Volkswagenwerk Wolfsburg, Germany

Efficiently Cut

The new 8,000 kN board cutting machine of a well-known press manufacturer at Volkswagen in Wolfsburg cuts, straightens, and stacks quickly, precisely, and economically. The motion control-based automation plays a big part in the productivity and power efficiency of the machine.

The Volkswagen factory in Wolfsburg invested in a new board cutting machine in the course of reorganization of its press shop. The machine replaces two old machines: one with a swivel cutting device and one for cutting with forming tools. “By using a swivel tool, it can handle angled and trapezoidal cuts, and the press table can be fitted alternatively with forming tools,” Rainer Schierding, electrical planner at Volkswagen Wolfsburg explains. It can process coils of 300 mm to 2,100 mm in width and handle feed lengths of 180 mm to 4,100 mm.

Faster than previous lines
Since the new board cutting machine mainly prepares sheets that later form the outer shell of automobile bodies, the highest demands are made on the surface and edge quality of the boards produced here. The machine therefore controls a stacking device with an intermediate stop developed by the press manufacturer for sensitive parts. Instead of ejecting the boards from the conveyor belt on the fly against a stop, every board is positioned above the stack by motion control before placing it on top. “The machine designed for 65 strokes per minute achieves a much higher yield per week than the two previous lines,” Schierding sums up from his experience. “It also provides the high process safety and reliability we need in our 18-shift operation.”

Modular motion control system
The automation with Simotion D and the Sinamics S120 drive system plays a major role in the high
productivity. All the drive processes are adapted to each other with this motion control system consisting of an Active Line Module, 11 inverters, and two Simotion D. The machine is divided into independent safety zones for simple integration into the operating procedures. “This enables us to make the preparations for changing coils and tools without interrupting the ongoing straightening and cutting operation,” electrical planner Jens Lorke explains.

Combined with low-power motors of the EFF1 efficiency class, the Sinamics S120 drive system helps make the machine extremely power efficient. All servodrives – from the book-size class to chassis modules, from conveyor motors with a few kilowatts to the large press drive with more than 200 kilowatts – are connected by a common direct voltage intermediate circuit. An actively controlled Active Line Module – which is self-controlled both in power consumption and in feedback – ensures stable voltage conditions on this intermediate circuit, called “DC-Link” at Volkswagen Wolfsburg.

“It enabled us to achieve much higher energy savings than originally expected. The DC-Link has the effect that a large percentage of the energy is only carried back and forth between the servos depending on which servos are currently operating as motors or generators,” Schierding explains. If the feedback of currently surplus power from the DC-Link into the supply network is considered, only the power difference and the low power loss are drawn from the network in ongoing operation. The power consumption has dropped to a third of the installed total power.

Reference for new plants
Another beneficial side effect: the reactive power part of the machine fed back into the network tends toward zero, and in practice the reactive power part of other machines can even be compensated by capacitive feedback in operation. In addition, this type of power control allows the entire plant to be shut down without data loss and to be restarted without problems with the residual electrical and kinetic power in the event of a sudden failure.

The innovative automation of the machine enabled very quick development and a short commissioning time. “The acceptance of the new system among our developers and application technicians was high from the start,” Günter Popp, head of electrical design of the press manufacturer, reports. “And they soon achieved good results with it, especially with the competent support which was always available from Siemens Erlangen.”

Machine details
The new cutting machine can process steel coils (far left) of 300 mm to 2,100 mm in width and handle feed lengths of 180 mm to 4,100 mm. The steel sheet is fed into the machine (middle).

The cut sheets are destined for automotive bodies, so the cutting process has to meet the highest surface and edge quality standards. To avoid damaging the sheets during stacking, the machine is equipped with a stacking device with intermediate stop (right).