

Editorial

Dear readers,

The Internet as a global platform for real-time communication acts as an enormous accelerator of business processes around the world. Customized single-unit production and just-in-time delivery to the customer are becoming critical competitive factors for an increasing number of companies. This development affects not only the consumer goods industry but also machine building and OEMs.

We are convinced that every company needs to find its own way into the digital future. However, we want to support our customers in this and are working on providing a corresponding comprehensive portfolio of products, systems, and solutions. Ultimately, every enterprise will need to create a digital twin of its entire industrial value-added process in order to respond flexibly to customer behavior and market changes.



Siemens AG / E. Maltzer

Our Digital Enterprise Software Suite with Teamcenter software as the data backbone is an important step toward a digital future and enables effective, sustainable solutions for all industrial enterprises that wish to embrace and shape the transition toward digitalization and Industrie 4.0.

This issue illustrates how we support machine builders in particular on their way to digitalization, and demonstrates the advantages users have already gained from it. Digitalization helps companies make their processes leaner, faster, and more flexible – and thus enables them to be more successful in the market in the long run.

Enjoy the read!

A handwritten signature in black ink, appearing to read 'A. Huber', written in a cursive style.

Anton S. Huber
Chief Executive Officer der Siemens AG
Digital Factory Division



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Digitalization helps improve quality and efficiency in machine building

The digital twin

Soon it will accompany every machine from initial idea to modernization. With a digital twin, machine manufacturers are able to use the power of digitalization to achieve improved efficiency and quality. This approach helps ensure optimized machine design, straightforward commissioning, short changeover times, and smooth operation.

Digitalization and Industrie 4.0 are major trends not only in Germany but also globally. New products need to reach the market in ever-faster cycles, and in many cases these products are completely individualized items that customers configure online and that are then produced on demand. The classic static production line in manufacturing is being complemented by modular designs.

Higher flexibility is also required for another reason: despite the increasing variety of products and processes, production must not consume more time, energy, and resources than previously. Consequently, innovations related to digitalization are also always being examined for their potential contribution to higher efficiency, from product design and engineering to production design, commissioning, operation, and modernization of machines and plants.

Digital Enterprise comprises four core elements

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Reduce time to market
Shorter innovation cycles
More sophisticated products
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Increase flexibility
Individualized large-scale production
Volatile markets
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Increase efficiency
Energy and resource efficiency
as key competitive factors

Digital Enterprise Software Suite

The comprehensive portfolio of software-based systems for discrete industry, developed over a time of more than fifteen years, uses Teamcenter as collaboration platform (data backbone) and interlinks PLM (Product Lifecycle Management), MES/MOM (Manufacturing Execution System/Manufacturing Operations Management) and TIA (Totally Integrated Automation).



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PLM
Teamcenter / NX
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MES / MOM
Simatic IT
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Totally Integrated Automation
Simatic / Sinumerik

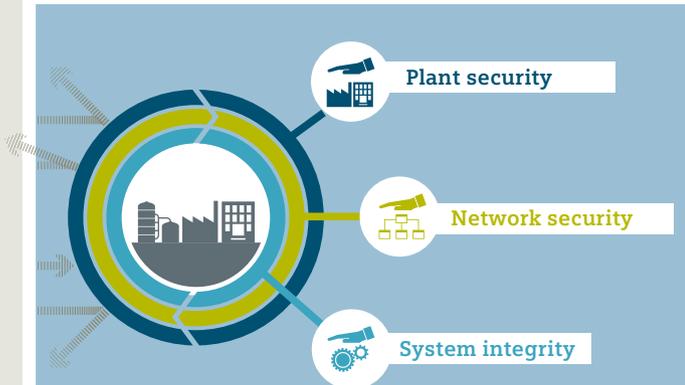
Industrial Communication

With Industrial Communication, Siemens has a comprehensive set of communication network offerings matched to one another from Industrial Ethernet with the associated Scalance family of network components to open and future-proof Profinet.

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Industrial Security



With Industrial Security, Siemens offers the industry a wide range of products and services to implement the "Defense in Depth" concept to protect industrial plants from cyber attacks. This portfolio includes plant and network security as well as system integrity products.

Industry Services

With Industry Services, Siemens offers the traditional services as well as data-based services such as Plant Data Services, Plant Security Services and Plant Cloud Services.



Green light for digital machine building

This is precisely where the concept of the digital twin comes in. This term is used to describe a digital copy that is created and developed simultaneously with the real machine – ideally from the first study on. Siemens provides its customers with high-performance software systems for the development of these digital twins. For example an innovative transport system from the German machine manufacturer Optima was digitally mapped (more on page 10). The company produces packaging and special machines for many industries and placed great emphasis on the machine's design as a mechatronic system that can be tested, developed, and validated digitally.

This allowed ideas to be tested and further developed before the actual manufacture began. The data of the real machine were loaded into the model already during the design phase. This resulted in a digital twin that enables simulation of changeover operations and product flow across the entire lifecycle of the machine. Using a cloud connection, it is possible to evaluate KPI data such as produced items, downtime analyses, failure rates, and energy data. To protect sensitive production data, comprehensive industrial security systems are also critical. By using state-of-the-art software tools for the digitalization of the machine lifecycle, the user gains considerable flexibility in the design and operation of the machine – a milestone for machine manufacturing.

Integrated foundation for digitalization

With the right tools, digitalization boosts efficiency in all phases of the machine lifecycle. It is possible to validate designs earlier and test the configuration of the machine control system earlier. Routines and checks take place earlier in the engineering process, which reduces the risk of failures and errors in critical phases of the lifecycle, such as during commissioning, which previously could only be eliminated with great effort and under time pressure. If the machine information is available on an integrated data platform, later modifications can be tested and verified in exactly the same way, thus accelerating the introduction of a new product. In addition, with the help of models, the operating data of the machine can also be used to optimize

characteristic parameters for production – from energy consumption to error rates and cleaning cycles.

Siemens is already supplying essential components for the complete digitalization of the value chain and the digital enterprise in its portfolio for the digital enterprise. These aligned solutions address four areas: software to create a central data platform for digitally supporting the entire value chain for discrete manufacturing; intelligent networks for industrial communication as a basis for simple data exchange within the different production modules and for collecting operational data; and, due to the growing number of networked systems, effective solutions to protect digital factories against security threats. One security solution is the so-called defense-in-depth concept that Siemens has been systematically implementing for several years. This concept is based on the new IEC 62443 standard. Structured security mechanisms, ranging from using passwords to continuous security monitoring, allow for reliable and customized adaptation to the current security requirements of the digital factory.

At the same time, Siemens is driving the expansion of industrial services. For example, the open Siemens Cloud for Industry platform serves as the foundation for new digital business models for industrial enterprises. With this platform, machine and plant data can be securely transferred to the cloud and evaluated using special tools – for instance, in order to assess and optimize the condition of machines and plants. In this way, Siemens supplements its offering of data-based digital services for the industrial environment.

New plant designs, new business models

An example from the machine tool industry shows how far digitalization has already come and how machine manufacturers are benefiting. The development of a new milling machine with a standardized CAM platform based on Teamcenter significantly shortens the time from virtual product to real production facility. As a data backbone, Teamcenter integrates all modules and guarantees access to information for later retrofits or for maintenance and servicing. The virtual machine tool enables a realistic simulation of the real Sinumerik



control on the real workpiece. The results of this project were impressive: the deviation of the real machine from its digital twin was less than 1%, the running-in period of the machine was reduced by more than 70%, and productivity during operation was increased by more than 10%.

The next steps

Today, customers can already invest in future-proof solutions for a step-by-step transition to Industrie 4.0 using the Siemens portfolio for the digital enterprise. The solutions for digitalizing the processes upstream and downstream of machines and making them more flexible are already very tangible, especially for parts and materials handling. Robots will carry out increasingly complex and advanced processing steps both precisely and efficiently. The networking of machines with each other and with higher-level systems is also making great progress. For instance, resources and production data can be managed centrally.

A great benefit here is the consistency of the Siemens portfolio, as Product Lifecycle Management and Manufacturing Execution Systems can also be connected for even greater productivity. This ensures cost benefits in procurement and operation. Order data are thus available throughout the entire company, and it is possible to identify optimum production strategies for allocating orders to the various production sites in the organization. Moreover, material stocks, logistics processes, and tool availability can be seen at a glance and efficiently coordinated.

While the simple “plug-and-produce” addition of machines to a line, analogous to the USB connection of external devices to a computer, is still a long way off in the manufacturing environment, it is one important goal for development in the areas of automation and industrial communication. Machines should then be able to identify themselves and connect to the network, making the required modification of lines faster and more efficient. According to automation experts, the digital twin’s potential to increase quality and efficiency due to the improved documentation of processes and machines is much more exciting. In the future, every manufacturer will know exactly which component has been installed with which characteristics in which of its products and will thus be able to respond to problems in a targeted manner and to optimize processes.

In its Simatic production facility in Amberg, Germany, Siemens is already using a comprehensive documentation and evaluation system and has achieved an extremely low level of errors in production. And the digital twin is ensuring greater efficiency and productivity in other sectors as well: with the step from integrated engineering to integrated operation, Siemens enables the process industry to build a continuous data model from plant engineering to operation. Here, too, digitalization ensures a shorter time to market, greater flexibility, and increased efficiency. This gives companies the opportunity to respond effectively to the volatility and diversity of global markets and to increase productivity as well as energy and resource efficiency. ■

INFO AND CONTACT

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