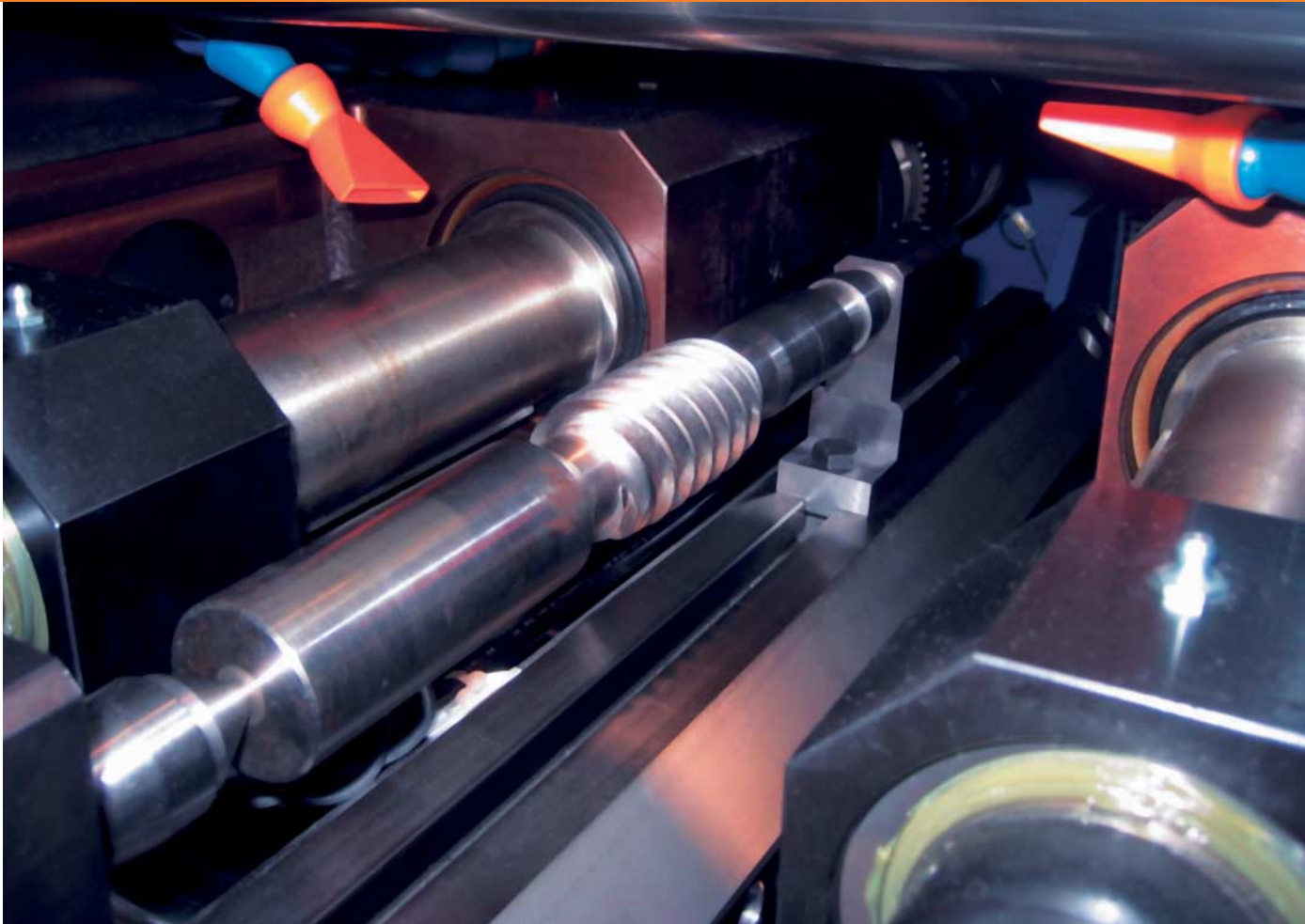


PC-based NC technology ensures flexibility for profile forming machines

Getting into shape quickly

→ Rollwalztechnik (RWT) have been producing NC- and CNC-controlled profile forming machines with particular focus on the automotive sector for about 15 years, based on a consistent assembly system for drive, control and hydraulic components. This machine concept offers benefits in terms of simplified service and flexible adaptation to the respective production tasks, as illustrated by a thread rolling machine that sets new standards with regard to flexibility, performance and ease of operation, thanks to PC-based automation technology from Beckhoff.



Rollwalztechnik Abele + Höllich GmbH was established in 1982 and is based in Engen, Germany. The company manufactures profile forming machines, i. e. thread and profile rolling machines with 1 or 2 rollers, for forming rotation-symmetrical workpieces. Typical applications include high-precision external splines, threads and recirculating ball screws. This type of machine is usually classified according to the maximum available compressive force. RWT covers a range between 12 and 60 t and produces both classic versions (with frequency converter-controlled drives and simple, end position-controlled hydraulic systems) and fully CNC-controlled versions.

Innovative machine construction

The design of the thread rolling machines from RWT enables universal application of rolling techniques using thread rolls, for example penetrating rolling or pass rolling with pivoted roller screws, or a combination of both techniques. The compact design of the machines with non-positive roll frame ensures that the rolling forces can be controlled safely. The self-lubricating, asymmetric 3- or 4-column guide prevents slide lift – an important prerequisite for improving the service life of the rolling tools. As a good example for the innovative machine design, Helmut Sproll, technical director at RWT, describes the 2-roller thread



Control

- | Control cabinet PC C6140
- | Control Panel CP7832-0001 with push-button extension C9900-E768
- | SERCOS PCI fieldbus card FC7501 or FC7502
- | TwinCAT NC PTP, TwinCAT PLC Library "Hydraulic Positioning" application-specific user interface
- | Windows XP

I/O system

- | SERCOS Bus Coupler BK7520
- | various Bus Terminals

rolling machine RWT 30X CNC/AC: "The machine has two pick-up screws for the forming tools. Both are driven by servomotors and synchronized via the NC controller in terms of relative rotational position and synchronous operation. The workpiece to be profiled is located between two forming tools that move towards each other, driven by a servo-hydraulic system. In this way the workpiece is picked up, rotated, and formed through the feed motion of the hydraulic system."

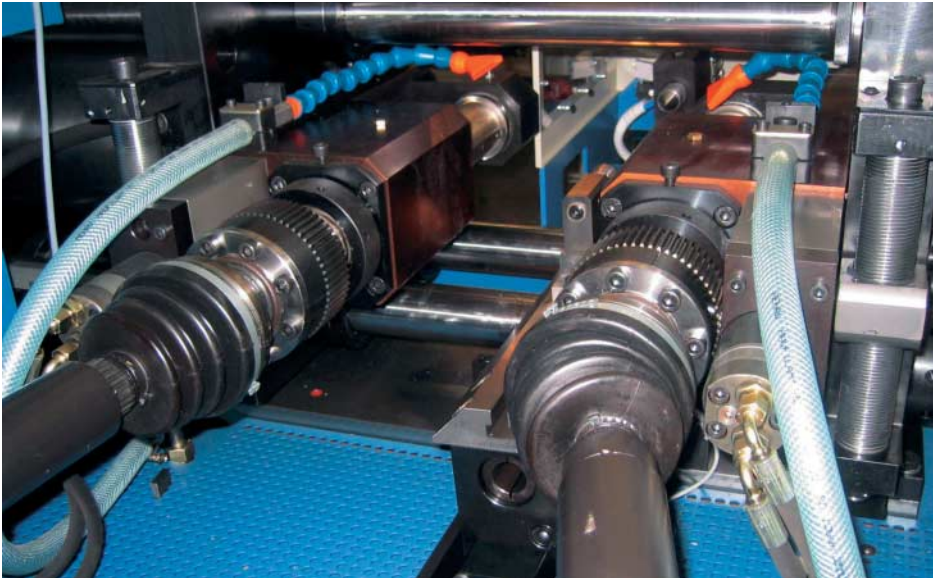
"The two rotary axes have to meet very high synchronization requirements, in order to be able to produce high-precision workpieces such as external splines for the automotive sector", said Helmut Sproll. "The hydraulic feed motion of the third axis is responsible for ensuring dimensional accuracy of the workpieces in the 0.001 mm range. For certain applications it can be synchronized with the rotary axes (start angle). Additional quality control of the forming process is achieved by monitoring the forming forces and the drive power. Beckhoff automation technology meets all these requirements." Frank Würthner from the Balingen Beckhoff branch said: "The special feature of the thread rolling machines is that the required profile can be cold-formed, which means that the natural fibre direction of the material is not disturbed. This results in a higher strength and impact strength."

Flexible and integrated automation

Helmut Sproll's decision to start using Beckhoff automation technology about a year ago was based on several factors. The PC Control system is very flexible and can be optimally adapted to the process engineering requirements. It offered an opportunity for creating an integrated user interface, and the high-performance PC achieves very short position control cycle times. "The integrated software PLC enables implementation of a wide range of automation tasks, and the machine can relatively easily be extended with additional NC axes. And all that with a good price/performance ratio," said RWT's technical director.

For this first project Beckhoff very successfully handled the software projecting aspects. Frank Würthner said: "We were able to benefit from our comprehensive hydraulics know-how and from the fact that we could respond very flexibly to customer requirements thanks to the open Beckhoff technology. For example, we were able to select the bus system freely without any restriction. Based on the drive technology we used, we decided to use SERCOS." According to Helmut Sproll, EtherCAT will no doubt become an issue, since it offers substantially higher transfer speed than SERCOS.

The three machine axes are controlled by the higher-level Beckhoff control system, which also deals with the PLC functions for workpiece feed and discharge



and clamping functions. The system is based on the Beckhoff control cabinet PC C6140 with Windows XP and SERCOS master card and the "Economy plus" Bus Coupler BK7520 for integrating the I/O level and the Servo Drives. Other system components are the TwinCAT NC PTP positioning software, the TwinCAT PLC libraries for hydraulic positioning, and the NC interface on the Control Panel CP7832.

The user interface is displayed and controlled via a touch screen and covers the actual CNC machine control, the PLC application, integrated rolling force monitoring for quality control purposes, and output measurement for the drives. Like the machine control, it was developed based on special industry know-how and in close cooperation between RWT and Beckhoff. Helmut Sproll said: "Our experience has been very good. Through the cooperation with Beckhoff we were able to utilize important synergy effects, and we were very happy with the advice and technical support from Beckhoff."

Benefits of software control

Helmut Sproll has no doubt that the decision to use a pure software control has paid off: "The PC-based automation technology from Beckhoff offers flexibility, a common user interface, consistent projecting, and integrated remote maintenance and diagnostic options." According to Frank Würthner, further benefits arise from the scalability of the TwinCAT NC PTP axis positioning software and the hydraulics library. "We expect that about 90 % of the wide range of benefits of the flexible and integrated automation solution manifest themselves in the machine design, and 10 % in the application." Thanks to the comprehensive functionality of TwinCAT NC PTP, i. e. axis positioning (set value generation, position control), integrated software PLC with NC interface, operating software for commissioning and I/O interfacing of the axes through a wide range of fieldbuses, the software was able to replace conventional positioning modules and NC controllers.