

# **SIEMENS**

**Dr. Olaf Rathjen,**

**Head of the Motion Control Systems (MC) Business Unit of the Siemens  
Automation and Drives Group (A&D), Erlangen**

On the occasion of a press conference  
held in Nuremberg on 28 November 2006

- Check against delivery -

Ladies and Gentlemen,

We have just discussed the way in which simulation helps increase planning security at the factory level. This process naturally continues at production level. Our customers and we as automation partners of mechanical engineering companies are faced with requirements which are largely determined by developments in society at large. On the one hand, we recognise that raw materials are becoming scarcer and energy costs are rising, while on the other we are experiencing a dynamic development in innovations. This also means that, as Mr. Helmrich mentioned, energy costs are becoming increasingly important as an item in machine users' present cost-effectiveness analyses, and both users and OEMs are paying greater attention to life-cycle costs.

In consumer goods, there is a rapidly growing trend towards product and variant diversity. At the same time, these goods are expected to be available within ever shorter time frames.

These dynamics present new challenges to machine and systems builders alike.

To ensure a more flexible use of their machines and to increase machine availability through shorter resetting times, we have been relying for years on generally integrated automation concepts and specifically on mechatronics.

Future viability, flexibility, shorter time-to-market and reduced life-cycle costs are the buzz words paving the way for new machine concepts. As leading automation partners, we are here to make a substantial contribution with our mechatronic concepts.

We believe mechatronics do not denote a specific property of a machine or plant component but stand for a design philosophy underlying a holistic approach to the interaction of mechanics, software and hardware. It is only logical therefore, if this mechatronic philosophy applies to the initial stage of a mechanical engineering project: i.e. the simulation stage. It is at this stage that we at Siemens A&D introduce our Automation Designer, providing OEMs and users with the production tools that fit in with the digital factory concept.

From the mechatronic approach also follows another design principle, i.e. the modular design of production machinery. Modular machine concepts allow the mechanical engineer and builder of machinery to respond more flexibly to customers' requirements and to shorten deliveries. They also reduce the cost of developing customised machinery. Moreover, modular machine designs help set up flexible production lines that can be easily adapted to suit changing market requirements.

Modular design also applies to the components level where free scalability of automation systems provides both OEMs and users with future-oriented and easily adaptable solutions.

Simulation tools combined with modular designs make for a considerable reduction of project lead times, commissioning or training of operator personnel.

Siemens A&D is the only supplier in the market able to offer full simulation of both mechanical and manufacturing process. Our portfolio includes Mechatronic Support for virtual prototyping, a Machine Simulator to simulate commissioning of the machine, Virtual Production to simulate the actual manufacturing flow, and simulation of the process chain including all non-productive time.

This shortens the OEM's time-to-market in development, reduces the cost of prototyping and minimises training costs during production start-up. At the end of the day, it takes less time to design a perfectly running machine which meets the special requirements of the production scenario it was intended for. To the machine user, this translates into high productivity right from the start, high quality output, and a machine that does exactly what it was expected to do. Within a production line, it works at a productivity rate that has been precisely simulated in advance. It produces parts which are perfectly matched in terms of processing time, accuracy and surface.

Modular machines consist of mechatronic functional units which have their own smartness built into them. In order to merge these functional modules into a performing machine, the machine builder requires standard automation and drive components such as Simotion and Sinamics which are based on a uniform platform, as well as standardised communication media between control, HMI, peripherals and drives, such as Profinet. Standardised but open modules for control, drive and visualisation software allow the OEM to apply his own expertise.

The high-performance Scout engineering system with scripting capability is used to automate the creation of control projects and therefore accelerates the development of innovative and flexible overall solutions. The system platform of Simotion, Sinamics and Profinet presents the mechanical engineer and machine builder with the full benefit of modular design: short project lead times, reduced development costs and improved quality thanks to the use of tried and tested hardware and software modules.

Allow me to enlarge a little on communication at production level.

### **Customised industrial communication**

Transparent production, modularisation and a mechatronic approach are based on integrated communications. Industrial Ethernet has become a well-established integrated bus system in automation and Profinet is continuing to enjoy success in the market whenever systems are an option.

Throughout all sectors of industry, a large number of Profinet systems are in factory automation use. For extremely time-critical data exchange, as is required in motion control systems for coordinating numerous individual axes, special modules have been developed to provide an integrated solution that complies with the standard. Profinet makes consistent deterministic real-time communication available right down to field level. It is a powerful bus system which is available for both useful data and real-time-critical machine data, providing the basis for modular machine concepts with seamless Ethernet communication.

Profinet ensures that all distributed Motion Control controllers and drives are synchronised; in so doing it also supports secure data communications. Thanks to Profinet's time-saving and cost-cutting synergies, the availability of a broad basis of Profinet-enabled controls, drives and peripherals and of proxies serving major field bus systems is increasingly benefiting mechanical engineers and machine builders. These benefits by far exceed the obvious advantage of a "one-for-all cable".

What is required is highly flexible solutions for more innovative and more complex machines. What is required is economical solutions for economical machines which also increase productivity in terms of technical data sets, cycle times and the number of individual drives. With machine concepts changing, there is growing demand for an ever-higher number of axes, which means that mechanical and hydraulic systems are increasingly being replaced by modular mechatronic designs. In contrast to rigid mechanical designs, such machines can be rapidly converted by simply resetting the software parameters, without having to modify or even exchange mechanical components. Distributed Motion Controllers thus play a key role in this high-performance network. At the fair we are exhibiting our new C240 controller.

In this connection, innovative and effective diagnostics and maintenance based on tried-and-tested IT standards are also gaining in importance, since they help cut machine downtime to a minimum.

Profinet relies on a fully scalable solution and ensures that besides real-time communication there is sufficient performance available for simultaneous open IT communication via TCP/IP. With its real-time capability known as Isochronous Real Time (IRT), PROFINET also provides deterministic real time. It enables low-effort, high-performance, clocked motion control applications whilst also allowing simultaneous TCP/IP communication. IRT has all it takes to meet the requirements: response times under one millisecond, clocked transmission, and a jitter of less than one microsecond.

In order to ensure deterministic communications in motion control applications and to close dynamic control loops via bus, actual and target figures need to be exchanged at exactly defined (isochronous) time intervals. . Exact synchronisation of all subscribers combined in the network, including switches, becomes more important as a growing number of compo-

nents are connected in series. Profinet's IRT mechanism uses a method which picks up all time parameters along the line, thus allowing all switches to be ultra-precisely synchronised with the cycle start at a jitter of less than a microsecond.

A special algorithm is used to determine the optimum temporal sequence of individual telegrams for each network section, taking into account the general topology. For each individual switch it is then determined which station must receive which telegram and to which station it must be forwarded. Before even receiving this information, the switch directs/sets its subscribers to the right port and thus passes on the telegram without any delay (optimised Cut-Through method). For this purpose, Siemens has developed the ASIC ERTEC (Enhanced Real-Time-Controller) with an integrated two-port or four-port real-time switch. ERTEC provides a simple means of conveying IRT capability to motion controllers and drives at low cost. The integrated switch enables flexible topologies, including line topology, thus providing for optimum adaptation to the plant or machine concerned.

The Ertec (Enhanced Real Time Ethernet Controller) family of controllers is produced by NEC; it is available from the worldwide distribution channels of NEC and Siemens. Both the powerful Ertec400 with an integrated 4-port switch and the low-cost Ethernet controller Ertec200 for developing Profinet devices have been successfully launched on the market.

Industrial Ethernet is also becoming an increasingly attractive proposition for process automation, where actuators and sensors are usually spread across a large plant and need to be centrally monitored, controlled and maintained. Industrial Ethernet lends itself particularly well here as an efficient network covering the entire plant and all devices within it. In this field of application, we are currently working hard to push the integration of Profibus PA (Process Automation).

#### Wireless and safe

In the future, Wireless Ethernet will replace existing communication paths using loop lines or drag chains, thus opening up new applications. To work in industry, wireless LAN for mobile data communication must be secure, robust and reliable. Wireless LAN is of particular advantage in areas which are difficult to access and wherever conventional installations would be too costly and disruptive. Practical applications of industrial wireless LAN have demonstrated that even time-critical and cyclical communication is possible. There are more facets to industrial communication, one being security. Whereas special bus systems in industry have traditionally served as a "natural" protective wall because of the difficulty of accessing them from public and corporate networks, this automatic protection no longer exists with integrated Ethernet use.

Major user organisations are addressing this issue by developing security concepts; we are already supplying security solutions designed specifically for industry which are exhibited at our stand in Hall 9.

Our Siemens A&D portfolio was extended by the wide area and wireless technologies operations taken over from the Siemens Wireless Modules (WM) business unit. This WM business unit is the number one worldwide in wireless machine-to-machine communication and it significantly strengthens our position as market leader in the important field of industrial communication.

Communications also provide the basis for overcoming the next challenge which OEMs will be facing, i.e. the availability of plant and machinery. Large data volumes are required to ensure such availability. They need to be compacted to a condition monitoring maintenance concept. At this point, Siemens A&D is providing its internet-based services under ePS.

### **Maintenance**

Our ePS services are aimed at increasing the productivity and availability of machines and optimising worldwide service and maintenance processes. These services are provided from an internet-based platform which supports service and support processes across companies, thus ensuring safe communications.

The demands placed on machine builders and plant maintenance may vary significantly between different applications. Whilst machine builders require shorter response times, greater machine availability and wider OEM and user support plant maintenance are suffering from tight budgets, ever more complex machinery and more flexible production processes, requiring new maintenance strategies. The objective of our ePS services is to support all our partners in resolving these particular tasks.

Using the internet as a means of communication raises the issue of IT security, which is what the ePS platform ensures for all data and at any time. SSL encryption protects data from unauthorised access, from the machine itself all the way to the ePS servers in the internet. ePS uses firewalls and standard ports to connect to the machines and does not require a publicly accessible internet address. User and machine administration lie solely in the responsibility of our customers. Only authorised service staff or administrators belonging to the respective service organisation will decide who is authorised to access the various services or data. Access to machine data is settled between the service organisations themselves.

The ePS basic service provides remote access. This reduces the number of local interventions and allows for better preparations. Engineers can work together, across company confines, to analyse faults and errors and to remedy the problem.

In the event of a fault, maintenance staff can be alerted by e-mail or text message. At this point, more detailed last-minute information is available from the ePS servers, thus reducing response times. ePS is also ready to assist with preventive maintenance. Here, continuous tests pick up machine status data and present it in what is referred to as trend analyses.

When a critical limit is reached, the user is alerted directly. Throughout the life cycle of the machine, load monitors display the load of the machine which is automatically picked up at predefined cycles.

Knowledge of the real load of the machine and an analysis of the mechanical dynamic data enable the mechanical engineer to specifically plan maintenance action and to draw conclusions for an optimisation of the machine design. We thus provide both service personnel and machine builders with interesting options in terms of optimising the service and maintenance process. We believe that it will be increasingly important for machine manufacturers to provide innovative and intelligent services.

In the field of process technology, we also continue to extend our range of maintenance concepts.

At his fair, we are showing the new WinCC-Option Simatic Maintenance Station. This Maintenance Station displays all automation components and monitors the plant status. Based on the STEP 7 hardware configuration, the Maintenance Station identifies the units which are part of the plant network and creates a display for maintenance purposes in WinCC. During operation it generates a database which is used for plant optimisation, thereby reducing maintenance costs below the line.

## **Summary**

Ladies and Gentlemen,

In view of the growing significance of the concepts of TCO or life cycle costs and the unabated dynamism of innovations it is only the suppliers of fully integrated automation solutions who provide the market with future-proof and viable solutions for the entire automation world. All the trends which appear on today's industry agenda became part and parcel of our Siemens A&D portfolio strategies many years ago. TIA and TIP are the integrated concepts for machine and plant engineering, providing innovative solutions from MES to sensor level, and a universal hardware and software platform down to each drive in the system.

Items like TCO and energy efficiency will certainly remain on the agenda, just like the demand for shortening the time-to-market and increasing productivity for both OEMs and users.

At this press conference we have presented a general overview of what makes our industry tick at the present time, rather than a detailed technical report.

I would be pleased to meet you at our pavilion in Hall 9 to enlarge on some of these topics and to explain one or the other technical detail.

We are looking forward to seeing you there. Thank you for your kind attention.