



PC-based control and drive technology ensures that the customer receives the final product – the office cabinet from Godrej Interio – with a dimensional accuracy in the folding radii of less than 0.3 mm.

PC- and EtherCAT-based control and drive technology for high-precision metal forming

# Sheet metal folding with PC Control yields faster production cycles and improves tolerance by 40 percent

Reduced labor costs, improved production accuracy, reduced cycle times, minimized tool changes, and optimized overall quality of parts – these were the requirements that needed to be met by a new sheet metal folding line for a major furniture and household appliance manufacturer in India. The Beckhoff solution, integrating PC-based control technology, fast EtherCAT communication and modern drive technology meets these requirements, enabling more flexible production processes.

Indian machine builder, Multifold Machinery Manufacturing Co. is considered to be the first choice when it comes to the design and development of sheet metal folding lines. Against this background, Godrej & Boyce, a leading Indian manufacturer of home and office furniture, refrigerators, and air conditioning units, commissioned the machine manufacturer to develop fully-automated folding systems for the production of filing cabinets. These systems were designed to guarantee a faster process and higher precision in the production of the filing cabinet housing, drawer fronts, and drawers, while at the same time offering simple operation and easy maintenance. Beyond that, the production was adapted to more flexibly enable workpiece changes and increase reliability.

## **TwinCAT and intelligent drive technology lower costs**

The result of this development work at Multifold is a dynamic machine built up of a drawer-front folding line and a drawer-body folding line. From the outset, Arun Mistry, Technical Director and joint founder of Multifold Machinery Manufacturing, favored PC-based control technology for fast communication between the control systems, the servo drives, and the I/Os. In addition, as the company had worked with Beckhoff since 2013, the decision in favor of an automation solution from Beckhoff was an easy one to make.

Two Beckhoff CP6201 Panel PCs, with 12-inch touch display, dual-core CPU and Windows CE operating system, plus TwinCAT automation software, form the

foundation of the system, serving as the central controllers for both folding lines. EtherCAT provides high speed and simple handling of data communication. Mistry continues: "TwinCAT gives us greater scope in the design of the machine and reduces engineering effort. Also, the ready-made function blocks in TwinCAT increase programming flexibility."

#### **Drawer front: reduced cycle time**

Providing advanced motion control in the drawer-front folding line are 14 servo axes with a rated torque of 4.3 Nm each, together with two stepper motor axes and EtherCAT terminals for a total of 67 digital inputs and 39 digital outputs. The compact AX5203 2-channel servo drives take up very little space and reduce both control cabinet size and component costs. Shyam Shinde, Head of Automation at the client, Godrej & Boyce, discusses the advantages of One Cable Technology (OCT) from the servomotors in the Beckhoff AM8000 series: "Parameterization is very simple, contributing to smooth and efficient implementation of the project." The drawer-front folding line benefits from the OCT servomotors in the view of Arun Mistry, as well: "We are able to decrease our costs substantially, as the required wiring and the cable sizes are reduced by up to 50 percent."

The drawer-front folding line is used to manufacture two upper drawer fronts and a larger filing drawer front. Sheet metal is transferred successively from three different piles and loaded into the system to begin the measuring process. The sheet metal is measured only once with plug gauges, positioned by two stepper motors. A secure clamping and transfer mechanism maintains the measurement reference value from the beginning to the end of the process. Until unloading after a completed sub-process, the secured clamping reference is the basis for indexing the movements. Two individual servo motors ensure the accuracy of the sheet metal transfer positioning. This complex process was made possible through an integrated work process using TwinCAT NC I software. Several steps of the measuring process were eliminated, significantly reducing the production cycle time.

#### **Drawer body: multiple grouping of interpolated axes**

For producing the drawer body, the sheet metal is conveyed to four stations with upward and downward folding mechanisms. The folding tool follows a curved track in order to fold the securely clamped sheet metal to the required angle. The upward and downward folding requires an X- and Y-interpolated functionality at four different stations, for which eight servomotors are used. TwinCAT NC I provides advanced control for this operation; it permits the grouping of two axes at each station for an interpolated function. Four servo axes were used at four different positions for sequential folding processes.

The sheet metal is precisely placed by positioning pins, guided by a stepper motor. Subsequently, the sheet metal is transferred to a sheet folding machine with two modules, which processes both sides at the same time. Servomotors take care of the positioning of the folding modules and the folding process. Two interpolated groups of two servo axes, each for left and right folding, are implemented at each station. The same procedure takes place a second time inside a further folding machine with two upward and downward folding modules.

#### **Benefits for production multiply**

With various product sizes, a complete production cycle – both for the drawer front and for the drawer itself – includes 11 folds in a combination of upward and downward folds, completed in only 16 seconds with fully automated operation.



From left to right: Arun Mistry, Technical Director; Maneck E. Behramkamdin, AVP & Engineering Head, and Rajendra Panchal, AGM Process Engineering at Godrej Interio, in front of the finished Multifold machine.



Maneck E. Behramkamdin presents the control cabinet space, which is optimally used by the compact AX5203 2-channel servo drive with One Cable Technology (OCT).

Arun Mistry additionally stresses the accuracy of the production: "As opposed to earlier controllers, with which the tolerance was around 0.5 mm, we can now achieve less than 0.3 mm, an impressive improvement of around 40 percent."

Positive results realized by the Indian machine manufacturer have prompted their intent to use PC-based automation technology from Beckhoff as Multifold's standard in all machines for the export market. Arun Mistry comments: "The open automation platform from Beckhoff is a decisive advantage for international projects, because it optimally upgrades our machines to international standards."

Further information:

[www.multifoldindia.com](http://www.multifoldindia.com)

[www.beckhoff.co.in](http://www.beckhoff.co.in)