

Numerous Wire Bending Options

WAFIOS AG in Reutlingen offers one of the most extensive ranges of wire bending machines. The range is characterized by a wealth of both mechanical and software-based options. The introduction of the new WPS 3.2 EasyWay control system has brought about a particular increase in the variety of software options in the form of *iQ* functions.

The WAFIOS wire bending machines process soft wire from 1.5 mm to 16 mm and spring wire from 1.5 mm to 10 mm into two- or three-dimensional bent parts. Although some of these parts feature coils and therefore provide a spring function, they are not classic extension or compression springs. If such springs are to be produced in large numbers, manufacturers will find alternative solutions in the Reutlingen-based machine builder's range of torsion spring coiling machines.

WAFIOS is increasingly equipping bending and coiling machines with the new WPS 3.2 EasyWay control and programming system. The system was developed in-house, features a graphical interface and enables fast, user-friendly plain-text programming. The operator enters the geometrical data for the wire workpiece to be formed and the machine takes care of the rest. The programming system also forms the basis for the latest software functions and for communication with other internal or external components, thereby helping to increase digitization in production.

This convenient system is now available for almost all Performance and High-Performance single-head and multiple-head wire bending machines. The single-head machines are comprised in the BM and BMU series. The BM machines offer seven CNC axes as standard and can be extended to up to 14 axes as an option, depending on the equipment. The BMU machines can be extended to include up to 24 CNC axes. The new B 36 Performance machine from the B series (equipped with a maximum of six axes) also features the current WPS 3.2 EasyWay control system, bringing it closer to the BM series. The B 36 was presented to experts for the first time at this year's wire trade fair in Düsseldorf. Even in the basic version, the machine enables numerous application options, e.g., in the automotive, furniture, domestic appliance, or electrical industry.

When it comes to mechanical options, the BM 60 really stands out from the crowd. Its design is based on a modular principle: The basic BM 60 version provides the same range of functions as a B-series machine. Extending the range of functions turns it into a mid-range BM machine. Add on all of the functions that are currently available and it becomes a high-end BMU machine. The BM 60 is currently one of the newest single-head bending machines in the WAFIOS range. It is suitable for soft wires up to 13 mm and spring steel wires up to 7 mm in diameter.

The BMS series of multiple-head bending machines also includes WPS 3.2 EasyWay as part of its basic equipment, as does the enhanced BT series. Both series are top of the range and are based on different concepts. The BT models feature two or four bending heads. A special feature of this series is the ability of the bending units to operate independently; preferred areas of application include asymmetrical bent parts such as seating components as well as serpentine springs for vehicle seats. In the BMS series, a highly dynamic, rotary straightening system and state-of-the-art servomotor drive technology ensure maximum precision. Machines from the BMS series all feature two bending heads and enable a bent part to be machined from two sides simultaneously.

Easy set-up

WPS 3, the previous version of the control and programming system, already offered the possibility of integrating individual *iQ* functions, e.g., *iQbend*, to automatically adjust bending speeds and minimize time-consuming manual

optimization. The current WPS 3.2 EasyWay version offers even more: A whole range of intelligent and – in some cases – entirely new **iQ** software functions. Invariably, the aim of these functions is to optimize processes and increase productivity and component quality. Even while setting up the machine, the operator saves a significant amount of time and avoids the scrap parts that usually accumulate during the set-up phase before the start of series production.

Simulating the bending operation is an important control option – in particular when bending complex three-dimensional parts – to prevent collisions during the bending process. **iQwire** provides a simulation tool for this purpose. Before or during machine set-up, the operator can graphically display the entire bending process. And that's not all: The software also determines the cycle time, which can be very important for production planning.

In conjunction with **iQconvert**, single-head bending machines from the BM/BMU series and multiple-head bending machines from the BMS and BT series offer the option of automatically converting the component's CAD data in IGES and STEP formats into WPS data for the machine control system. The automatic conversion eliminates the possibility of reading or writing errors which are common in manual data transfer and programming.

Thanks to **iQinspect**, it is possible to connect an external measuring system to the wire bending machine in order to carry out component corrections automatically. If a prototype is measured in advance, the machine can use this data to be ready for series production more quickly. Furthermore, WPS geometrical data can be transmitted as setpoint data to the measuring system in order to further simplify set-up by comparing the setpoints with the actual values.

Depending on their length, bent wire parts tend to vibrate during production. With **iQsmartbend**, the software developers at WAFIOS have created a solution that suppresses vibrations and increases productivity by optimizing the tool movements. It can be used on machines from the BM, BMU, and BMS series. The process of reducing vibrations requires complicated calculations. For this purpose, the machine control system uses a WAFIOS computer cluster via an online interface. Depending on the component, productivity increases of more than 50% can be achieved thanks to this award-winning solution.

New applications

Another highlight of WAFIOS's software development work is **iQbendcontrol**, a camera-based system for measuring and controlling up to fifteen bending angles per component. For each angle measurement, the function can activate a control to automatically correct subsequent parts, if required. The WPS 3.2 interface makes programming as easy as always. The software also features a tool monitor with an immediate stop function. An XML Lite export is available as an option. If required, the measured values can be logged. The software can currently be used on various BM and BMU single-head bending machines. "In-process control by intelligent systems will continue to increase in importance," explains Dr. Uwe-Peter Weigmann, Executive Board spokesman at WAFIOS. "Customers are increasingly demanding complete traceability with regard to quality, right down to the individual part. We can already offer that option now."

Another issue that is set to play an increasing role in the future of wire bending is the use of electric vehicles. Electric drives in vehicles require contact rails which act as connections between the different components. The latest generation of electric motors no longer consists of classic coils, but of a large number of hairpins – parts that are ideal for bending machines. "We already have the concepts for the bent

parts in electric drives that will be needed in large numbers in the future," explains Weigmann. "We are prepared for the processing of materials such as copper or the machining of rectangular cross-sections. Our machines are designed to be flexible right from the start."



Fig. 1 Typical wire coil part (tedder fork), produced ready-for-use on a BM 90 single-head wire bending machine.



Fig. 2 Coiling unit of a BM 90 single-head wire bending machine.



Fig. 3 The WAFIOS B 36 Performance single-head wire bending machine is the latest model in the B series. First machine in this series with the WPS 3.2 EasyWay programming system.



Fig. 4 BT-series multiple bending unit allows simultaneous wire bending with up to four bending heads.