

SIEMENS

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Berlin/Munich

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- Check against delivery -

Ladies and Gentlemen,

I am delighted to be with you all again today. To me it means returning to the roots of automation and industry. Besides my responsibilities for the Asia/Pacific Region and the top+ program, automation has remained the centerpiece of my occupation.

What have I got for you today?

What I intend to do is

1. to present a rough outline of our portfolio covering the equipment for today's production plant especially for those of you without in-depth knowledge of the subject-matter,
2. to discuss current developments and innovations at Siemens, and
3. to share with you a vision of the future of automation.

I am convinced that innovations are the key to meeting the challenges of today and tomorrow, and that innovation leadership is one of the most important levers a company needs to use in order to run a successful business.

Siemens as a trendsetter

Ladies and Gentlemen,

Innovation leadership is important, especially in terms of the capability of running a business successfully in the long term. However, innovation leadership can only be achieved by looking further than the results of the next quarter into the future beyond. Siemens has demonstrated frequently in the course of its long history that it is capable of doing just that, from Werner von Siemens' development of the dynamo right up to the latest communications or medical systems of the present day. Looking back at our long history of innovation, one may be tempted to say that we were trendsetters long before the term was invented.

I am proud and grateful – and I am saying this from the bottom of my heart – to have been privileged to accompany some of this development over the years.

Some of you will remember that the AUT Group, one of the precursors of today's A&D Group, did not, in the early Nineties, enjoy the success that A&D is enjoying today. I will now be reviewing very briefly the way in which we found our way back to the world's best because I think that this serves as an ideal example:

- We have developed world-class products with greater benefits for our customers. A&D has continued to enhance these benefits, as in the case of our Sinamics drive platform which will be presented to the general public for the first time at this Hanover Fair.
- We succeeded in broadening the industrial communication base earlier and more tenaciously than any of our competitors. Today,

Siemens has installed roughly 400,000 Ethernet nodes and almost 10 million Profibus nodes.

- With the launch of Totally Integrated Automation in 1996, we succeeded in advancing the integration of engineering, data management and communication to unprecedented performance levels, thus enabling our customers to achieve concomitant increases in productivity. This platform has remained a yardstick to the present day; it takes into account the requirements of our customers, who want innovations, while simultaneously seeking to protect their investments. Thanks to this platform, we are the sole supplier capable of providing a sound solution to the convergence of production and process automation in the form of hybrid automation.

Communications and platforms require standardization. I personally take this subject very seriously, and this is why I am the President of IEC (International Electrotechnical Commission) Germany.

- After TIA, we launched Totally Integrated Power in 2000, a platform for power distribution and building services automation. It goes without saying that this platform can be linked to the Totally Integrated Automation platform.
- In the course of IT integration, we – like no other automation company – studied and dealt in depth with the matter of MES systems (Manufacturing Execution Systems), that is management software, which was further strengthened by acquisitions. With Simatic IT Framework and Components, we can now offer a product range which brings order into the MES world and which teaches our competitors the meaning of fear.
- We have continuously broadened our competence within the I&S group from a systems integrator to a provider of high-tech solutions and services. With customized IT integration and smart maintenance, we are providing two major elements of successful plant design and low-cost plant operations.

- It was therefore a logical step for A&D and I&S to take the lead in the development and launch of the Siemens Industry Suites, which represent a uniquely comprehensive and yet specific industry portfolio.

Industry Suites are also provided by the Power Transmission and Distribution Group as regards power distribution, Siemens Dematic for logistics, and Siemens Building Technologies for building services automation.

Based on our customers' processes, Industry Suites merge the worlds of automation and power distribution to create a comprehensive, modular industry offering, a tailor-made Siemens suit off the peg, if you like. The basis is provided by the open, standardized and integrated system platforms of Totally Integrated Automation and Totally Integrated Power. Within the Industry Suite, Siemens combines products with process expertise, specific MES solutions and services to provide a new offering to the industry, thus opening up further potential for the enhancement of productivity.

The Industry Suites show that Siemens understands and is familiar with its customers' processes, and that it is in a position to supply the required automation, power distribution and service packages. This can also be observed in our Industry Portals, which are the Internet versions of our Industry Suites:

Oil and gas industry (www.siemens.com/oil-gas),

paper and pulp industry (www.siemens.com/paper),

automotive industry (www.siemens.com/automotive),

and the pharmaceuticals industry (www.siemens.com/pharma).

In addition to that, today we have activated the Industry Portal for the

Food and beverages/breweries industry (www.siemens.com/beer).

From the Industry Portals, for instance, you can also visit the A&D Mall, which is A&D's Internet market stall.

As a coach for the A&D and I&S Groups, I am also kindly predisposed towards these Industry Suites because all the areas where there is still potential for improvement in the offering for each individual industry are fast revealed in the course of their development. This does not mean, however,

that Siemens now does everything by itself or reinvents the wheel. Siemens still requires its partnership with mechanical engineers, system integrators and solution providers, and we plan to continue and even to step up such cooperation in the future.

As usual, information on the Industry Suites, Industry Portals, and all other offers of the A&D and I&S Groups with many new products and the portfolio of seven solution providers is available in Hall 9, Stand A 72.

As you will be aware, Hanover Fair is and remains to Siemens one of the most important forums to talk to our established and prospective industrial clients, partners, and universities. It is less about closing deals than about presenting new products and demonstrating ways in which current trends can be translated into practice in conjunction with other trade fairs under the same roof.

With all these developments, which we are continuing to promote, Siemens has managed to achieve the position of world market leader in automation. This applies to both business volume and technologies alike. If you look at the figures for the A&D Group, you will also discover that a trendsetter can achieve good EBIT margins even during difficult times. This fact has also been confirmed in scientific studies. At any rate, I expect A&D to get again a little closer to a target margin of 11 to 13 percent this year than last year – without, again, having to save anything in the way of spending in research and development. There is no contradiction between investing in R&D and making good money; on the contrary, the two conditions are mutually dependent.

The I&S Group is currently finding itself in a less good position. I&S was not competitive enough because its portfolio was too broad. The current reorientation of I&S aims to concentrate on its core business which relates to the standardization of planning, operation, and maintenance. With its core competences in the fields of industrial services, construction and IT integration, the I&S Group can concentrate on two major areas for

productivity improvement. The first area of interest is the life cycle of a plant, from planning and construction via commissioning all the way to maintenance. The second topic is the production process itself. Here, too, I&S has services and, more particularly, IT solutions in its portfolio which help this Group to optimize manufacturing and production processes. By applying and integrating standardized IT tools and technical services, it is possible to optimize plant configurations and production processes which may vary from one location to the next, and to increase productivity further.

Current trends in automation

Ladies and Gentlemen,

let me now move on to the second part of my speech covering what I regard as the currently most important trends in automation.

In principle, trends have always been driven by two elements: the requirements of the end user and technical development. What end users want – and very soon this will apply to all users throughout the world – can be put in a nutshell: products with a consistent premium quality at affordable prices, incorporating as many customized options as possible. In other words: Lot size one for the price of a mass-produced item. The drivers on the technological side are microelectronics and software.

Allow me at this point to comment on what is sometimes regarded as the over-automation of manufacturing: This debate clearly lacks cogency. The actual point is the flexibilization of production, and hence also that of automation and power distribution.

The following current trends in automation will help meet customers' requirements at profitable terms:

Software systems

After the major surge in innovation triggered by PC technology, it is now mainly Internet technologies that are advancing into the field of automation. Web servers, browsers, TCP/IP and XML have set standards which, irrespective of an Internet link, result in benefits in terms of human machine interface, and the connection of smart sensors and actuators, for example, as well as in open horizontal and vertical data exchange.

The trends towards networking, distributed intelligence and powerful engineering tools have resulted, and continue to result in rapid growth of the software development percentage among all automation manufacturers. To combat the rising cost of research and development, manufacturers have introduced the most diverse measures such as better, more “mature” software development processes and clear software platforms which are stable in the long run, such as Siemens Simatic IT as part of Totally Integrated Automation and Totally Integrated Power.

There are three major application areas designed to meet what are to some extent diverging requirements: Embedded systems, manufacturing execution systems, and engineering systems. The greatest challenge, to my mind, is to provide uniform engineering for all subprocesses within a plant that rely on one uniform data base.

Industrial communications, the link between information and power

Other current developments target the extended use of wireless communications and the joint transmission of information and power via a single bus. The aim is to shift savings, that can be made using field bus technology – mainly due to cabling – to the power side. This renders switching cabinets largely superfluous. At Siemens, we have been working on this topic under the keyword Ecofast. As part of A&D’s Safety Integrated approach, safety systems no longer require an additional bus as well.

Progress in industrial communications will continue to be determined by developments in the field of general communications technology; this is true of hand-held devices, mobile phones, PDAs and networks alike. Current

examples include the spreading of UMTS or the use of new frequency bands for wireless communications in the 5 GHz or even 60 GHz range. The rising data rates of buses and networks right up to the 10-gigabit Ethernet, as well as the plug & play capabilities of devices and networks, are no less important. For industrial plants, the safety of communications to and from the outside world is a particularly important criterion. This will be a crucial factor in determining whether or not the Internet is accepted in automation.

Siemens itself installed wireless LAN in its Amberg factory in February 2002. This is where we manufacture Simatic controllers for the lower and medium power range. In Amberg, process data is picked up online at the machine itself, using wireless communications; inbound inspections are performed directly on the pallet, and preventive maintenance data is available online at the machine. In other words: the operator has all the data available wherever he needs to process it, and the wireless LAN infrastructure gives him absolutely free maneuverability.

Special attention is currently being given to adding real-time capability to standard Ethernet communications. Together with the “Profibus Nutzer Organisation” (PNO, Profibus User Organization), Siemens relies on Profinet as the base technology which combines the advantages of fieldbus and Internet technology. The A&D Group is developing what is referred to as isochronous real-time Ethernet which the PNO will involve in Profinet version 3. For the first time it will be possible to synchronize more than 100 driving axles on a single bus with deviations of less than one microsecond, and without affecting any standard Ethernet function. This brings me to another important trend:

Mechatronics

Mechatronics changes the conventional form of mechanical engineering. Machine functions, which used to be defined by mechanical components, will now be realized through an interplay of mechanics, electronics, and software – in short “mechatronics”. This allows new machine designs to be developed at considerably lower cost, while enhancing performance and efficiency. In a packaging machine, for instance, a “virtual axis” ensures that all motions

(events) within the system are verified and recalculated or adjusted as necessary. This creates a self-correcting and self-optimizing system.

Under the name of ePS-Network – which stands for electronic Production Services – Siemens founded its on-line services to benefit the end-users and OEMs of machine tools in 2001. These services use data which is available via CNC or PLC to improve machine efficiency, process this data, which is then made available to the machine operator in an automated service via the Internet. Within the field of mechatronics, Siemens is also dealing with the simulation of machines and workpieces in order to bring further productivity gains to its customers.

Networked production

In general, we are seeing a trend towards globalized production management and organization in many industries. Production facilities and plants distributed around the globe need to be interconnected in terms of logistics and information technology, and must be controlled by company management. In addition, a global quality management system must be in place to ensure that a product always has the same product characteristics, regardless of where in the world it has been made. This is what critical consumers require.

An exemplary case of networked production was a project at Saudi Aramco, a petrochemical company in Saudi Arabia. In a gas plant, the I&S Group set up a business information portal which combined several functional areas, including data on processes, maintenance and business, as well as inventory and production data from various sources. A Process Information Management System (PIMS) and SAP were also integrated. Data is compiled into useful information for the different operating levels in the form of Management Dashboards. Thanks to this faster and easier access to organized information, better decisions can now be made, plant availability increased, inventories (assets) reduced and on-time deliveries improved.

It goes without saying that a Business Information Portal can be designed so as to provide access to all relevant plant information from any location or facility of the company anywhere in the world. This allows the benefits outlined above to be optimized “synergistically” across all corporate operations. Management could, for instance, check and identify the plant from which the customer could be served best.

E-business

Ladies and Gentlemen,

In my speech here two years ago, I discussed the topic of e-business for industry. There were some of you who asked me why Siemens was stretching the point again, and indeed e-business had already passed its zenith by then, and the Internet hype was almost over.

However, and I stressed this at the time, e-business remains a major and unstoppable development in the industrial field among others, despite the disillusionment of the past two years. These days, nobody refers to the Old Economy and the New Economy as opposites. What counts is substance and/or True Economy, and here we are on the right track.

E-business is more than e-commerce. E-business is supply chain management and customer relationship management; it is e-procurement and e-manufacturing. E-business is also particularly important when it comes to improving the internal processes within a company. Without stable, standardized processes on an electronic basis, there can be no knowledge sharing, no R&D activities across company boundaries, and no networking of production facilities around the globe. Only with e-business can individual customer requirements be met in cost-effective fashion. To produce top-quality products at affordable prices, within a limited period of time, and tailored to specific needs: these are the challenges of the present. They include another important field which is gaining more and more importance, a

field which is bound to benefit from e-business transactions: consumer protection and product liability.

Anybody wishing to operate a production plant these days has to produce an increasing number of certificates to the regulatory and certifying bodies. This is most evident in the pharmaceutical industry. Standards applied in European countries and in the Americas are converging more and more with the passage of time. For the food, beverages and tobacco industry too, such requirements will be reflected in legislation, for example in the envisaged European Regulation 172/2002.

A lot of cost and effort goes into validation procedures that demonstrate the sustained quality of a process, and it requires automation manufacturers and plant operators to work together very closely. Many of the functions of automation products can help the validation process and provide effective support in maintaining a validated status, for example:

- tracking & tracing of raw materials and finished products,
- uniform access control and rights administration for relevant data in the engineering and control systems,
- tamper-proof archiving of raw data.

To meet these requirements, Siemens already provides powerful products, systems and services such as the PCS 7 process control system, Simatic IT components, IT integration and IT services.

E-business also provides a basis for setting up and/or optimizing a global production network. An MIT (Massachusetts Institute of Technology) study has shown that, in a network of this type with functioning e-business, warehousing costs can, for example, be reduced by 40 to 70 percent.

E-commerce too, is up and coming. Internet auctions run by E-Bay in Germany alone had a turnover of over one billion euros in the fourth quarter of 2002. According to a current Forrester study, a volume of roughly 77 billion euros is traded via B2B online marketplaces in Europe. In the United States, it is expected that as early as next year roughly 25 percent of the B2B trade

will be transacted via the Internet. By the end of the current fiscal year, the Siemens A&D Group will be handling almost 60 percent of its product business by electronic means, thereby successfully maintaining its pioneering role in this area.

Augmented reality

Another future-oriented form of human-machine interface is referred to as augmented reality. To view augmented reality, the viewer has to wear data goggles into which any text or graphics can be inserted. In this way, the natural field of vision is augmented by camera-produced and computer-controlled insertions. This technology has a wide range of applications, ranging from development support via production all the way to maintenance. The machine tool industry, for instance, expects augmented reality to make maintenance and service easier and less costly.

The future of automation

Ladies and Gentlemen,

Before coming to the third part of my speech which takes a look at the future of automation, I would like to make some fundamental remarks about innovation:

The topic of innovation must be accorded top priority, not only at Siemens, but throughout Germany. While it is true to say that Germany has said goodbye to technophobia, the current neutral attitude towards technology, however, is not good enough if Germany wishes to maintain its position as leading industrialized nation. Already our technical expertise in the field of nuclear power has been almost lost, and Germany's position in the development of pharmaceuticals has weakened. I can only hope that this country does not miss the bio-technology train too. Siemens has certainly secured a seat on this train and is, for example, cooperating with biotech company November AG in such varied fields as medical engineering and

DNA-based forgery-proof labels; Siemens has also supplied this company with venture capital.

To support and promote young scientists and engineers is one of the most urgent tasks for the future. We need the imagination, intelligence and creativity of young people for the development of innovative technologies, new methods to solve the tasks of the future in the fields of communications, mobility, health , and power. We need first-class young engineers and scientists to secure our competitive strength.

Siemens is working together with many universities and colleges, for example the RWTH Aachen and the Technical University of Chemnitz, for which I am the responsible patron within the Corporate Executive Committee, on such subject matters as machine tool design and mechatronics. Our factory in Amberg has been able to maintain close contact with the Amberg technical college of higher education, resulting in the direct acquisition of 30 young engineers. In addition, Siemens supports a large number of colleges across the country in an effort to engender enthusiasm among young people for the scientific and engineering professions, thereby nipping recruitment problems in the bud.

At Siemens, innovation has always been part and parcel of the corporate culture. But we nevertheless have to be aware that a position as a trendsetter can only be achieved and maintained through continuous hard work. During fiscal 2002, our company invested 5.8 billion euros in research and development, which employs over 53,000 people. We hold a leading position in patent ranking not only in Germany, but also in Europe and the United States.

We have developed a number of tools within our top+ program to ensure that this innovation process continues to move forward: Trend Setting, Innovation Benchmarking and Business Factory for the establishment of new business models. Top+, as at least the Siemens workforce is by now well aware,

stands for clear goals, specific measures and unequivocal consequences. Specific measures are implemented by means of the top+ toolbox.

At Siemens, innovation is not limited to Germany alone, though; it was no coincidence that we chose as our slogan the “Global Network of Innovation”. It is this idea, together with the available top+ tools, that we carry to over 190 countries of the world where we are represented.

Pictures of the Future

Another method goes even further than the top+ innovation; it was developed by the Siemens Corporate Technology department and implemented together with the various Siemens Groups. It is, admittedly, not enough to know and shape the current trends if one is aspiring to long-term success. Instead, one needs to look further ahead and think about what the requirements of the future might be. This is why Siemens came up with its Pictures of the Future. In the context of Pictures of the Future, innovation planning is based on two opposite views: extrapolation from today’s world and retropolation from the world of tomorrow.

Extrapolation tries to assess precisely at which point something is available and needed, although discontinuities and major development leaps cannot be forecast. Retropolation puts itself into the future and develops scenarios that could apply in 10 or 20 years’ time. The combination of both is reflected in Pictures of the Future for the Siemens business segments of Information & Communications, Transportation, Medical, Power, and Automation & Control. Pictures of the Future not only covers technological trends but also social and market developments, and analyzes the resulting business opportunities.

Let me now pick out some technical topics and present them to you here:

Micro systems technology

Microsystem technology is based on the manufacturing process of microelectronics. New products are being created that go beyond electronic

and opto-electronic components, including micro-sensors, micro-actuators and even micro-reactors for deployment in process systems. Micro-sized reactors could be implemented in modular units and switched in multiple parallels - a great advantage in such industries as pharmaceuticals and chemicals, for example. The corresponding automation is due to follow these concepts of size and distribution in the medium term. Automation needs to become an integral part of micro-system technologies. Once this has been achieved, it will result in entirely new types of savings potential. If a production process has been certified in pilot scale and only has to be reproduced via a standardized process using the same technology, both the capital expenditure and the time-to-market are bound to drop dramatically. In the same way, entirely new methods of developing tailor-made pharmaceutical agents become conceivable.

Siemens is currently launching the new MicroSAM microsensor which incorporates the latest advances in microsystem engineering. The Micro Single Analyzer Module is our latest and smallest process gas chromatograph. In terms of dimensions, this means it has a diameter of fourteen inches and a height of nine inches. MicroSAM is explosion-protected and was developed using silicon-based micro-mechanics, which allow miniaturization of devices whilst simultaneously enhancing their performance.

Polymer electronics

Another future-oriented development, which relies on plastics instead of semiconductors, is polymer electronics. In contrast to silicon chips, which are made in expensive cleanroom environments, it will be possible to print polymer chips as easily as a newspaper in the future. They are flexible and can be applied to flexible substrates such as textiles. Plastic chips are unlikely to replace semiconductor chips, however; rather, they will open up new, low-cost markets.

Human machine interface

Standards that are first established in the office environment also find their way, sometimes after considerable delay, to industrial applications. This also

applies to human-machine communications. Scenarios which will make the office of the future appear in an entirely different light involve such elements as voice, gestures, or virtual screens. Many of these technologies will be used in slightly adapted form also in industrial applications. One example of how things which are quite common today will change visibly in the future can be found in what is known as fish eye technology: Mobile devices often have only very small displays, which makes mobile access to operating and monitoring data difficult for commissioning and maintenance purposes. Fish eye technology provides an interesting solution to this problem. It combines a high level of detail in the display section currently viewed with a compressed overview of the remaining sections, without there being a clear cut line between the close-up and the other areas. The viewer is free to dynamically shift the position of the detailed section. Although it will take more developers' sweat before a system can be operated by voice and gestures, many enhanced and much simpler applications can be conceived in the field of operations and maintenance.

How then, based on current and future developments, do optimistic experts imagine the factory of the future?

Factory of the future

The dream of every factory designer and automation specialist is a digital factory. In the same way as a product and all its components is designed, displayed, and simulated as a digital and virtual CAD model, the digital factory will ideally also be designed and simulated by computer. The automotive industry is paving the way here. In the future, it plans to release a new model only after having seen the digital vehicle pass successfully through the digital factory and after having exhausted all product design and production process options.

In 2010, developers and factory planners will be expected to take their seats in front of the screen and watch the virtual vehicle emerge from the virtual factory. If anybody has any modification requests, these can be made on-line

and via voice control. The system automatically reviews both the entire vehicle and the factory design whenever any detail is modified. Time-consuming manual calculations or interventions will no longer be necessary.

Thanks to the excellent planning, involving the automatic setup of control programs, factory start-up will take only a fraction of the time it takes today. Already today do we see some of these ideas become reality as is the case with the eM-PLC engineering tool which was jointly developed by Tecnomatix and Siemens. It optimizes the workflow between design, simulation and PLC programming of plant sections and manufacturing cells. It has already been responsible for the considerable acceleration of both product launch and production start-up in a car manufacturing facility.

Based on the modular architecture of machines, their powerful micro-sensors and vast communication capabilities, automotive production as a whole will become significantly more flexible. These machines have plug-and-play capabilities which help accelerate the commissioning of an entire production line as well as any conversion to a new product that may become necessary at a later date.

Service will take on an entirely new dimension. Operation and maintenance will be optimized on the basis of powerful tools. Predictive and condition-based maintenance will be the rule. Maintenance activities will be virtually planned before the plant is built. Secondary processes, IT networks and even power management will be run by specialized service providers and will still slot in beautifully with the entire workflow. On-site service will be supported by augmented reality, and specialists will intervene wherever necessary from a central point which does not need to be geographically defined. 24-hour service will be the norm, “following the sun”, as is already the case at A&D and I&S today.

That should suffice by way of a rough outline.

Hard development work will be needed to achieve the scenario I just described. The required computer performance is the least of our problems in this regard, as it will continue to follow Moore's law. Greater efforts will have to go into bringing researchers, manufacturers and users from many different disciplines together and have them work together.

Automation has a future

Ladies and Gentlemen,

The present political situation in the world and the impact it may have on the world economy, and the adverse economic situation prevailing in many regions of the world, including Germany, have created a feeling of insecurity amongst people.

Does this insecurity also apply to the field of automation? My unequivocal answer is No, because the conditions that apply to automation have remained unchanged! People in general wish to plan their life better and to make it more comfortable. They wish to get rid of everything that is physically or mentally too demanding, too dangerous, too monotonous, too expensive, not reliable enough or too time-consuming. In short: people wish to mechanize their tasks; in modern jargon this translates into "automation".

The economy will continue to be determined and driven by the industry segment – and automation is always an essential basic element.

So, automation does have a future. And a future requires a past. Siemens stands for both: with its history of 156 years of continuous innovation, and with its future.