

Increased efficiency is multi-dimensional



Meeting the demands for higher efficiency in machine development is only really possible by going beyond the limits of traditional methods and increasing efficiency. It's worth taking a look into the near future. End users are subject to considerable cost pressure for production. This in turn leads to louder calls for overall cost reduction in machine manufacturing.



A well-planned and optimized range of products forms the foundation upon which efficient automation solutions are built.

In the past, when talking about increased efficiency for machines and systems, the topic was usually approached from two separate angles: On one hand, increased efficiency of the machine itself in daily operation for production companies, and on the other hand, the quick and cost-effective implementation of the machine development from the concept right through to the available and fully commissioned machine. The grouping of multiple machines into one complete production system was also usually discussed and implemented separately from these two topics.

However, these topics have been converging more and more frequently to the point where it now seems appropriate to adopt a shared view of the development and operation of machines and systems. It is now important to look at efficiency throughout all phases of the product life cycle as the aim for all developments.

The machine's overall efficiency is determined in the very first phases of development. In the past, system designers and automation technicians worked separately and successively. The existing time pressure

has created the need for parallel development tasks. Simulation even in the area of classic machine automation opens up new perspectives.

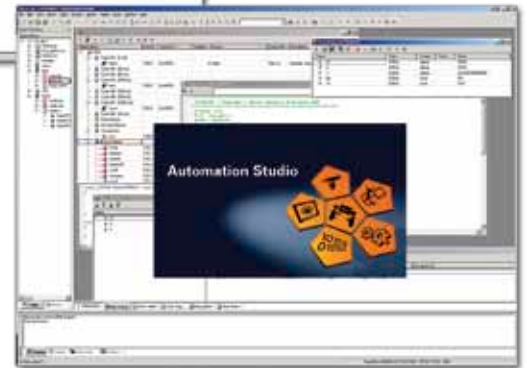
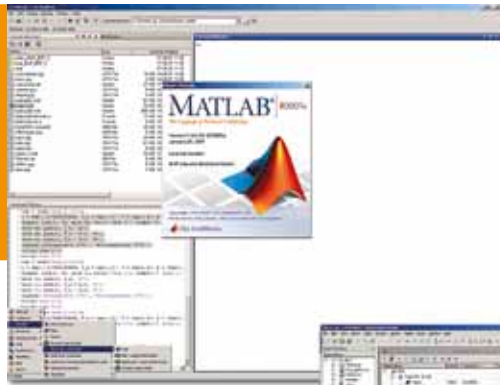
Simulation increases safety and lowers costs

Simulation technology introduced a significant shift in development methods. While simulation methods have already been applied in mechanical construction for some time, they only recently started being used in automation technology. The use of simulation tools such as MATLAB / Simulink with automatic code generation for model-based software development increases traceability. The functionality and timing of the machine can already be tested before mechanical parts are physically created. This not only speeds up development and introduces the possibility of preliminary acceptance by the customer, it also lowers the cost of the machine. Expensive prototype trials are reduced to a minimum and the need for costly improvements to be made at the customer's location can be avoided. "Hardware-in-the-loop" is the keyword when the goal is to test individual mechatronic components separate from the fully assembled system. This isolates development processes, saves time and eliminates temporary mounting tasks.

Today, most machines are no longer series products. This is precisely why early testing of the desired functionality and the machine's ability to be produced is so important. Transparency of the physical limits makes it possible to dimension certain machine parts thinner without sacrificing safety, and while accounting for the possibilities of the automation. This can in turn lead to smaller sized motors and power transmission system components. This makes it possible to reduce energy consumption and purchasing costs thanks to more efficient layout of the electrical connection technology. Simulation models not only reduce commissioning times but also reduce downtimes when implementing subsequent adaptations and maintenance work, because the tasks at the machine manufacturers can first be tested on the computer model.

However, the use of simulation technology is not only beneficial during machine development, but also in the actual production process. For example, if the wall thicknesses of a product were only determined empirically in the past, simula- >>

Machine manufacturers see a huge savings potential in the area of improved development methods. Reusing existing structures for new product lines can drastically shorten the development process. At the same time, the machine manufacturer benefits from improved readability and optimized serviceability thanks to model-based design, supported by simulations.



tion tools now make it possible to optimize wall thicknesses without sacrificing quality, thereby lowering material costs. Observing the manufacturing time in the machine simulation offers an additional benefit, because secured knowledge is a better basis for calculating productivity than approximate estimates.

Lowering maintenance costs

There is a high potential for increasing the overall efficiency of machines and systems in the area of maintenance: Event-based preventative maintenance of individual system parts in classical machine manufacturing is only in the early stages of development. However, all automation components currently offered by B&R already provide machine manufacturers with all possibilities. The SDC (Service Diagnostics Center) is an innovative development in this direction. Standard web technology helps to serve any computer as qualitative diagnostics tool without special software.

This subject area also includes analog modules that, despite low costs, can record a large amount of operating data at high scan rates, as well as integrated log books that log information about all operating states by default, such as the operating states of ACOPOS drive modules.

Safety technology without wiring

The integrated safety technology with SafeLOGIC also contributes to the reduction of fixed costs. Retrofitting safety equipment for meeting changed conditions used to be a venture that was expensive, difficult and sometimes even impossible. Programmable safety systems have made it possible, even in this area, to lengthen the economically useful lifetime of production machines. For new machines, this technology decreases the amount of wiring needed and keeps the safety system more flexible than the fixed-circuit safety logic of the

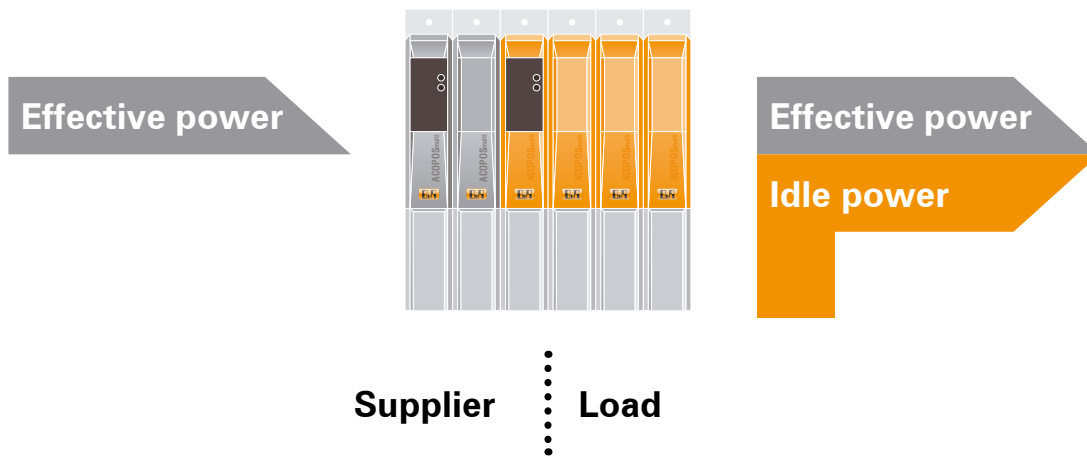
past ever could have been. The signals of mechanical safety equipment use the same fast bus – POWERLINK, in the case of B&R – as well as “non-safety-related” signals. Programming of the safety logic using one development tool for the entire automation reflects the high degree of integration.

Energy savings using advanced drive technology

“Especially in those cases where stop & go operation is the norm in a production process, it is often very beneficial to consider updating the drive systems as soon as possible. The utility companies calculate companies’ power supply fee by measuring the peak power. Electrical drives with low “total power factors” can bring with them hidden costs.” Of course, modern drive technology can be more expensive to purchase than traditional systems. However, an ideal total power factor of $TPF = 1$ can largely help reduce operating costs as well as to optimize the dimensioning of the connections – in the machine but also in regard to the mains connection.



Adaptations to meet changed specifications are a thing of the past in the field of safety technology. Integrated safety technology makes it simple to program safety functions, which saves both time and costs.

Power factor $\varphi = 1$ 

Energy efficiency with electric drives: power factor $\varphi = 1$ with ACOPOSmulti thanks to Power Factor Correction (PFC). This means savings up to 50% at the mains.

Due to the high levels of performance provided by electrical drives today, it can also be beneficial to replace hydraulic drives with electrical drives. These drives offer higher precision, adjustable power levels and use only the energy that is needed. Controlling hydraulic pumps with intelligent motor drive technology can also bring about considerable savings.

chines and systems comes from complete and uniform development, in which everything is taken into account starting from the basic concept of the machine up to the later production process. B&R provides their customers with Automation Studio and platform-independent inspection options such as SDC tools, which represent the entire life cycle of the machine and assist in planning. Of course, this also includes bidirectional interfaces to CAD/CAE/CAM systems from other manufacturers for the electro-mechanical design. This further increases the modularity of production machines because, depending on the design, the automation program that was created just one time can be implemented on the respective hardware easily and without extra programming. ■

Complete solutions as the key to profitability

However, the greatest effect regarding the efficiency of production ma-



The Author:

Franz Enhuber has been at B&R since 1982. Extensive international application experience prepared him perfectly for leadership positions in the areas of project management and technology. Since 2000, Enhuber has managed the business and technical aspects of some of the company's most important projects as a „Key Project Agent“. Since January 2010, Enhuber has also served as the director of the B&R Automation Academy.