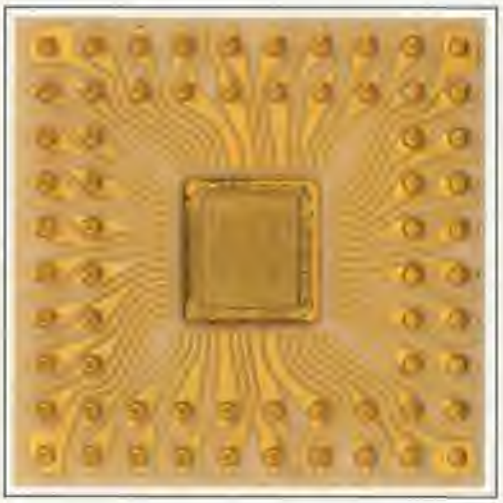
SIEMENS

this is Siemens

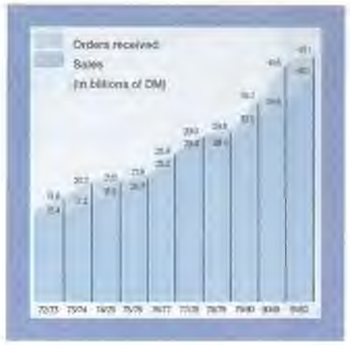


Contents

Our cover:

This logic module in LSI technology was jointly developed by the Components and the Data Systems Groups. Its roughly 500 gate functions, integrated on an area of just 36 mm^2, have extremely short switching times of only 0.5 ns. The module is used in Siemens' highspeed System 7.500 computers, in communication systems for digital transmission, and as a switching matrix for TV and video telephone signals.

The Company



Siemens is one of the largest of the world's leading electrical/electronics enterprises. The Company has production facilities, local companies, liaison and local sales offices, and agencies in 123 countries, and a work force of 324,000 people worldwide. More than half of total Siemens sales, which amounted to DM 40.1 billion in fiscal 1981/82, are generated abroad.

Siemens includes Siemens AG and domestic and foreign companies in whose capital Siemens AG holds a direct or indirect interest of more than 50% and which are included in the consolidated financial statements. Among Siemens' subsidiaries in the Federal Republic of Germany are Kraftwerk Union AG, Transformatoren Union AG, OSRAM GmbH, Dr.-Ing. Rudolf Hell GmbH, and Vacuumschmelze GmbH.

While the prime focus of activity is in the field of power engineering and communications, the Company's comprehensive product lines run the gamut from electric motors to power plants, telephones to powerful computers, electronic components to X-ray departments. Siemens is noted for special expertise as a supplier of total systems and installations, as well as total service in the areas of consultation, project planning and handling, and after-sales maintenance and service.

Substantial expenditures for research and development ensure technological progress and a position of strength in the future. In fiscal 1981/82 alone, research and development expenses totaled DM 3.4 billion, or a good 8% of worldwide sales.

High capital expenditures and investments improve and safeguard the Company's competitiveness in international markets and create the conditions for transforming laboratory results into new products.

Evidence of this innovation-minded management policy is the large number of new products in the Company's sales spectrum. More than 50% of Siemens products now on the market were developed over the last five years.

The dedication and skill of its employees is vital to the Company's competitiveness in the international marketplace. In the 1981/82 fiscal year, Siemens AG spent DM 432 million for the training of young people and the continuing education of its employees.

The development of leading-edge technologies and processes – the tools required to stay on top of the rapid and far-reaching technical changes that are revolutionizing the world around us – will continue to be one of Siemens' key corporate goals.

A corporate management oriented toward innovation and characterized by consistency and prudence; operating groups that enjoy a high degree of autonomy and entrepreneurial responsibility; a broad geographical sales base – all are factors contributing to the stability and strong continuing growth of the company founded by Werner Siemens in 1847.

Outside the Federal Republic of Germany, Siemens is active in 123 countries with local companies, agencies, or liaison and local sales offices. The Company's activities abroad are backed up by manufacturing facilities in 27 countries, where it operates 98 plants of its own.

Siemens AG

The major portion of Siemens business is conducted by Siemens AG, which comprises the key operating sectors.

Organizationally, Siemens AG consists of six Groups and five Corporate Divisions.

Each Group is responsible for the business it conducts worldwide, including development, manufacture, and marketing.

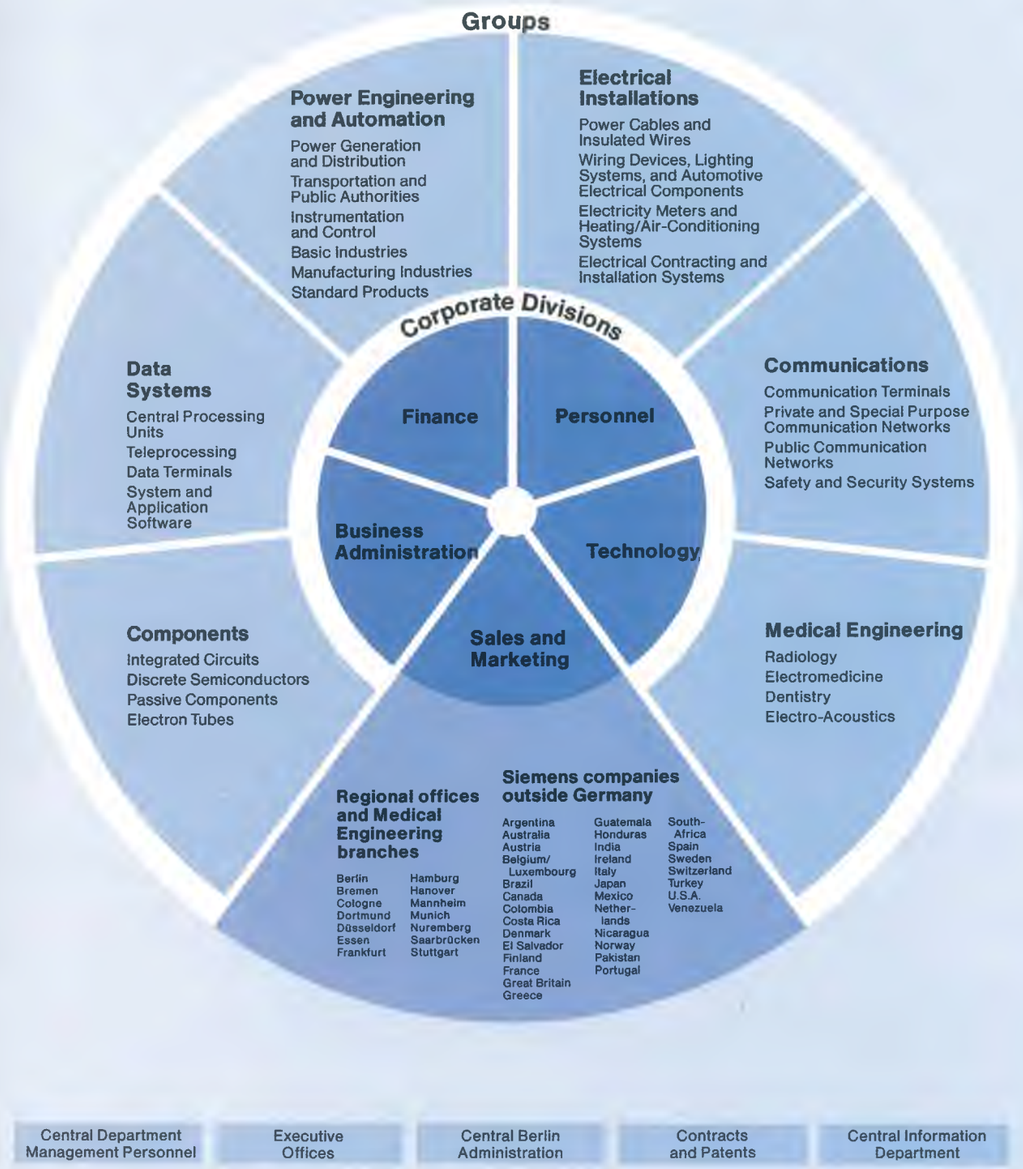
The Corporate Divisions advise the Groups and assists corporate management in achieving its overall business policy.

Sales and marketing are handled in the Federal Republic of Germany by regional offices and branches, and abroad by local subsidiaries or agencies.

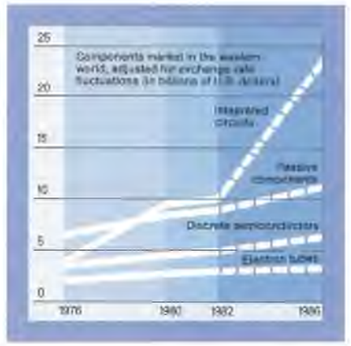
Dr. Bernhard Plettner
Chairman of the Supervisory Board

Dr. Karlheinz Kaske
President and Chief Executive Officer

Organizational structure and activities



Components



The components market in the western hemisphere is growing rapidly as electronics applications expand. The growth rates, particularly for integrated circuits, are clearly above those for the industry as a whole. With a share of roughly 5% in this worldwide market, Siemens ranks among the leading components manufacturers.

Without electronics it would not be possible to witness events in foreign countries on television, to telephone or transmit telex messages across continents, or to collect, store, and process data in science, administration, and industry.

Without electronics there would be no economically viable way of controlling traffic flows, trains and aircraft, or of requesting emergency transportation from a highway telephone.

The rapidly expanding use of electronics in all fields of technology and all walks of our daily life is essentially the result of advances in the components sector. For electronics to perform new tasks, it is normally necessary to improve existing components or to introduce new ones. This is particularly the case in microcomputer technology.

Components are created by the close cooperation of all branches of science. Physicists, chemists, and engineers all make a valuable contribution. It is necessary to control processes down to the molecular and atomic levels in the course of manufacture. The result: products are mass-produced by the millions with ever higher precision and quality while at the same time prices are reduced, due above all to the advances in large-scale semiconductor integration.

Hyperfine gold wires connect the highly intricate network of many thousand transistors with the external pads of an integrated circuit. The approximately 10x magnification cannot give more than a vague idea of the fine patterns, with structures of the order of a thousandth of a millimeter. Development and manufacture of integrated circuits are among the top technical achievements of today. ▷

Integrated Circuits
Discrete Semiconductors
Passive Components
Electron Tubes

A multitude of diverse components – integrated circuits, transistors, diodes, thyristors, capacitors, ferrites, displays, tubes – are indispensable to modern electronics. Ever higher reliability and performance are required of electronic systems in business and industry. And premium-quality components have become a matter of course in many consumer products, too. With its broad product spectrum, the Components Group can offer optimal solutions for any application problem.

Some typical applications for components

More safety and information for the driver: among other things, the new on-board computer calculates gas consumption and average speed, reminds the driver to fill up, and warns him of icy road conditions. The core of the system is a single-chip microcomputer which was specifically developed for this application and is being produced in large quantities.

Electronics can save energy in power distribution. HVDC transmission systems are able to carry electric energy with minimal loss from the power plant to the customer over distances of several thousand miles. Thyristors, i. e. controllable semiconductor valves, play an important role in building up the high voltage required to deliver the high power.

The design of large electronic circuits depends increasingly on semiconductor integration, a term denoting the concentration of all transistors, diodes, and conductor paths of a circuit on a tiny silicon chip only a few millimeters long. These chips are obtained by cutting up a silicon slice, about the size of the palm of a hand, on which several hundred integrated circuits have been fabricated in a single process. The process assures high quality at a favorable price.

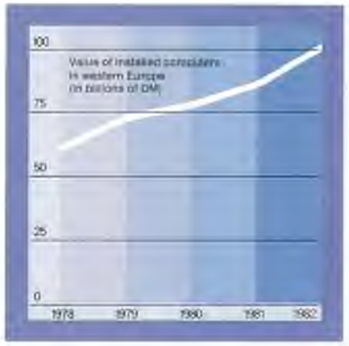
The development of the microcomputer represents another quantum leap in semiconductor technology: A small, yet fully self-contained computer can now be built on the area of a single chip. The capability of such a computer is restricted to specific applications, as in point-of-sale terminals, coin-change machines, sorting devices, vending machines, telecommunications switching equipment, diagnostic equipment in medical engineering, monitoring systems for environmental protection, facilities for machine automation, etc.

The central elements of electronic circuits, i.e. integrated semiconductors and microcomputers, require extensive contact with the surrounding conditions if they are to be effective. Sensors "feel" such aspects of their environment as pressure, temperature, humidity, light and, of course, electrical states, and transmit the values determined to the central electronics. Once the values have been processed, the various actuators come into play: they issue commands in the form of electric currents to solenoid valves and control elements, or give visual displays in the form of digits, characters, or symbols to inform the human operator or prompt him to intervene.

The active components, such as integrated circuits, discrete semiconductors, and electron tubes, require passive components to become effective. The impact of miniaturization, which had its origins in semiconductor technology, also produced outstanding results in the field of capacitors: over the last 25 years, capacitors have seen a hundredfold reduction in size for the same capacitance values.

When it comes to high power ratings at high frequencies, semiconductor components are reaching their physical limits: This is where the electron tube comes in. Its field of applications ranges from radio and TV transmitters to industrial uses, such as the heating of materials. Furthermore, the technology of tube manufacture yields a wealth of experience which can be highly beneficial in the design of power circuit breakers and surge arresters.

Data Systems



The expanding market for computers is representative of the growth in data and information systems.

Due to the rapid pace of components miniaturization, new applications for DP systems have again expanded substantially in recent years. Today, electronic data processing has an impact on more and more sectors of the economy, affecting almost all areas of life. Data that has to be collected, stored, processed, and retrieved, is generated everywhere: in trade and industry, in science, in the service sector, in government, and in training and education.

For a highly industrialized nation, data processing is thus an economically vital tool that is urgently required to cope with the increasing number of tasks to be performed and, above all, with the ever larger volume of information. In addition to individual products, there is an increasing demand for complete, tailor-made solutions: DP systems are used to solve commercial, scientific, and technological problems; computers are needed which supply comprehensive information rapidly as the basis for specific and efficient decision-making; and systems are required which provide distributed computer power at the workstation, to help optimize overall office efficiency.

Apart from the computer, software is an essential element of data processing systems. The system software controls the operation and interaction of CPUs, local and remote peripherals, and application programs. The latter are used to solve user-specific and industry-oriented problems.

Screen-based workstation in a travel agency. The video terminal gives easy access to the computer and allows customers to be served much faster. ▷

Central Processsing Units
Teleprocessing
Data Terminals
System and
Application Software

Designing on screen using
the Siemens CADIS system

Compact workstation with integral high-performance processor: Siemens System 7.500 computers can be used without specialist knowledge of DP. The 7.531 compact computer shown here is employed in an office as a software development unit.

Videotext not only makes up-to-the-minute information available to a large circle of users, but also permits them to engage in dialog with exerrnal computers or the in-house system that supplies the information.

Data processing is here to stay – this cannot be questioned. Whether data is processed in a central computer room or decentralized at the individual workstation depends on the jobs involved.

The Siemens TRANSDATA teleprocessing system offers the advantages of both the centralized and the distributed approach, whether over a distance of a thousand miles or a mere hundred yards. The important thing is direct communication between host computer and terminals, providing computer power wherever it is needed: in the executive suite and in the accounting department, in the research laboratory and the engineering office, in the work scheduling and shipping departments, at the bank counter and in travel agencies.

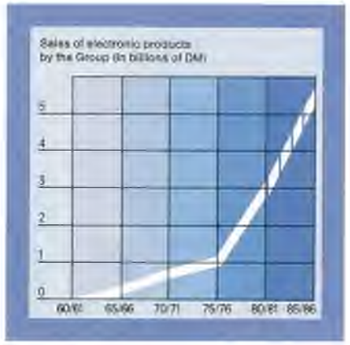
One figure will be sufficient to prove that the concept is right: over 70% of the general-purpose Siemens computers installed are used in teleprocessing. This success is based on a broad performance spectrum, extending from specialist consulting services and systems analysis to training of customer staff; on a comprehensive range of software and hardware; and on Siemens' own extensive experience in using teleprocessing equipment.

Interactive videotex (VDX) is the easy approach to data processing. Although a new communication and information medium, it is largely based on existing units and systems: it utilizes domestic television sets for display purposes and transmits coded information via the public telephone network.

VDX subscribers can retrieve information from the public videotex system of the Deutsche Bundespost twenty-four hours a day. The „external computers" connected to the system provide access to up-to-date information and to current programs. In addition, Siemens developed an "in-house system" for VDX applications that operates independently from the public videotex system of the Deutsche Bundespost. The Siemens interactive videotex system permits users to implement at the same time both external computers and in-house systems on the same DP equipment.

To give users the opportunity to enjoy the benefits and convenience of interactive videotex, Siemens offers users a choice of two access procedures: the selection tree method and logical search. In the logical search approach, the desired information is directly retrieved by entering alphanumeric keywords.

Power Engineering and Automation



Further progress in the integration and utilization of ultramodern electronics and data processing for automation purposes will be increasingly determinative for a substantial portion of our activities.

In power engineering, generators, transformers, cables and wires, switchgear and motors are combined with control equipment to form systems designed to generate, distribute, and use electric power.

The flow of power undergoes various transformation processes on its way from the power plant to the motor in a rolling mill, from the high-voltage switchgear to the domestic appliances. High voltage is converted to low voltage, alternating current to direct current, electric power to mechanical or chemical energy, to heat or light.

The basic functions of process automation, such as measuring, open-loop and closed-loop control, and computation, lend themselves to integration into these transformation processes. Electronics is playing an ever greater role.

Industrial production and manufacturing processes, for example, can be efficiently controlled by automation systems. They assure consistently high product quality, while at the same time reducing consumption of both materials and energy.

Manufacturing and technological processes are becoming more and more complex. As a result, the proportion of engineering involved in project planning and handling, installation and servicing is increasing constantly.

We offer these engineering services to our customers all over the world, together with our specially developed high-quality and market-oriented line of products.

Computer-controlled high-capacity universal mill for the manufacture of girders in the steelworks of Peine-Salzgitter AG. Our picture shows the control pulpit, mill motors, and shear drive. ▷

Power Generation and Distribution

Metal-enclosed medium- and high-voltage power breakers using sulfur hexafluoride (SF_6) as the insulating gas are available for voltages ranging from 6 kV to 800 kV.

A power supply system involves generation, transmission, and distribution of electric energy. Consumption is increasing, as is the number of power consumers. This means that voltages of 110 kV and above have to be taken right up into congested areas and industrial plants. The space required by SF_6 gas-insulated metal-enclosed power breakers, in addition to being completely safe and extremely quiet in operation, makes such switchgear well suited for service in residential areas.

In response to the international market trend to make increasing use of this kind of switchgear, we introduced a new line of medium-voltage SF_6 gas-insulated circuit breakers for 6-kV to 36-kV ratings, incorporating for the first time the advantages of vacuum breaker technology. Larger and denser supply networks and increasing transmission voltages confront system planners with new problems. In the power distribution sector, too, the need for efficient use of power requires the widespread use of computers.

Transportation and Public Authorities

Attractive railways capable of handling rush hour traffic are needed in congested urban area as an alternative to individual vehicle traffic. An efficient network of metropolitan rapid transit systems, including light-rail rapid transit and underground railroad systems, considerably eases traffic problems. The city of Hanover with its new light-rail cars serves as a good example.

Growing industrialization is stimulating the exchange of goods. New transportation systems and handling methods are being created and tested, and existing ones extended and modernized. In goods traffic, higher capacities and faster turnaround times are called for. Electrical engineering is increasingly meeting new challenges.

A high degree of automation streamlines and speeds up transportation. By making extensive use of electronic installations in land, water, and air transport systems, automation results in an extremely high level of safety for passengers, facilities, and cargo.

Many institutes of technology and research and training centers are financed and kept up-to-date by public funds. We supply complete installations and turnkey training facilities for institutions ranging from vocational training to technical universities. Research laboratories, for example high-energy physics research centers, are supplied with high-precision equipment for large-scale experiments.

Instrumentation and Control

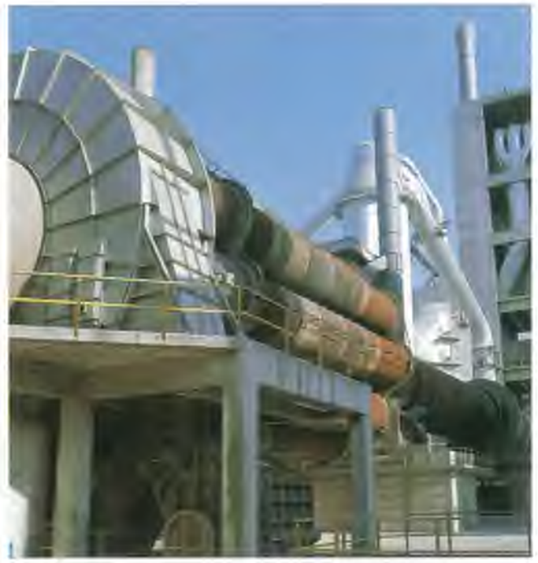
A new process control system handles process operations. Video terminals equipped with light pens make man-machine dialog easier and more reliable.

Instrumentation and control equipment and systems are used to measure, test, analyze, monitor, control, and optimize operations in power engineering, process and manufacturing technology, telecommunications, transport, research and development, training and education, and environmental protection. Our spectrum ranges from standard measuring devices to tailor-made complex automation systems.

Technical processes are automated with the aim of improving productivity and efficiency, while maintaining the same high level of product quality, making energy consumption and the use of raw materials more efficient, and assuring a maximum of on-the-job safety for human operators.

The diversity of jobs that can be handled by automation technology is reflected by the manifold applications of data systems, extending from microcomputers integrated into individual units to large central computer systems.

Basic Industries



Rotary kiln plant capable of producing 3,000 tons of cement per day. Siemens provides the cement industry with electrical engineering equipment such as power supplies, drives, and automation systems.

The winning and treatment of raw materials is becoming increasingly difficult. Less profitable deposits must be worked economically. Quality has to be improved by purifying, refining, or enrichment. Costs need to be kept down by streamlining, which in turn demands ever more efficient electrical equipment and systems. Powerful drives, fast and highly accurate control systems, and extensive automation are today an essential requirement in mining, steelworks, rolling mills, the chemical industry, and oil refineries.

Standardization is now taken for granted. Extensive use of standard modules in drive and control systems is conducive to greater efficiency and operational safety. It also simplifies such diverse activities as project planning, erection and installation, maintenance, spare parts inventories, and plant expansion, if any. While facilities are growing in complexity, standardized planning and design represent the only means of keeping the high proportion of engineering work within reasonable limits.

Advanced technology, a line of complete systems, and a comprehensive knowledge of the various technological processes involved enable us to plan and build complete industrial plants in close cooperation with our customers.

Manufacturing Industries

Standard Products

Machinery in a paper mill. Drives and controls are designed to the strict quality requirements of calender systems with web widths of roughly 8 meters and speeds of around 1,000 m/min.

Every year our Amberg manufacturing plant produces about 5 million contactors for switching three-phase AC motors with ratings of up to 325 kW at 380 V.

The workstations for assembly of the newly introduced contactor series are designed according to the latest ergonomic findings, for example as group assembly positions.

Whether it be a machine tool, a paper-making machine, a sugar refinery, or a brewery, the result of the production process is determined by the efficiency and reliability of the power supplies, drives, and control systems.

Economical production means maximum output with minimum consumption of power and raw materials; it also implies streamlining and automation of manufacturing. This calls for high-quality modular equipment and programs as well as for an overall concept specifically tailored to the task.

In such a concept, the components and systems must all match. Motors, switchgear, and control equipment must be integral parts of a comprehensive program. A process computer is able to control all production operations within the system as a whole. Data processing technology provides the small business computers for the office and administrative sector.

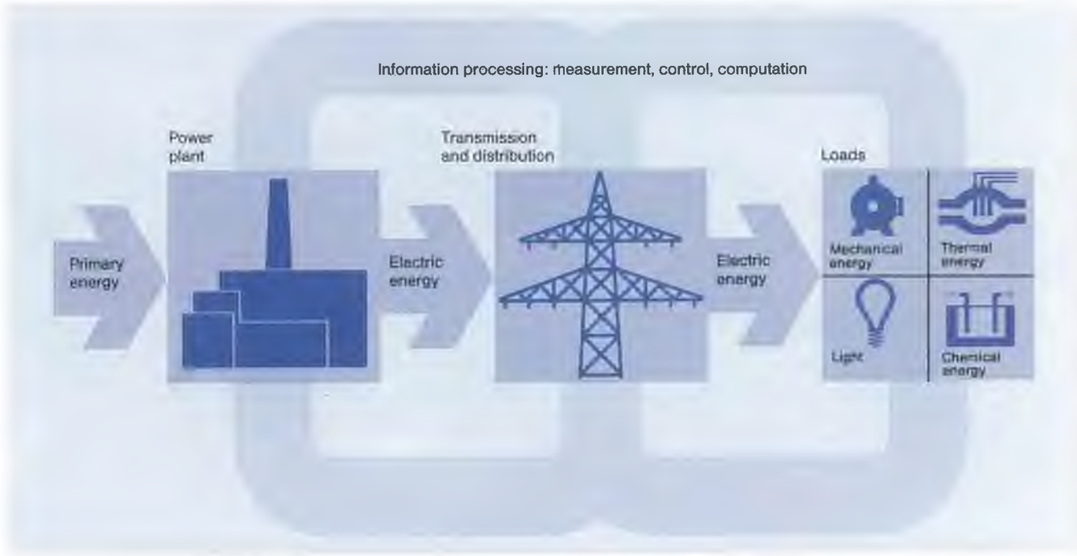
In cooperation with our customers, we undertake work both large and small, supply equipment tailored to the needs of specific industries, and design and build entire plants and industrial complexes.

Standard products in the power engineering field range from standard motors and pumps to compressors and high-voltage motors, from auxiliary contactors to low-voltage circuit breakers, from control stations to low-voltage distribution systems. They also include industrial electronic modules.

Standard products are put to use everywhere where special solutions are not required. A multitude of product types and the possibility of combining families of equipment enable standard products to be adapted to individual applications. The use of standardized equipment combinations reduces the cost of project planning, installation, and commissioning, and facilitates servicing.

Products must be easy to operate, reliable even under difficult conditions – for example, when exposed to wet or dusty atmospheres or severe jolting – and simple to handle during assembly.

Systems Engineering Development



The generation, distribution, and use of electric power invariably involves energy conversion. Technically and economically optimum solutions can be attained, if all power engineering activities are conceived as parts of the system as a whole.

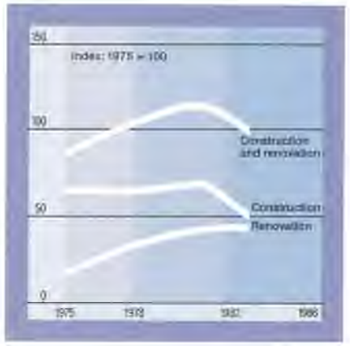
Energy may be converted several times on its way from the generating plant to the consumer. Information processing operations, such as measuring, controlling, and computing, are integrated into these conversion processes at all levels.

Complex power supply systems call for high standards of engineering, from project planning to installation, erection, and commissioning. Only if all efforts are integrated, can top quality be guaranteed for the system as a whole. In view of the wide range of power engineering applications, the development of standard methods of information processing is indispensable, if the economical and comprehensive solutions required by the market are to be found. In addition, it is necessary to elaborate and apply efficient methods for project planning, engineering, and implementation.

Moreover, it is the task of systems engineering development to ensure that the design of different technical components is such that they can be combined, and to make available standard methods and equipment for all conceivable fields of application. In this respect, it is vital to select at the earliest possible stage of development the most economical solution of all those technically feasible.

Systems engineering thus represent a combination of advanced manufacturing technology and modern engineering.

Electrical Installations



A structural change has affected our most important market for electrical installations products, the German building market. Since 1980 renovation business has grown steadily, while new building starts have steadily declined. This trend is particularly marked in the housing sector.

The field of electrical installations illustrates just how indispensable electric power has become to us, how it works in the many spheres of life, and how much we take it for granted. Electric power is used for light, heating, and air-conditioning at home; to light up factories, roads and bridges; to floodlight sports stadiums; to illuminate airports and theater stages; to control automobile engines and operate on-board computers – evey sector requires new answers to new challenges.

The growing use of electrical appliances, machines, and systems at home, in the office, and in the manufacturing plant requires constant progress in electrical installations technology.

This means providing new transmission cables, flexible supply and wiring systems, insulated wires, electricity meters, fuses, switches, structural and mounting accessories.

The Electrical Installations Group offers a wide range of technically advanced products to crafts and trade, to building contractors and electric utilities, and to industry in general. Its line includes functional, efficient products that can be adapted to the specific application; products which surround us in our everyday life and enhance our working capacity and well-being; products, equipment, and systems that are undergoing a constant change, just as we and the demands we make on our environment are constantly changing.

Olympic Stadium in Munich: ▷
Night is turned into day by 550 high-performance floodlights fitted with 3,500 W metal-halide lamps and arranged in four main and six smaller groups. Suitable for color television broadcasts, the lights evenly illuminate the arena with 1,875 lux.

Power Cables and Insulated Wires

The partial discharge test is especially important for assessing the reliability of medium- and high-voltage cables with polyethylene insulation. Our picture shows the test rig in the PD hall of our Berlin cable plant.

Cables and insulated wires carry electric power from the producer to the consumer. Stringent requirements with regard to ease of installations, reliability, and efficiency lead to the development of more and more types of cable. Cross-linked polyethylene is now the main insulating material for cables in the medium- and low-voltage ranges. Artificially cooled EHV cables rated for voltages of up to 400 kV enable previously attainable transmission power to be trebled.

Sealing ends and sleeves made of high-grade insulating materials, such as cast resin or silicone rubber, are used to connect loads and make cable joints.

Many different types of insulated wires are required to carry electric power in equipment of all kinds.

In industrial architecture, insulated wires of all descriptions and cross-sections are required for both permanent installation and flexible leads capable of withstanding high currents and mechanical stresses. In the home they are the main link between the distribution box and the socket of the electrical appliance.

Wiring Devices, Lighting Systems, and Automotive Electrical Components

The new DELTA-studio system with its attractive design makes it possible to arrange various accessories in any desired combination. The light switch matches the temperature control, the hygrometer the digital display. The system is available in light and dark bronze finishes. SILUZET® luminaires ensure that interior working areas are properly illuminated.

Wiring accessories and installation systems suitable for installation in every type of building are available to meet all requirements. The product spectrum includes automatic controls, current-operated earth-leakage circuit breakers, fuses, switches and plug-and-socket devices, connectors, and signaling and alarm systems. New mechanical, electrical, and electronic components ensure that these products are highly reliable, future-oriented, and economical.

The need to make efficient and economical use of electric energy has led to the development of new luminaires and wiring accessories:

The two-component system for office lighting is a new method of combining ceiling and desk lights to achieve both good visual comfort and minimum power consumption.

The best lighting arrangement for a particular type of street can be determined from experiments conducted under practical conditions at the outdoor lighting laboratory. The results of such experiments are incorporated in the design of new luminaires. Siemens floodlights are used to illuminate buildings, sports stadiums, airports, and television studios.

Automotive electrical components are increasingly gaining in importance. Electronic ignition and engine control systems help reduce gas consumption, while on-board computers provide more safety for the driver and make driving more economical.

Electricity Meters and Heating/Air-Conditioning Systems

A computer-controlled laser beam passes through the glass front of electricity meters to inscribe the customer-specific technical data.

The demand for electric power will continue to rise, due to the growing shortage of raw materials. Measuring and metering the electrical work performed will increase in importance. The induction meters used for domestic billing are extremely economical in view of their required service life, measuring accuracy, and reliability.

Modern electronic meters have a measuring accuracy greatly surpassing that of conventional meters working on the Ferraris principle: in the highest measuring class, the errors are of the order of less than 0.2%. At major power transfer points, this means an appreciable improvement in metering accuracy. As elsewhere, electronics is steadily gaining ground in the field of electricity metering, where it opens up new interesting methods of billing. Centralized ripple control systems are increasingly being adopted to exert a direct influence on electric power consumption.

Heating systems with electrically driven heat pumps save primary energy, e.g. oil, thereby making an important contribution to the reduction of our dependence on imported fossil fuels as well as benefiting the economy as a whole. The renovation of existing buildings has become an important factor in the building industry. Electric storage and central storage heaters are easy to install in houses and other buildings and involve no messy work or structural alterations.

Electrical Contracting and Installation Systems

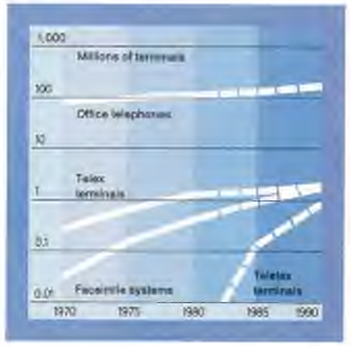
TV center in Riyadh, Saudi Arabia: This installation with a power rating of 15 MVA comprises the medium- and low-voltage supply, the distribution and lighting systems, the cable and wiring network, and the emergency power supply.

While hospitals and airports demand extremely reliable power supply systems, office buildings call mainly for benefits such as adequate illumination and electrical installations that can be quickly adjusted to rearrangements of working space.

Modern multistory buildings have their own transformer stations and switchgear plants for the distribution of electric power. Electricity-powered building facilities such as lighting, heating, and air-conditioning systems, communications equipment, conveyor-system drives and controls, medical systems, and housekeeping appliances are fed by numerous vertical and horizontal line networks. The utility value of buildings is determined by the quality, operational reliability, and efficiency of these facilities.

Airfield lighting equipment, stage and television-studio lighting systems, floodlight installations for sports arenas, and outdoor illumination for fountains are all examples of applied installation technology, which also includes the development of special-purpose electrical systems and equipment.

Communications



Office communication terminals (world market trends up to 1990)

Communication systems are the lifeline of business and administration on a regional and international scale. The services they provide are as indispensable to the office as they are to the media, and as vital for science and research as they are for security, utilities, and traffic coordination. Even in the private sector, communication systems are becoming more and more important.

Market research shows that there is a growing worldwide need for means of communicating speech, text, images, and data – for means of communication which will fulfill all requirements for the recording, distribution, transmission, retrieval, and reproduction of information. Communication systems, therefore, are of paramount importance to the economy.

Siemens is among the few suppliers on the world market who combine the three "C" technologies (communications, computers, components) under one roof – technologies shaping the future of telecommunications.

This future will be determined by digital technology. Integrated service digital networks and intelligent terminals featuring semiconductor modules will enable the development of new forms of communication, such as the simultaneous transmission of voice, text, images, and data over a single line.

All this makes considerable demands on the quality of the software involved. Only a company that offers a full range of communications products and services will be able to provide comprehensive, tailor-made solutions in the future.

The Communications Group is the third largest supplier in its sector worldwide.

The Group develops, designs, manufactures, installs, and maintains a range of systems and products extending from individual units to complete networks.

In 1983 the Deutsche Bundespost will begin with the introduction of interactive videotex for all telephone subscribers. They will be able to access data banks, consult timetables or the telephone directory, check inventories, or transfer money automatically. This high-convenience video telephone combines telephone service and interactive videotex in a single unit. It is a prototype that made its debut at the 1983 Hanover Fair. ▷

Communication Terminals

Text Terminals

The new Model 5511 Display Writer fits in with any office. It satisfies the ergonomic requirements for screen-based workstations and is an entry-level system to modern word processing and text communications.

With the advent of efficient and user-friendly text terminals, written correspondence is rapidly giving way to electronic mail.

Teleprinters are speeding messages directly to and from the place where they have to be dealt with, i.e. the office. Facsimile systems receive document copies automatically, even in the absence of an operator.

Memory typewriters and word processing systems are a particularly effective way to reduce paperwork and thus increase office efficiency, whether it be individual composed letters or repetitive form letters.

Text terminals facilitate the handling of every type of correspondence. Incorporating the functions of both typewriter and video terminal, they are able to communicate over the teletex service network and have access to the telex network.

Interactive videotex systems will give users in office and home direct access to a wide variety of information from public and in-house databases via the public telephone network.

New versatile ink-jet printers for use in the office were developed specifically for the OEM market, including an efficient low-priced hardcopy printer.

Telephone Terminals

A new line of office telephones, the SIEMENS teamset® 200 key telephone system, was added to our comprehensive range of telephone terminals.

A wide range of telephone terminals provides just the right telephone for every situation, saving both time and costs.

Examples of the capabilities offered by the new telephone terminals are high-convenience units with handsfree equipment, repertory dialer, or – in conjunction with the EMS telephone system – with feature keys for automatic callback, add-on conference, call pickup, speed calling, etc.

For executives and their secretaries and for work groups, there are special telephones available which relieve the pressure on the executive and improve the communication between team members. The new telephones can be used both as the main station and as a satellite PABX.

A preview of tomorrow is provided by the Siemens vicoset® video communication terminal. Besides permitting conventional and video telephony and document transmission, it enhances workstation efficiency even further by making interactive videotex and other advanced services available.

Private and Special Purpose Communication Networks

The EMS telephone system with stored program control (SPC) combines reliability and performance and sets new standards in efficiency and ease of operation.

The MS 5800 DOCUMENT communication system provides professional workers and executives with new services in the office sector, saving approximately 20% of working time.

In all sectors of business and administration, as well as in such areas as transportation, power supply utilities, police forces, and national defense, communication networks and systems have a vital role to play.

Siemens communication networks and systems reflect the latest advances in technology.

Siemens systems for voice, text, image, and data communication cover the entire field of office communication. They can be adapted to any business and all possible requirements.

The EMS communication system sets new standards in performance, flexibility, and overall convenience. Its features range from automatic callback to rapid text communication, and from electronic mail to paperfree document filing.

The EMS 5800 DOCUMENT system is used to prepare, file, and distribute the most diverse office documents, thus relieving pressure on more than half the office staff, including professional workers and executives who so far have made little use of office systems.

But Siemens also offers complete networks for applications that place particularly high demands on the security and availability of the communications links. The KN system for special purpose communication networks is the latest product of development efforts in this sector.

Public Communication Networks

Public Switching Systems

Tomorrow's communications will make use of worldwide digital networks. The fully digital EWSD switching system provides an ideal basis for this development.

With over 50 million line units to its credit, Siemens has made a substantial contribution to the high standards achieved throughout the world within the public telephone, telex and data networks. High-quality, well proven switching systems from Siemens with direct- or register-controlled electromechanical switching, with semi-electronic exchanges under central control, or processor-controlled all-electronic systems are found at all levels of the network hierarchy from small local exchanges to large long-distance exchanges and international gateways.

Siemens is preparing to meet the growing communication demands of tomorrow with digital public switching systems using a standard 64 kbit/s channel. They are equally suitable for voice communication and for highspeed text, image, and data transmission.

Transmission Networks

Intercontinental communications is being handled mainly by satellite. As general contractor, Siemens supplied the five antennas of the world's largest earth station at Raisting.

Siemens supplies equipment and systems for reliable, high-quality transmission of telephone calls, radio and TV programs, teleprinter messages, and data. This involves the provision of connections for individual calls, for blocks of several thousand calls, or for an equivalent amount of information over short or intercontinental routes employing copper cables or optical fiber waveguides, radio relay links or satellites.

The wide variety of problems involved in transmission demands an equally wide range of products designed to suit each application. This range covers everything from compact transmission equipment for mobile use to fully equipped national transmission networks.

Safety and Security Systems

Radio and Radar Systems

Reliable air space surveillance: Aircraft movements over widespread areas are displayed in this control room.

Electronic systems and equipment increasingly determine the effectiveness of national defense. The Radio and Radar Systems Division is chiefly concerned with air space surveillance and air defense systems to protect individual installations or an entire country. This range of equipment is supplemented by reconnaissance and command systems and by equipment and networks for military communications.

Besides the mastery of the various manufacturing techniques involved, the planning and production of such systems requires the necessary R&D potential and the application of the latest logistics methods.

Security Systems and Components

Fire departments, emergency services, and the police are called upon to perform an increasing number of tasks. Computer-assisted operations control centers make it possible to conduct operations more efficiently.

Fire protection and operations control systems help fire departments to act fast and effectively. Intrusion protection systems guard premises against break-ins. Siemens security measures fit smoothly into any organization. Electronic clocks and clock systems show the correct time everywhere. Attendance control equipment guarantees the right figure on every pay check. Traffic control systems increase road safety and improve road capacity utilization. Traffic control computers keep signals optimally timed for every traffic situation.

Electromechanical components such as relays, plug connectors, and switches are indispensable accessories to electronics.

Railway Signaling Systems

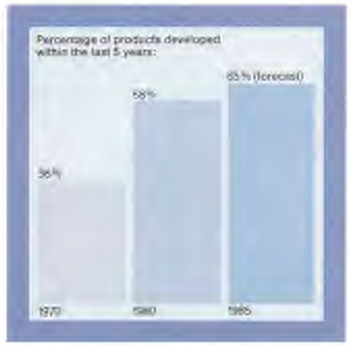
Railway signaling systems protect and control rail traffic.

Railway signaling systems ensure that neither irregularities nor technical defects can endanger rail operations.

This is achieved by interlocking cabins, at which train routes, switches, and signals can be reliably set and monitored.

In addition, rail traffic can be automated by inductive train control systems. Computers of all sizes are making an increasing contribution toward the protection and automation of railroad operations. For example, running schedules with all train movements are fed into the computer, so that deviations from the schedule can be detected immediately.

Medical Engineering



For more than 100 years, we have cooperated closely with doctors throughout the world to find better and less complicated means of diagnosis and treatment and to provide greater patient comfort. The knowledge we have gained thereby has been translated into appropriate medical equipment and systems.

Modern medicine is inconceivable without the advances achieved in medical engineering. Many of the injuries and diseases, which at one time led to years of suffering or certain death, can now be cured.

Although the field of medical engineering appears heterogeneous and multifaceted, it is nevertheless a field of its own with clearly defined tasks.

These are:

- making diagnosis more reliable and therapy more effective,
- reducing to a minimum the stress on the patient during examination and treatment,
- making both examination and treatment as economical as possible, and
- making the physician's work as easy as possible while relieving him of routine tasks.

The activities and product lines of the Medical Engineering Group are as broad as the fields in which medical technology is applied. They include the development, manufacturing, and marketing of equipment and systems for use in conventional radiological diagnostics, computed tomography, nuclear magnetic resonance (NMR) tomography, nuclear diagnostics, and radiotherapy. Cardiac pacemakers, respirators, liquid jet recorders, and sonography systems also belong to the product range, as do microcomputer-controlled patient monitoring systems and complete dental treatment setups. Hearing aids, speech-hearing training equipment, and special devices for hearing-impaired children round off the product line. The Medical Engineering Group also helps its customers to plan and equip individual and group medical practices, hospital wards, and entire hospitals.

SOMATOM® DR ▷
Computed tomography has opened up to medical diagnosis a new dimensions of X-ray examination: From a cross-sectional image through the body of the patient, the physician obtains information that he was not able to obtain with conventional X-ray techniques. In neurology, for example, the efficiency of this new diagnostic tool has made is possible to reduce examination times to one-tenth of that of its predecessors. In addition, the new technique is causing no discomfort whatsoever to the patient.

Radiology

The treatment of cancer is inconceivable today without the use of high-energy radiation, preferably generated by linear accelerators. With the aid of a computer, the therapist establishes a radiation dosing plan which is so accurate that the radiation dose is concentrated on the tumor, while the exposure of the surrounding healthy tissue is kept to a minimum.

Versatile X-ray technology is helping the doctor to diagnose diseases earlier and more accurately. In addition, it permits the monitoring of critical surgical interventions and continuous follow-up of the healing process inside the patient.

A new diagnostic procedure we have been pursuing intensively is nuclear magnetic resonance (NMR) tomography. This makes it possible to determine those characteristics of tissues and organs within the body which cannot be detected by other imaging systems.

The basic principle of nuclear magnetic resonance tomography is to subject the nuclei of the hydrogen atoms that are contained in large quantities in the human body to a strong magnetic field and to short, high-frequency pulses, so that they emit response pulses indicating their distribution within the body. From the multitude of response pulses, a computer puts together – as in computer tomography – a graphic image clearly showing the distribution and concentration of the hydrogen.

From this image the physician can draw conclusions about the biochemical condition of tissues and organs, and make his diagnosis accordingly. The patient is not exposed to any ionizing radiation during the examination.

Electromedicine

Thanks to advanced microcomputer technology, the new SIRECUST® 400 system for patient monitoring is even more efficient and easier to use, while at the same time providing greater patient safety.

The basis and starting point of electromedicine, a classical discipline of medical engineering, were the fields of thermotherapy and stimulation current therapy. In the course of time, such interesting and important diagnostic methods as electrocardiography, electroencephalography, and ultrasonic diagnostics were added, a particular field of application for the latter being antenatal care with no radiation hazards to mother or fetus.

Often, a doctor has to evaluate many types of physiological data in combination before he can determine what treatment a patient should receive. Accordingly, the equipment and methods of modern measuring technology are highly refined. This field, covering automatic monitoring during surgery and computer-controlled post-operative intensive care, has now reached an extremely high level of sophistication.

The latest results of our intensive research and development work in the field of electromedicine include a programmable cardiac pacemaker, an implantable insulin pump, and a servo ventilator for use in anesthesiology.

Dentistry

Studio 3000 – the advanced, ergonomic dental workstation. The cabinet units are conveniently arranged around the chair, within easy reach of dental surgeon and assistant. All instruments and materials are ideally positioned to speed up the course of treatment.

Today, fear of the dentist should be a thing of the past. In recent years, there has been a radical change in treatment methods: With the patient in a recumbent position, even lengthy orthodontic surgery has lost its terrors for the patient. The dentist himself is seated, which means that one of the classical occupational diseases among dentists – vertebral disk damage due to working with a constantly bent vertebral column – is avoided.

Modern turbine heads with air or ball bearings, scarcely thicker than a ballpoint pen, attain speeds of more than 400,000 rpm, which helps to take the pain out of treatment.

As an important diagnostic aid in orthodontic treatment, for example, panorama views of the entire upper and lower jaws can be obtained by using modern X-ray units specially designed for dentistry.

Electro-Acoustics

Hearing-impaired children have difficulty in learning to speak. Speech-hearing training equipment are important modern aids for the speech therapist.

Today, hardness of hearing can be corrected quite inconspicuously: behind-the-ear aids and hearing spectacles offer satisfactory solutions. The aids can be easily adjusted to the various types and degrees of hearing impairment.

Our engineering products open up the world of sound to speech- and hearing-impaired children in special schools for the hard-of-hearing. Cable-free units permit them to move around the classroom. With the aid of stereophony, the hearing experience is virtually indistinguishable from normal.

Research and development

Our research and development expenditures in 1981/82 amounted to over DM 3.0 billion, or roughly DM 12 million per workday.

Continuously changing economic structures, dwindling raw materials and energy resources, and the danger of reaching the limits of ecological viability all call for increased efforts in research and development, in order to further improve the design and operation of existing products, develop new ones, and work out more efficient manufacturing technologies.

Pioneering technical solutions cannot be found without first recognizing and thoroughly understanding the relationships and laws of physics.

It is the goal of industrial research to extend our knowledge in selected area and to make use of newly discovered processes in industry.

It is no longer sufficient to optimize the design of individual products. Even prior to the development phase, it is essential to investigate the combination of various products within a system. This demands close cooperation between pre-production research on the one hand and equipment and systems development on the other.

More than 30,000 of our employees are engaged worldwide in research and development. Nine out of ten work in the development laboratories and manufacturing departments of the Siemens Groups. One out of ten works in the Corporate Research and Manufacturing Technology Laboratories. These employees are an important link between all our various engineering activities.

Examples of the work of our research laboratories are given on the following pages.

In our arc discharge research laboratory we investigate the complex physical processes occurring within a fraction of a second upon actuating a switch. The objective is to reduce the size of electrical switchgear installations for conurbation areas, while at the same time improving their efficiency and reliability. ▷

Superconducting multi-element wire

Six-element wire with niobium-tin conductors arranged around a copper core (manufactured by VAC)

The phenomenon of superconductivity offers new possibilities for future energy generation. At extremely low temperatures many metals lose their ohmic resistance and are able to conduct an electric current without losses.

Such superconductors can be used in electrical machines and for the generation of high magnetic fields, e.g. in nuclear fusion plants. We are investigating suitable materials and production processes.

The illustration shows a superconducting wire (manufactured by Vacuumschmelze GmbH) which is 2.6 mm in diameter. It consists of six niobium-tin conductors arranged around a copper core. Each conductor consists of 10,000 Nb_3Sn filaments 3 microns in diameter which are embedded in a copper-tin matrix. This wire will conduct a current of several thousand amps without losses.

Systems research

Testing a fault-tolerant multiprocessor system in the research laboratory.

To keep pace with the rapid advances being made in semiconductor technology, computer systems are becoming ever larger complexes which serve a wide range of applications. One of the main concerns of systems research is the design of clearly structured configurations which allow operations to go forward even after a fault has occurred.

These requirements are to be met by the development of suitable function-oriented multiprocessor systems. Each of the processors is programmed for its own specific task. Redundancy is built into the configuration in such a way that the processors can provide mutual backup. The designing of simple well-structured operating systems for this purpose is of prime importance. Data processing systems based on this concept can be more easily dealt with by the operating staff. They are manageable and reliable.

Database technology

Conceptual data model based on the example of a consumer market.

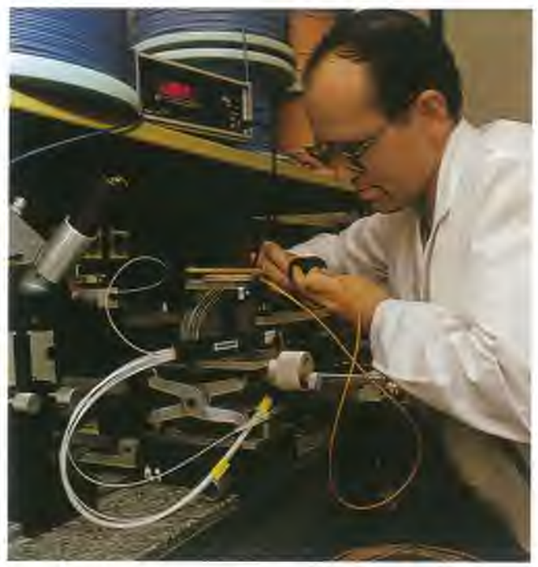
The great importance which data banks have come to assume for many branches of industry and public administration makes new demands on database systems.

A database system has to offer the database designer, the applications programmer, and the final user of the database sufficient convenience for the accomplishment of their tasks. The designer of a database requires suitable means in order to represent his information area completely, unambiguously, and independently of the technical implementation.

It is important that both the original and the updated data holdings are free of any inconsistencies. This problem is not adequately solved in present-day systems because responsibility for the consistency of the data is passed on to the applications programmer. The conceptual data model we have developed, demonstrated in the picture by the example of a consumer market, solves this problem inside the database system.

The strict real-time conditions imposed by dialog systems also make exacting demands on database systems. Concepts that we have developed make use of modern LSI semiconductor technology in order to implement optimally adapted hardware structures, permitting, for example, the access to data via their content or extensive paralleling of search processes.

Components for transmission of information via optical waveguides



Measurement of light distribution at a coupling network for the optical transmission of information.

The transmission of information via optical fiber waveguides represents a new telecommunication technique which points the way to the future. They are particularly suitable for the transmission of digital signals and are immune to interception and electromagnetic interference. Laser diodes or light-emitting diodes (LEDs) are used as transmitters, the intensity of the light emitted being modulated as a function of the signals to be transmitted.

The modulated light is transmitted via thin glass fibers. Branching and coupling networks or changeover switches are used to distribute the light signals among several fiber channels or to select a particular channel.

The picture shows the measurement of light distribution at a coupling network where the light is fed into one of 16 input channels and distributed among 16 output channels.

At present we are also working on electro-optical changeover switches and components designed to permit multiple utilization of optical fibers through the use of different wavelengths. In this way several signals of different wavelengths can be transmitted simultaneously over the same optical waveguide.

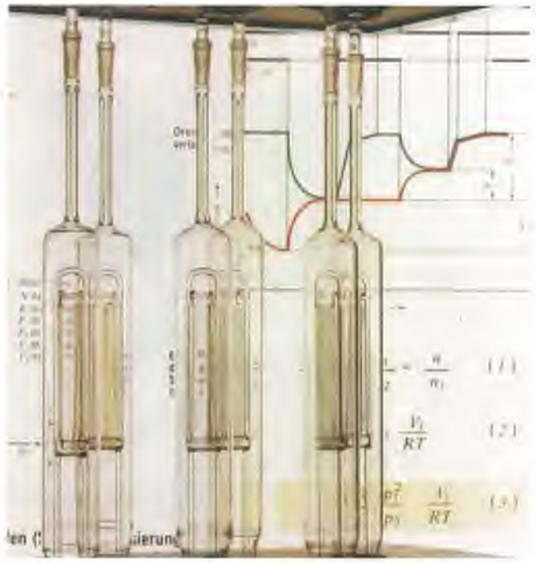
Electrochemical process for extracorporeal plasma regeneration

Test rig of a laboratory cell for the electrochemical elimination of urea.

In patients suffering from kidney disease the urea in the blood builds up to such an extent that it must be removed every two or three days. Treatment by dialysis and hemofiltration, the methods in general use today, is time-consuming and cost-intensive. Matters could be considerably simplified if it were possible to chemically convert the urea in the hemofiltrate into non-toxic substances and reinfuse the filtrate.

Our research and development activities in the field of new physico-chemical methods of therapy include an electrochemical process for transforming the urea in the filtrate. The urea is oxidized by electrochemically produced chlorine to form nitrogen, carbon dioxide, and water. The remaining substances to be eliminated in the urine are absorbed by active charcoal. The quantity of urea formed per day is converted in approximately 3 hours in a laboratory cell of 2 l volume. The concentration in the filtrate sinks from 200 down to less than 10 mg/dl. The most important feature of this process is that urea is oxidized solely into nitrogen, carbon dioxide, and water. First experiments with animals have given no indication of toxic by-products.

Oxidation stabilizing of polymers



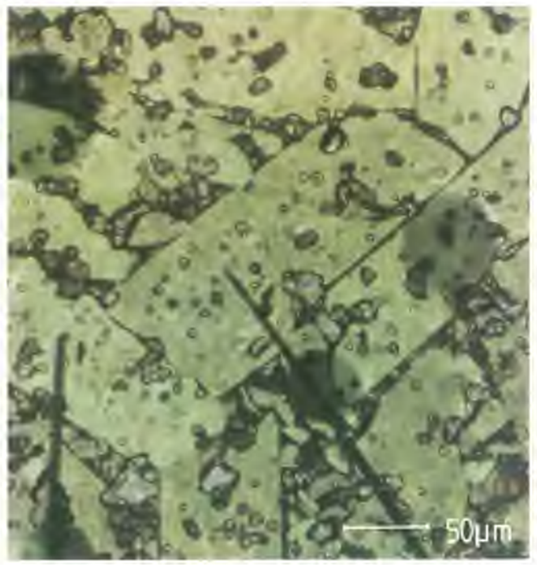
Measuring the oxygen absorption of polyolefines.

Plastics are coming to be used for ever more applications in electrical engineering and electronics, a trend which has led to the implementation of improved and more cost-effective plastics manufacturing methods. This has entailed the development of plastics with special structures and properties, which are specifically adapted to the application in mind, and of highly effective additives which lengthen the useful life of plastics exposed to severe operating conditions.

The oxidation stabilizers for cable and wire insulating materials made of cross-linked polyolefines are just one example. They give long-term protection against oxidation aging due to exposure to atmospheric oxygen.

To assess the stabilizing effect, we measure the oxygen absorption of stabilized polymers at increased temperatures by means of a specially developed microprocessor-controlled unit.

Functional ceramics used in electronics

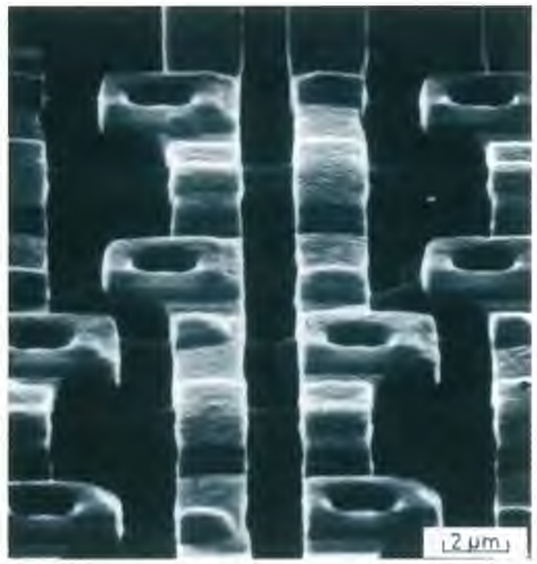


Photomicrograph of a low-voltage ceramic element with tungsten prods for measuring microvaristor voltage.

Within the last few decades, ceramics – the traditional material for sturdy insulators to be used under tough environmental conditions – has been able to penetrate into an ever increasing number of new fields of application. Phenomena like the ferromagnetism of the ferrites or the high relative permittivity as well as the piezoelectric effect of barium titanate opened up first functional applications. More recently, the findings on the granular structure of ceramics have stimulated specific developments of components which are to take over vital functions in an integrated circuit environment.

Ceramic zinc oxide varistors thus protect electronic systems against overvoltages. In this connection ceramics research investigates questions of grain growth and the physics of grain boundaries. The photomicrograph shows large, electrically conductive grains of doped zinc oxide. With the aid of additives, barrier layers develop at the grain boundaries. Measurements of the electrical properties with the help of delicate prods show ignition voltages of 3.5 V for each barrier layer. As the structural pattern is forming in the sintering process, the number of series-connected grain boundaries must be controlled, while simultaneously optimizing the properties of the barrier layers. Based on the findings of our intensive ceramics research and the experience gained from our highly developed ceramics technology, we were able to develop varistors for the desired broad spectrum of applications.

The 1-micron semiconductor process



MOS test circuit with 1-micron structure.

The degree of integration of semiconductor circuits has risen exponentially over the past few years. Larger chip areas, enhanced circuit technologies, and scaled-down structures are the major factors which contributed to this development. Only with a maximum of precision and full mastery of the corresponding manufacturing processes can such hyperfine structures be achieved.

In our research laboratories we have developed a MOS process for structures right down to 1 micron. A reducing photo-optical projection technique produces a degree of accuracy which is normally attained only by way of electron beam techniques. The electrical behavior of circuits with 1-micron structures is largely determined by the transistor parameters becoming geometry-dependent. To understand and master this phenomenon we are taking resort to numeric simulation procedures illustrating the physical processes inside the transistor.

To be able to meet the growing demands on the test methods, our development laboratories in particular are making increasing use of the scanning electron microscope besides the conventional optical and electrical methods. With a special mapping technique the electric-potential distribution can be converted into brightness levels or be measured on the conductor paths contact-free and accurately.

Production

As international business continues to grow, local manufacture is becoming more and more important. Apart from manufacturing facilities in the Federal Republic of Germany, Siemens AG and its consolidated companies manufacture in 27 countries, where they operate 98 plants of their own.

Large companies are caterers to the world. But success in world markets cannot be won by export alone. In many countries, only locally-produced goods are allowed easy entrance into the national market. Siemens is therefore not only one of the world's largest export suppliers, but also a worldwide producer of goods in countless customer countries. This has many advantages:

More intimate knowledge of customer needs and a better chance of filling them; shorter distribution routes; conformance of products with national standards; trading in local currency and reduction of foreign exchange problems; elimination of customs- and import-related difficulties.

Our worldwide activities generate the funds required for research and development, thus enabling us to continue offering our customers high-quality, high-performance products, regardless of where they are manufactured.

By laying the groundwork for production, assisting in the solution of manufacturing problems, and stimulating the exchange of ideas, the development of basic manufacturing technologies contributes significantly to increased productivity and the future viability of Siemens plants everywhere.

Assembly of an 805-MVA hydroelectric generator ▷ at the Berlin Dynamowerk.

Manufacturing plants worldwide

Top left: Our Oostkamp plant in Belgium, established in 1960, has roughly 2,000 employees and covers an area of 56,000 m². The plant manufactures components and equipment for use in telecommunications, ranging from simple connectors to complex telephone systems.

Top right: In Villach, Austria, Siemens opened up one of the most advanced semiconductor manufacturing plants in Europe. The VLSI Center, which has an area of 8,000 m², manufactures dynamic memory devices (16- and 64K-bit) and microprocessors in very large production runs.

Bottom left: Assembling low-voltage switchgear in Lapa, Sao Paulo. At four locations in Brazil – Sao Paulo, Rio de Janeiro, Curitiba, and Porto Alegre – Siemens manufactures a broad spectrum of products, all to international Siemens quality standards. Siemens has more than 11,000 employees in Brazil.

Bottom right: Servicing of Siemens Model 1000 teleprinters at Saudi-Telex in Riyadh.

Development for production

Top left: The manufacturing instructions for each new product are set out in a routing plan, which forms the link between development and production. The plan contains all process steps in the appropriate sequence, the materials and supplies to be used, and the tools, equipment, and machines to be employed. We have developed programs for computer-aided preparation of such routing plans at interactive data terminals.

Development for production pursues a variety of objectives: to pave the way for the manufacture of new products; to keep manufacturing facilities up to date; to improve product quality; to adapt working conditions at our plants more closely to the abilities and needs of employees without loss of efficiency; and to comply with the requirements of environmental protection regarding workstation operation and the disposal of industrial wastes.

We use about 3,000 numerically controlled machines. They shape the shafts of turbines and electric motors, for example, fit wires to equipment, and test electrical assemblies. We develop program systems which provide the control information for these machines. Computers monitor and handle the production process and optimize inventories.

Our contribution to product quality includes the development, testing, and introduction of new technologies and suitable new materials as well as the development of special test methods.

Methods of biotechnology are applied to steadily improve working conditions in our plants.

Top right: We are constantly extending our development work on the design and manufacture of printed circuits. The manufacturing methods and the equipment used, like the automatic electroplating machine shown, assure efficient production runs and high quality.

Bottom right: Lighting factors such as illuminance, color, angle of incidence, and glare are examined in our lighting engineering laboratory in order to adapt visual conditions at workstations to the requirements of the human eye.

Sales and marketing

Our sales organization covers the entire world. We have 300,000 customers in the Federal Republic of Germany and partnership arrangements in 123 other countries. International business accounts for more than half our sales.

Around the world, experienced Siemens specialists are available to our customers for consulting and project planning services, equipment supply and installation, and systems maintenance and service. Specialist engineers prepare detailed project analyses and plans. Backed by the resources and experience of one of the world's leading electrical and electronics companies, they work in close cooperation with the customer to solve his problems and satisfy his requirements.

More than 300,000 customers in the Federal Republic of Germany and Berlin (West) are served by 96 sales and service units – regional offices, technical and engineering offices, Medical Engineering branches – and 88 sales depots.

These units employ some 40,000 people, including 14,000 installers of Siemens equipment and systems, now at work at approximately 5,000 sites, and a maintenance staff of 4,900.

Outside the Federal Republic of Germany, an extensive network of sales and service facilities fills the needs of customers on every continent.

In the 1981/82 fiscal year, our international sales came to DM 22.1 (previous year 19.3) billion.

Individualized customer care

Siemens consulting and project planning services provide detailed analysis of customers' requirements, farsighted project planning with allowance for future expansion, economic appraisal, and an array of alternative proposals – all based on realistic and practical considerations. Our engineers and sales consultants are familiar with the customer's operations and problems. They speak his language and can often supply immediate, on-site solutions.

Siemens systems are assembled from our proven standard equipment and products, or from special parts manufactured in our workshops and factories. Systems and plant are then installed and put into operation by experienced Siemens installers, fitters, technicians, and engineers.

Our commitment does not end with the delivery of products and systems, or the commissioning of installations and plant. We go on to provide a comprehensive program of Siemens after-sales services. High on the list are systems maintenance, spare parts supply, and the training of operating personnel. Dependable, routine servicing of sold or leased equipment and systems is as much a part of our service package as is the reliable, round-the-clock readiness of our skilled staff of troubleshooters.

Consulting and project planning

Discussing and analyzing the problem, proposing solutions

Circuit diagrams, construction plans, engineering drawings, costing, scheduling

Supply and installation

Design, assembly, wiring, testing, commissioning

Maintenance and service

Routine maintenance, technical service, training of customer personnel

Our employees

Siemens employees (September 30, 1982)	
Siemens	324,000
Federal Republic of Germany and Berlin (West)	220,100
Europe without Federal Republic of Germany	51,600
Africa	6,000
North America	11,800
Latin America	17,000
Asia and Australia	15,300

Siemens employs men and women all over the world. The majority, 84%, are in Europe. 9% of Siemens employees are in North and Latin America, 7% in Asia, Africa, and Australia.

At September 30, 1982, Siemens employed a total of 324,000 people throughout the world; of this number, roughly one-third were working abroad. The work force includes scientists, engineers, and technicians, as well as commercial staff, professional workers, skilled and semiskilled labor, trainees, and temporary student labor.

Its size and variety of projects enable the Company to offer its employees job opportunities suited to different talents and capabilities.

The dedication and skill of the Company's employees are the key to product quality and continuing business success.

This is why we attach importance to thorough in-house training, a wide range of continuing education opportunities, and the development of executive talent, as well as preventive medical and other employee benefit programs.

One out of seven employees of Siemens AG is a ▷ trained engineer or scientist. The picture shows engineers of our tool and machinery plant checking leak test figures for automatically assembled dishwasher pumps. As part of the Corporate Technology Division, the plant develops and builds electronically controlled production machinery for our factories.

Training and continuing education

With our factories in Third World countries we promote the exchange of technical know-how and contribute to the local training of skilled workers and management personnel. In our trainee workshop in Jakarta (picture), young Indonesians are trained to become skilled workers.

Junior commercial staff are trained in a one-year program in India.

The current training program of Siemens AG in the Federal Republic of Germany and Berlin (West) covers manufacturing, technical, and commercial training and apprenticeships for 11,700 young people, both Germans and foreigners.

Another 1,200 young people are trained in cooperation with Public Employment Offices and vocational advancement services, or for other companies.

The focus is on manufacturing training, with 9,560 young men and women in 64 trainee workshops learning one of 40 manufacturing trades. 700 full-time instructors and an even greater number of part-time staff are involved, and are in charge of the young persons in the workshops and on the installation sites.

Roughly 1,300 young men and women, 330 of them preparatory school graduates, are enrolled as commercial trainees. The training program for industrial clerks is divided into areas of activities corresponding to the organizational structure: procurement, production, sales and marketing, and accounting. For those who achieve a suitable standard – and this includes non-graduates – this training can be the first step in a career leading to corporate management level.

640 young people are learning a technical trade. In our schools for technical assistants in Munich and Erlangen, young men and women are trained as engineering assistants in data systems and telecommunications and as electrical assistants.

About 1,700 young people are currently being prepared for a manufacturing and about 300 for a commercial career at Siemens companies outside Germany.

The type of training varies from country to country, depending on local conditions and requirements.

In view of the rapid advances in the field of electrical engineering, particularly in electronics, and the need to open up new markets, it is important to supplement employees' basic vocational training with continuing education, a large part of which involves on-the-job instruction. Product schools attached to the operating Groups provide the latest information about products and technologies. A wide range of seminars and courses are also available, covering technical, operational, and general subjects.

Every year, some 67,000 employees participate in around 7,000 continuing education programs of Siemens AG.

The aim of our continuing education programs is to assist employees in their vocational and personal development, while at the same time safeguarding the Company's efficiency and competitiveness in the future.

Development of executive talent

For years, our subsidiary in South Africa has pursued an intensive program of training and development for its young people in commercial careers.

A core aim of our personnel policy is the professional development of young executive talent. Since demanding technical and management tasks are generally assigned to people already in the Company, possibilities for promotion are always open to qualified junior staff. The practical experience and breadth of knowledge required are provided by job rotation and a systematic program of continuing education.

The practice of promoting from within calls for long-term planning. We therefore consider it essential to keep junior staff posted on career opportunities within the Company. Career goals and the future course of professional development can then be set jointly by superiors and junior staff in regularly-held assessment and promotion talks.

Health Retirement benefits

Since Siemens is a corporate member of the tennis club in Chofu, Japan, its employees can use the facilities free.

Siemens' medical service centers, preventive health care and fitness programs offered by the Company at its health resorts, the balanced diet provided by the meals served in Siemens cafeterias, the availability of economy vacation facilities, and the encouragement of sports activities – all form part of a program of preventive medicine for our employees.

By constantly striving to increase on-the-job safety, we have been able to reduce the number of work accidents to a level well below the average for the industry.

In many of our companies we offer retired employees a Siemens pension as a supplement to the payments received under the statutory German national pension plan.

Siemens companies

Siemens companies are those domestic and foreign companies in whose capital Siemens AG holds a direct or indirect interest of more than 50% and which are included in the consolidated financial statements.

After approximately seven years of construction, the Grafenrheinfeld nuclear power plant with a 1,300-MW pressurized-water reactor was handed over by KWU to Bayernwerk AG in the middle of 1982. This plant, which is designed to provide roughly 8 x 10^9 kwh. per year in electricity, was the first nuclear power plant to be commissioned in the Federal Republic of Germany after a moratorium of more than two years. From the start, the Grafenrheinfeld plant has been working with remarkable reliability: the availability attained over the first six months of operation was 99.7%.

KWU and the Japanese Mitsubishi Works have each installed six gas turbosets in the world's largest gas turbine power plant, Ras Abu Fontas in Doha, the capital of Qatar on the Persian Gulf. The waste heat from the turbines is used for seawater desalination. The plant has an electric rating of 630 MW and can produce 180,000 m^3 of drinking water a day, which corresponds to 80% of Qatar's drinking water demand.

Kraftwerk Union AG

Kraftwerk Union AG (KWU) has focused its versatility and development potential on the requirements of the world energy market and occupies a leading position in international power plant construction.

The activities of KWU and its subsidiaries include project planning and construction of fossil-fired power plants, nuclear power plants, and nuclear steam generating systems; development and manufacture of steam turbines, gas turbines, and turbine generators; design and manufacture of fuel elements and nuclear fuel management. In addition, KWU's activities cover the investigation of new energy strategies and participation in future-oriented projects, such as coal gasification plants and solar power stations.

KWU employs a total of 14,400 employees.

KWU is linked to numerous foreign companies by cooperation, licensing, and technology transfer agreements.

Ten branches in the Federal Republic of Germany and Berlin (West) as well as some 70 offices all over the world look after KWU's customers.

KWU' major subsidiaries include:
INTERATOM Internationale Atomreaktorbau GmbH,
Reaktor-Brennelement Union GmbH,
Alkem GmbH,
GHT Gesellschaft für Hochtemperaturreaktor-Technik mbH,
Internationale Natrium-Brutreaktor-Bau-GmbH (INB),
Utility Power Corporation, U.S.A.

The GEAFOL® cast-resin transformer is one of the milestones in latter-day transformer engineering. Its technology, which is extremely flexible and kind to the environment, permits highly economical network concepts to be established.

GEAFOL® cast-resin transformers are designed for ratings of up to 15 MVA and voltages of up to 36 kV. Over 15,000 units are in operation worldwide in town and country planning, in industry, and in the transportation sector.

OSRAM's largest and most modern manufacturing plant for discharge lamps is located in Berlin. The new energy-saving fluorescent lamps with 26-mm tube diameter are also manufactured here, washing and coating being an important part of the process (picture).

Transformatoren Union AG

Transformatoren Union AG (TU) is one of the world's leading manufacturers of power distribution transformers and inductors, ranging in capacity to the highest ratings and transmission voltages. Special transformers for industry and transportation and stepping switches for transformers round off the program.

In fiscal 1981/82, the company had 4,100 employees worldwide and reported sales of DM 541 million, more than 50% of which was accounted for by export markets.

TU holds major investments in Brazil, Portugal, and Iran.

License business is a further illustration of the company's importance and the high technical reputation of its products. Transformer manufacturers in more than 20 countries are currently manufacturing under TU licenses. Another field of activity is planning the construction of entire transformer plants.

OSRAM GmbH

OSRAM is one of the world's leading lamp manufacturers. Its product line covers lamps and light fixtures for all kinds of applications.

In terms of sales, OSRAM is the world's fourth largest company in this special electrical engineering sector, ranking second in Europe, and leading the lighting market in the Federal Republic of Germany. In 1981/82 OSRAM GmbH recorded sales of DM 919 million.

The foreign share of OSRAM's business increased to 64%. Of its 28 production sites, 18 are outside Germany. 100 companies and agencies in 90 countries are responsible for marketing the company's product spectrum which lists some 3,500 different lamp types. Since the end of 1978 OSRAM also has a subsidiary in the U.S.A.

Research and development is primarily concerned with more energy-efficient light sources and better process technologies for lamp manufacture.

As of September 30, 1982 OSRAM GmbH had 7,200 employees, 3,000 of them working in Berlin.

Using the new Chromacom electronic full-page composition system developed by Hell, the compositor can lay out complete pages for four-color process work. This new methods of preparing a full page ready for printing uses digitized images stored in a computer. Tasks such as page mounting and retouching are automatically handled by the computer, once the parameters required for page layout have been input by the operator.

Regular checks were carried out during the construction of an 11.4 m³ electromagnetically shielded chamber, which was developed and designed by Vacuumschmelze GmbH for the Berlin Institute of the Physikalisch-Technische Bundesanstalt (PTB). The chamber, which required 10 tonnes of MUMETALL strips arranged in 6 layers for shielding, permits biomagnetic examinations of the human body to be carried out, which are only possible if the surrounding magnetic disturbance is greatly reduced. A minimum shielding factor of 1,000 is required.

Dr.-Ing. Rudolf Hell GmbH

The inventions of Dr.-Ing. Rudolf Hell GmbH, Kiel, have triggered sweeping changes for the entire graphics industry. With the aid of Hell devices, whole industry branches have switched to new working methods. Today, 50 years after the company's foundation, products such as Chromagraph scanners, Chromacom systems, Helio-Klischograph equipment, Digiset photocomposition systems, and facsimile receivers and transmitters – to name only a few examples – have become concepts with an established market value in the fields of electronic reproduction, photocomposition, and information technology. What is particularly fascinating about the manifold devices from Hell is the fact that they all rely on a single technical principle: that of resolving images or characters into dots and processing them electronically. This simple fundamental idea gave birth to various new technologies which were developed into complete systems with the help of modern computer techniques.
In fiscal 1981/82, the company employed 2,200 people at its five manufacturing plants in Kiel. Sales were up 12.4% from the year before, reaching DM 444.5 million. Almost 75% of sales went to foreign countries. Besides western Europe, the U.S.A. is still the company's most important export market.

Vacuumschmelze GmbH

Vacuumschmelze GmbH manufactures metallic materials with special physical and magnetic properties which are mainly used in electrical engineering and modern electronics. The company's product line includes semifinished products, parts, inductive components, and subsystems, e.g. magnet systems. A high value is attached to research and development, 10% of the total number of employees being engaged in this sector. The company's development engineers are concerned with various future-oriented fields of activity, ranging from amorphous metals to special superconductor designs. Some of this work is receiving the support of the German Federal Ministry for Research and Development. Customers come from all branches of electrical engineering and electronics, the chemical process equipment industry, medical engineering, precision engineering, and the clock making industry. Problem-solving experience and close cooperation with the user safeguard the company's future development.
Approximately 2,100 people are employed in the plants in Hanau and Berlin. Sales in fiscal 1981/82 amounted to DM 211 million.

Other major Siemens subsidiaries are:
Siemens Finanzierungsgesellschaft für Informationstechnik mbH, Computer Gesellschaft Konstanz mbH, Heimann GmbH, KKW Kulmbacher Klimagerāte-Werk GmbH

Major associated companies

In its domestic and foreign associated companies, Siemens AG holds a direct or indirect interest of 50% or less. These companies are not consolidated.

BSHG is one of the leading companies in the electrical consumer goods industry in Europe. Its program includes refrigeration equipment, washing machines, laundry equipment, dishwashers, heating equipment, kitchens and small appliances, television sets, video recorders, hifi stereophonic equipment, and portable sets.

Sir Georg Solti, director of the Chicago Symphony Orchestra and conductor with the highest number of awards, shown here during a recording for Decca. Since 1980 most of Decca's music business, with a repertoire covering major classical works up to the present day, is handled by Polygram.

Bosch-Siemens Hausgeräte GmbH

The products of Bosch-Siemens Hausgeräte GmbH (BSHG) are marketed by Robert Bosch Hausgeräte GmbH under the BOSCH label, by Siemens-Electrogeräte GmbH under the SIEMENS label, by Constructa GmbH under the CONSTRUCTA label, and by Neff GmbH under the NEFF label.

BSHG acquired the assets of Neff-Werke GmbH and Neff-Hausgerate GmbH, as well as the related NEFF trademarks. On November 15, 1982 NEFF sales activities were taken over by the newly formed Neff GmbH, a BSHG subsidiary. In December 1982, manufacturing operations of NEFF home appliances were resumed with about 1,000 employees.

BSHG has manufacturing facilities in Berlin, Dillingen, Giengen, and Traunreut. The production site of Neff GmbH is located in Bretten.

BSHG is a joint subsidiary of Robert Bosch GmbH and Siemens AG, each holding 50% of the capital stock of DM 180 million.

At the end of 1982, BSHG including Neff GmbH employed a total of 13,800 people. Sales surpassed the previous year's figures, with a pronounced rise in export business. A profit was reported for fiscal 1982.

Polygram

Siemens and Philips each hold a 50% interest in Polygram, which operates worldwide and has its offices in Hamburg and Baarn.

The company's activities are focused on music operations, consisting primarily of the repertoires of Polydor International, Phonogram International, and Decca International. Sound recordings are made in own production facilities in 18 countries. In 30 countries, subsidiaries sell these products under traditional labels such as "Deutsche Grammophon," "Archiv Produktion," "Polydor," "Philips," and "Mercury." In the international music publishing business, Polygram is again one of the leading companies on the market with its publishing groups of Chappell and Intersong.

In addition, the company's business activities in the movie and TV-film sector and with home video programs are particularly noteworthy.

In 1981, Polygram had 12,400 employees and achieved sales of DM 2.6 billion.

Other major associated companies are:
Bergmann-Electricitäts-Werke AG,
Sigri Elektrographit GmbH

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Siemens Museum
The Siemens Museum traces the path of electrical engineering from its early pioneering days to the latest achievements of modern technology.

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