

TwinCAT Hydraulic Library masters complex drive control

Deep drawing press convinces with speed and energy efficiency

The Danish press manufacturer Kiermar Technology has developed a revolutionary deep drawing press that challenges traditional concepts of size, speed and energy efficiency: although it has a pressing force of 1200 t, the press itself weighs just 26 tons; its overall height, including the crane for tool handling, is only four meters. The press also impresses with extremely fast cycle times, based on fast tool and integrated material handling: as a result, the press cycle for the production of a sink takes less than 15 seconds. The electrical and hydraulic Servo Drives are controlled by a Beckhoff C6920 Industrial PC with TwinCAT automation software and the EtherCAT communication system.



Martin Hansen, Managing Director of Kiermar Technology, presents the sink, which is pressed with the deep drawing press.



The main feature of the ADP deep drawing press from Kiermar is the horizontal movement of the upper tool when the finished product is ejected and placed on the conveyor belt. The tool is only moved bottom to top during the actual pressing procedure.

With its Advanced Deep Drawing Press (ADP), the Skanderborg, Denmark-based Kiermar Technology A/S has introduced a deep drawing press to the market that is characterized by the horizontal movement of the upper tools. Only the actual pressing procedure takes place from bottom to top. The upper tool only has to move freely five millimeters in a vertical direction before it drives horizontally out of the press and the finished product is placed on the conveyor belt by means of an ejector. "A complete pressing cycle takes less than 15 seconds and is thus around 30 % faster than other hydraulic deep drawing presses," explains Martin Hansen, Managing Director of Kiermar Technology.

Up to 60 % energy savings

The extremely small movement of the upper tool means that only minimum vertical movements are required in the subsequent process in order to develop the sheet metal holding force. Therefore, the ADP press requires hydraulic pumps with a power rating of only 118 kW compared to the usual 300 kW. "In conventional presses all movements take place vertically, which means that the tool must be raised in accordance with the height of the finished product in order to remove the product from the press. Raising the tool requires considerable expenditure of force and, correspondingly, large amounts of hydraulic oil. Our deep drawing press concept runs with two hydraulic pumps: A large one for the actual pressing procedure and a small one for opening and closing the pressing tool. The pressure and flow rate of the

hydraulic axes are precisely dosed during operation in order to save energy," explains application engineer Hans Christian Pallesen from Beckhoff Denmark.

Universal Industrial PC platform for PLC and Motion Control

Just one Beckhoff C6920 Industrial PC is required to handle the PLC and Motion Control. PC-based control ensures that both the pressing procedure and the horizontal tool movements operate precisely and smoothly. The press is equipped with three electrical and three hydraulic servo axes. "This is where the challenge lies, because electrical and hydraulic servo axes are controlled very differently," explains Hans Christian Pallesen and he adds: "In the case of electrical axes, a certain operating profile can be created in advance on the basis of ramps, position and speed. That is not possible with hydraulically-controlled axes, since they change their profile during operation. In addition to that, the hydraulics behave very differently, depending on the valve type, oil flow, oil temperature, etc."

The hydraulic axes are "path controlled;" i.e. the position controller is active only when at a standstill. The set value generator controls the cylinder according to ramp and speed, while its current position is constantly checked via the encoder signal. Once the set value position is reached, the position controller is activated again in order to maintain the current position.



Martin Hansen, Managing Director of Kiermar Technology, at the deep drawing press. The control components are accommodated in a control cabinet beside the press and the hydraulics below the tool pullout, which enables fast inspection or maintenance.



Engineer Bjarne Steenbjerg from Kiermar Technology and application engineer Hans Christian Pallesen from Beckhoff Automation Denmark (from left) in front of the control cabinet of the deep drawing press

TwinCAT Hydraulic Library controls hydraulic axes

While the electrical axes are controlled by TwinCAT NC PTP software, the hydraulic axes are controlled via the TwinCAT Hydraulic Library. "With the aid of this standard software library we were able to master the special challenges of the ADP deep drawing press, such as the movement of 2,000 kg horizontally by 2 meters for discharging the work piece – in less than two seconds and with an accuracy of ± 0.1 mm."

Update 500 times per second

TwinCAT automation software forms the cornerstone for the execution of the PLC program. The PLC data performance enables extremely fast execution while at the same time handling the very demanding travel movements. The entire PLC program is updated every 2 ms, i.e. 500 times per second. To do this, EtherCAT is used for communication with Beckhoff servo drives and I/O components. The extremely fast update rate gives rise to an ultra fast control system, which contributes to the precise positioning.

"The prototype of the ADP Press was completed in October 2011 and has generated great interest", says Martin Hansen. "We now focus on the export market and are about to establish a worldwide sales network for our machinery."

Further Information:

Kiermar Technology A/S: www.kiermar.com
www.beckhoff.dk