Schlumberger

1979 Annual Report

Schlumberger
Limited

In Brief

	1979	1978	1977
Revenue	$3,641,438,000	$2,683,942,000	$2,205,710,000
Net Income	$ 658,396,000	$ 501,973,000	$ 401,492,000
Net Income Per Share	$5.18	$3.94	$3.12
Dividends Declared Per Share	$1.10	$0.83	$0.63

To the Shareholders

The closing year of the seventies was a record year. Net income of $658 million was up 31%. The last quarter of the year was very strong: net income was up 42%. The figures do not call for comments, they tell a simple story. All business segments of Schlumberger had record earnings built on higher sales. Oilfield activity continued the same pattern of expansion in all parts of the world, in all services. After a slow start, the United States was very strong in the second half of the year. All the other units of Schlumberger pulled their own weight: Sangamo Weston and Fairchild in North America, Measurement & Control in Europe had excellent results.

In this past decade, revenue grew by a factor of 6 and net income per share by a factor of 12. Success is the child of luck and hard work. We had both.

Two factors had a major impact on our development. The price of crude oil increased tenfold, from $2.80 a barrel to roughly $28 while the price of a semiconductor memory tumbled 25 times, from 1 cent to 0.04 cents. The oil price increase changed dramatically the energy situation of the world, spurring the search for hydrocarbons to an intensity heretofore unknown and stimulating the quest for new energy sources. Maybe more important are the ultimate consequences of this new age of artificial intelligence, as the scientists call it. Coal and oil brought about the industrial revolution because they provided abundant and cheap physical power. Microprocessors and memory will bring about a new revolution because they will provide abundant and cheap intellectual power.

What does this mean for the decade ahead of us, for the eighties?

The first consequence is under way. We are at the dawn of a new era in the search for oil. New era by its geographical spread, new era by the enormous amounts invested, new

era by the technical developments which are bound to follow the intensity and magnitude of this effort. Thirty years in the oil industry have taught me a simple conviction. If you want to find oil, you have to look for it; if you look, you find oil. The world has now understood that it cannot live forever on Middle East oil, the search has started and the finds are coming in.

The economic value of new energy sources will belong to the twenty-first century. Meanwhile the additional energy required will have to come from electricity. And yet it does not make sense to make electricity with oil. Coal and nuclear energy must be the answer.

As to the artificial intelligence, we have hardly begun to understand what this abundant and cheap intellectual power will do to our lives. It has already started to change physically the research laboratories and the manufacturing plants. It is difficult for the mind to grasp the ultimate consequences for man and society.

What does this mean for the future of Schlumberger?

We are in the right business; luck or not, we are. I cannot imagine for the eighties fields of activity with greater growth potential than the ones we are in: the technical services for the exploration and production of hydrocarbons, the technical products tied to the distribution of electrical power, the advanced products of the semiconductor industry.

We have our hands full. If we are to be ready to face the growth ahead, if we are to have the number and the quality of field service engineers, if we are to remain creative in research and engineering, if we are to invent the products of the future, if we are to regain in the semiconductor industry a position of innovation and leadership, our hands are full. We will need all our resources, human and financial.

We have to be prudent. The potential for growth is so obvious that one could forget that growth is never a straight line into the future but a pattern of cycles. This has been true in the past and will be true whether it is for offshore semisubmersibles at fifty million dollars a unit or for electronic chips at fifty cents apiece.

We have to be adaptable. Adaptable to the world of tomorrow, to the politics of tomorrow, to the youth of tomorrow, to the technical changes of tomorrow. We cannot become an establishment.

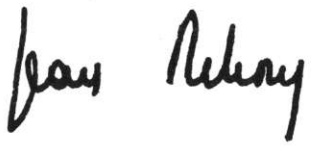
We have to work harder. Success can breed complacency and this is the end of success.

To prepare this future, we have in 1979 invested as fast as we could.

- Expenditures for fixed asset additions were $503 million compared to $393 million in 1978. Oilfield services investments were $405 million. The plan to equip the field with the new cyber service unit is on schedule; in 1979, a total of 235 new CSU logging units was put in service. In addition, $11 million were invested in computing facilities for the wireline. For Fairchild alone, in the six-month period since acquisition we invested $45 million.
- Research & Engineering expenses were increased in all units. Oilfield service R&E alone was increased 29% to $64 million. A major expansion of the wireline central research laboratory in Ridgefield, Connecticut has just been completed.
- We have recruited 1,017 oilfield graduate engineers in 1979, from 51 nationalities. In addition, for laboratories and plants we recruited 891 engineers.

On February 21, 1980 the Board of Directors declared a quarterly dividend of 33 cents per share on outstanding common stock. This increases the annual rate from $1.10 to $1.32 per share.

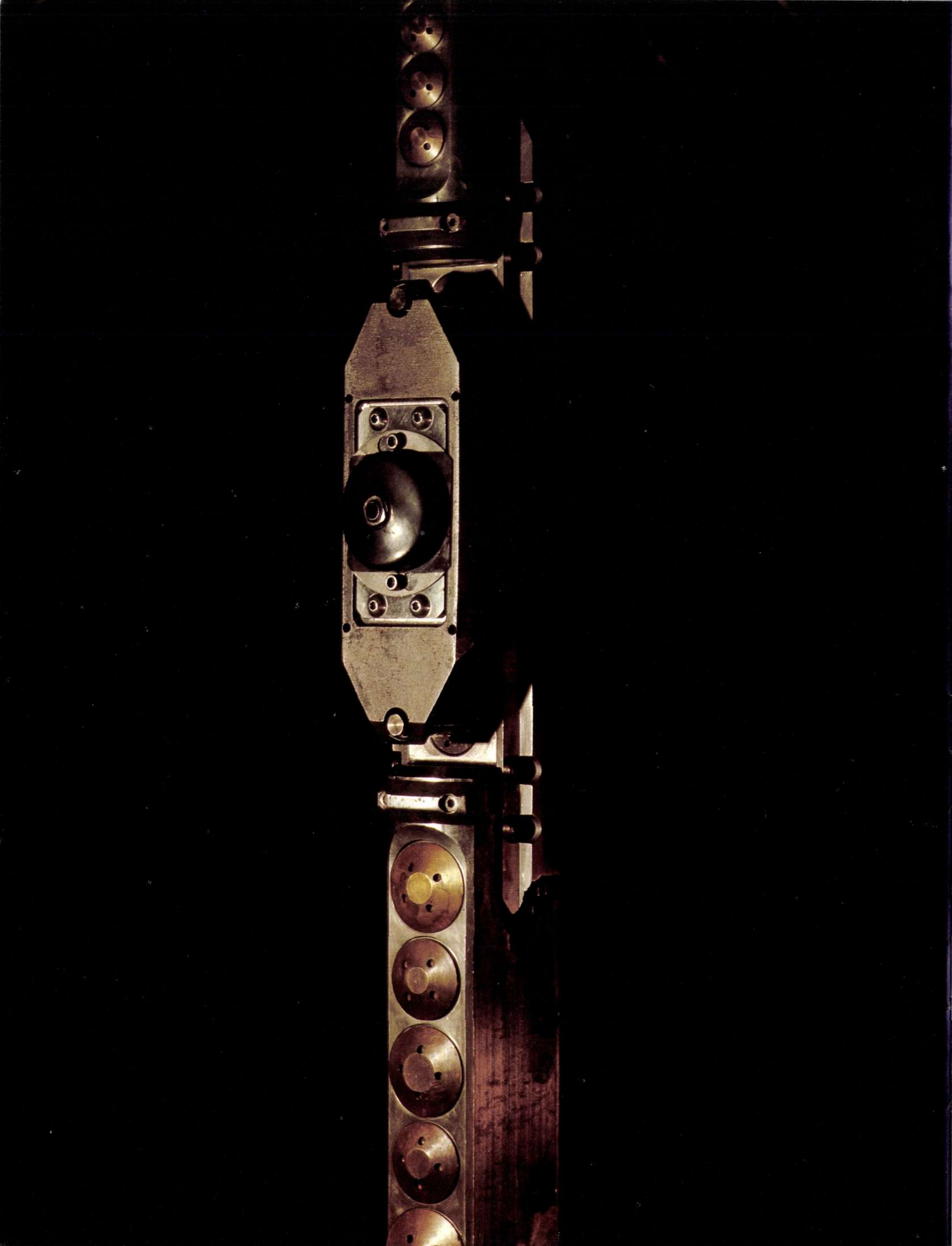
February 25, 1980



Jean Riboud
Chairman and President

Oilfield Services

Revenue: $2,037 million +25%



Wireline Services

BUSINESS REVIEW

Wireline revenue worldwide was 24% higher in 1979 than in the previous year.

In North America, wireline revenue increased 22%. After a slow start, drilling activity in the United States reached record levels during the second half of 1979, as the industry reacted to the incentives provided by the new Gas Policy and by the recent phased decontrol of U.S. oil prices. At year end, the number of active drilling rigs in the U.S. had reached 2600, the highest in 23 years. The overthrust belt in the Rocky Mountains and the deep Tuscaloosa trend in Louisiana were areas of intense activity in 1979. In Canada, drilling rigs were up 25%, the fourth consecutive record year. Offshore Labrador was also very active.

In the Eastern Hemisphere and South America, wireline revenue was up 26%. The largest gains occurred in South America and the Far East. Wireline services for PEMEX, the Mexican National Oil Company, have grown steadily during the year. Today, 12 units are operating offshore. Africa showed good results as operations in Libya were particularly strong. While revenue from Saudi Arabia and the United Arab Emirates showed above average growth, activity in Iran was very low and sporadic.

Contract negotiations continue for providing wireline services to the People's Republic of China.

The $7 million expansion program at the Schlumberger Doll Research Center in Ridgefield, Connecticut was completed and the research staff was increased by 15% during 1979. The Ridgefield center conducts basic research on wireline technology related to measuring the physical properties of underground formations.

TECHNIQUE

Wireline Services

Wireline Services provide the oil and gas industry with information essential to discover and produce oil and gas economically. The physical properties of underground formations are measured by instruments lowered into a borehole by an armored electrical cable called a "wireline". Measurements are transmitted to the surface where they are recorded on magnetic tape and on a graph called a "log". Interpretation of these logs determines the location and producible quantity of oil and gas.

LEFT The Repeat Formation Tester, a Wireline downhole tool for taking samples of formation fluids and measuring formation pressure.

CSU Report

The Schlumberger Cyber Service Unit (CSU) is a computerized field laboratory for acquiring data from oil and gas wells during wireline logging operations. The CSU was first introduced into the field three years ago to replace the standard analog field units. The CSU provides expanded capabilities and paves the way for future improvements in logging services.

Client acceptance continues to be strong as a result of the many improvements offered by the CSU system. Multiple measurements in a single run and faster logging speeds contribute to significant savings in rig time. Wellsite computer analysis provides better data and timely answers for wellsite decisions.

At the end of 1979, 400 CSUs were in service worldwide. This more than doubles the number of CSUs that were in field service one year ago. Rapid conversion to CSU will continue throughout 1980.

CSU wellsite computation products are becoming increasingly important in helping clients make immediate decisions on drilling and completion:

–Cyberlook is the basic wellsite analysis that provides a determination of the presence of hydrocarbons.

–Cyberdip, introduced in 1979, affords a means of defining reservoir structural conditions at the wellsite.

–CSU converts recorded data to true vertical depth, an important benefit offshore where many deviated wells are drilled from production platforms.

Cased-hole logging services utilized Cyber Service Units for the first time during 1979. The CSU offers detailed wellsite computer analysis:

–The Cyberscan, using data from the through-casing Thermal Decay-Time log (TDT) provides the production engineer with information on hydrocarbon type, content and depth.

–The Cyberbond, analyzing data from the cement bond log, provides a simple evaluation of how effectively the cement has isolated the strata around the well bore.

The new Cable Communications System (CCS), a downhole digital telemetry system, designed to run with the CSU, allows complex tool combinations to be run simultaneously. One such combination–the Litho-Density, Compensated Neutron, Natural Gamma Ray Spectroscopy, Electromagnetic Propagation, Caliper (LDT/CNT/NGT/EPT/Caliper) is currently in field test.

New Downhole Tools

Several new wireline tools were successfully field tested during 1979:

–The Gamma Spectroscopy Tool (GST) records the radioactive emissions induced when formations are bombarded by high energy neutrons emitted from an electronic source. These emissions are analyzed to provide information on the hydrocarbon and mineral content of the formation. Tests have been run on wells in Saudi Arabia with good results.

–Electromagnetic Thickness Tool (ETT-C) determines average casing wall thickness through electromagnetic induction. The new system automatically compensates for permeability changes in the steel casing.

–Thermal Decay-Time Log is a nuclear logging tool that detects and identifies the type of hydrocarbons behind the casing of producing wells. The TDT-M is a new generation TDT that provides improved measurements through casing for monitoring hydrocarbon saturation.

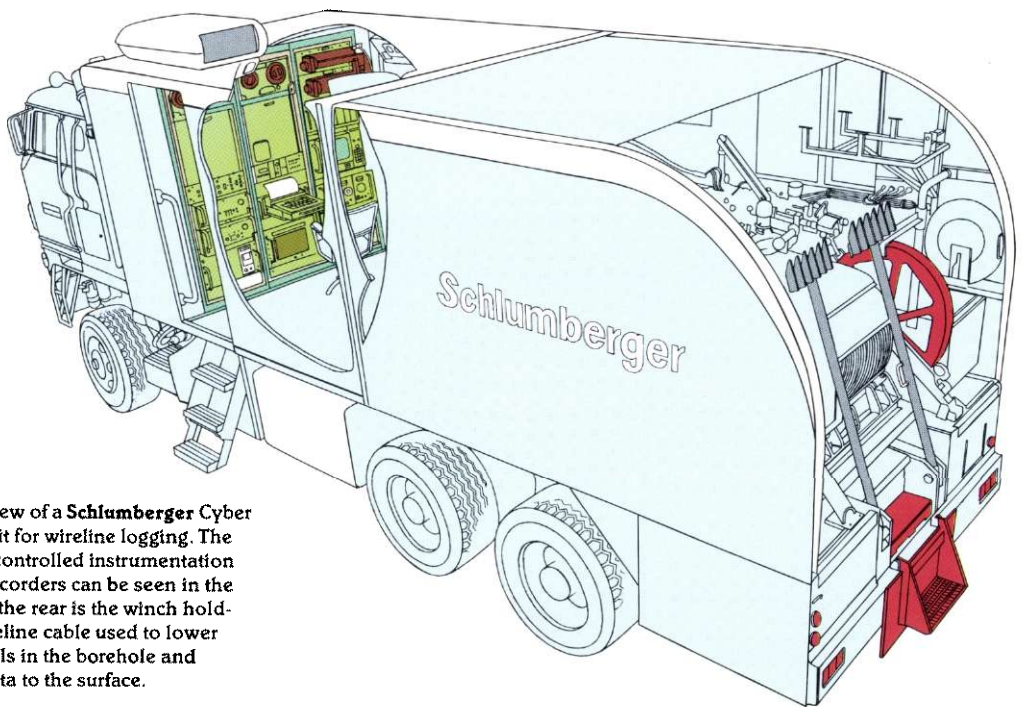
Several tools have moved from field testing to commercial production:

–Long Spacing Sonic (LSS) employs advanced acoustic transmitters and detectors to record sonic waves traveling over longer distances than with conventional tools. Long spacing provides a better transit time measurement in large holes and altered shales. Seismic interpretations are enhanced by the more accurate measurements provided by the LSS.

–Electromagnetic Propagation Tool (EPT) measures the propagation time and attenuation of an electromagnetic wave traveling through the formation at microwave frequency. Applications for the tool include hydrocarbon detection, regardless of water salinity, and lithology determination.

–Litho-Density Tool (LDT) is now replacing the standard density tool. Its advanced electronics and detection system produces a more accurate measurement of bulk density as well as a new measurement of lithology. The new indicator is useful in areas of complex lithology, while the increased density resolution is very important in low porosity formations.

–Natural Gamma Tool (NGT) analyzes the spectra of natural gamma ray emissions. The identification of the three sources of gamma rays emitted from the earth, Thorium 232, Uranium 238 and Potassium 40, gives a more accurate shale evaluation in areas of complex interpretations. The tool also helps solve difficult correlation problems and aids in lithology determination.



Cutaway view of a Schlumberger Cyber Service Unit for wireline logging. The computer-controlled instrumentation and data recorders can be seen in the interior. At the rear is the winch holding the wireline cable used to lower logging tools in the borehole and transmit data to the surface.

–Production Logging Tool (PLT) allows simultaneous recording of pressure, temperature, flow, casing diameter and pressure gradients in flowing wells.

Wireline Manufacturing

Even with the decline in U.S. drilling activity during the first half of 1979, overall requirements for wireline field technical equipment increased 29% in 1979 compared to the previous year. Much of the increase was handled through extensive "farmouts" to other Schlumberger companies, a program that was started in 1978.

Expansion in both wireline manufacturing facilities in Clamart, France and Houston, Texas was completed in 1979. Houston manufacturing was expanded by 400,000 square feet (37,000 m^2). In Clamart, efficiency was improved through the installation of automatic testing equipment. Also, the testing of new tools was aided by a new 2,400 feet (732 meters) deep test well, and a new pressure vessel capable of pressures up to 36,000 psi (2531 kg/cm^2) and temperatures up to 650°F (343°C).

In Sugar Land, Texas, construction began on a new perforating center that is scheduled for completion by late 1980. The center will develop and manufacture shaped charge explosives used in all phases of casing perforation. Schlumberger currently designs its own shaped charges, but does not manufacture them. The new plant will assure a reliable supply of shaped charges and will improve manufacturing quality through state-of-the-art techniques.

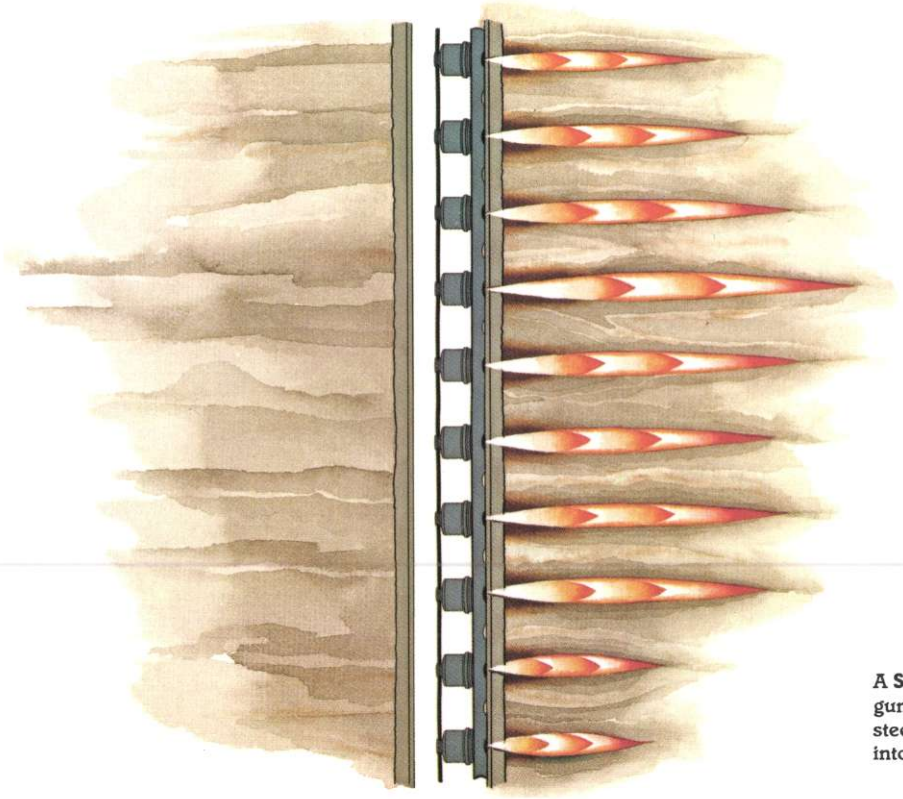
Vector

Vector, headquartered in Sugar Land, Texas, manufactures cables and connector assemblies for wireline logging and for other specialized applications.

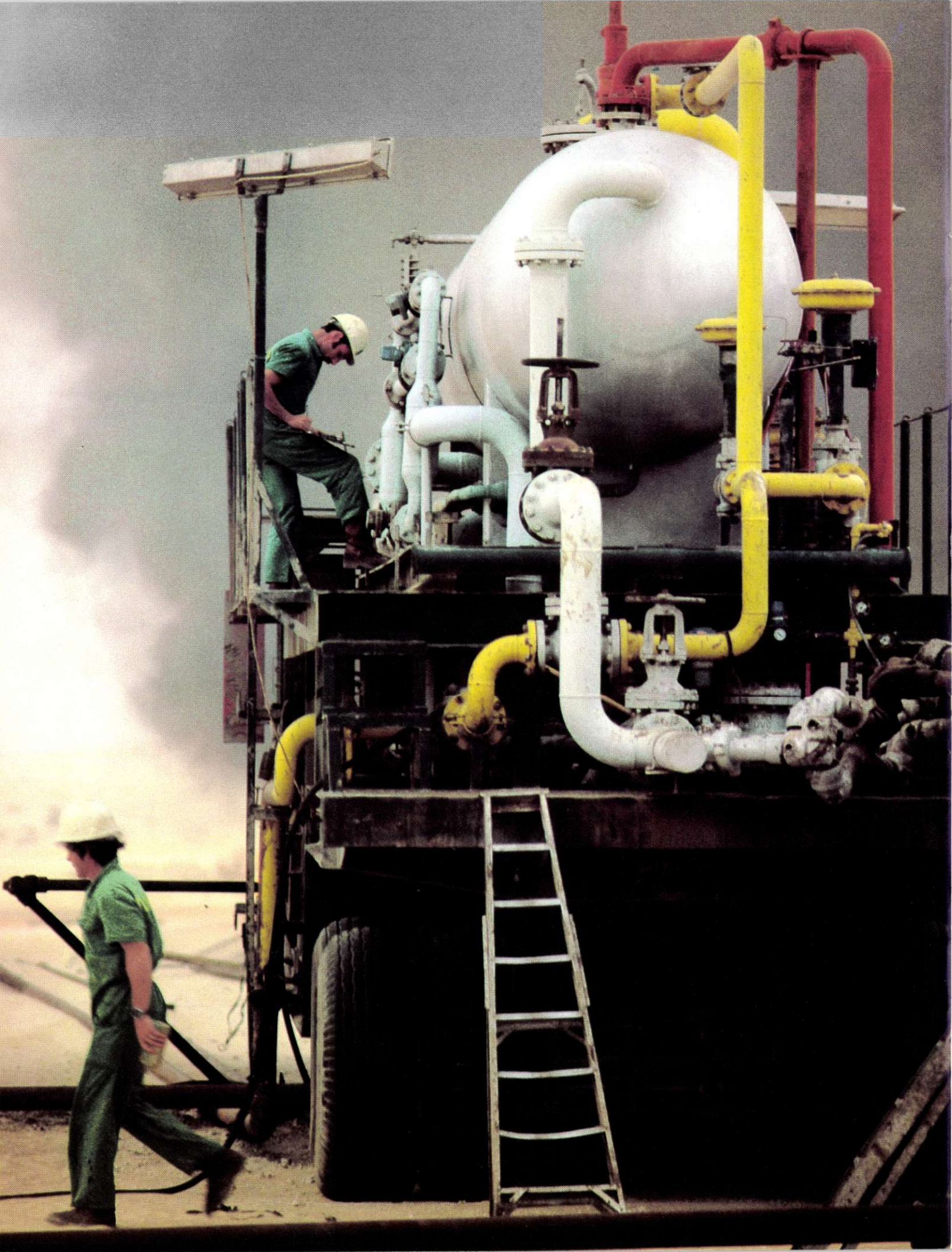
Production of wireline logging cables is Vector's primary activity. To keep pace with rapidly growing demand, Vector installed in 1978 a high-speed cable armoring machine. In 1979, Vector added a high-speed cabling machine and a high-speed prestressing machine to further increase capacity.

The cabling machine prepares insulated conductors for armoring. The prestresser removes all but 10% of the stretch from logging cables.

In addition to manufacturing well-logging cables, Vector makes other specialized cables for geophysical and oceanographic applications such as cables for subsea blowout preventer controls, subsea well completions, diving, remotely controlled vehicles and cable systems for geophysical exploration.



A Schlumberger Enerjet® perforating gun fires explosive charges through the steel casing permitting oil or gas to flow into the well bore and to the surface.



Drilling & Production Services

Drilling & Production Services revenue increased 25% in 1979. Revenue of all operating groups improved, as oilfield activity increased in every area:

–Forex Neptune revenue was 22% over 1978, as both land and offshore rig utilization remained at high levels.

–Flopetrol revenue rose 29%, as Africa and South America showed particular strength. Again, workover services and production testing operations made significant contributions to revenue increases.

–Dowell Schlumberger (50% owned) reported a 25% revenue increase, as operations continued to gain in all regions except the Middle East which was adversely affected by Iran.

–The combined revenue of U.S. based units (Johnston, Macco and The Analysts) improved by 26% over 1978, as U.S. oilfield operations regained significant momentum in the second half of the year.

OPERATIONS

Forex Neptune
The Forex Neptune group of companies provides contract drilling in the Eastern Hemisphere and South America.

Revenue increased 22% over 1978. Development and exploration drilling increased, both on land and offshore worldwide, except in the Middle East. At year end, 46 land rigs and 12 offshore rigs were in operation. Highlights of the Schlumberger drilling group in 1979 were:

–Offshore, rig utilization was around 90% for most of the year; the market for semisubmersible rigs recovered with an accompanying increase in daily rates; demand for jack-up rigs continued to be high. The drilling group has ordered four new jack-up rigs for offshore drilling. Two will go into operation in Nigeria in 1980 and the others in the Middle East and Cameroun in 1981. An offshore workover tender also is being built. A new jack-up, Trident 3, started drilling in 1979 in the Arabian Gulf.

–Land rig utilization averaged 91% during the year. Three new land rigs went into service in Niger, Tunisia and Indonesia.

Flopetrol
The Flopetrol group of companies offers reservoir evaluation and production services such as well testing and pressure measurement; production management; workover services mostly by means of snubbing.

Revenue increased 29% over 1978 as activity was substantially higher in Algeria, West Africa and Norway, and grew steadily in Brazil, Argentina and in the Mediterranean area. This performance was partly offset by a substantial reduction of activity in Iran.

To keep pace with expanded operations, new service centers were opened in Venezuela, Germany and the Ivory Coast. In addition, the main plant in Melun, France, where Flopetrol equipment is assembled and tested, was expanded by 50%.

Oil and gas well testing, the principal activity, grew in line with drilling. Currently the company is introducing an integrated well testing service, which provides continuous monitoring and interpretation of data during a production test.

Slickline services expanded substantially. These services use a small-diameter nonconducting

LEFT A Flopetrol team running a production test on well Aindar 104 in Saudi Arabia.

wire or "slickline" to perform light maintenance operations in producing wells and to record downhole production data.

Snubbing services continued to expand. Two new snubbing units were introduced in Algeria and West Africa. Snubbing is a hydraulic technique for working against pressure in a producing well to perform major repairs or workover services.

Johnston

Johnston provides drill stem testing, well testing and packer services in the U.S. and Canada; in addition, the company markets specialized drilling tools.

Johnston revenue was 26% higher than in 1978. Offshore production testing activity and computer-based testing services, such as Teleflow and Surface Pressure Readout, were responsible for the increase.

In the last quarter, Johnston introduced the Surface Pressure Readout (SPRO) system which gives real-time downhole pressure measurements during drill stem tests. SPRO uses a downhole electronic pressure transducer which transmits data through an electrical cable to a wellsite computer at the surface. Pressure information is recorded and analyzed while the flow test is in progress.

Production testing services together with associated burners and subsea test trees had a good gain over 1978. Drill stem testing revenue also reached a new record.

A shipment of oilfield test equipment to the People's Republic of China helped boost equipment sales substantially above the level of 1978. Revenue from fishing and drilling tools increased notably in 1979; drilling jars and shock absorbers led the gain.

Operations were significantly expanded in 1979 in offshore and frontier areas of North America.

The Analysts

The Analysts group of companies offers wellsite computer analysis of both surface and downhole drilling parameters to improve drilling safety and efficiency.

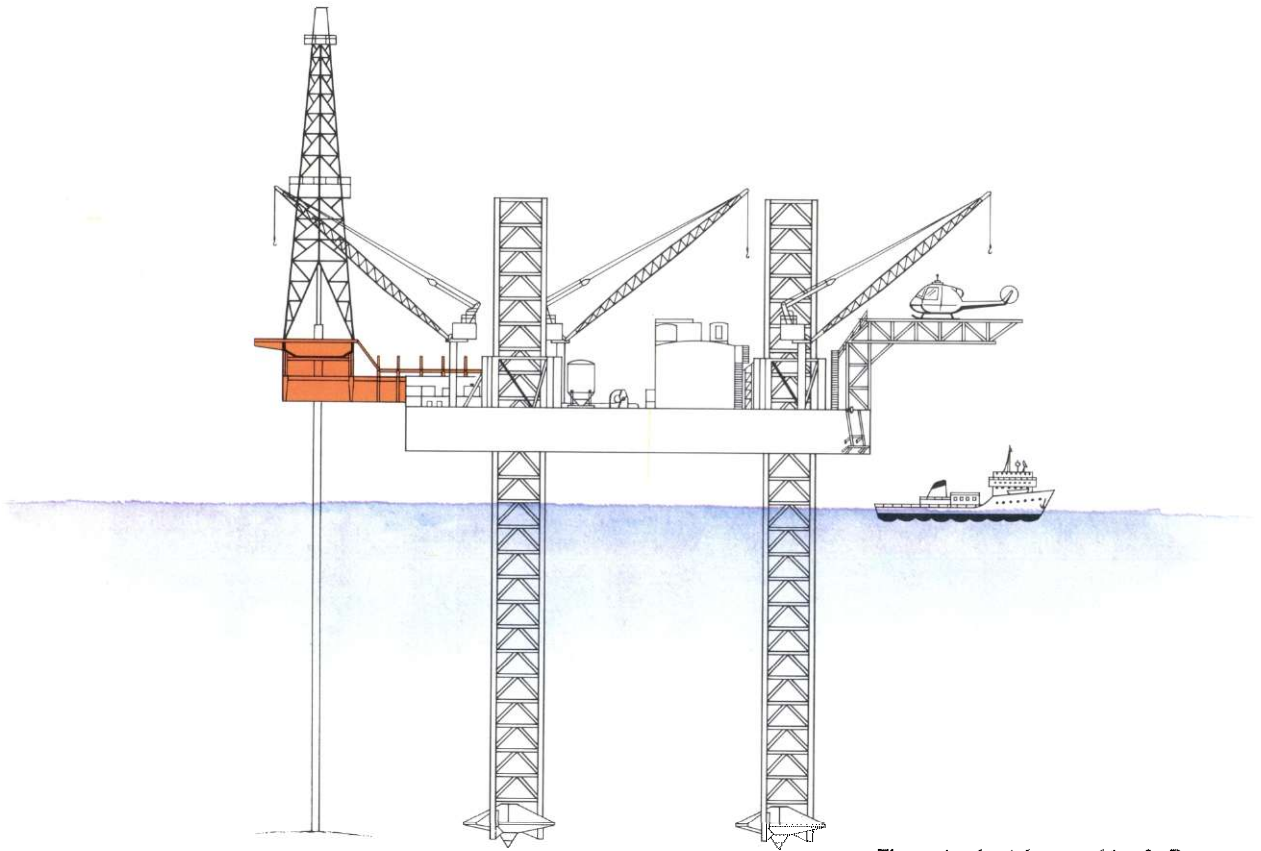
Activity showed an overall increase of 11% over the previous year and strengthened in the second half of the year.

Field testing and evaluation of Measurement While Drilling (MWD) continued in 1979. MWD is a downhole measurement system which is designed to collect drilling and rock data and transmit them continuously to the surface, while drilling is in progress. These data provide directional information and aid safety and efficiency of drilling operations. Following successful tests, commercial operations will start in the first quarter of 1980.

Macco

Macco designs, manufactures and markets gas lift and safety valves; Macco provides mechanical slickline, hydraulic workover, and other services to the oil industry.

Revenue was up 44% over 1978, as both product sales and services



The entire derrick assembly of a **Forex Neptune** cantilever jack-up can be moved as a unit and positioned over an offshore well head for drilling or workover.

contributed equally to the growth.

Macco obtained a certificate of authorization for the manufacture of safety valves and other oil well equipment to meet U.S. Government regulations for offshore applications.

Fabrication facilities were set up in Sugar Land, Texas to produce slickline and hydraulic workover service units.

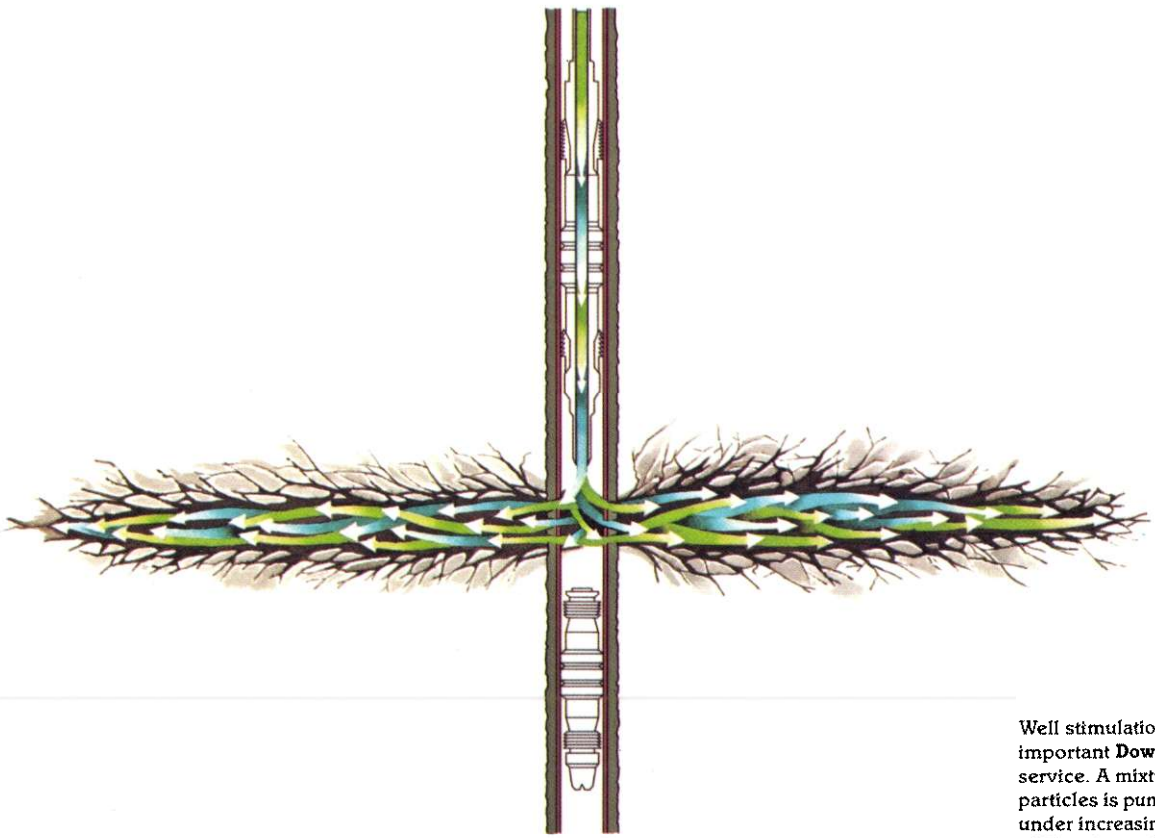
During 1979, Macco contracted for the construction of a jack-up barge for hydraulic workover and testing operations on offshore wells. This unit will go into service early in 1980.

Dowell Schlumberger (50% owned)
Dowell Schlumberger offers cementing, stimulation, drill stem testing, directional drilling and fishing services to the oil industry.

Revenue was up 25% over last year, despite an almost total shutdown in Iran. Activity was higher in all regions except the Middle East. Latin America was particularly strong as a result of more extensive exploration in most countries and successful entry into Mexico. Revenue also was significantly ahead in West Africa, especially in the Gulf of Guinea.

The stimulation fleet in the Middle East was upgraded by the addition of a new vessel, Bigorange X. An additional service vessel, Bigorange XII, started operating offshore Congo in November 1979. These service vessels are designed for oil well stimulation–acidizing and fracturing–to enhance the ability of subsurface formations to produce oil and gas.

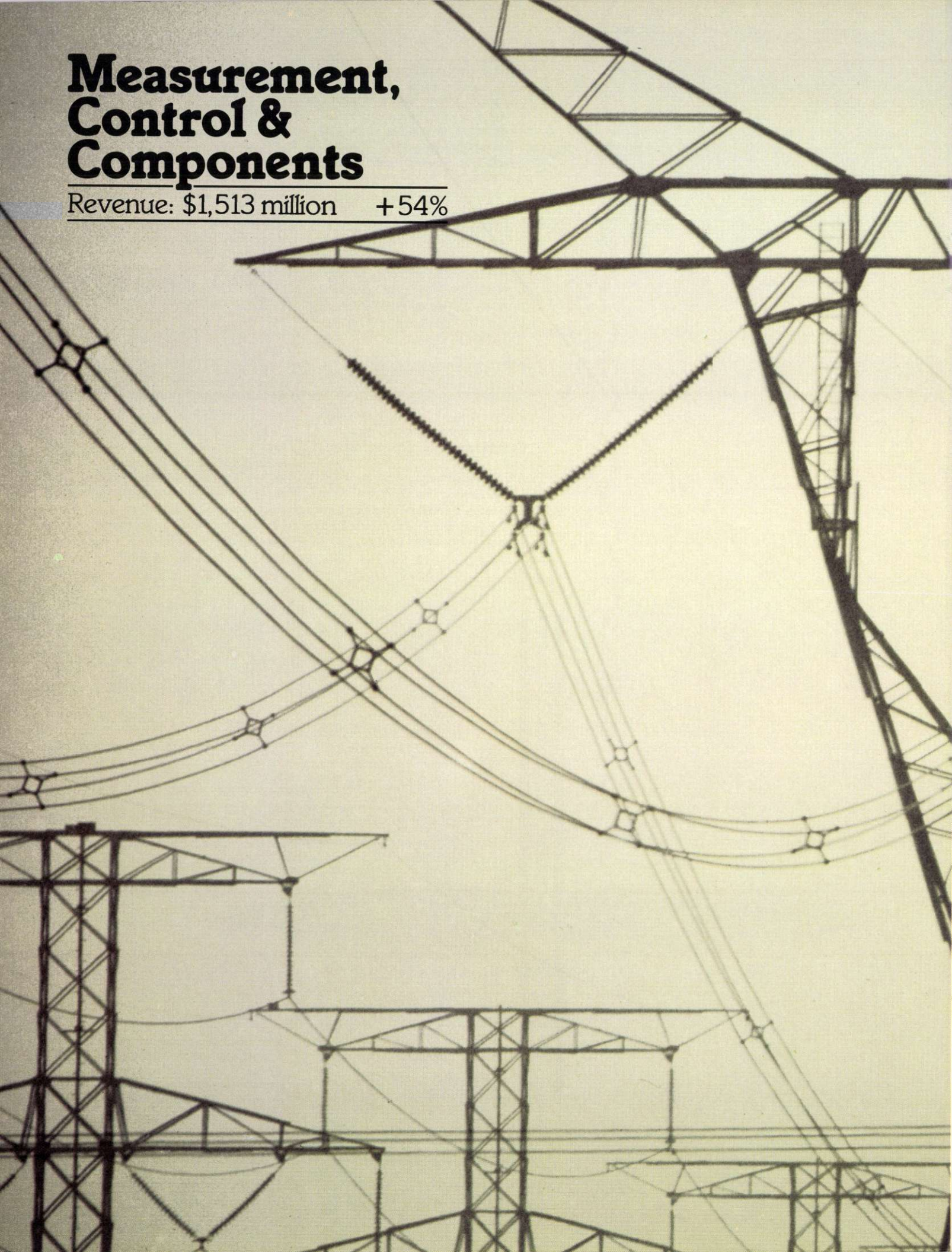
A significant contribution to Dowell Schlumberger growth in 1979 was the large number of pumping units installed on offshore rigs. In addition, growth was aided by the introduction of new technologies in cementing, such as the liquid additives system, recirculating mixers, chemical washers and spacers which are directed at improving the quality of cement jobs, mainly offshore.

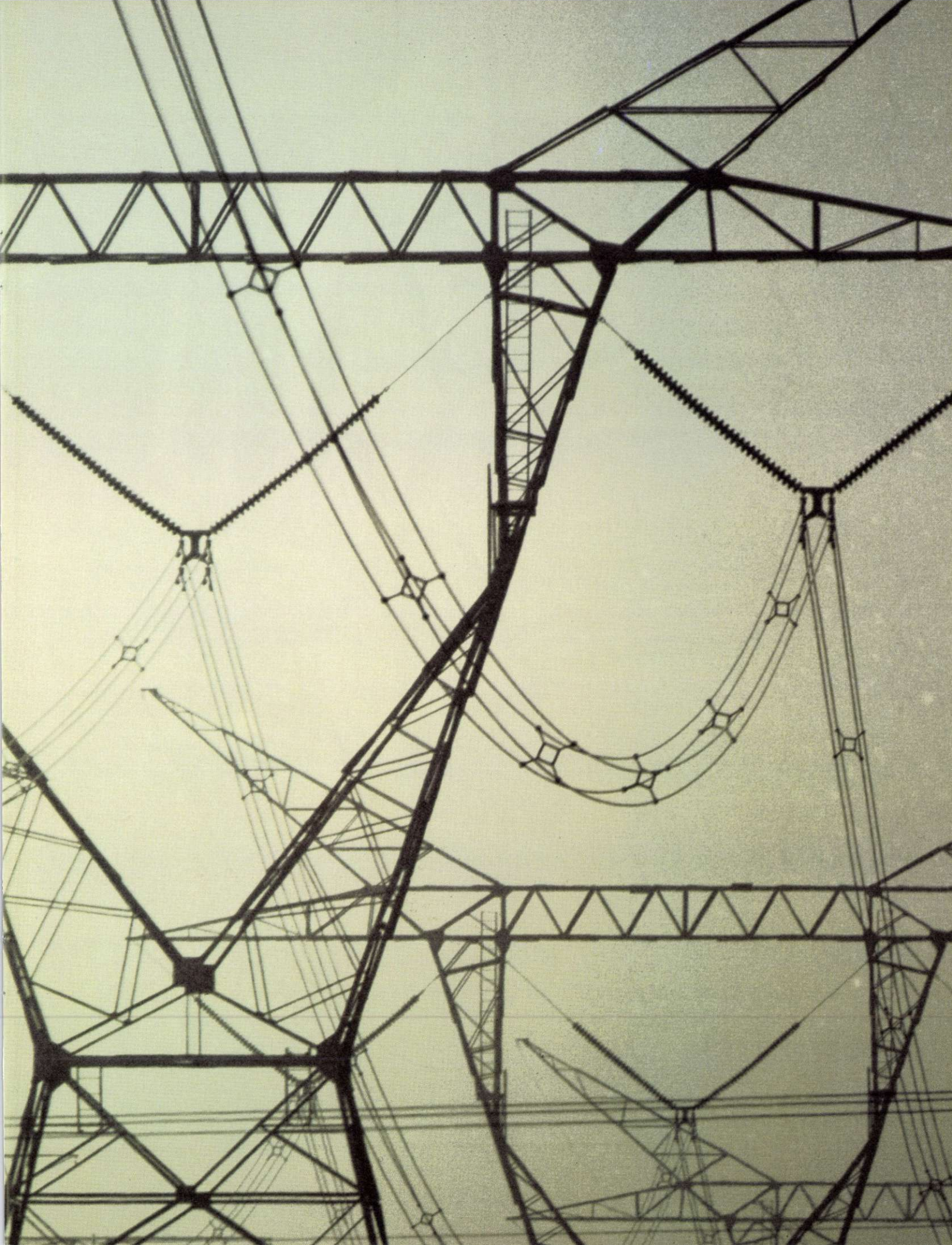


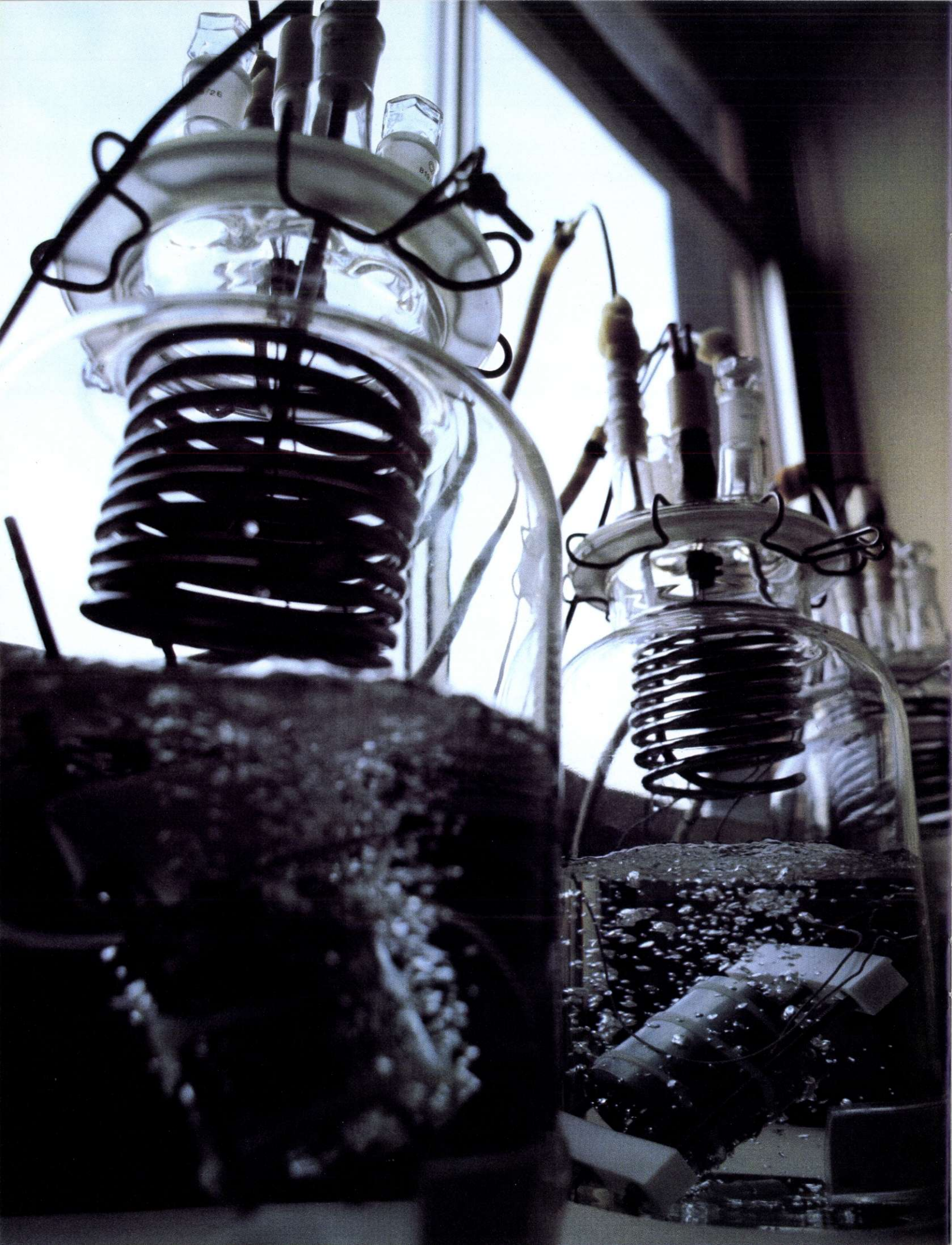
Well stimulation by fracturing is an important **Dowell Schlumberger** service. A mixture of liquid and solid particles is pumped into the well under increasing pressure until the oil-bearing rock fractures leaving drainage channels for the oil to flow more freely.

Measurement, Control & Components

Revenue: $1,513 million +54%







Measurement & Control -Europe

Revenue of Measurement & Control-Europe improved 11% expressed in local currencies; however, translated into U.S. dollars, the increase was 21% because of further weakening of the American currency in 1979.

Enertec and the Service Division in France, Solartron and Membrain in the United Kingdom and Brazilian operations had the largest growth.

Orders were strong throughout the year, as a result of both new product introductions and improved growth. Products related to natural gas, nuclear energy and aerospace had the highest gains. The significantly higher backlog at the end of 1979 is the best indication that 1980 will continue the progress achieved in recent years.

Research & engineering expenditures amounted to $36 million, while capital expenditures were $35 million.

In the following discussion, year to year comparisons of revenue from operations refer to local currencies unless otherwise stated.

OPERATIONS

Enertec

Enertec manufactures electricity power distribution and transmission equipment such as watthour meters, load management systems and network protection systems; electronic instruments such as oscilloscopes, magnetic tape recorders, data acquisition systems, audio broadcast equipment and automatic test equipment.

Enertec revenue increased 15%, despite a relatively weak market for electricity meters in France. Sales of electricity network protection equipment, magnetic tape recorders, automatic test equipment and logic analyzers continued to grow.

Sales of electricity meters and load management systems increased 11%. A large contract for electricity meters for export to Indonesia more than offset the low level of sales in the French market. Plans have been made to install a new, more automated manufacturing line for singlephase meters. This line will go into operation in 1981. Demand for load management systems, based on ripple control technology, continued strong.

Sales of equipment for electricity network protection, such as protective relays and measurement transformers, increased 18%. This equipment is designed to restore service automatically within a fraction of a second after a fault is detected on an electrical power line. The very high voltage protective system, used in the 400 kv network of Electricité de France has been very successful.

Sales of electronic products increased 16%. A number of new magnetic tape recorders was marketed for testing or monitoring applications. These included crash recorders for aircraft, cassette recorders for monitoring telephone switchboards and an airborne tape recorder for in-flight testing and monitoring. Electronic instrument sales also improved. Among the major new products introduced in 1979 were a new logic analyzer, a radio-frequency synthesizer with a frequency range up to 1 GHz, an automatic tester for microprocessors and a series of new oscilloscopes, signal generators and chart recorders.

Flonic

Flonic makes water meters and irrigation systems, gas meters, heating control equipment, time control devices and mechanical products.

Flonic revenue increased 9%, due mostly to a surge of gas equipment sales in France, Italy, Germany and the United Kingdom, as a consequence of rising fuel oil costs.

Sales of water meters were lower in volume as the result of continuing weakness in the building industry; higher export sales did not completely offset this slowdown. Water systems activity was lower in 1979 but several new large contracts for export should reverse this situation in 1980.

In December, four of Schlumberger's French water meter companies and seven of their officers, were cited under French law in a discriminatory pricing case related to their activities back in 1975-1977.

LEFT **A step in the fabrication of a nuclear detector at the Enertec plant at Mundolsheim, Alsace.**

This matter will come before the court in April 1980.

Orders for valves used in new buildings, particularly those with thermostatic controls, were substantially up as a result of a French government campaign to save energy.

Schlumberger has a 34% participation in a French company called Innovatron which owns a number of patents in the area of electronic fund transfer. Flonic has a patent license agreement with Innovatron and will develop a system around a credit card which incorporates a microcircuit logic and memory chip. This card has information storage capacity much larger than the conventional magnetic strip card and an access protection system that prevents transactions by anyone but the card owner.

Applications of the new card include its use as a normal credit card. In addition, all transactions are recorded in the memory and can be easily retrieved by the card owner. This card also can be used as a type of checkbook with a prepaid balance stored on the card from which funds can be automatically drawn. Another application allows a privileged card owner access to a data bank through the telephone network and to use the card in pay-by-phone applications.

Sereg

Sereg manufactures process control equipment and valves for the nuclear, petroleum and other industries.

Sereg revenue increased only 9%, as capital investments in Europe remained at a low level.

High performance valves had a satisfactory 18% growth. These valves are needed in uranium enrichment and in nuclear powered electricity generating plants. In France, an ambitious program is under way with the goal of producing over 50% of the country's electrical power needs in 1985 through nuclear fission.

Although sales of petroleum valves were level with 1978, orders improved at year end. Complete high-pressure wellhead equipment is being developed for the oilfield and currently is under test by two large potential customers. A significant order was received for special valves used for coal gasification.

The process control division has introduced several new products: a full line of electronic analog controls, Modumat 100; the Model 6000 pressure sensor; the Pyromat 200 temperature controller; and the EPSY microflow control valve. A newly designed digital process control system, Modumat 800, also was introduced and has attracted interest.

Service

The Service Division offers services for the distribution of water and gasoline, and for natural gas heating; the division also installs industrial ducting.

Revenue of the Service Division increased 12%, primarily as a result of public awareness of the necessity for saving energy by better control of home heating and hot water use. Activities related to energy savings were up 22% in 1979.

CICO, a company engaged in industrial ducting, received several large contracts related to the building of nuclear power plants.

In 1980, the plant at Abbeville, France will begin manufacturing wireline cables for use in Schlumberger oilfield service operations. The new unit will use technology developed by Vector, a Schlumberger company based in Sugar Land, Texas.

International

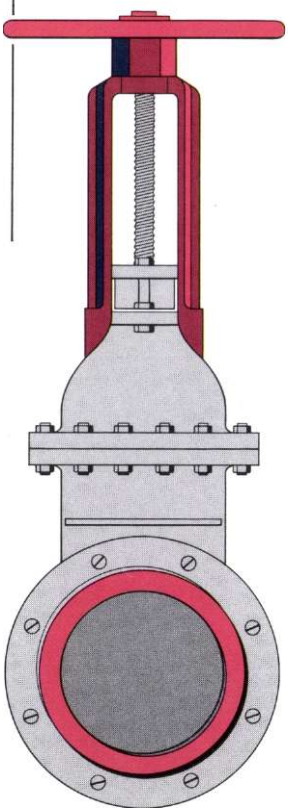
The International group of companies manufactures and sells electricity distribution equipment, water and gas meters, in several countries in Europe and South America.

Revenue of the International Division increased 17% (in U.S. dollars), as every country, except Austria and Chile, had higher sales. Demand for electricity and gas meters was generally good, while sales of water meters were lower.

In Belgium, revenue increased 7%. Part of this increase came from the acquisition of Compagnie des Compteurs de Chaleur, a company which installs and services a device that allocates heating expenses in condominium apartments.

Revenue in Spain increased 11%, as demand for electricity meters improved; progress also was made in operating efficiency.

Demand for meters in Brazil continued strong and revenue increased 22% (in U.S. dollars). Introduction of Brazilian manufactured protective relays was pursued actively and significant orders were received in the last quarter.



A turbine flowmeter (right) for custody transfer of hydrocarbon liquids such as fuel oil or gasoline. Petroleum gate valve (far right) meets specifications of the American Petroleum Institute. Both products are made by **Sereg**.

A substantial order was received from Argentina for domestic gas meters to be delivered over the next two years.

United Kingdom

United Kingdom companies manufacture electronic instruments and systems, automatic test equipment, transducers, watthour meters, time switches and training systems.

United Kingdom revenue increased 11%. Highest growth was attained in data acquisition systems, transducers and automatic test equipment.

The U.K. group is organized into five operating units:

–Membrain: automatic test equipment.

–Solartron Instruments: digital voltmeters, dynamic analysis instrumentation and data loggers.

–Solartron Systems: industrial data acquisition systems and radar simulators.

–Sangamo Electricity: watthour meters and time switches.

–Weston Controls: transducers, simulators and aerospace instruments.

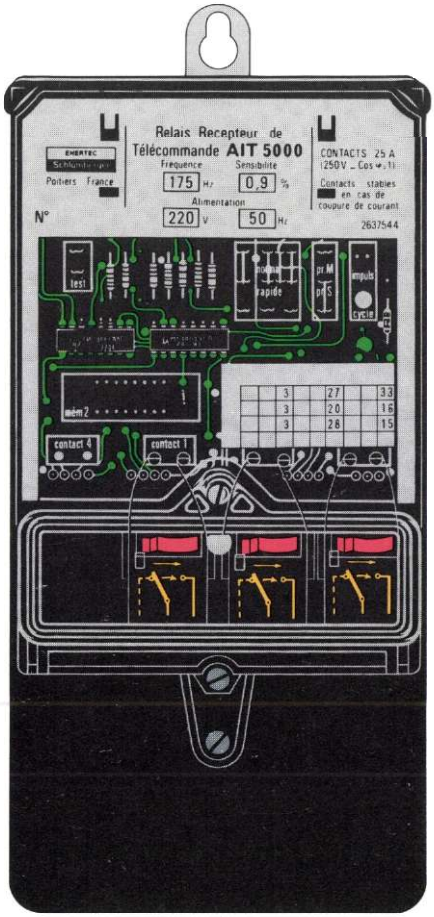
Membrain successfully launched the new 7700 series of automatic test systems aimed at functional testing of electronic circuit boards. The British Post Office now uses 7700 systems to test printed-circuit boards which are incorporated in the new U.K. all-electronic telephone exchange called System X.

There was strong interest in the new Solartron Instruments frequency response analyzer which defines the characteristics of structures by examining their response to controlled stimuli.

Solartron Industrial Systems produces computer-controlled data acquisition systems for use in process monitoring and engine testing environments. Rolls Royce has purchased a data acquisition system for testing the Gem engine. A major order was received from the Greek Navy for a tactical training system incorporating radar simulation.

Sangamo Electricity metering is developing a teleswitch which can turn electrical loads on or off in a wide area, in response to a radio signal that is superimposed on the regular BBC broadcast frequency. Electric utilities could control peak electricity demand using these radio commands. Rising fuel costs were a primary factor in growing demand for time switches and central heating programmers.

Weston Controls made further progress in selling to the aerospace market. In particular, there was significant growth in the application of thermocouples used to measure gas temperatures inside turbine engines. Revenue of the entire transducer product line continued to show steady growth. Transducers are devices that convert a physical property, such as temperature or pressure, into an analog electrical signal that can be measured. Demand was high for the 7900 process computer which translates the electrical signals from transducers into actual physical units.



This Enertec ripple-control receiver can detect a coded signal sent over the power lines and turn loads on or off; this helps utilities reduce peak loads.

Sangamo Weston

Sangamo Weston revenue was 26% higher. Each of the three divisions-Sangamo, Weston and EMR-reported higher sales, with the largest gains coming from polyphase watthour meters, electronic capacitors, modems and oilfield equipment manufactured for the Wireline division of Schlumberger.

Research & engineering expenses were more than 50% above 1978; significant investments were made for the development of new electrical load and rate control systems, and data recorders.

Capital expenditures were $15 million, a decrease of 39% from 1978 when a substantial new building program was completed. Expansion and modernization of the Energy Management facility in Toronto began in 1979. Facilities and equipment were added for the production of multitariff register meters in Oconee, South Carolina and electronic capacitors in Pickens, South Carolina and Juarez, Mexico.

Sangamo

Sangamo manufactures equipment for electric power distribution: watthour meters, load and rate control systems; also capacitors for power-factor correction and for electronic circuits.

Sangamo sales reached a record level as revenue increased 22%.

Energy Management – U.S. achieved record revenues, up 26% over 1978. Demand slackened for singlephase watthour meters, used primarily on residences, as housing starts slowed down. However, shipments of polyphase meters, for commercial and industrial applications, reached record levels.

LEFT **Assembly of watthour meters at the Sangamo Weston plant in Oconee, South Carolina.**

Increased export shipments of both singlephase and polyphase meters also contributed to the growth.

Energy Management continued to expand in the growing U.S. market for time-of-use meters and load management systems. A series of microprocessor-based, multitariff revenue meters introduced late in 1978 achieved good sales levels and market share. These meters permit different rates to be applied for power consumed at different times of the day.

Development of System 5, a load management system designed specifically for U.S. utilities, was completed early in the year. The system allows electric utilities to reduce peak demand by injecting a coded signal on existing power lines to either shut off or cycle customer loads. Seven systems were ordered in 1979; three are in operation.

Sales of tape recorders for recording power consumption were up substantially as a result of new Federal legislation which requires major electric utilities to measure electricity demand by various classes of customers. Also, utilities and public service commissions are required to consider time-of-use rates and direct load control which should favorably affect recorder sales.

Domestic sales by Energy Management – Canada remained relatively flat. However, export sales of revenue meters were high. Two new products were marketed: an encoded-time tape recorder that measures and records electrical energy and the time of use; and a new series of 15 kilovolt and 25 kilovolt instrument transformers

which are in demand as utilities go to higher voltages for more efficient energy distribution.

Revenue of the Capacitor unit was a record for the fourth straight year. This was due to continued strength in the market for electrolytic and mica capacitors. Both plants at Pickens, South Carolina and Juarez, Mexico were expanded to meet demand for capacitors.

Weston

Weston makes nuclear controls; potentiometers; panel and portable meters; aerospace instruments; and vehicle performance recorders.

Weston revenue increased 13% over the previous year.

Weston Instruments continued an upward trend in 1979. Manufacturing improvements upgraded efficiency, with particularly good results in the Schlumberger Puerto Rico operation.

Orders for aerospace instruments were strong; important new orders were received from several major commercial aircraft manufacturers. In addition, both digital and analog-digital instruments were introduced for new generation executive aircraft. The combination analog and digital displays simultaneously provide trend information (analog) and accurate numerical measurements (digital).

Industry's first "audio response" digital multimeter, the Model 6100 Roadrunner, was introduced in the fall. The 3-1/2 digit meter provides instantaneous answers and also can be set to put out an audible tone when a test limit is exceeded. This allows the technician to concentrate on the job without constantly looking at the meter. The Model 6100 will be in full production in 1980.

For Weston Components & Controls, 1979 was a year of consolidation with 16% revenue growth, following a 74% jump the year before. Revenues from all product lines increased. Potentiometer sales volume was the highest ever recorded due to continued acceptance of the high-reliability cermet potentiometers introduced over the past two years.

An important first commercial order for nuclear power plant controls was obtained during 1979. This safety equipment will monitor conditions in the reactor containment vessel, control building and a wide range of radioactive environments.

Engler Instrument revenue was up 8%. The a-c hour meter grew rapidly in 1979, passing the previous high in sales volume.

Rising costs of fuel and equipment in the heavy duty commercial vehicle field stimulated demand for tachographs and hubodometers which are used by fleet owners to record over-the-road vehicle performance. As a result, tachograph shipments were at a record.

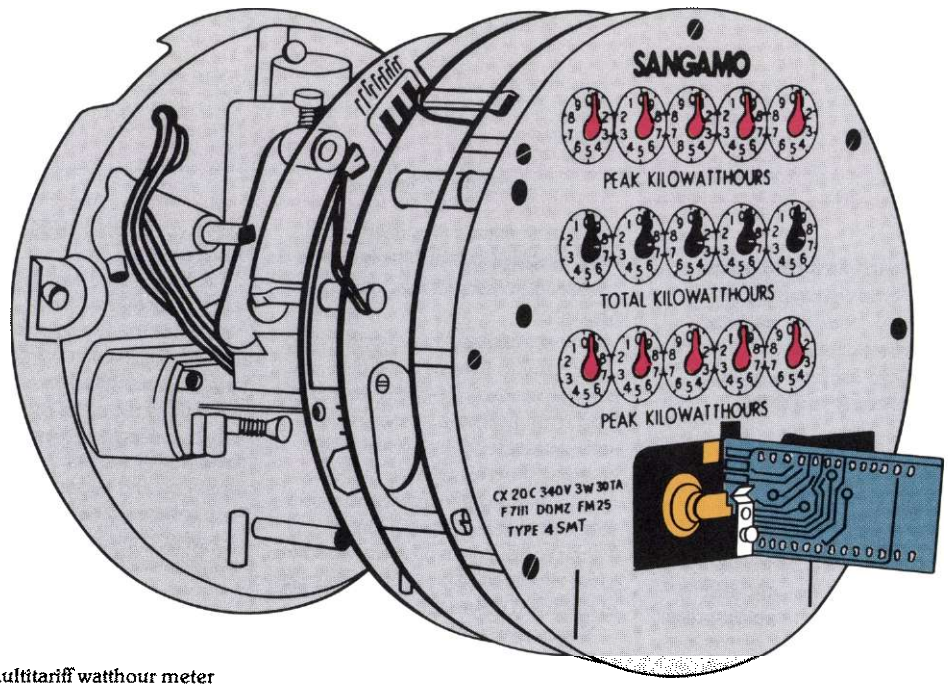
EMR

EMR makes data systems; supervisory control, and data communication systems and products; data recorders; and photomultiplier tubes.

EMR revenue increased 44% over 1978.

Shipments at EMR Photoelectric were 24% higher primarily due to increased demand for photomultiplier tubes used in oil well logging.

In 1979, the first phase was completed in the development of a photomultiplier tube for operation in the presence of high-level nuclear radiation. This photomultiplier is the critical detector of the Galileo Orbiter Satellite which will operate in the high radiation



A Sangamo multitariff watthour meter contains a microprocessor that is programmed over a period of four years to switch registers at different times of day, thus changing the rate charged for power.

field around the planet Jupiter.

Rixon designs and manufactures products for data communications. The primary product is a modem, a "telephone" for computers, which enables computers to communicate with each other over ordinary telephone lines.

At Rixon, orders were more than double the 1978 level while revenue was up 51%. Rixon supplies most of the modems sold to the independent telephone company market. In 1979, sales of modems to customers of the telephone company were successful and accounted for 20% of revenue.

Several new products were introduced: a microprocessor-based high-speed 9600 bits per second modem, the T209, and an LSI-based medium speed 2400 bits per second modem, the TA201. Demand for higher speed modems like these will follow the market for higher speed computers. The T212, a Bell-compatible modem, was a primary contributor to growth, accounting for 51% of revenue growth in 1979.

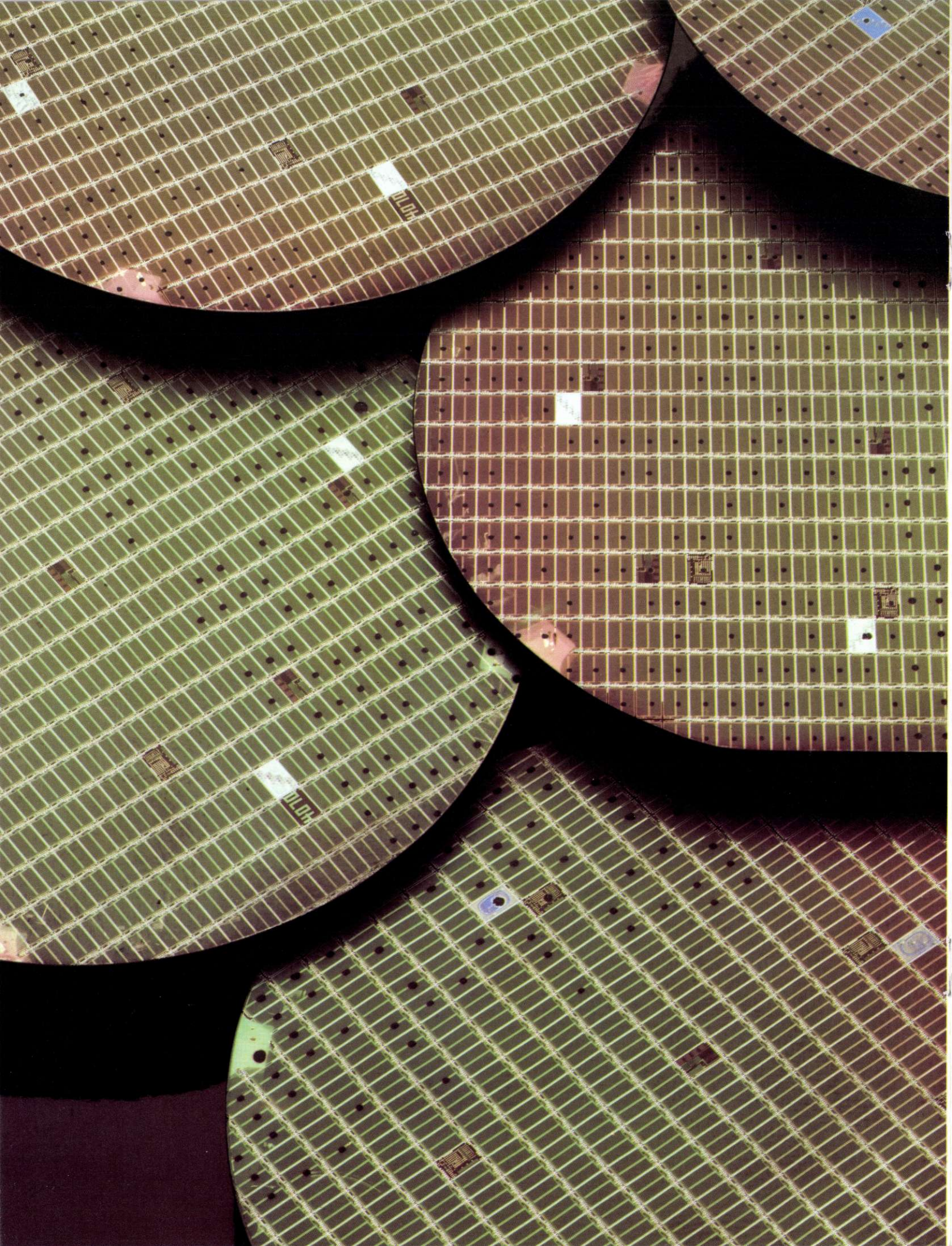
EMR Sarasota has three basic activities: test systems for aerospace vehicle development, measurement and control equipment for industrial processes, and magnetic tape recorders for recording analog data.

Revenue at Sarasota was 47% above the previous year, with increases in all product lines, mainly due to increased government contract awards.

Several large orders were received: the U.S. Army awarded a $2.5 million order for a system to preprocess data from aircraft flight tests. Contracts were also received for additional data acquisition systems for the U.S. Wind Energy Turbine Development program. This program is developing windmills to produce up to several million watts of power. Also, the Federal Aviation Administration has ordered systems to monitor dangerous wind gusts (called wind shear) at an additional 34 U.S. airports. This will increase the total number of systems to 47.

A new industrial supervisory and control system named RECON III was introduced in the fourth quarter. This system can monitor and control over 5,000 remote data points. The Los Alamos Scientific Laboratory has purchased a large RECON III system to monitor remotely a radioactive liquid waste facility.

Three of the variety of aerospace instruments which Weston makes for commercial jets, executive aircraft, helicopters, and also for manned spacecraft.



BUSINESS REVIEW

Revenue from worldwide operations rose 25% in 1979; all product groups showed improved performance as market demand was strong throughout the United States, Europe and the Far East:

–Semiconductor revenue, accounting for over 70% of total sales, increased 29%. Orders exceeded shipments in each quarter, with year-end backlog up 65% over 1978.

–Test Systems revenue improved 75%. The company introduced new LSI (large-scale integration) component testers for both semiconductor users and suppliers, as well as printed-circuit board testers for manufacturers of electronic systems.

–Government & Industrial Products revenue was ahead 14%, with particular strength in aerial reconnaissance cameras and electronic imaging systems.

Research & engineering expenditures rose 23% in 1979. Capital spending of $73 million more than doubled the 1978 outlay. The company installed four-inch semiconductor wafer fabrication lines at plants in California, Maine and New York; a new assembly plant in the Philippines was near completion at year end. Facilities were added in New York and Florida for the manufacture of printed-circuit board testers, and in Santa Clara, California for LSI test systems.

OPERATIONS

Semiconductor
The semiconductor line covers a wide range of products: discrete components, such as transistors and diodes, provide a single function per unit; integrated and large-scale integrated circuits (LSI) contain as many as tens of thousands of active components per chip. These electronic devices are essential elements of computers, telecommunications systems, automobiles, aerospace equipment and consumer electronic products.

Semiconductor revenue grew 29% in 1979.

In the discrete components sector, revenue showed good improvement, but orders softened late in the year after strong demand during the first two quarters. Major contracts for electronic ignition systems and other automotive components, were received from Ford and General Motors in the U.S. and Bosch, Volkswagen, Lucas and Femsa in Europe. Electronic ignition modules are hybrid devices made up of both discrete components and integrated circuits.

Demand for integrated circuits remained high throughout 1979. Orders were specially strong for digital logic, particularly for low-power Schottky TTL (transistor-transistor logic) circuits, paced by the company's FAST (Fairchild Advanced Schottky TTL) series introduced in 1979. To meet this demand, the company installed a new fabrication line at the South Portland, Maine plant. A comparable facility is being added in Mountain View, California for linear integrated circuits. These lines, both of which are equipped to process four-inch diameter silicon wafers, will upgrade operating efficiency and expand existing production capacity.

Sales of LSI circuits made the greatest gains in 1979. Fairchild employs several different processes to make these circuits: bipolar, MOS (metal-oxide semiconductor) and CMOS (complementary metal-oxide semiconductor).

In bipolar, Fairchild strength was reflected in the sustained demand for high-performance memories and logic circuits, for which the computer industry is a primary

LEFT Partially tested wafers containing memory chips–the Fairchild automatic tester sprays black spots on rejected chips.

customer. Work began on a new bipolar manufacturing facility at the South San Jose, California LSI plant. This facility, among the most advanced in the industry, is scheduled to go onstream during the first half of 1980 and will improve Fairchild's ability to meet increasing customer requirements.

In MOS, output of LSI memory circuits at South San Jose showed only slight improvement during 1979, the first full year of the plant's operation. Start-up problems on the 16K dynamic RAM (random access memory) continued during the year and will require considerable effort in the coming months to correct. At the Wappingers Falls, N.Y. plant, a new four-inch wafer fabrication line was installed during the year. This line eventually will increase production capacity for MOS microprocessors and static RAMs.

In CMOS, initial improvements were made late in the year by a new management team. Unprofitable product lines were eliminated and stronger production control led to some increases in manufacturing efficiency.

Test Systems

The Test Systems group produces computer-based equipment for testing semiconductor components and printed-circuit boards or subassemblies. Such testers offer the best means of performing the numerous incoming inspection and quality control tests required by today's complex electronic products.

Revenue in 1979 increased 75%, representing 17% of total sales.

Test Systems introduced two new high-speed semiconductor device testers in 1979: the Sentry Series 20, a family of general purpose LSI testers, and the Xincom 5582, a dedicated memory tester. Fairchild entered a new segment of the LSI test market with Sentinel, a medium-priced production line tester which bridges the gap between the large Sentry systems and less expensive benchtop testers. At midyear, Sentinel manufacturing moved into a new 60,000 square foot (5,600 m^2) leased facility in Santa Clara, California.

The Faultfinder and Testline series of in-circuit board testers were consolidated into the Subassembly Test Systems Division and the two units occupied new plants in Latham, N.Y. and Titusville, Florida, respectively. A new functional board tester, manufactured by Membrain in England, was introduced into the U.S. market by Fairchild at the beginning of 1980.

The Integrator II, a test systems host computer, was well accepted in the marketplace in 1979. The data that this computer collects and analyzes during tests helps semiconductor producers evaluate and control processing techniques. The company also introduced a graphics option that provides four-color illustrations from this test data.

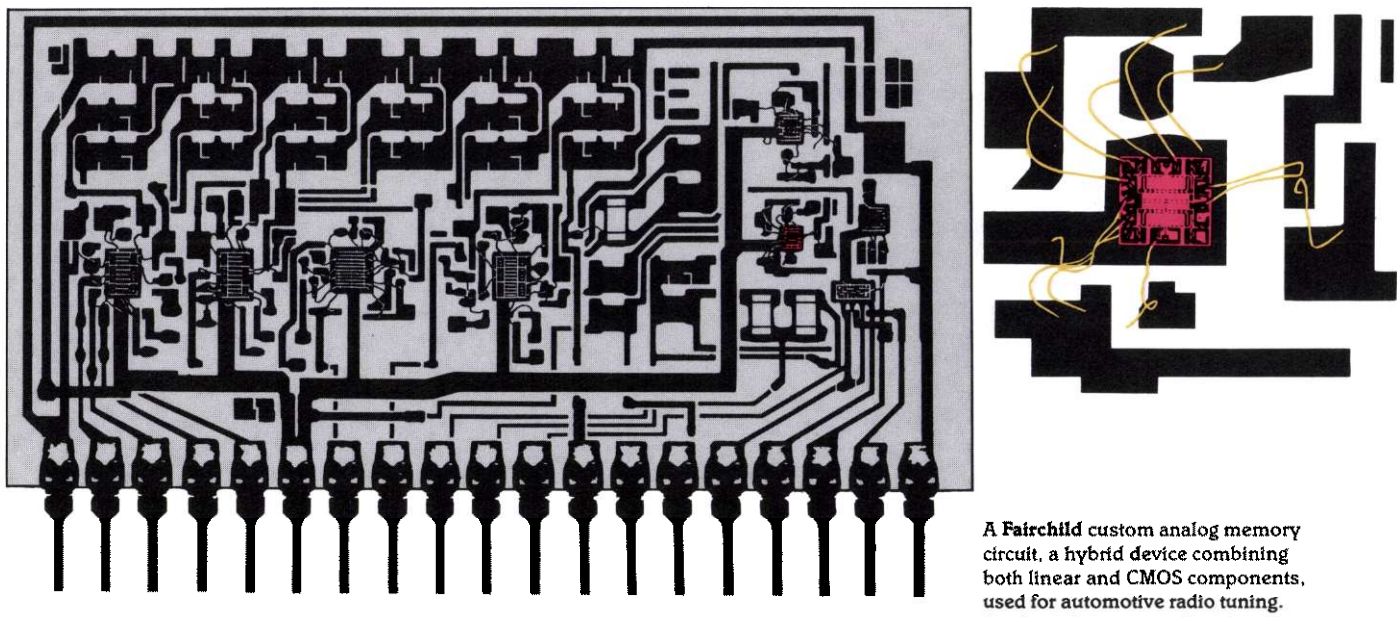
Government & Industrial Products

The Government & Industrial Products group manufactures aerial reconnaissance and surveillance systems, communications and signal processing systems, commercial aviation equipment and audio-visual projectors.

Sales in 1979 improved 14% over the previous year.

Several major contracts were awarded to Government Products group during 1979, including a $7.4 million order from the U.S. Air Force for cockpit television sensor systems (CTVS) which permit continuous recording of heads-up display and target data using CCD (charge-coupled device) imaging technology. Fairchild made its first international sale of CTVS systems for use on the French Mirage military aircraft.

Cockpit voice and flight data recorders, designed for the new generation of commercial aircraft, were sold to various U.S. and international airlines including Continental, Air France, Lufthansa, Hapag-Lloyd and Varig. Fairchild also developed and introduced an electronic tire monitoring system that senses the pressure of aircraft tires, providing pilots with a constant visual readout.



A Fairchild custom analog memory circuit, a hybrid device combining both linear and CMOS components, used for automotive radio tuning. On the right is a magnified detail.

Report on Fairchild

In both size and product mix, Fairchild has dramatically changed since its origin in 1927 as a supplier of aerial cameras and aviation equipment. While some product lines retain strong links with the past, about 70% of Fairchild's sales today derive from semiconductors–the tiny silicon "chips" which are the building blocks of all electronic products. The company is a pioneer and one of the leading U.S. producers of these solid-state devices.

Today, Fairchild provides semiconductor products for the computer, telecommunications, consumer and industrial markets; automatic test equipment for solid-state component and printed-circuit board testing; aerial cameras and electronic systems for government applications; as well as audio-visual products. Fairchild employs over 27,000 people, more than half of them outside the United States.

This is the actual size of a memory chip that can store 16,000 bits of computer data.

History

The company was founded by Sherman Mills Fairchild, an American industrialist and scientist who served as Board Chairman until his death in 1971.

His first business venture was in 1919. He had invented a fast, efficient between-the-lens camera shutter and timing mechanism which made accurate aerial photography possible for the first time. In order to make full use of his camera, he designed his own closed-cabin and later folding-wing airplane.

In 1927, the various businesses which were the outgrowth of these inventions were incorporated as Fairchild Aviation Corporation. Nine years later, the aircraft and engine manufacturing business was spun off into a new company today known as Fairchild Industries. The aerial camera and electronics segment of the business continued as a separate entity, and was renamed Fairchild Camera and Instrument Corporation in 1944.

In the late 1950s, a breakthrough placed Fairchild Camera and Instrument in the forefront of semiconductor technology. A decade earlier, the invention of the transistor had touched off a revolution in electronics, but no successful process had been devised for mass producing transistors. Fairchild scientists in California achieved this goal with the development of a fabrication technique called the Planar* process–still the basic method for making the majority of semiconductor devices.

In addition to making possible the mass-production of transistors, the Planar process paved the way for such Fairchild advances as the first integrated circuit and the first MOS (metal-oxide semiconductor) circuit. These developments laid the foundation for the rapid expansion of semiconductor usage. As a result, Fairchild evolved from an equipment company that also made semiconductors into a semiconductor company making other electronic equipment.

In May 1979, Schlumberger entered into an agreement with Fairchild Camera and Instrument providing for the acquisition of Fairchild by Schlumberger. This acquisition was completed on July 1, 1979.

Operations

Today, Fairchild consists of three business groups: Semiconductor, Test Systems, and Government and Industrial Products.

Semiconductors have been the major part of Fairchild business since the 1960s, when the company began adding manufacturing capacity to serve the fast growing solid-state market.

For the past 15 years, semiconductor technology has progressed so rapidly that circuit density (functions-per-chip) has doubled every year. The first integrated circuits had up to eight transistors on one chip while today's circuits contain more than a quarter of a million active elements. Semiconductor memories have grown in storage capacity from 256 bits in 1970 to 65,000 bits today and 250,000 bits forecast for the 1980s.

Fairchild supplies a wide range of semiconductors to the electronics industry:

–Typical discrete components include various types of diodes and transistors.

–Integrated circuits include digital logic devices, linear amplifiers, various types of computer memories, and microprocessors or "computers on a chip". Technology employed in integrated circuit design includes bipolar, metal-oxide semiconductor (MOS), charge-coupled devices (CCD), integrated injection logic and others.

Microprocessors are creating new markets for semiconductors because they offer processing power equivalent to the large-scale computers of a few years ago at a fraction of the cost. Fairchild manufactures a family of microprocessors and supporting circuits which are applied to the automobile, office equipment, home electronics, communications and numerous other growing markets.

The Test Systems Group originated from equipment the company produced in the early 1960s to test semiconductor products on its own manufacturing lines.

Demand for automatic test equipment to evaluate semiconductor components and printed-circuit boards has mushroomed with the growth of the world electronics market. Both producers and volume users of solid-state devices utilize such computer-based testers to perform the variety of tests necessary to certify the integrated circuits made today.

Testing has become a very complex science. A Sentry system can accurately make millions of tests on a single integrated circuit in less than two seconds. The system tests the circuit's cells, addresses and decoders in millions of instruction combinations.

Testing the 256 million data paths of a 16K LSI random access memory can take up to 25 seconds. Up to three years would be needed to test a VLSI (very large scale integration) device if all data path combinations were exercised. This is impractical, so systems are tested only for specific device applications. For example, if a microprocessor is going to be used to compute a car's air-to-fuel ratio, it is tested only for that specific job.

The future of automatic test equipment is as wide open as the semiconductor industry itself. In 1980, one trillion electronic elements will be produced by the industry. It is expected that more than half of these will be tested by Fairchild test equipment.

Government and Industrial Products represents the original Fairchild product lines. This group manufactures aerial cameras, along with miniature CCD cameras, communications and signal processing systems, commercial aviation equipment and audio-visual projectors.

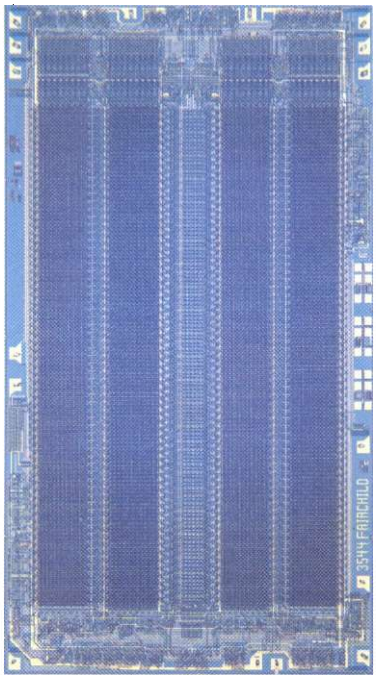
Camera systems are designed mainly for government aerospace and defense applications. CCD TV cameras are installed in tactical aircraft cockpits for use in observing and tracking other aircraft. Air Force fighters are equipped with a CCD reconnaissance camera with a 72-inch focal length, called the most sophisticated camera in its field.

Other products in the government and military market include countermeasure or jamming systems, radio frequency monitoring systems and mobile tactical reconnaissance facilities.

The Industrial Products Division produces a line of audio-visual equipment for 35mm slide, Super 8 movie and 110 filmstrip media. More than 200 aircraft fleets currently use Fairchild's voice and flight data recorder. Other aviation equipment includes a music and announcement reproducer, a weight and balance system and a tire pressure monitoring system.

*Planar is a patented process of Fairchild Camera and Instrument Corporation.

The Making of a Semiconductor



This is a 250X magnification of the memory chip shown on page 27.

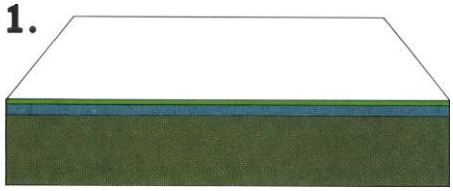
The basic raw material for semiconductors is sand. A purified form called ferro-grade silicon is changed chemically into liquid trichlorsilane and combined with hydrogen at high temperatures to produce semiconductor-grade polycrystalline silicon.

The silicon must be converted into the orderly structure of a single crystal before it can be used for semiconductors. Chemicals, or "dopants", also must be added to give the crystal the desired negative or positive electrical characteristics. This all takes place in the glowing heat of a crystal-growing furnace.

At temperatures of 1400°C, a pea-sized single crystal "seed" is immersed in a mixture of molten silicon and dopants. As the seed is slowly rotated and withdrawn, the melt "freezes" on its surface, reproducing the atomic structure of the single crystal. The result is a cylindrical ingot several feet in length.

This ingot is ground to a perfect cylinder four inches in diameter and is sliced on a diamond saw into wafers about .012 inch thick.

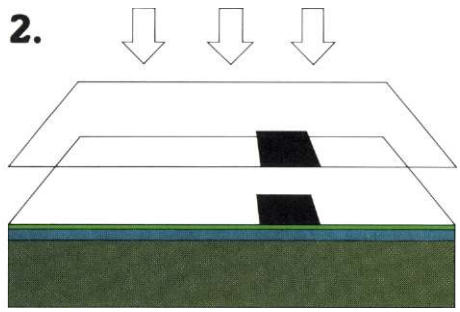
1.



(1) After being polished to a mirror surface, the wafers are covered with a protective layer of oxide by exposure to heat and oxygen. The oxidized layer in turn is coated with a light-sensitive material called photoresist.

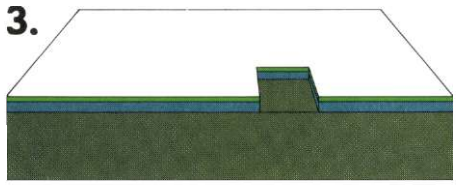
The next step—wafer fabrication—consists of a series of masking and diffusion operations which create an array of semiconductor components within the surface of the slice of silicon.

2.



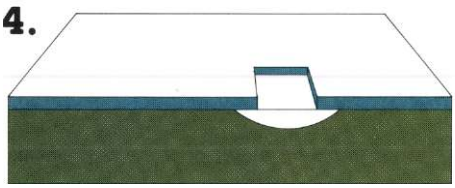
(2) In the masking operation, the wafer is exposed to ultraviolet light through a glass mask containing the pattern of desired circuit elements.

3.



(3) Each wafer carries as many as 500 identical circuits, typically about 0.15 inch square. The photoresist hardens wherever light strikes; softer unexposed portions are dissolved away in a developer. Then, "windows" are etched through the original protective oxide layer wherever the photoresist is absent.

4.

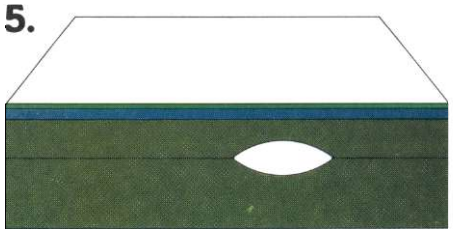


(4) The etched wafer is then stripped of remaining photoresist and placed in a diffusion furnace where dopants in the form of a chemical vapor enter the exposed silicon to

alter the electrical characteristics of tiny areas.

An alternative technique for placing dopants within the silicon is ion implantation, in which charged particles are electrically accelerated into the exposed silicon areas. This technique gives better control of some circuit elements.

5.

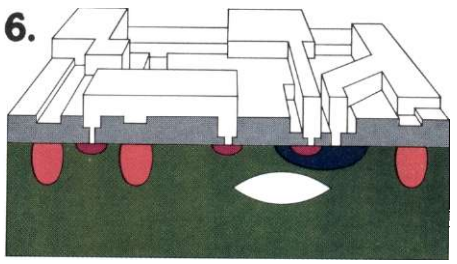


(5) At the end of the first diffusion period, the oxide is removed, an epitaxial layer of silicon is grown over the entire wafer and covered with a new oxide layer.

The process is carried out simultaneously for each of the hundreds of identical integrated circuits "printed" on the wafer.

The sequence of coating, exposing, developing, diffusing and oxide growing is repeated as many as 10 to 12 times for modern integrated circuits before all of the circuit elements are built up within the wafer.

6.



(6) After all diffusions and implantations are complete, the next step is to interconnect the elements just created in the silicon. This is accomplished by coating the entire wafer with a thin layer of aluminum and then using the same coating, masking and etching techniques to define the fine metal lines that form the "wiring" of the final integrated circuits.

Completed wafers are separated into individual circuits by scribing and breaking or by cutting the material with saws or laser beams.

These individual "chips" or "dice" are mounted in packages, and aluminum wires smaller than a human hair are bonded between the contact areas on the silicon and the connecting pins on the package.

After assembly and sealing of the package, the devices are subjected to rigorous testing, marked with product codes and packed for shipment.

Semiconductor Applications

Today, virtually every industry uses electronics in some form, whether in manufacturing or as part of the products sold. Semiconductors are the building blocks of all electronic products.

Semiconductors have become one of the truly deflationary industries, as the number of functions per chip have risen, and the cost-per-function has declined. This alone has spurred advances in electronic-based products and has created new markets outside of traditional areas.

The simplest semiconductor, a diode, serves as an electronic gate or rectifier. Transistors, a step up in the hierarchy of complexity, amplify current and voltage much as the vacuum tubes they have replaced.

Integrated circuits (IC) may contain hundreds of thousands of interconnected transistors on a single silicon chip. Most ICs fall into one of two broad categories—memory or logic—the first of which involves the storage, and the second the processing of information.

Traditionally the dominant use of integrated circuits has been in computers and data handling equipment. A single large-scale computer contains thousands of integrated logic circuits so this market alone consumes some 11 billion devices per year.

The introduction of the microprocessor or "computer on a chip" has started a new trend. First, the microprocessor cost per logic function is so low that computing power can be added to a product with performance options limited only by the imagination of the product designer. Second, the microprocessor is so small and consumes so little power that it can be incorporated in home appliances, typewriters and other office machines, home entertainment products, automobiles and even in hand-held products.

The traditional heavy users of electronic components like the producers of data processing equipment, electronic measuring instruments and industrial controls have been quick to appreciate and absorb advances in semiconductor technology as they occurred. Expanding use of microprocessors in turn has increased demand for IC memories and peripheral circuits to supplement the functional capability of electronic equipment.

Technical Glossary

Bipolar
A term used to describe semiconductors that use both positive and negative charge carriers and in which current traverses both positive and negative regions (two poles). It implies a current-controlled device.

CCD (Charge-Coupled Device)
A device utilizing a technique in which information is stored and transported by means of packets of minute electrical charges as opposed to varying amounts of current flow or voltage levels.

Chip (or die)
A small piece of silicon which is a complete but unpackaged semiconductor device—a transistor, diode or integrated circuit.

CMOS (Complementary MOS)
An MOS device which incorporates both p-channel and n-channel structures within the same silicon substrate. It is noted for low power requirements and high immunity to electrical noise.

Diffusion
A high-temperature process by which selected chemicals, called dopants, enter the crystalline structure of semiconductor materials to change the electrical characteristics at desired locations.

Discrete Device
A single-function packaged component such as a diode or transistor.

Epitaxial
A silicon layer grown on top of the silicon wafer such that the crystalline structure of the epitaxial layer is oriented with the substrate.

Integrated Circuit
A semiconductor circuit combining the functions of many electronic components in a single monolithic substrate which is usually silicon.

Ion Implantation
An alternate means to diffusion for adding dopants to a semiconductor material. Charged atoms (ions) are accelerated in an electric field and fired into the semiconductor material. It is especially useful for thin doped areas.

Isoplanar
A proprietary Fairchild process which uses an insulating oxide to isolate the collectors of transistors from each other in integrated circuits, improving both packing density and speed. Isoplanar II ™ is an advanced version of this process in which both collectors and emitters are walled off from other elements by an insulating oxide.

I^3L ™ (Isoplanar Integrated Injection Logic)
A proprietary Fairchild circuit structure which combines Isoplanar processing with injection logic circuitry for high performance circuit structures. Injection logic utilizes transistors that are constructed both vertically and horizontally in the same silicon substrate, thus increasing density and speed.

LSI (Large-Scale Integration)
The term is generally applied to integrated circuit chips containing from 100 to 5,000 logic gates, or 1,000 to 16,000 bits of memory.

Memory
A device which stores information. Data may be stored in the form of electrical charges, voltage or current levels.

Microprocessor (MPU)
A standard LSI circuit design that provides in one or more chips, functions equivalent to those contained in the central processing unit of a computer. A microprocessor interprets and executes instructions and usually incorporates arithmetic capabilities.

MOS (Metal-Oxide Semiconductor)
Originally a term applied to field effect transistors and integrated circuits that utilized a metal gate insulated by an oxide layer from the semiconductor or silicon channel. Now applied to a wide class of field effect devices, even though metal gates have been largely replaced by silicon gate devices.

MSI (Medium-Scale Integration) A term generally applied to integrated circuit chips containing from 20 to 100 logic gates, or less than 1,000 bits of memory.

N-channel
A type of field effect transistor structure in which the conducting channel is n-type (negative) semiconductor material. N-channel devices operate at higher speed than p-type (positive) devices.

Planar
A patented Fairchild process in which all PN junctions intersect the top surface of the semiconductor material such that these intersections are permanently protected by the masking oxide and all contacts to the device can be made from the top surface. This process is the basis of most current silicon integrated circuit technology worldwide.

RAM (Random Access Memory)
A memory in which information can be entered into or retrieved from any storage site at the same speed. Its contents are always electrically alterable.

Semiconductor
A nonconducting chemical element with a crystal structure whose atomic bonds have been altered by the addition of dopants to allow the conduction of current by either positive or negative carriers.

Solid State
An electronic device, like a silicon transistor, that conducts and controls the movement of electrons (electrical current) within solid materials.

SSI (Small-Scale Integration)
A term applied to integrated circuit chips containing from 1 to 20 logic gates.

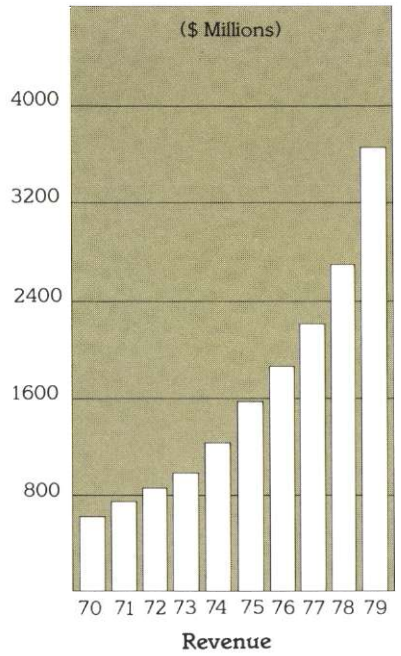
Transistor
An active semiconductor device with three electrodes (emitter, base and collector) that acts primarily either as an amplifier or as a current switch.

TTL (Transistor-Transistor Logic) A type of digital integrated circuit structure that utilizes a transistor output.

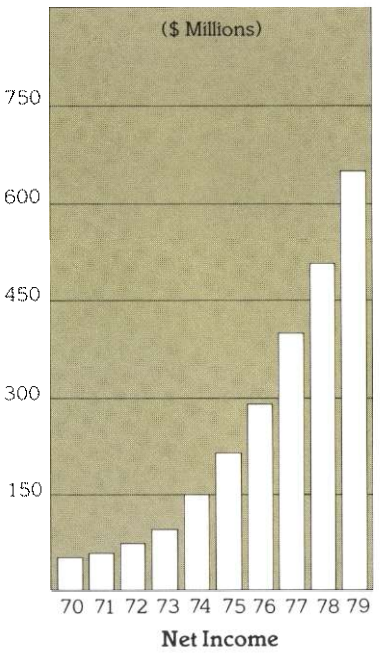
VLSI (Very Large-Scale Integration)
A term applied to integrated circuit chips containing a minimum of 5,000 logic gates, or more than 16,000 bits of memory.

Wafer
A thin disk of semiconductor material in which many semiconductor devices are fabricated at one time. The devices are subsequently separated and assembled in individual packages.

Financial Review



Revenue



Net Income

Comparison of 1979 Results with 1978

Net income of $658 million was 31% higher than the $502 million earned in 1978. Revenue of $3.6 billion gained 36%. Net income was 18% of revenue, as compared to 19% for the preceding year. Return on average stockholders' equity was 31% compared to 29% in 1978. Earnings per share, adjusted for the three-for-two stock split in March 1979, were $5.18 compared to $3.94 for the prior year.

In the Oilfield Services segment, both Wireline and Drilling & Production Services had substantial gains in revenue. Wireline revenue in North America increased 22% as drilling activity in the United States, after a slow start, reached record levels in the last half of the year; active drilling rigs in Canada also set a record. Wireline revenue in the Eastern Hemisphere and South America climbed 26%. Activity increased in all major geographic areas, including the Middle East despite the decline in Iran. Drilling & Production Services revenue grew 25% overall as all units had significant gains, except The Analysts which increased 11%. Drilling revenue grew as rig utilization was about 90% for both land and offshore and daily rates for semisubmersible rigs firmed during the year.

Measurement, Control & Components revenue increased 54%. About two-thirds of this increase was due to the inclusion of Fairchild results from July 1, 1979. Sangamo Weston sales grew 26% as demand was strong for data modems, capacitors, watt-hour meters and products for the Oilfield Services segment. Measurement & Control-Europe sales increased moderately excluding the favorable effect of the strengthening of most European currencies against the dollar. The largest gains were in products related to natural gas, nuclear energy and aerospace.

As shown in the Five Year Summary on page 47, pretax operating income for Oilfield Services was $809 million, an increase of $161 million over 1978. Measurement, Control & Components pretax operating income was $188 million compared to $122 million in 1978. The increase in pretax operating income was primarily attributable to the higher level of revenue.

Indirect costs of research & engineering, marketing and general expenses were 14% of revenue, the same as the percentage in the preceding year. Interest expense increased $34 million largely due to an increase of $404 million in long-term debt to finance the Fairchild acquisition. Interest and other income increased $27 million as a result of generally higher interest rates as well as the higher level of short-term investments.

The 1979 provision for taxes on income of $355 million was $60 million higher than last year principally due to the increase in pretax income. The effective tax rate was two percentage points lower than the prior year because the U.S. corporate income tax rate declined from 48% to 46% and the overall effective rate was lower for operations outside of the U.S.

Research & Engineering

Expenditures for research & engineering increased 45% over 1978 to $131 million and were 3.7% of revenue. Oilfield Services expenditures for research & engineering totaled $64 million. Measurement, Control & Components spent $67 million, including $17 million by Fairchild during the last half of the year.

Currency

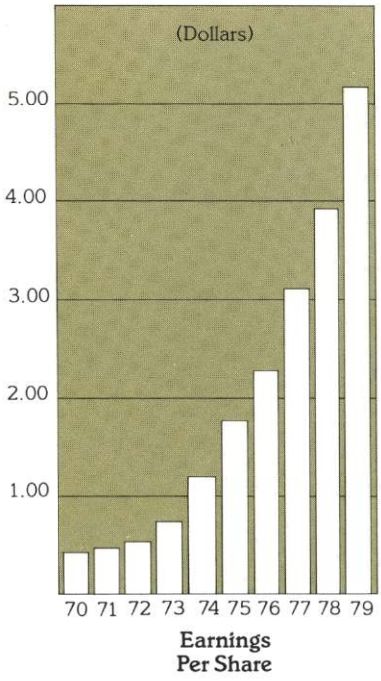
Currency exchange losses were $5.3 million compared to $6.7 million in 1978. Most of the loss in the current year was due to the continuous devaluation of the Argentine peso. Changes in other currency exchange rates, including the French franc and the pound sterling, had the effect of increasing the dollar translation of revenue and expenses; the favorable effect on consolidated net income was not material.

Estimated Liability for Taxes on Income

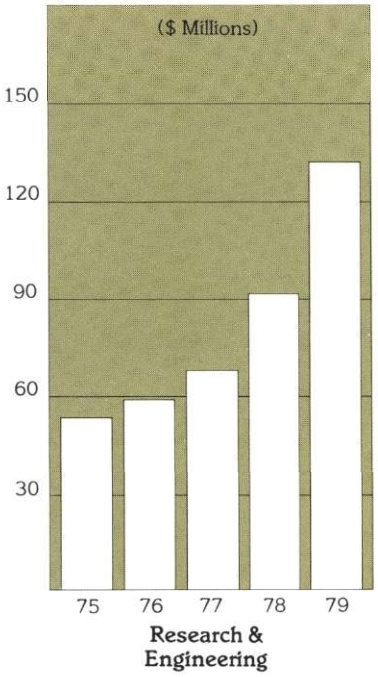
The estimated liability for taxes on income at year end was $516 million, an increase of $155 million from the previous year end. The increase was the result of the higher pretax earnings, provisions for income taxes which may be payable in future years depending upon interpretation of tax laws and regulations of taxing authorities in various countries and of the inclusion of Fairchild in the Schlumberger consolidated financial statements.

Investments

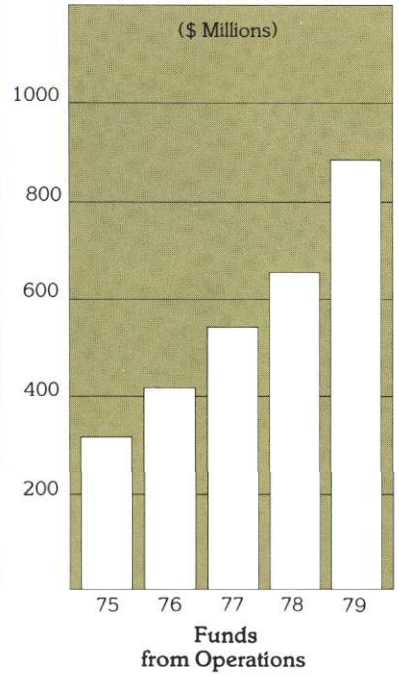
On June 30, 1979, Schlumberger acquired Fairchild Camera and Instrument Corporation which manufactures and sells electronic



Earnings Per Share



Research & Engineering



Funds from Operations

components and equipment worldwide. This acquisition was made by a tender offer to stockholders of Fairchild at a price of $66 a share and was accounted for as a purchase. The excess of the investment over fair value of net assets acquired was $253 million which is being amortized over a period of 40 years by charges to income. The financial results of Fairchild have been consolidated with those of Schlumberger from July 1, 1979.

During 1979, Schlumberger purchased additional shares of Rowan Companies, Inc. in the open market to increase its ownership of Rowan to approximately 23% of the voting shares. The investment in Rowan has been accounted for under the equity method as from January 1, 1979.

In 1979, Schlumberger entered into a consent order with the U.S. Federal Trade Commission to sell all shares of common stock of Unitrode Corporation which were purchased in 1979. On December 7, 1979, Schlumberger announced it had entered into a contract with The Signal Companies, Inc. to sell all of the 496,425 shares of Unitrode common stock owned by Schlumberger for $32.75 per share. This agreement is subject to approval by the U.S. Federal Trade Commission.

On October 1, 1979, Schlumberger sold the Heath business to Zenith Radio Corporation for $64.5 million. Heath produces and markets build-it-yourself electronic kit products for computing, communications, testing, home entertainment and other consumer uses.

Fixed Assets

Expenditures for fixed assets in 1979 were $503 million compared to $393 million in the prior year.

Additions by business sector were as follows:

	1979	1978
	(Stated in millions)	
Oilfield Services:		
Wireline	$283.2	$245.4
Drilling & Production	121.5	94.7
	404.7	340.1
Measurement, Control & Components:		
Sangamo Weston	15.7	25.7
Fairchild	45.0	—
Measurement & Control-Europe	35.3	24.0
	96.0	49.7
Other	2.7	3.5
	$503.4	$393.3

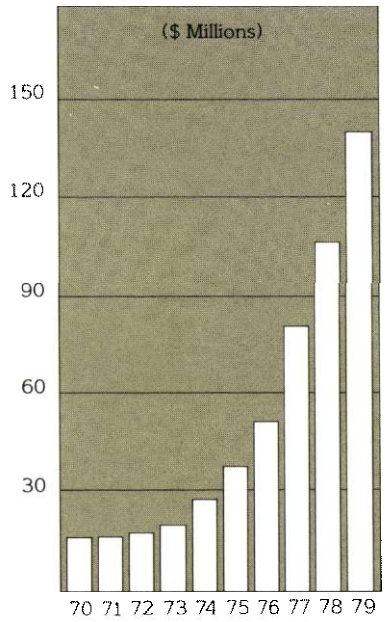
Common Stock

At their meeting on May 8, 1979, the stockholders approved an increase in the authorized Common Stock to 300,000,000 shares from 200,000,000 shares.

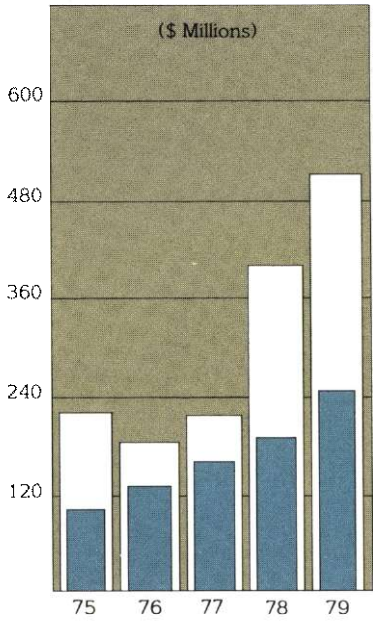
During the year, 406,300 shares of the Company's Common Stock were purchased at market value for the Treasury. In addition, 382,516 previously unissued shares were sold to employees under stock option plans. At year end, 127,101,861 shares of Common Stock were outstanding compared to 127,125,645 shares at December 31, 1978, adjusted for the three-for-two stock split in March 1979; outstanding shares exclude 6,496,507 and 6,090,207 shares, respectively, held in the Treasury.

Financial Position

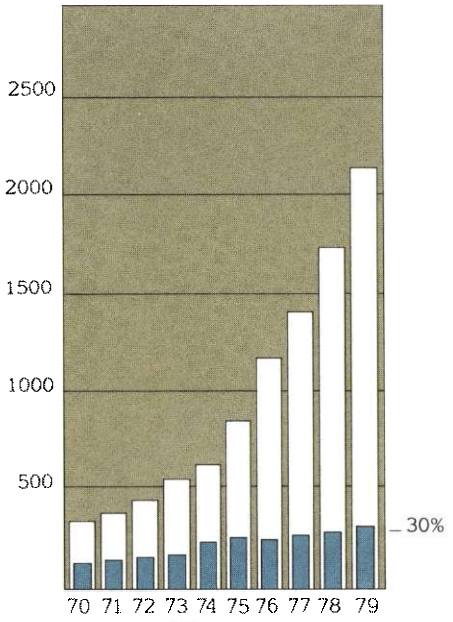
At year end, working capital was $1.0 billion, $156 million over the prior year; the current ratio was 1.75 to 1, moderately lower than the ratio at December 31, 1978. The growth rates of receivables and inventories were in line with the growth in business. Net asset exposure in Iran at December 31, 1979 was insignificant.



Dividends Declared



Gross Fixed Assets
Additions
Depreciation



Average Shareholders' Equity ($ Millions)
Return on Average Shareholders' Equity (%)

Market Prices and Dividends Paid Per Share

Quarterly high and low prices for the Company's Common Stock as reported by The New York Stock Exchange (composite transactions), together with dividend paid per share in each quarter of 1979 and 1978 were:

	1979*		
	Price Range		Dividends
	High	Low	Paid
Quarter			
First	$ 71⅛	$61¾	$0.233
Second	77	68⅝	0.275
Third	88⅛	72¼	0.275
Fourth	100⅜	81⅞	0.275

	1978*		
	Price Range		Dividends
	High	Low	Paid
Quarter			
First	$48⅝	$42¾	$0.183
Second	57¼	42¾	0.183
Third	62⅞	54⅜	0.183
Fourth	65⅜	54⅛	0.233

*Adjusted for three-for-two stock split of March 1979.

Comparison of 1978 Results with 1977

Revenue in 1978 of $2.7 billion increased 22% over 1977 with both segments of the business contributing to the improvement.

Revenue of the Oilfield Services segment gained 25%. Wireline revenue in North America was up 25% as the average number of active drilling rigs in the United States was 14% above 1977 although drilling activity slowed toward year end. In Canada, activity remained strong throughout 1978. Wireline revenue in Eastern Hemisphere and South America gained 28%; all regions were well ahead of 1977, particularly Africa and the Far East. Drilling & Production Services revenue gained 22%, mainly because of increased activity at Flopetrol and Dowell Schlumberger (50% owned). Drilling revenue grew moderately; demand for land rigs was good, but daily rates for offshore semisubmersible rigs were soft.

Revenue of the Measurement, Control & Components segment, including sales to Oilfield Services, increased 18%. Sangamo Weston grew 25% because of large shipments to Wireline and increased sales of watt-hour meters and capacitors. Measurement & Control–Europe revenue grew 20% partly because of changes in currency exchange rates during the year; in local currencies, revenue increased 12% on improved sales of electronic products, valves and process control equipment. Sales of electricity, water and gas meters in France made little progress due to weakness in housing and construction, but sales of these products were good in Italy, Austria, Brazil and the United Kingdom. Heath declined 5% mainly because of the expected drop in contract sales to correspondence schools.

Operating income grew at 21%, the same rate as the revenue gain; a slight decline in the Oilfield Services gross profit rate was essentially offset by an improved rate in Measurement, Control & Components.

Interest and other income grew to $65 million from $46 million almost wholly due to increased interest income as a result of higher interest rates in 1978 and an increased level of short-term investments.

The provision for taxes on income was $295 million, up $47 million from 1977, mostly due to the increase in pretax income. The effective tax rate for the year was 1.2 percentage points lower than in 1977 principally due to the U.S. investment tax credit on fixed asset additions and to a slightly lower overall tax rate on income outside North America.

Net income of $502 million represented a return of 29% on average stockholders' equity compared to 28% in 1977.

Information on Effects of Changing Prices (Inflation)

In September 1979, the Financial Accounting Standards Board (FASB) issued Statement No. 33, Financial Reporting and Changing Prices. This Statement establishes standards for disclosing the effects of general price level changes (constant dollars) and price changes of specific assets (current cost). Current cost information is not required to be reported until 1980. Replacement cost information will be included in the 1979 Annual Report to the Securities and Exchange Commission on Form 10-K.

The historical cost/constant dollar method adjusts historical cost by using the Consumer Price Index for All Urban Consumers (CPI-U) published monthly by the U.S. Department of Labor. The constant dollar data is expressed in average of the year dollars, reflecting changes that have occurred in the purchasing power of the dollar as measured by the CPI-U.

In conformity with the requirements of FAS 33, the CPI-U, an index of U.S. inflation, was applied to both U.S. and non-U.S. operations. Since the major portion of the Company's business is conducted outside of the United States, the restated data may not be indicative of the effect of inflation on the consolidated results and financial position.

In addition, it should be realized that this method of measuring the effects of inflation is experimental in nature.

The Company suggests great caution be exercised in using these data to estimate the effects of future inflation or to make comparisons from company to company or industry to industry. Under this new concept, the provision for income taxes is not adjusted for the effect of inflation on income before taxes.

Statement of Income Adjusted For Effects of Changing Prices

(Millions of average 1979 dollars)	YEAR ENDED DECEMBER 31, 1979
Net Income—As reported	$658
Adjustment to restate cost of goods sold and services and depreciation for the effects of general inflation	(83)
Net Income—Adjusted for general inflation	$575
Loss from decline in purchasing power of net monetary assets	$ 36

Five-Year Comparison of Selected Supplementary Financial Data Adjusted For Effects of Changing Prices

(Millions of average 1979 dollars, except per share data)	YEAR ENDED DECEMBER 31,				
	1979	1978	1977	1976	1975
Revenue—As reported	$3,641	$2,684	$2,206	$1,840	$1,588
—Adjusted for general inflation	3,641	2,986	2,642	2,346	2,141
Net Income—As reported	658				
—Adjusted for general inflation	575				
Net Income per share—As reported	5.18				
—Adjusted for general inflation	4.53				
Loss from decline in purchasing power of net monetary assets	36				
Net assets at year end—As reported	2,400				
—Adjusted for general inflation	2,531				
Cash dividends declared per share —As reported	1.10	.83	.63	.40	.29
—Adjusted for general inflation	1.10	.93	.76	.51	.39
Market price per share at 12/31 —As reported	93.75	63.17	48.50	42.83	33.78
—Adjusted for general inflation	88.81	67.68	56.66	53.48	44.16
Average consumer price index	217.4	195.4	181.5	170.5	161.2

NOTE: Depreciation charged to restated costs and expenses amounted to $278 million, as compared with reported depreciation of $242 million.

SCHLUMBERGER LIMITED
(Schlumberger N.V., Incorporated in the Netherlands Antilles) and Subsidiary Companies

Consolidated Balance Sheet
Assets

	December 31, 1979	1978
	(Stated in thousands)	
CURRENT ASSETS:		
Cash	$ 16,694	$ 12,455
Short-term investments	1,006,959	771,784
Receivables less allowance for doubtful accounts (1979–$23,373; 1978–$19,671)	875,891	626,431
Inventories	488,357	341,993
Other current assets	44,920	36,167
	2,432,821	1,788,830
INVESTMENTS IN AFFILIATED COMPANIES	191,886	96,615
LONG-TERM INVESTMENTS AND RECEIVABLES	52,248	69,310
FIXED ASSETS less accumulated depreciation	1,334,920	904,855
EXCESS OF INVESTMENT OVER NET ASSETS OF SUBSIDIARIES PURCHASED less amortization	305,915	57,007
OTHER ASSETS	57,396	38,223
	$4,375,186	$2,954,840

SEE NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Consolidated Balance Sheet
Liabilities & Stockholders' Equity

	December 31, 1979	1978
	(Stated in thousands)	
CURRENT LIABILITIES:		
Accounts payable and accrued liabilities	$ 650,464	$ 395,908
Estimated liability for taxes on income	516,273	361,713
Bank loans	123,183	97,143
Dividend payable	34,978	29,687
Long-term debt due within one year	66,681	19,026
	1,391,579	903,477
LONG-TERM DEBT	489,629	85,433
OTHER LIABILITIES	81,158	53,918
MINORITY INTEREST IN SUBSIDIARIES	12,493	12,017
	1,974,859	1,054,845
STOCKHOLDERS' EQUITY:		
Common stock	268,172	255,543
Income retained for use in the business	2,295,680	1,777,117
Deduct Treasury stock at cost	(163,525)	(132,665)
	2,400,327	1,899,995
	$4,375,186	$2,954,840

SEE NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

SCHLUMBERGER LIMITED
(Schlumberger N.V., Incorporated in the Netherlands Antilles) and Subsidiary Companies

Consolidated Statement of Income

	Year ended December 31, 1979	1978
	(Stated in thousands)	
REVENUE:		
Operating	$3,549,647	$2,619,245
Interest and other income	91,791	64,697
	3,641,438	2,683,942
EXPENSES:		
Cost of goods sold and services	2,061,392	1,498,939
Research & engineering	131,334	90,519
Marketing	173,192	119,565
General	209,981	160,089
Interest	52,175	17,962
Taxes on income	354,968	294,895
	2,983,042	2,181,969
NET INCOME	$ 658,396	$ 501,973
Net income per share *	$ 5.18	$ 3.94
Average number of shares outstanding (thousands) *	127,117	127,482

*Adjusted for three-for-two stock split in March 1979

SEE NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Consolidated Statement of Stockholders' Equity *

	Common Stock				Income retained for use in the business
	In Treasury		Issued		
	Shares	Amount	Shares	Amount	
	(Dollar amounts in thousands)				
Balance, January 1, 1978	5,025,507	$ 77,765	132,938,224	$246,334	$1,381,316
Purchases for Treasury	1,064,700	54,900			
Sales to optionees			277,628	9,209	
Net income					501,973
Dividends declared ($0.83 per share)					(106,172)
Balance, December 31, 1978	6,090,207	132,665	133,215,852	255,543	1,777,117
Purchases for Treasury	406,300	30,860			
Sales to optionees			382,516	12,629	
Net income					658,396
Dividends declared ($1.10 per share)					(139,833)
Balance, December 31, 1979	6,496,507	$163,525	133,598,368	$268,172	$2,295,680

*Share and per share amounts adjusted for three-for-two stock split in March 1979

SEE NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

SCHLUMBERGER LIMITED
(Schlumberger N.V., Incorporated in the Netherlands Antilles) and Subsidiary Companies

Consolidated Statement of Changes in Financial Position

	Year ended December 31, 1979	1978
	(Stated in thousands)	
SOURCE OF WORKING CAPITAL:		
Net income	$ 658,396	$ 501,973
Add (deduct) amounts not affecting working capital:		
Depreciation	242,183	183,801
Amortization of intangibles	8,014	3,171
Earnings of companies carried at equity, less dividends received (1979–$8,335; 1978–$7,167)	(30,147)	(20,693)
Other–net	(12,474)	(18,766)
Working capital provided from operations	865,972	649,486
Increase in long-term debt	425,029	44,149
Retirement and sale of fixed assets	37,148	13,080
Proceeds from sale of shares to optionees	12,629	9,209
Other–net	1,396	4,730
Total working capital provided	1,342,174	720,654
APPLICATION OF WORKING CAPITAL:		
Net noncurrent assets of Fairchild Camera and Instrument Corp. acquired and consolidated	407,747	—
Investment in Rowan Companies, Inc.	22,379	44,626
Increase in other long-term investments and receivables	15,066	7,334
Additions to fixed assets	503,415	393,312
Dividends declared	139,833	106,172
Reduction of long-term debt	66,985	15,061
Purchase of shares for Treasury	30,860	54,900
Total working capital applied	1,186,285	621,405
NET INCREASE IN WORKING CAPITAL	$ 155,889	$ 99,249
INCREASE IN WORKING CAPITAL CONSISTS OF:		
Increase in current assets:		
Cash and short-term investments	$ 239,414	$ 104,995
Receivables	249,460	129,899
Inventories	146,364	45,057
Other current assets	8,753	5,772
Increase in current liabilities:		
Accounts and dividend payable	(259,847)	(93,574)
Estimated liability for taxes on income	(154,560)	(53,065)
Bank loans and debt due within one year	(73,695)	(39,835)
NET INCREASE IN WORKING CAPITAL	$ 155,889	$ 99,249

SEE NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Notes to Consolidated Financial Statements

Summary of Accounting Policies

The Consolidated Financial Statements of Schlumberger Limited have been prepared in accordance with accounting principles generally accepted in the United States of America. Within those principles, the Company's more important accounting policies are set forth below.

Principles of Consolidation

The Consolidated Financial Statements include the accounts of all significant majority-owned subsidiaries. Significant 20%-50% owned companies are carried in investments in affiliated companies on the equity method. The pro rata share of revenue and expenses of Dowell Schlumberger, a 50% owned oilfield services company, is included in the individual captions in the Consolidated Statement of Income. Schlumberger's pro rata share of after tax earnings of other equity companies is included in interest and other income. Other investments in affiliated companies are carried at cost less allowances for possible losses which, based in part on unaudited figures, approximates Schlumberger's share of underlying equity.

Translation of Non-U.S. Currencies

Balance sheet items recorded in currencies other than U.S. dollars are translated at current exchange rates except for inventories, fixed and intangible assets and long-term investments which are translated at historical rates. Revenue and expenses are translated at average exchange rates during the year except for those amounts related to balance sheet items translated at historical rates. Translation adjustments and gains or losses on forward exchange contracts are taken up in income currently.

Short-Term Investments

Short-term investments are stated at cost plus accrued interest, which approximates market value.

Inventories

Inventories are stated principally at average or standard cost, which approximates average cost, or at market, if lower.

Fixed Assets and Depreciation

Fixed assets are stated at cost less accumulated depreciation, which is provided for by charges to income over the estimated useful lives of the assets by the straight-line method. Fixed assets include the cost of Company manufactured oilfield technical equipment for use in wireline operations. Expenditures for renewals, replacements and betterments are capitalized. Upon sale or other disposi-

tion, the applicable amounts of asset cost and accumulated depreciation are removed from the accounts and the net amount, less proceeds from disposal, is charged or credited to income.

Maintenance and repairs are charged to operating expenses as incurred.

Excess of Investment Over Net Assets of Subsidiaries Purchased

Costs in excess of net assets of purchased subsidiaries having an indeterminate life are amortized over 40 years.

Deferred Benefit Plans

The Company and its subsidiaries have several voluntary pension and other deferred benefit plans covering substantially all officers and employees, including those in countries other than the United States. These plans are substantially fully funded with trustees in respect of past and current services. Charges to expense are based upon costs computed by independent actuaries.

In France, the principal pensions are provided for by union agreements negotiated by all employers within an industry on a nationwide basis. Benefits when paid are not identified with particular employers, but are made from funds obtained through concurrent compulsory contributions from all employers within each industry based on employee salaries. These plans are accounted for on the defined contribution basis and each year's contributions are charged currently to expense.

Taxes on Income

Schlumberger and its affiliated companies compute income taxes payable in accordance with the tax rules and regulations of the many taxing authorities where the income is earned. The income tax rates imposed by these taxing authorities vary substantially. Taxable income may differ from pretax income for financial accounting purposes. To the extent that differences are due to revenue and expense items reported in one period for tax purposes and in another period for financial accounting purposes, appropriate provision for deferred income taxes is made. The provisions were not significant in 1979 or 1978.

Investment credits and other allowances provided by income tax laws of the United States and other countries are credited to current income tax expense on the flow-through method of accounting.

Approximately $2.1 billion of consolidated income retained for use in the business at December 31, 1979 represents undistributed earnings of consolidated subsidiaries and Schlumberger's pro rata share of 20%-50% owned companies. It is the policy of the Company to reinvest substantially all such undistributed earnings and no provision is made for deferred income taxes on those earnings considered to be indefinitely reinvested.

Treasury Stock

Treasury stock is carried at cost and is shown separately on the balance sheet as a reduction of stockholders' equity.

Net Income Per Share

Net income per share is computed by dividing net income by the average number of common shares outstanding during the year.

Research & Engineering

All research & engineering expenditures are expensed as incurred, including costs relating to patents or rights which may result from such expenditures.

Acquisition of Fairchild Camera and Instrument Corporation

During 1979 the Company acquired Fairchild Camera and Instrument Corporation, an international firm which develops, manufactures and markets electronic components and equipment primarily for commercial, industrial and governmental markets, at a cost of $425 million (including expenses). The acquisition has been accounted for as a purchase and the accounts of Fairchild have been consolidated with those of Schlumberger effective July 1, 1979 after assigning fair values to the individual assets acquired and liabilities assumed. Cost in excess of net assets acquired in the amount of $253 million is being amortized on a straight-line basis over 40 years.

The following pro forma consolidated amounts combine the historical accounts of Schlumberger and Fairchild and reflect all purchase accounting adjustments as though Fairchild had been acquired January 1, 1978.

	Year ended December 31, 1979	1978
	(Stated in millions)	
Revenue	$3,956	$3,208
Net income	$ 666	$ 506
Net income per share (dollars)	$ 5.24	$ 3.97

Fixed Assets

A summary of fixed assets follows:

	December 31, 1979	1978
	(Stated in millions)	
Land	$ 37.3	$ 27.6
Buildings & improvements	307.6	198.7
Machinery and equipment	1,615.6	1,207.5
Construction in progress	240.4	183.2
Total cost	2,200.9	1,617.0
Less accumulated depreciation	866.0	712.1
	$1,334.9	$ 904.9

Long-Term Debt

At December 31, 1979 consolidated long-term debt, excluding amounts due within one year, consisted of the following:

	(Stated in millions)
Loans from U.S. banks payable in dollars, due 1981–1985, interest 105% of U.S. prime	$425.0
Loans from French banks payable in francs, due 1981–1985, interest 5.75%-10%	17.4
Other loans payable mainly in dollars, interest 5.75%–11%	47.2
	$489.6

Long-term debt at December 31, 1979 is due $104.9 million in 1981, $95.8 million in 1982, $90.8 million in 1983, $90.5 million in

1984, $90.1 million in 1985 and $17.5 million thereafter.

Common Stock

Common Stock, par value $1.00 per share, comprised the following number of shares adjusted for the three-for-two stock split in March 1979:

	December 31, 1979	1978
Authorized	300,000,000	200,000,000
Issued	133,598,368	133,215,852
In Treasury	(6,496,507)	(6,090,207)
Outstanding	127,101,861	127,125,645

Options to officers and key employees to purchase shares of the Company's Common Stock were granted at prices equal to 100% of fair market value at date of grant.

Options previously granted by Fairchild to its employees which were assumed by the Company were converted to options to purchase shares of the Company's Common Stock at prices not less than 50% of fair market value at date of assumption in accordance with the terms of the 1979 Stock Option Plan.

Transactions under stock option plans during 1979 and 1978 were as follows:

	Number of shares under option 1979	1978
January 1,	1,140,890	1,388,130
Granted for		
five years	683,163	107,625
seven years	108,152	—
ten years	633	—
Exercised	(382,516)	(277,628)
Lapsed or terminated	(43,988)	(77,237)
December 31,	1,506,334	1,140,890

The 1,506,334 shares under option at December 31, 1979 were held by 863 officers and key employees at option prices ranging from $31.70 to $95.63; options for 409,837 shares were exercisable at that date. A balance of 4,366,743 shares of Common Stock remained available for future option under the plans. During 1979 and 1978, 382,516 and 277,628 previously unissued shares, respectively, were sold on exercise of stock options.

Leases and Lease Commitments

Total rental expense was $68.4 million in 1979 and $52.1 million in 1978.

Future minimum rental commitments under noncancelable leases for years ending December 31 are: 1980-$20.6 million; 1981-$15.3 million; 1982-$11.9 million; 1983-$9.1 million and 1984-$6.3 million. For the ensuing three five-year periods, these commitments decrease from $21.7 million to $12.3 million. The minimum rentals over the remaining terms of the leases aggregate $16.7 million. Noncancelable rental commitments are principally for real estate and office space. Noncapitalized financing lease commitments are not material.

Tax Assessments

As previously reported, the U.S. Internal Revenue Service has completed its examination of Schlumberger's U.S. income tax returns for 1967-1969 and has assessed additional tax. The principal parts of the assessment (excluding interest) arise from nonrecurring transfers of assets from a subsidiary to the parent company ($24 million) and from continuing wireline operations on the U.S. outer continental shelf ($6 million). The Company maintains that the tax effects of these transactions were properly determined and reported. While the principal issues in the case involve novel questions as to which there is no direct authority, independent counsel is of the opinion that the Company's position will prevail.

The Company is contesting this assessment and in connection therewith, tax payments totaling $24.7 million (including interest) with respect to 1967 and 1968 were made in 1975, and, in addition, a tax payment of $22.6 million (including interest) with respect to 1969 will be made in 1980. These payments will not affect net income.

The U.S. Internal Revenue Service has completed its examination of Schlumberger's U.S. income tax returns for 1970-1972 and, as expected, has proposed additional assessments including, consistent with its earlier position, a deficiency of $8 million (excluding interest) based upon income from continuing wireline operations on the U.S. outer continental shelf. Similarly, the Internal Revenue Service is examining Schlumberger's U.S. income tax returns for 1973-1975 and is expected to propose additional assessments of $19 million on this income for these years. A determination for the earlier years does not necessarily resolve the taxability of this income subsequent to 1969.

Management is of the opinion that the reserve for estimated liability for taxes on income is adequate and that any adjustments which may ultimately be determined will not materially affect the financial position or results of operations.

Supplementary Information

Short-term investments are collectible mainly in U.S. dollars and include interest bearing time deposits of $970 million and $740 million at December 31, 1979 and 1978, respectively.

Interest income was $82 million in 1979 and $60 million in 1978.

Investments in affiliated companies are summarized as follows:

	December 31, 1979	1978
	(Stated in millions)	
20%-50% owned companies	$189.0	$93.0
Other	2.9	3.6
	$191.9	$96.6

During 1979, Schlumberger purchased additional shares of Rowan Companies, Inc. in the open market raising its ownership to approximately 23% of the voting shares. Effective January 1, 1979, the investment in Rowan was accounted for under the equity method.

During the year, Schlumberger purchased 496,425 shares of common stock of Unitrode Corporation for $12.4 million. Schlumberger has entered into an agreement to sell all of the Unitrode shares to The Signal Companies, subject to the approval of the Federal Trade Commission.

In 1979, expense of the pension and deferred benefit plans was $55.4 million and of the compulsory contributions for French retirement benefits was $22.4 million; 1978 amounts for such plans were $38.9 million and $16.8 million, respectively.

Foreign exchange losses in 1979 and 1978 were $5.3 million and $6.7 million, respectively.

Segment Information

Financial information for the years ended December 31, 1979 and 1978 by industry segment and geographic area is as follows:

Industry Segment–1979

(Stated in millions)

	Oilfield Services	Measurement, Control & Components	Adjust. and Eliminations	Consolidated
Operating revenue–				
Customers	$2,036.8	$1,512.8	$ —	$3,549.6
Intersegment transfers	1.1	59.0	(60.1)	—
	$2,037.9	$1,571.8	$(60.1)	$3,549.6
Operating income	$ 809.1	$ 188.8	$(13.6)	$ 984.3
Interest expense				(52.2)
Interest and other income less other charges–$10.5				81.3
Income before taxes				$1,013.4
Depreciation expense	$ 197.2	$ 43.4	$ 1.6	$ 242.2
Fixed asset additions	$ 404.7	$ 96.0	$ 2.7	$ 503.4
At December 31–				
Identifiable assets	$1,630.2	$1,624.0	$(31.0)	$3,223.2
Corporate assets				1,152.0
Total assets				$4,375.2

Industry Segment–1978

(Stated in millions)

	Oilfield Services	Measurement, Control & Components	Adjust. and Eliminations	Consolidated
Operating revenue–				
Customers	$1,636.3	$ 982.9	$ —	$2,619.2
Intersegment transfers	.5	36.7	(37.2)	—
	$1,636.8	$1,019.6	$(37.2)	$2,619.2
Operating income	$ 647.5	$ 122.5	$ (6.0)	$ 764.0
Interest expense				(18.0)
Interest and other income less other charges–$13.8				50.9
Income before taxes				$ 796.9
Depreciation expense	$ 154.6	$ 27.4	$ 1.8	$ 183.8
Fixed asset additions	$ 340.1	$ 49.7	$ 3.5	$ 393.3
At December 31–				
Identifiable assets	$1,281.4	$ 813.7	$(11.8)	$2,083.3
Corporate assets				871.5
Total assets				$2,954.8

The Company's business comprises two segments: (1) Oilfield Services and (2) Measurement, Control & Components. The Oilfield Services segment offers well site services to the petroleum industry throughout the world. The Measurement, Control & Components segment manufactures measurement and control products and electronic components, which are sold to public utilities, governments, laboratories and industrial plants primarily in the U.S. and Europe. Services and products are described in more detail earlier in this report.

Geographic Area–1979

(Stated in millions)

	U.S. and Canada	France	Other European Countries	Other	Adjust. and Elim.	Consolidated
Operating revenue–						
Customers	$1,205.6	$618.5	$469.0	$1,256.5	$ —	$3,549.6
Interarea transfers	149.2	131.1	7.2	93.8	(381.3)	—
	$1,354.8	$749.6	$476.2	$1,350.3	$(381.3)	$3,549.6
Operating income	$ 349.1	$ 82.5	$117.5	$ 448.2	$(13.0)	$ 984.3
Interest expense						(52.2)
Interest and other income less other charges–$10.5						81.3
Income before taxes						$1,013.4
At December 31–						
Identifiable assets	$1,368.7	$633.1	$339.9	$1,023.0	$(141.5)	$3,223.2
Corporate assets						1,152.0
Total assets						$4,375.2

Geographic Area–1978

(Stated in millions)

	U.S. and Canada	France	Other European Countries	Other	Adjust. and Elim.	Consolidated
Operating revenue–						
Customers	$789.1	$496.9	$363.1	$ 970.1	$ —	$2,619.2
Interarea transfers	113.2	100.3	—	1.7	(215.2)	—
	$902.3	$597.2	$363.1	$ 971.8	$(215.2)	$2,619.2
Operating income	$263.2	$ 61.4	$ 88.3	$ 361.9	$ (10.8)	$ 764.0
Interest expense						(18.0)
Interest and other income less other charges–$13.8						50.9
Income before taxes						$ 796.9
At December 31–						
Identifiable assets	$635.3	$562.7	$261.5	$ 687.4	$(63.6)	$2,083.3
Corporate assets						871.5
Total assets						$2,954.8

Transfers between segments and geographic areas are for the most part made at regular prices available to unaffiliated customers. Certain Oilfield Services segment fixed assets are manufactured within that segment and some are supplied by Measurement, Control & Components.

Corporate assets largely comprise short-term investments.

During the years ended December 31, 1979 and 1978, neither sales to any government nor sales to any single customer exceeded 10% of consolidated operating revenue.

Quarterly Results (Unaudited)

The following table summarizes results for each of the four quarters for the years ended December 31, 1979 and December 31, 1978.

	1979			
	Operating revenue	Gross profit*	Net income Amount	Per share**
	(Stated in millions)		(Dollars)	
Quarters				
First	$ 734.5	$ 304.0	$128.0	$1.01
Second	781.7	338.0	160.9	1.26
Third	962.2	406.3	173.8	1.37
Fourth	1,071.2	439.9	195.7	1.54
Total	$3,549.6	$1,488.2	$658.4	$5.18

	1978			
	Operating revenue	Gross profit*	Net income Amount	Per share**
	(Stated in millions)		(Dollars)	
Quarters				
First	$ 607.1	$ 262.7	$ 97.2	$0.76
Second	656.8	282.7	131.6	1.03
Third	651.8	283.1	135.7	1.07
Fourth	703.5	291.8	137.4	1.08
Total	$2,619.2	$1,120.3	$501.9	$3.94

*Operating revenue less cost of goods sold and services.

**Adjusted for three-for-two stock split in March 1979.

Replacement Cost Data (Unaudited)

Inflation during recent years has caused increases in the prices paid for purchased goods and services. Generally, the Company has been able to compensate for these increases through technological upgrading of plant and equipment, cost controls and sales price increases.

In its annual report to the Securities and Exchange Commission on Form 10-K to be filed by March 31, 1980 the Company will report estimated replacement cost of productive capacity and inventories at December 31, 1979 and the approximate impact this would have on cost of goods sold and services and depreciation expense for the year then ended.

Report of Independent Accountants

PRICE WATERHOUSE & CO. 153 East 53rd Street, New York 10022
February 13, 1980

TO THE BOARD OF DIRECTORS AND STOCKHOLDERS OF SCHLUMBERGER LIMITED:

In our opinion, the accompanying consolidated balance sheet and the related consolidated statements of income, stockholders' equity and changes in financial position present fairly the financial position of Schlumberger Limited and its subsidiaries at December 31, 1979 and 1978, and the results of their operations and the changes in their financial position for the years then ended, in conformity with generally accepted accounting principles consistently applied. Our examinations of these statements were made in accordance with generally accepted auditing standards and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

Price Waterhouse & Co

SCHLUMBERGER LIMITED
(Schlumberger N.V., Incorporated in the Netherlands Antilles) and Subsidiary Companies

Five Year Summary

(Amounts in millions except per share amounts)

	YEAR ENDED DECEMBER 31,				
	1979(A)	1978	1977	1976	1975(B)
SUMMARY OF OPERATIONS					
Revenue:					
Oilfield Services	$2,037	$1,636	$1,310	$1,005	$ 845
Measurement, Control & Components	1,513	983	850	805	721
Interest and other income	91	65	46	30	22
	$3,641	$2,684	$2,206	$1,840	$1,588
% Increase over prior year	36%	22%	20%	16%	30%
Cost of goods sold and services	$2,061	$1,499	$1,231	$1,071	$ 950
Operating income:					
Oilfield Services	$ 809	$ 648	$ 540	$ 383	$ 299
Measurement, Control & Components	188	122	93	77	64
Eliminations	(13)	(6)	(1)	—	(2)
	$ 984	$ 764	$ 632	$ 460	$ 361
% Increase over prior year	29%	21%	37%	27%	41%
Interest expense	$ 52	$ 18	$ 16	$ 15	$ 24
Taxes on income	$ 355	$ 295	$ 248	$ 168	$ 125
Net income	$ 658	$ 502	$ 401	$ 293	$ 219
% Increase over prior year	31%	25%	37%	34%	49%
Per common share:					
Net income	$ 5.18	$ 3.94	$ 3.12	$ 2.27	$ 1.74
Cash dividends declared	$ 1.10	$ 0.83	$ 0.63	$ 0.40	$ 0.29
SUMMARY OF FINANCIAL DATA					
Net income as % of revenue	18%	19%	18%	16%	14%
Return on average stockholders' equity	31%	29%	28%	25%	26%
Fixed asset additions	$ 503	$ 393	$ 212	$ 187	$ 222
Depreciation expense	$ 242	$ 184	$ 159	$ 130	$ 99
Average number of shares outstanding	127	127	129	129	126
AT DECEMBER 31—					
Working capital	$1,041	$ 885	$ 786	$ 625	$ 457
Total assets	$4,375	$2,955	$2,385	$1,995	$1,716
Stockholders' equity	$2,400	$1,900	$1,550	$1,280	$1,038

(A) Results of Fairchild Camera and Instrument Corp. have been consolidated with Schlumberger beginning July 1, 1979.
(B) Results of Sangamo Electric Company have been consolidated with Schlumberger beginning July 1, 1975.

Directors

Jacques de Fouchier*
Former Chairman, Compagnie financière de Paris et des Pays-Bas, Paris

Roland Génin*□
Executive Vice President-Operations, Schlumberger

Charles Goodwin, Jr.
Partner, Shearman & Sterling, attorneys, New York City

George H. Jewell○
Partner, Baker & Botts, attorneys, Houston, Texas

Paul Lepercq*□
Managing Director, Lepercq International, N.V., London

George de Menil
Director, Center for Quantitative and Comparative Economics, Ecole des Hautes Etudes en Sciences Sociales, Paris

Ellmore C. Patterson□ ○
Former Chairman, Morgan Guaranty Trust Company, New York City

Françoise Schlumberger Primat
Director, Schlumberger Museum, France

Jean Riboud*□
Chairman and President, Schlumberger

Pierre Marcel Schlumberger○
Attorney, Houston, Texas

Benno C. Schmidt*○
Managing Partner, J. H. Whitney & Co., private investment firm, New York City

Jerome B. Wiesner*
President, Massachusetts Institute of Technology, Cambridge, Massachusetts

○Member Audit Committee
*Member Executive Committee
□Member Finance Committee

Officers

Jean Riboud
Chairman and President

Roland Génin
Executive Vice President-Operations

Arthur Lindenauer
Executive Vice President–Finance

Bernard Alpaerts
Executive Vice President

D. Euan Baird
Executive Vice President

Thomas C. Roberts
Executive Vice President

Michel Vaillaud
Executive Vice President

David S. Browning
Secretary and General Counsel

Arthur W. Alexander
Vice President and Director of Personnel

Jean Babaud
Vice President

Michel Gouilloud
Vice President

André Salaber
Vice President

Nick A. Schuster
Vice President

Roy R. Shourd
Vice President

William W. Dunn
Controller

Richard B. Stearns, Jr.
Treasurer

Horace R. Cardoni
Assistant Secretary

André Laloux
Assistant Secretary

Management Changes

On August 1, 1979 Euan Baird was elected Executive Vice President of Schlumberger Limited, in charge of worldwide Wireline operations. Mr. Baird was previously Vice President-Wireline Operations Eastern Hemisphere and South America. He replaces Charles Evans, who retired after 31 years with Schlumberger.

On November 7, 1979 Thomas C. Roberts was elected President and Chief Executive Officer of Fairchild, following the resignation of Wilfred J. Corrigan. Mr. Roberts was elected Executive Vice President of Schlumberger Limited. Previously, Mr. Roberts was General Manager of Measurement & Control operations in the United Kingdom and most recently Vice President and Chief Financial Officer of Schlumberger Limited.

On January 1, 1980 Arthur Lindenauer joined Schlumberger Limited as Executive Vice President and Chief Financial Officer. He was a Partner of Price Waterhouse & Co. in New York.

On January 1, 1980 Carl Buchholz was appointed President of The Analysts, a Houston subsidiary, replacing Mike McCutchan. Mr. McCutchan was made Assistant to Roland Génin, Executive Vice President-Operations of Schlumberger Limited. Mr. Buchholz was Vice President and Director of Personnel for Schlumberger Limited.

On January 1, 1980 Arthur Alexander, Deputy Director of Personnel, was appointed Vice President and Director of Personnel for Schlumberger Limited.

On March 3, 1980 William Dunn was elected Controller of Schlumberger Limited, replacing James H. Poyner, who resigned.

Stock Transfer Agents

Citibank, N.A.
New York, New York

Bank of the Southwest
Houston, Texas

Registrars

Citibank, N.A.
New York, New York

Bank of the Southwest
Houston, Texas

Schlumberger stock is listed on the following exchanges:
New York (trading symbol: SLB)
Paris
London
Amsterdam
Geneva

Form 10-K

Stockholders may receive a copy of Form 10-K filed with the Securities and Exchange Commission without charge on request to the Secretary, Schlumberger Limited, 277 Park Avenue, New York, New York, 10017.

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The Schlumberger CSU Wireline Logging Truck

Schlumberger Limited
277 Park Avenue, New York, N.Y. 10017/42 rue Saint-Dominique, 75007 Paris