

# Effective drive system layout for increased energy efficiency



Over-dimensioning drives causes inefficiency in many ways. There is enormous potential here for saving both initial costs and long-term energy costs. Over-dimensioned motors perform significantly below the rated power. The result: Lower efficiency, which results in higher energy costs. An ideal drive layout requires a defined functional specification: Precise analysis of the dynamics, speed and performance requirements, movement profiles, mechanical coupling and environmental conditions as well as extensive information about thermal conditions.

B&R believes in service - also when configuring drives: Users are provided with comprehensive support for the selection and configuration of their drive solutions. The sales and application experts at B&R rely on the layout and optimization tool ServoSoft®. This enables them to answer customer queries quickly and to create a drive solution that is optimally tailored to the respective application.

"Configuring a satisfactory multi-axis system using conventional tools is nearly impossible," explains Friedrich Forthuber, who introduced the software from the Canadian company ControlEng to B&R, and goes on to reason: "Either the necessary calculations simply take too long or the tools do not cover the entire drive system." The variety of tools used and the associated medley of procedures further complicates central

data storage, teamwork on shared projects and documentation.

## One standard software, company-wide

The decision to use the ControlEng product has brought B&R the benefits of a standard tool that is used internationally by many manufacturers and drive component users. "ServoSoft® supports the full spectrum of drive types used by our customers. It is also well-suited for setting up drive systems with a DC bus and active power supply modules using power regeneration," adds Forthuber.

## Faster results

ServoSoft®'s main strength involves the automation of complex calculations and analyses. Because these automatic functions are either not included in other tools or are only

available with limitations, they are often based simply on empirical values and rough estimates. While this may produce functional solutions, they are often over-dimensioned because of additional safety measures (larger motor, larger braking resistor, etc.). When using ServoSoft® however, not only will you achieve your results more quickly, you will also achieve better technological and economical results.

The mechanical application is specified at the beginning of each project. The software loads a corresponding template for entering the parameters that define the mechanical components. If the inertia values were not determined beforehand, then integrated processing makes it easy to calculate them. Limit values, such as the maximum tractive force the product can handle, can also be specified.

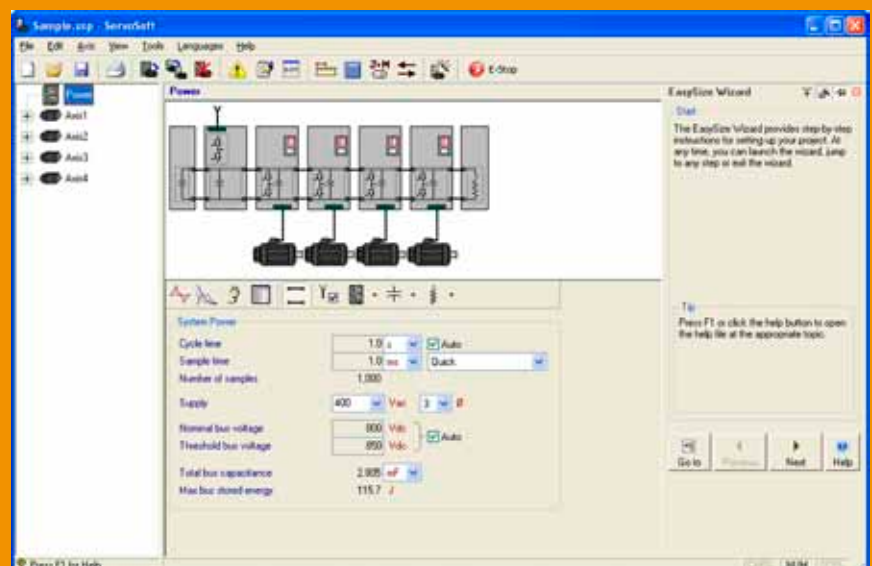
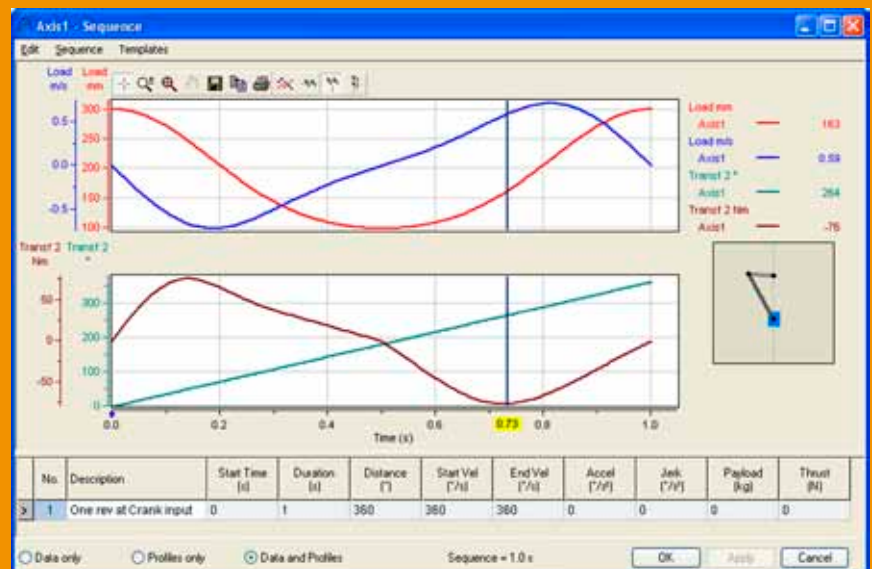
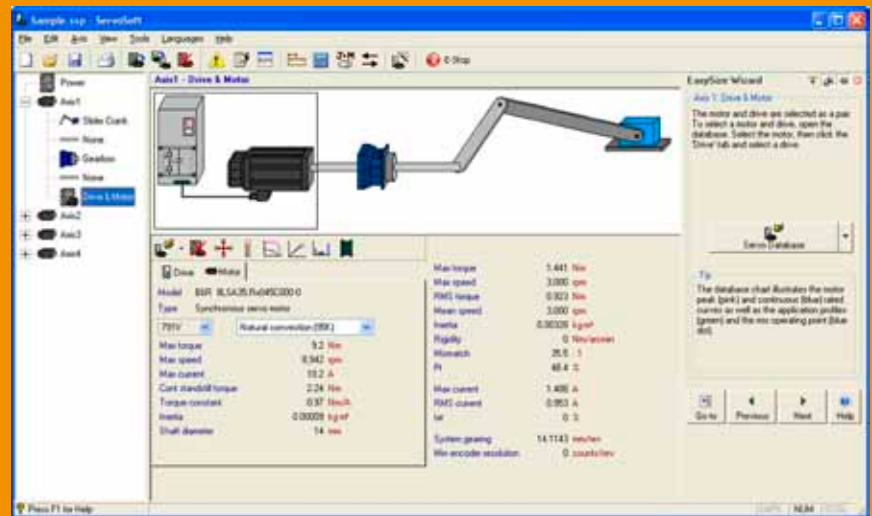
The motion profile for the axis is defined in the next configuration step. To do this, the individual movement segments are configured using either a time-distance, a distance-speed or a time-speed diagram. The integrated import and export functions can also be used to apply a freely defined movement profile including the load and inertia characteristics.

### Graphics for convenient analysis of the drive system

After choosing the gears, motor/inverter and motor/servo combination, ServoSoft® offers clearly organized graphic elements for easier analysis. This method can be used for expanding a project to include up to 20 axes, which can be operated on a DC bus voltage that is configured in the next step. ServoSoft® provides a variety of views and analysis options to perform functions such as analyzing the efficiency of a capacitor module or setting up the power supply module to be more energy efficient. Once configuration is complete, a system check determines if any of the rated values and specified limit values are being exceeded. A warning message is then generated automatically if necessary. A parts list can be generated for documentation purposes, which contains all of the components in the drive system including the supply feed, bleeder and capacitor modules.

"ServoSoft® takes a lot of the load off our employees in the sales and application departments that would otherwise require many hours of work. This includes process steps such as checking whether the braking resistor or the rectifier units have been sufficiently dimensioned. Thanks to ServoSoft® our technicians are able to apply their know-how much more effectively," concludes Friedrich Forthuber. "They can use the time saved to run through not just one, but many different drive solutions and to ultimately present the customer with the perfect drive solution in regard to functionality, material usage and energy efficiency. B&R makes all these advantages available to its customers." The ServoSoft® Promotion Version will be included in future releases of the Automation Studio DVD. ■

## ServoSoft® examples



# Testing and sorting solar cells in record time



Testing 3,600 solar cells per hour and sorting with a 99.7% yield of good products and machine availability of over 95% - no other cell testing and sorting machine in the world does this as fast as the TS 3600 from Schiller Automation. The testing machine's internal values are also worthy of acclaim: By using a motion control solution based on B&R technology, the system manufacturers from Germany's Baden-Württemberg region were able to break their dependence on the higher-level machine/system controller during planning, development and sales of drive functions. This enabled the company to significantly reduce the engineering and manufacturing costs for the TS 3600 and future system generations.



Watch a video on this subject at [www.automotion.info](http://www.automotion.info)

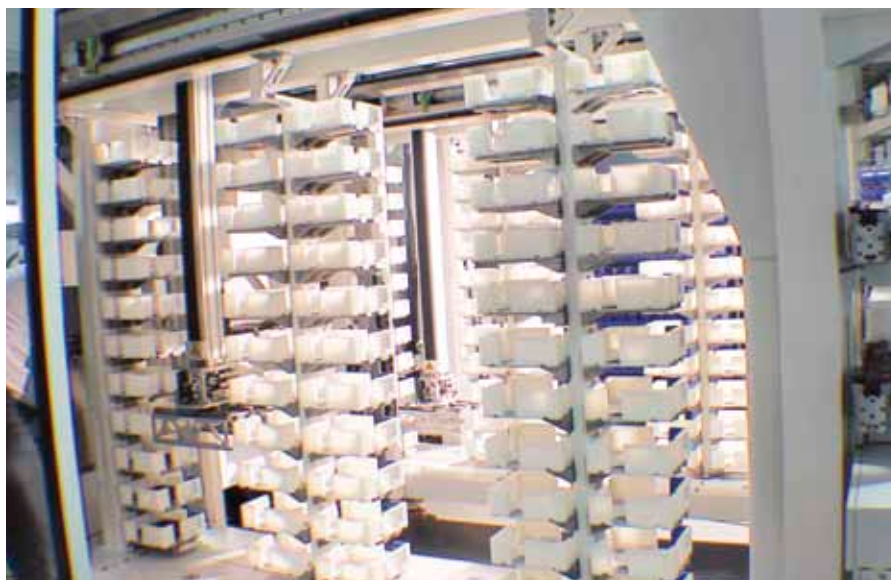
"In the past, we were not able to simply transfer drive functions that we had already implemented on a specific system controller to a control solution based on a different type or manufacturer," explains Thomas Wagner, developer at Schiller Automation GmbH & Co. KG. "This meant that our designers had to adapt the drive functions whenever designing a new system controller. This process sometimes took a good deal of time."

Schiller Automation is not alone in this situation. Many manufacturers of special machines and systems are frequently confronted with this problem because clients who order custom system solutions - depending on their company history or the planned application of the production equipment - often require that a certain control supplier be used.

### Reduced engineering time for drive functions

For the system manufacturer, these requirements mean becoming familiar with a variety of control environments. They also mean that guaranteeing specific (drive) functions or to delivery deadlines carries risks that are hard to estimate and unforeseeable additional costs. After all, at the time a contract for a conventional drive system concept is signed, it is generally not possible to foresee whether a certain drive function is even technically feasible with the customer's preferred controller or which drive-motor combination must be installed in order to make it work.

It's not hard to imagine why Schiller Automation GmbH & Co. KG started



The TS3600 provides up to 55 containers for the various quality classes of solar modules.

searching for possibilities to avoid the risks associated with changing controllers in the future.

This search culminated in an innovative motion control solution based on B&R technology, which provides uniform control of all drive-oriented functions in all of the company's systems, while remaining independent of the higher-level system controller which is connected via TCP/IP. This essentially separated the controller and drive levels, which means that once a drive function has been created, it can be used again and again. "This standardization of drive functions reduces the variety of different hardware being used and therefore the complexity of the system. The functional safety and the reliability of our machines and systems are also increased proportionally. Technical sales representatives are also able to guarantee availability of functions that have been implemented in the

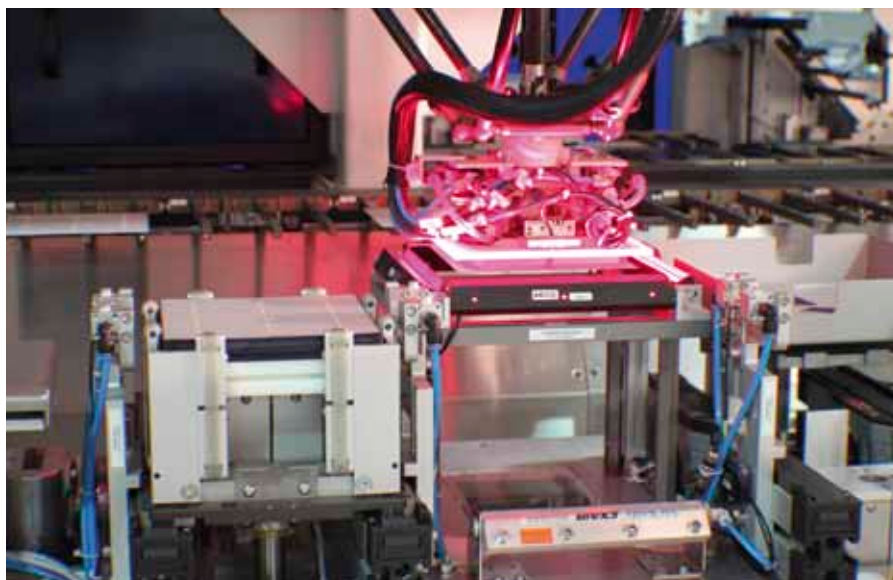
past, without risk and without requiring lengthy research on the part of the Design Department," points out Thomas Wagner, who is also responsible for the motion control concept at Schiller Automation GmbH & Co. KG.

### Controller-independent drive solution

The company chose a CPU from B&R's System X20 product series to run its motion controller, providing them with the comforts only found in a B&R solution. This makes it possible to combine robotics, CNC, linked axis movements and single-axis positioning in a homogeneous system, which is designed, implemented and commissioned a single engineering environment - B&R's Automation Studio. The staggering number of different tools that were previously needed for engineering and maintenance are now a thing of the past. The time and money needed for training - as well as the associated hardware and software costs - are also accordingly reduced, as Thomas Wagner adds: "For example, when integrating CNC functions from other suppliers, the result is often additional tools and associated licensing fees and in the worst case even the need to change over to a considerably more expensive machine controller. With B&R, on the other hand, everything is covered by a single system. Thanks to the downward compatibility of the hardware and software, our customers are >>>



An X20 CPU is the central controller for robotics, CNC and axis movements.



3600 wafers are checked electrically and optically per hour.

parameters such as power, open-circuit voltage or short-circuit current.

The TS 3600 combines the reliability of the measurement results with extremely careful handling of the solar cells, to achieve the record-breaking 99.7% yield of good parts. The engineers at Schiller Automation were able to achieve these results by reducing the number of required transfers to an absolute minimum and developing a new method of contact for the electrical test of the solar cells, which accounts for the exact cell position and the remaining arching of the wafer and establishes electrical contact with the testing equipment using a monitored amount of force.

To summarize, an innovative motion control concept based on B&R technology and countless other innovations enable solar cell manufacturers and processing companies to increase their productivity with the cell testing and sorting machine from Schiller Automation and to significantly lower the total cost of ownership (TCO). ■

able to benefit from B&R's high potential for innovation, which also increases the security of their investment."

During Schiller's evaluation of potential motion control suppliers, this was not the only reason why B&R was able to prevail over six other suppliers. The flexibility of their solution was another key factor, reveals the expert from Schiller Automation: "The servo drives from the ACOPOS series enable us to group our drive systems the way we need them." This ensures that different encoder systems can be used in the best possible manner. Only small individual modules must be replaced, while the basis device remains the same.

### Everything under one roof

The adaptability of the ACOPOS devices also provides clear advantages when integrating the different motor types. This also came in handy on the TS 3600, which has more than 30 axes, because the testing and sorting machine uses both rotary motors as well as linear drives, stepper motors and torque motors from different manufacturers and a wide range of encoder types. These can now all be driven using devices from the ACOPOS series.

Thanks to this high-performance and adaptable motion control system and a completely newly developed transport system, the testing and sorting machine is easily able to process

3,600 wafers per second. As soon as testing equipment becomes available that is able to provide faster electrical and visual analysis, this throughput could be increased even further. A convenient interface not only allows the user to integrate specific testing equipment in advance, it also makes it possible to exchange the equipment down the road if necessary.

### Innovative transport system ensures optimum testing results

To ensure the best possible results, the testing machine's innovative transport system uses a vacuum to straighten the wafers, which become slightly arched during the production process. This ensures that the lens system of the visual testing device has the best possible view of the wafers in order to prevent off-focus image sections. The transport system also ensures that the wafers maintain their defined position while running through the testing machine, to produce more reliable and reproducible measurements.

This is fundamentally important for the user because the measurement results directly affect the amount of profit that can be achieved. The testing machine not only identifies and rejects defective cells, it also surveys and divides the solar cells into different quality classes (the TS 3600 provides up to 55 container spaces for this) based on the determined pa-

### Schiller Automation:



**Founded:** 1978

**Employees:** 270

**Total Revenue:** Approx. 50 m Euros (2009)

**Standort:** Headquarters and production in Sonnenbuehl (DE), offices in China and USA

**Products & Services:** Production systems for the manufacture and handling of photovoltaic products and micro-electronic components

[www.schiller-automation.com](http://www.schiller-automation.com)