured long-term supply of spare parts.
The electrical equipment of the established six-stage press line for automotive structural components at Audi AG in Neckarsulm, Germany, was showing its age. Total Productive Maintenance (TPM) measures increased and it became difficult to procure the necessary spare parts. As a result, the company decided on an extensive retrofit of its press shop in Neckarsulm. In the course of this retrofit, the rigid mechanical coupling of the transfer devices to the plunger motion was replaced with an up-to-date solution.

**Increasing the stroke rate as top priority**

The retrofit was carried out by Automatic-Systeme Dreher GmbH, based in Sulz-Renfrizhausen. Dreher replaced the old mechanical automation system with an integrated electronic solution, while Siemens upgraded the controllers and the operator control and monitoring systems of the six presses. According to managing partner Klaudijo Dreher, increasing the stroke rate as top priority.

Dreher’s electronic transfer systems consist of two identically constructed units for each end of the press. This means that the blanks can be freely positioned in all three axes – irrespective of the plunger motion. Now the traverse paths of the shuttles can also be programmed by the user independently of the plunger motion. It is possible to configure the motion sequence of the transfer systems and shuttles with a high level of flexibility now that they have been decoupled mechanically. Waiting times are minimized, and the desired increase in productivity is achieved. The intermediate conveyor designed as a turning device can be used in any position, enabling even more flexible processes. All connections were designed to be plug-in, so that the transfer units can be replaced. This was also one reason for using Simotics S-1FK7 servomotors in the highly dynamic version with Drive-Cliq, and for moving all parts to the outside. Four state-of-the-art motors with a further reduced moment of inertia were installed on the blank stacker.

**Complex motion control with Simotion**

Drive-based Simotion D445 motion controllers, one for each of the blank stackers and for each transfer system, ensure fast motion sequences that are nevertheless gentle on the mechanics. As the master, the Simotion assembly specifies the guide value for all the other presses via the Drive-Cliq digital system bus integrated into the system, and for this purpose it is linked to a virtual master axis in the Simotion system. The actual press controllers are subordinate to the motion controllers as slaves on the Profibus and in turn are synchronized with each other via Profinet in synchronous operation. All movements are user-programmable and can be modified at the touch of a button. Dreher has achieved this by using the pre-fabricated modules of the standard SimoTrans for Simotion application. STO (Safe Torque Off) and SLS (Safely Limited Speed) are used as safety functions. The press safety modules of the Simatic S7-F/P library were also used to create the safety program. These are easily integrated into the distributed safety-programming environment in Step 7.

**Availability and efficiency assured**

Use of Siemens state-of-the-art control and drive technology means that the age-related malfunctions and downtimes no longer present a problem, and this in turn has permanently increased both the availability and the output of the press lines. Thanks to the retrofit, it is now possible to create more flexible motion sequences. The line’s overall energy consumption has also dropped significantly due to the energy regeneration capability and energy efficiency of the cutting-edge drives. In conjunction with the higher productivity, the result is a further reduction in the energy cost per item.

“As a Siemens Automation Solution Partner, we have already proved in several joint projects that we can also complete complex tasks such as these on schedule.” The operator’s specific requirements included increasing the stroke rate from 12 to 16 per minute, or, in other words, increasing output by more than 30 percent. Up to that point, the stroke rate had been limited by the rigid sequences determined by mechanical cams and vertical shafts. Dreher has now replaced the mechanical automation with six electronic transfer systems in the presses, five so-called shuttles, and a turning device between the presses. A new highly dynamic blank destacker was also designed jointly with Audi.