The oil companies made record profits in 2000. The mood of crisis in 1998 and 1999 has disappeared, and the whole of the petroleum sector is looking forward to better times. Nevertheless, the situation in the future will never be the same as it was before 1998, because a thorough reorganisation of the whole industry has led to a situation with fewer, but larger, oil and supply companies.

SINTEF Petroleum Research has come through these difficult years with flying colours. Although turnover was reduced we have increased our equity capital in the course of this period, and we have established a much stronger focus on markets beyond the Norwegian continental shelf, resulting in contracts in the Gulf of Mexico, West Africa and the Middle East. During the past few years we have focused particularly on Iran, which we regard as a promising and rapidly growing market. In the face of extremely tough international competition we have won two contracts for integrated reservoir studies on the Azadegan field in southwestern Iran, the largest petroleum discovery the world has seen for 20 years.

It is still important to develop technology for the Norwegian shelf as well. By the end of last year, we had produced only 22% of the total petroleum resources on the Norwegian continental shelf. Enormous values still lie below the seabed, and new and even better technologies will be needed for every percentage increase in our rate of recovery of these resources. In 2000, oil and gas production made up 22% of Norway’s GNP and 46% of all Norwegian exports. We will be producing gas for at least another hundred years and oil for perhaps 50. At present, the Norwegian economy is highly dependent on revenue from the petroleum sector, and will probably continue to be so for several generations. It should therefore be in the interest of the Norwegian authorities to invest seriously in research on petroleum exploration and production, in order to guarantee this country the maximum yield from the natural petroleum resources that nature has given us. Nevertheless, for several years the Research Council of Norway has been reducing its support for petroleum research.

The past few years have seen a number of initiatives taken by the Ministry of Petroleum and Energy to examine the conditions for research in the petroleum sector, while a number of committees have been looking at how Norway’s total investments in petroleum related R&D can be exploited more efficiently. I believe that the total innovation and development potential of SINTEF Petroleum Research and other Norwegian petroleum research institutes has been significantly underestimated during this process. SINTEF Petroleum Research produces new research-based knowledge in collaboration with most of the important international participants in the petroleum sector, and is part of a global R&D network. Our institute is thus a central node in the chain of wealth creation.

"New knowledge is the fuel of the future". SINTEF Petroleum Research is a supplier of research-based knowledge for the future, to the great benefit of our global network of customers, who come back to us time and time again to refill their tanks with our new knowledge.

David Lysne, President
Activities

SINTEF Petroleum Research is a research and development company located in Trondheim.

SINTEF Petroleum Research made a profit of NOK 2.8 million in 2000. This was the sum of an operating loss of NOK 1.2 million and net financial income of NOK 4 million.

The Board wishes to thank the staff of SINTEF Petroleum Research for their excellent efforts in carrying out their work in 2000.

In spite of high petroleum prices in 2000, the market for R&D services has not picked up again. The oil companies are earning a great deal of money, but both exploration and field development remain at a low level of activity. Service companies and suppliers to the petroleum market have therefore experienced a difficult market situation in 2000, as has SINTEF Petroleum Research. Mergers in the industry continued to take place in 2000, a process that has reduced the global volume of R&D yet further. Towards the end of 2000, however, a number of powerful signals have been received to the effect that an upturn in our market can be expected.

The Institute has to acquire a growing proportion of its income from abroad. For one year, from the summer of 1999 until summer 2000, the Institute was involved in joint marketing efforts with MARINTEK in Houston, Texas. However, these efforts were temporarily shelved as a result of our weak financial position in 2000. Subsequently, these efforts have produced results, both directly and indirectly, in the form of new projects that have justified the input of resources. Other international marketing approaches have enabled the Institute to capture contracts in the Gulf of Mexico, West Africa and Iran in tough competition with international companies. Such efforts ought to be further reinforced in the future, as it is becoming ever more difficult to survive as a research centre of adequate size on the basis of contracts for the Norwegian continental shelf.

The increasingly severe international competition has led to an even sharper focus on what the market is demanding. Focused efforts targeted at Iran have resulted in good contacts with the management of the National Iranian Oil Company (NIOC). Among the results of these contacts is the establishment of a joint venture with NIOC’s research institute, RIPI. This collaboration has brought SINTEF Petroleum Research a prestigious contract to study the Azadegan field, which lies in southwestern Iran near the Iraqi border. This field contains the largest oil discovery in the world made in the past 20 years. Tasks for NIOC offer us a new set of exciting research challenges with considerable international applications. These include R&D related to fractured carbonate reservoirs and processing of land-based seismics.

BASIN MODELLING

The hydrocarbon migration simulator SEMI underwent further development in 2000. One of the improvements consisted of integrating the PRESSIM pressure simulator into SEMI. This will allow the modelling of pressure and the effects of pressure on the migration, accumulation and phase distribution of hydrocarbons. PRESSIM can also be used to quantify lateral flows of formation water, a feature that can be employed, for example, to estimate tilted oil-water contacts. A study of this sort was carried out for one of our customers at the beginning of this year on Haltenbanken.

Another new technology that has been implemented in SEMI in the course of the year has been a set of methods for reconstruction of water depths throughout the geological history of a basin. A recently completed doctoral study has
Palaeo-water depth map restored by using new methods implemented in Semi. The scale is in meters. The histograms indicate hydrocarbon phases in the underlying reservoir. The left histogram in every set has been modelled using water depth input, while the two to the right in each set has been modelled without water depth.
demonstrated that this information may be of importance to total modelled quantities of hydrocarbons and for phase distribution within the traps.

SEMI has been licensed to five companies in 2000, and our clients have utilised the program in several basin modelling studies worldwide. One example worth mentioning in this respect is a study that was carried out in the fall of 2000 for Enterprise Oil in the northern North Sea. The results of this study will be presented at the EAGE Conference in Amsterdam in spring 2001.

In the course of 2000, progress was made in our strategic institute programme which will utilise high-resolution “fingerprinting” of selected hydrocarbon components to make more certain predictions of hydrocarbon phases in undrilled prospects. A prototype of a simulator has been developed that calculates generation and cracking rates of oil and gas components on the basis of heating experiments carried out on various types of source rocks. These experiments, which were carried out in our organic geochemistry laboratory, have provided a basis for constructing detailed kinetic models for the Draupne, Spekk and Åre source rocks, and the results can be utilised in both SEMI and other basin modelling simulators.

In autumn 2000 we launched a follow-up research project on migration in faults and fractures (SMIFF2). The project is being supported by Agip, Conoco, Statoil and TotalFinaElf and is being carried out in collaboration with IFE and NGI. This is a continuation of five years of good cooperation among these three institutes. Calculations of stress and hydraulic leakage are the focus of the second phase of this project.

SEISMSCS AND FORMATION PHYSICS
The year began with a series of organisational changes which involved the merger of the Seismics and Formation Physics departments.

A significant proportion of the activities of the department in 2000 have been concerned with an EU Thermie Programme project called SEISBAS, which started in 1999. The main objective of the project is to demonstrate how advanced
seismic processing techniques and geological interpretation can be employed to provide input for high-resolution basin modelling studies. This work is being carried out on data from the Sleipner field area and is being supported by two licensees in this area. The use of 3D AVO (Amplitude Versus Offset) inversion to estimate rock parameters from seismics has continued throughout the project. Basic studies in 4D AVO inversion have been carried out and this activity will continue in 2001.

Reservoir monitoring and multicomponent seismics are important core areas of activity in this department. One of several projects pursued in 2000 was the calibration of repeated seismics in order to monitor hydrocarbon migration through an area in the North Sea. The most important activities in multicomponent seismics have concerned elastic anisotropic migration, improved resolution in 3D borehole data and multicomponent AVO inversion.

A major study which has the aim of evaluating the use of seismic monitoring on the Snorre Nord field continued in 2000. We also carried out a project in which measurements of sound velocity in rocks with the seismic frequency range were made using apparatus developed by the department. In this project, velocity measurements on a number of shale samples (also field material) were carried out at frequencies of around 10 Hz, giving us the opportunity to study how seismic velocities are influenced by various rock mechanics parameters.

A commercial tool for 2D seismic hybrid modelling has been developed and completed in collaboration with NORSAR. The methodology consists of combining complementary modelling techniques into an improved, more efficient means of seismic modelling of complex reservoirs. Development of a 3D version is now in full swing.

Sand production is a growing problem for the petroleum industry. The department has been focusing attention on this problem for several years. The main fields of action in 2000 involved the prediction of expected amounts of produced sand under given conditions.

Research related to borehole problems in shale continued in 2000, with most emphasis being laid on interactions between shale and drilling mud. Statoil has made use of the results of this project on its Heidrun field, with good results. The study demonstrated a cost reduction of some NOK 20 million for an average well.

The department’s competence in reservoir compaction and subsidence was strengthened in 2000 through an exchange of personnel between Shell SIEP and SINTEF Petroleum Research. Studies were performed for a number of oil companies, including a verification study on the Ormen Lange field.

For a number of years, the department has been putting significant research efforts into the importance of stress-released induced core damage. In 2000 the department focused on modelling the effects of core damage at particle level, including porosity estimates. The results of this activity have been utilised for the most part in The Netherlands.

For some years a group of researchers has been developing methods for determining standard rock mechanics parameters on the basis of tests on small samples and drill cuttings as well as simplified tests made on cores. In 2000 a number of projects were carried out, in which rock mechanics parameters have been determined on the basis of measurements made on drill cuttings, and a patented apparatus for velocity measurements in drill cuttings was licensed to the American company Temco. In 2000, this apparatus was used during drilling on a field in the Gulf of Mexico, with good results.

**SUBSEA AND WELL TECHNOLOGY**

This year has been marked by both organisational and scientific processes of change. At the beginning of the year the Multiphase Flow Laboratory merged with the Department of Drilling and Well Technology to form what is now the Department of Subsea and Well Technology.

In 2000 the department experienced a growing interest in, and demand for, services related to deepwater problems.
Multiphase flow technology and gas hydrate treatment have become hot topics again. The industry has a rapidly growing need to qualify and demonstrate new technology for seabed and downhole production. DEMO 2000 is a national effort that aims to meet this need. Given the expected demand for this type of service, it was decided to make SINTEF’s industry-scale multiphase flow rig operational again in the first quarter of 2001. The status of SINTEF’s Multiphase Flow Laboratory as the EU’s principal laboratory in this sector has also been a contributory factor in making such an investment possible.

We expect to see a high level of activity in multiphase flow research and testing in the next five-year period. Among the activities of the department are two “heavy” multi-year projects. One is an industrial project on sand transport, in collaboration with IFE, while the other is an EU project on slugging in subsea pipelines with oil/water/gas flow, which is being carried out in collaboration with IFE, IFP and Imperial College. The results of this work are an important contribution to the improvements of the commercial multiphase flow simulator OLGA.

The purchase of Petreco’s wheel simulator laboratory in Stjørdal in April was part of our strategy to expand our services within gas hydrates. The wheel simulator makes it possible to study long range flows of oil and gas under seabed conditions, i.e. low temperature and high pressure. The technology is being licensed from Statoil. Two wheel simulators have been brought into operation in the hydrate laboratory. Manning in this field has also been further strengthened to the extent of two research scientists.

Since June 2000, we have been carrying out experiments on various inhibitors for gas hydrates, for BP’s Troika field in the Gulf of Mexico. In December, wheel simulator no. 2 was brought into operation for analysis of well-washing procedures for Statoil. So far, this appears to have been a worthwhile investment. The area of applications is wide, and in addition to gas hydrates, includes such problem areas as wax, asphaltenes and salt deposition in production equipment and transportation pipelines.

Yet another contribution to the internationalisation of our activities has been made by projects for Elf Exploration Angola (now TotalFinaElf) on gas hydrates in connection with the development of the deepwater Girassol field. Deliveries include courses for field operators in dealing with gas hydrates, studies of hydrate inhibitor injection and a customised hydrate plug simulator. We have also signed a contract with FMC Kongsberg Subsea for supplying hydrate courses for developers of subsea production systems.

The department’s largest current project on gas hydrates is CONWHYP, a concept for producing hydrate particles that will simply follow the wellstream without producing deposits and plugging of transportation pipelines. This can be done by simple mechanical methods, and the technology has been patented by SINTEF. The basic development of this concept started at SINTEF in the late 80-ies and the commercial development has taken place in projects since 1998. In 2000 the project was supported by Norsk Hydro, BP, FMC Kongsberg Subsea and the Research Council of Norway.
As well as multiphase flow technology, the department’s deepwater technology activities comprise drilling and intelligent well solutions for subsea wells. A wide-ranging study of challenges and technological solutions in drilling and completion in deep waters was delivered to Agip in April 2000. For the same company, we demonstrated a downhole safety valve for drilling, developed by SINTEF Petroleum Research, during drilling operations in Ravenna in northern Italy in December 2000.

For Norsk Hydro we have developed a rapid, simple simulator for modelling the response of resistivity instruments. The simulator has been tested on models and well logs from the Troll field, and is intended for use in the geological positioning of wells.

A contract with the Trondheim company Sensorlink, regarding the licensing of GeoMag, was signed in June 2000. GeoMag consists of methodology and software for the generation of local 3D–3C geomagnetic anomaly maps, which are used to correct magnetic directional measurements in well drilling. The method offers improvements of up to 50% or 100 m in the lateral positioning of a typical long-range horizontal well on the Norwegian continental shelf. Norsk Hydro and Statoil have already used the method on some 50 wells. GeoMag can cut costs by up to USD 50,000 per well by reducing the number of gyroscope runs needed.

In summer 2000 Halliburton tested Petrotech’s new downhole fluid sampler in their well test string. SINTEF Petroleum Research provided the acoustic communication system for controlling the sampling unit.

In our “Intelligent Wells” strategic institute programme we have developed methodology for evaluating the reliability of well equipment in terms of life-cycle costs and revenue generated. In connection with downhole measurements we have carried out tests at Norsk Hydro’s multiphase flow laboratory in Porsgrunn. The results of the tests show that passive listening to the acoustic noise from a choke allows the volume flow of the three fluid phases of oil, water and gas to be estimated with an accuracy of 10%. In combination with other sensors, accuracy is further improved to 5%. Acoustic measurements can also be used to estimate erosion, detect sand and the pressure drop across a well choke.

In collaboration with the Department of Seismics and Formation Physics we have completed a pilot study that describes methods of defining the vector sensitivity of sensor systems for acquiring seabed seismic data, and measures for qualifying this type of method for various applications. An industry consortium consisting of four oil companies has been established. One of several objectives of the main project, which is due to continue for two years, is to establish and obtain acceptance for an industrial standard for seismic data quality.

In the course of 2000 we have made significant and conscious efforts in international marketing vis-à-vis Houston and the major deepwater operators. A good network has been established; this includes operators, the supply industry and the Deepstar consortium. The focus has been on dealing with formation-induced problems in drilling, reliability analyses of new technologies, seismics while drilling and prediction of pore pressure. Within these last two areas in particular, we can envisage new products for SINTEF Petroleum Research, in which we will be able to exploit our unique expertise in multi-component seismic processing, and further develop the PRESSIM basin modelling tool for drilling purposes.

**RESERVOIR TECHNOLOGY**

The year was characterised by a difficult market situation for contract research and technical services in reservoir technology. Towards the end of the year, however, the situation appeared to become a little brighter, and a number of positive signals from the market are pointing in the direction of an improved market situation in this sector in 2001.

The department has played a core role in the Institute’s activities in the EU project SACS, which is analysing what happens when CO2 separated out from the Sleipner field gas is injected into a shallow aquifer. 3D seismic data acquired at the start of the project and after three years of CO2 injection became available for analysis last year,
enabling us to form a picture of how CO\textsubscript{2} accumulates in the aquifer. It was possible to reproduce the same CO\textsubscript{2} distribution by numerical simulation of the injection process. Access to 4D seismic data has enabled us to improve our understanding of the processes that take place in the aquifer during CO\textsubscript{2} injection. The SACS project has thoroughly demonstrated the usefulness of interdisciplinary project cooperation that combines geophysics, geology and reservoir technology.

A considerable long-term marketing effort vis-à-vis Iran resulted in the first project in this market in 2000. Through a joint venture with NIOC’s research institute, RIPI, SINTEF Petroleum Research won a prestigious contract to study the Azadegan field, which lies in southwestern Iran near the Iraqi border. This field contains the largest oil discovery in the world in the course of the past 20 years.

New projects have also been launched in the department’s CO\textsubscript{2} area of special interest. A sharper focus on the CO\textsubscript{2} challenges throughout the petroleum industry may lead to greater demand for the department’s unique expertise in improved oil recovery via CO\textsubscript{2} and CO\textsubscript{2} deposition.

The FAWAG (Foam Assisted Water Alternating Gas Injection) project on the Snorre field came to an end in 2000. This was the largest foam injection project in the world and it has produced very promising results. The project was launched on the initiative of the department, which participated in it through direct projects as well as through project work performed as part of the RESERVE Foam programme, and finally through a project that has evaluated the results.

A multi-year project for Enterprise Oil, in which we studied how hydrodynamic activity in underlying aquifers affect fluid distribution in petroleum reservoirs, also came to an end in 2000. This project included comprehensive experimental studies, simulations of fluid distribution in a number of characteristic reservoir geometries under various conditions of hydrodynamic activity, and studies of the importance of hydrodynamic activity for fluid distribution in existing oil reservoirs. The EU project RESPONS 2 was also completed in 2000. This was a collaborative project that involved SINTEF Petroleum Research, IFP, AEAT, the University of Liverpool, the University of Delft and the Ecole Normale Superieur. The project dealt with production in gas condensate fields, and

![Simulated CO2 accumulation compared with seismic image.](image-url)
focused primarily on condensate precipitation, blocking and productivity.

The department has performed studies of asphaltene precipitation and transportation in porous media, tests of blocking materials for reducing unwanted water production, measurements of interfacial tension under difficult conditions, various studies of phenomena related to secondary migration and measurements of diffusion. The department participates in a wide range of activities related to the strategic institute programme “Intelligent Wells”. These include modelling near-well flows, the control of intelligent wells and the use of electrical measurements to determine fluid migration in reservoirs.

**FORMATION EVALUATION**

Formation evaluation is a multidisciplinary competence network. Such competence is essential in the performance of integrated field studies. One of the main supports of this network has been a strategic institute programme financed by the Research Council of Norway. The programme has been running for four years and came to an end in 2000. In the area of formation evaluation we have focused on applications related to core activities within the Institute.

Deepwater field developments are offering the offshore industry many new challenges. We have studied how formation induced drilling problems, particularly related to deep water, can be detected and prevented at an early stage. Key words are better models, real-time analyses of measurements while drilling, and the use of borehole seismic data.

In the area of instrumented oilfields, reliable, advanced instrumentation will make it possible to utilise permanently installed sensor systems to monitor reservoir performance. We have developed methods for detecting fluid fronts and changes in fluid saturations, based on electrical and seismic measurement systems in the borehole. Well measurements are combined with information obtained from seabed seismic sensors. In combination with remotely operated downhole valves this offers new perspectives for optimising production.

Better logging data: Well measurements are often influenced by a number of parameters that are not taken sufficiently into account in the process of data interpretation. We have studied how changes in mechanical stress and micro-cracks affect acoustic logs and NMR logs. Such knowledge is of importance for reducing uncertainty in interpretation of petrophysical data.

**PRODUCT DEVELOPMENT**

The petroleum industry is faced with new challenges. Drilling in deep waters and production from marginal fields emphasise the demand for new technology. A systematic approach to product development is a key factor for success in this respect.

SINTEF Petroleum Research has developed a system for new technology development called “Product Development Adviser”. The system follows the product development process from market need to final tested prototype. Multi-discipline “help” support is linked to each activity. Example of “help” support within system reliability is reliability analysis, physical failure mechanisms, human failure mechanisms, formation induced problems and checklists. The “help” system is not necessary the ultimate support. It could also be an overview of a subject making the project team able to communicate with specialists in a particular field. A network of recommended specialists inside and outside SINTEF is included.

The Product Development Adviser is a result of previously accumulated experiences. It is updated continuously by good as well as bad experiences, thus becoming a collection of best practice. 10 years of experience from both product development projects and evaluation projects are integrated.

**ESTABLISHMENT OF NEW COMPANIES**

ExproSoft AS was set up on April 3, 2000 with the objective of commercialising the WELLMASTER well completion and reliability database tool and offering services in applied risk and reliability analyses. Key personnel in this field came from SINTEF Petroleum Research’s Department of Subsea and Well Technology, and these now make up the core
personnel of the new company. At the turn of the year ExproSoft had three full-time employees. Company headquarters are in Trondheim and they also have an office in Stavanger. SINTEF Petroleum Research has a 34% shareholding in ExproSoft.

ORMIS AS (Oilfield Rock Mechanics Integrated Services AS) was established in 1997 by two persons, one of whom came from SINTEF Petroleum Research. ORMIS currently has a staff of five, and its headquarters are in Trondheim. The company is located in Norway, Canada and Italy. In 2000, SINTEF Petroleum Research purchased a 10% shareholding in ORMIS via a share issue.

**Organisation**

At the end of 2000 SINTEF Petroleum Research consisted of four scientific departments in addition to its management support functions.

**Personnel Situation**

The Institute carried out 77 manyears of work in 2000, and the budget for 2001 is 69, a figure that includes budgetted layoffs the first half of the year. At the end of 2000 the Institute had 81 employees, of whom 58 were research scientists, including 31 with doctorates (53%). One member of staff completed his doctorate in 2000, and a further five doctorates were in preparation. A total of nine employees left the Institute in the course of the year, and five persons were employed.

In 2000 SINTEF Petroleum Research had three consultant agreements with members of NTNU’s academic staff.

Two members of staff of SINTEF Petroleum Research spent periods abroad in 2000. One has been employed by MARINTEK Inc. in Houston, and the other was on an exchange visit with Shell in the Netherlands.

Annual appraisal interviews with every member of staff are an important element of organisational development at SINTEF Petroleum Research.
Publications

Fifty-three presentations were made at national and international conferences, and SINTEF Petroleum Research employees were among the authors of 18 articles published in peer-reviewed journals. This is equivalent to 0.92 publications per manyear.

Work Environment

The Work Environment Committee, which is a forum for close cooperation with our staff, is where information is exchanged and important work environment topics are discussed. The Committee held four meetings in 2000.

A comprehensive HSE questionnaire survey was carried out in February 2000 throughout the SINTEF Group. The results that concerned SINTEF Petroleum Research were studied and an action plan for improving weak aspects was drawn up. Virtually all the measures proposed were implemented in 2000. Of these, the following are particularly worth mentioning: risk assessments of laboratories, assessment of work environment in offices, fire and evacuation courses, first-aid courses, ergonomic improvements in offices, and measures implemented at departmental level for improving the work enjoyment, cooperation and motivation.

Absence due to sickness in 2000 was 6.2%, as compared with 3.4% the previous year. The sickness absence picture is dominated by cases of long-term illness.

No accidents occurred in the course of the year, although a near-accident was reported. The necessary follow-up has been carried out and a report written.

External Environment

The company’s HSE system satisfies the requirements of the internal control regulations. This helps to ensure, for example, that our laboratory activities and handling of chemicals do not lead to contamination of the work or external environments. In practice, all chemical substances are dealt with and all waste is disposed of in accordance with current regulations. In 2000 there were no emissions of substances that required emission permits. No specific actions have been demanded by the Labour Inspectorate.

In the course of the year, however, an undesirable incident occurred in the Multiphase Flow Laboratory in connection with building works, when an unplanned leakage of diesel fuel to the ground took place. There were no personnel injuries and no damage was done, and the incident has been reported and improvements implemented in accordance with the requirements of the authorities.

Annual Accounts

SINTEF Petroleum Research's annual operating result for 2000 was NOK -1.2 million (NOK -5.2 million in 1999). Net financial income was NOK 4.0 million (NOK 5.1 million in 1999); this produced an annual result of NOK 2.8 million (NOK -0.1 million in 1999), when restructuring costs of NOK 0.6 million were taken into account.

Although the Institute's liquidity has been reduced by NOK 4.1 million to NOK 61.3 million, its liquidity situation is satisfactory.

Investments and acquisitions of scientific equipment in 2000 came to NOK 3.0 million and NOK 1.0 million respectively, i.e. a total of NOK 4.0 million.

The Board is not aware of any circumstances that have arisen since the accounts were balanced that are of significance for evaluating the economic position of the Institute.

Continued Operation

The Company’s equity has risen to NOK 58.1 million, which is 61% of its total capital, of which in turn the Company’s original share capital is NOK 9.0 million. This is a good basis
for continued operation of the Company, which is the assumption on which the accounts have been drawn up.

Future Developments

At the beginning of 2001, the situation in the service sector of the petroleum industry can be characterised by the phrase "restrained optimism". The oil companies can look back on a very good year, and it is time for them to put capital into new investment projects. This may well mean that the temperature within the petroleum industry will rise once again, which in turn will mean a "lift" for the institute. Regardless of a potential improvement of the Norwegian R&D marked the Institute's effort in increasing its international market share must continue. The volume of R&D related to the Norwegian continental shelf over which the institute sector is currently fighting has gradually become too small to justify the current structure of Norwegian petroleum research institutes. If this volume does not increase in the near future, three alternative solutions can be envisaged: either the structure will have to be modified, the institutes will have to increase the proportion of research they do for overseas clients, or the institutes must attempt to obtain a larger share of the market for technical services for the oil companies.

The Norwegian economy will continue to be dependent on oil revenues for the foreseeable future. At the end of 2000 we had produced only 22% of Norway's total petroleum resources. Considerable quantities of petroleum still lie beneath the seabed, although much of this would be difficult to recover using current technology. Focused research efforts in more efficient exploration technology, improved recovery and cheaper field development solutions would be capable of producing a formidable payoff for both the oil companies and Norwegian society. There is no lack of positive signals from the Norwegian authorities as far as a willingness to raise our level of R&D to the average OECD level is concerned. What remains to be done is to convert this willingness into action.

The privatisation of Statoil and the sale of SDØE shares will be important processes in the coming year. Both of them will have an indirect influence on the frame conditions that govern the Institute's future.

Disposition of Profits

The profit of NOK 2.8 million for 2000 will be transferred to the company's equity capital.

Trondheim, March 1, 2001

Nils Spidsøe                              Roar Arntzen                              Hans Borge
Chairman of the Board

Erik-Sverre Jenssen                              Jon Kleppe                              Erik Lindeberg

Ole Lindefjeld                              Fridtjof Nyhavn                              Sverre Aam

David Lysne
President, SINTEF Petroleum Research
SINTEF Petroleum Research board of directors

First row from left: Roar Arntzen, Nils Spidsæ, Erik-Sverre Jenssen and Ole Lindefjeld.
Second row from left: Hans Borge, Jon Kleppe, Erik G. B. Lindeberg, Fridtjof Nyhavn and Sverre Aam.

Karl A. Berteussen and Jofrid Klokkehaug were absent when the photo was taken.
## Income statement (mNOK)

### Operating income

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<th>Description</th>
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</tr>
<tr>
<td>Project funding from Research Council of Norway</td>
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<td>15,369</td>
</tr>
<tr>
<td>Basic funding from Research Council of Norway</td>
<td>4,500</td>
<td>4,500</td>
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<tr>
<td>Other income</td>
<td>695</td>
<td>354</td>
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<tr>
<td><strong>Gross project income</strong></td>
<td><strong>73,994</strong></td>
<td><strong>76,688</strong></td>
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<tr>
<td>- Direct project expenses</td>
<td>-16,357</td>
<td>-14,815</td>
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<td><strong>Net operating income</strong></td>
<td><strong>57,637</strong></td>
<td><strong>61,873</strong></td>
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### Operating expenses

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<tr>
<td>Wages and social expenses</td>
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<td>Other operating expenses</td>
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<td>Ordinary depreciation</td>
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<td>4,329</td>
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<td>Devaluation</td>
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<td><strong>Total operating expenses</strong></td>
<td><strong>58,863</strong></td>
<td><strong>67,112</strong></td>
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### Operating loss/income

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<tr>
<td><strong>Operating loss/income</strong></td>
<td><strong>-1,226</strong></td>
<td><strong>-5,239</strong></td>
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### Financial income and expenses

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<tr>
<td>- Financial expenses</td>
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<td>-18</td>
</tr>
<tr>
<td><strong>Net financial income</strong></td>
<td><strong>4,038</strong></td>
<td><strong>5,128</strong></td>
</tr>
</tbody>
</table>

### Loss/income

<table>
<thead>
<tr>
<th>Description</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Loss/income</strong></td>
<td><strong>2,813</strong></td>
<td><strong>-111</strong></td>
</tr>
</tbody>
</table>

### Allocation of net loss and equity transfers

<table>
<thead>
<tr>
<th>Description</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Transferred to the equity/from the equity</td>
<td><strong>2,813</strong></td>
<td><strong>-111</strong></td>
</tr>
</tbody>
</table>
Commisions

Research 82%
Service commissions 18%

Distribution of gross operating income by project duration

Programs < 2 years 31%
Programs > 2 years 51%
Short terms commissions 18%

Distribution of gross operating income by client

Contracts 68%
- Industry and commercial enterprises 49%
- International contracts 17%
- Public sector 2%

Research Council of Norway 32%
- Basic grants 6%
- Strategic programs 17%
- Strategic programs other SINTEF institutes 9%

Distribution of employees by position

Administrative staff 10%
Technical staff 8%
Researchers 72%
- (of whom Dr.ing. 53%)
Engineers 10%
## Balance sheet (mNOK)

### Assets

<table>
<thead>
<tr>
<th>Description</th>
<th>2000</th>
<th>1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific equipment</td>
<td>2,571</td>
<td>3,950</td>
</tr>
<tr>
<td>Office equipment, vehicles, inventories</td>
<td>15</td>
<td>113</td>
</tr>
<tr>
<td>Other shares</td>
<td>76</td>
<td>76</td>
</tr>
<tr>
<td>Deposits, companies within the SINTEF Group</td>
<td>50</td>
<td>1,583</td>
</tr>
<tr>
<td>Net pension fund</td>
<td></td>
<td>723</td>
</tr>
<tr>
<td>Deposits, offices/laboratories</td>
<td></td>
<td>119</td>
</tr>
<tr>
<td><strong>Total fixed assets</strong></td>
<td><strong>2,712</strong></td>
<td><strong>6,563</strong></td>
</tr>
<tr>
<td>Projects in progress</td>
<td>1,545</td>
<td>2,636</td>
</tr>
<tr>
<td>Accounts receivable</td>
<td>27,706</td>
<td>18,816</td>
</tr>
<tr>
<td>Acc. receivable, companies within the SINTEF Group</td>
<td>1,980</td>
<td>455</td>
</tr>
<tr>
<td>Other accounts receivable</td>
<td>253</td>
<td>405</td>
</tr>
<tr>
<td>Investments</td>
<td>23,282</td>
<td>43,352</td>
</tr>
<tr>
<td>Cash, bank and post accounts</td>
<td>37,972</td>
<td>21,999</td>
</tr>
<tr>
<td><strong>Total current assets</strong></td>
<td><strong>92,737</strong></td>
<td><strong>87,662</strong></td>
</tr>
<tr>
<td><strong>Total assets</strong></td>
<td><strong>95,449</strong></td>
<td><strong>94,225</strong></td>
</tr>
</tbody>
</table>

### Equity and liabilities

<table>
<thead>
<tr>
<th>Description</th>
<th>2000</th>
<th>1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share capital (900 shares at NOK 10,000)</td>
<td>9,000</td>
<td>9,000</td>
</tr>
<tr>
<td>Other equity</td>
<td>49,128</td>
<td>46,315</td>
</tr>
<tr>
<td><strong>Total equity</strong></td>
<td><strong>58,128</strong></td>
<td><strong>55,315</strong></td>
</tr>
<tr>
<td>Pension liabilities</td>
<td>711</td>
<td>1,407</td>
</tr>
<tr>
<td><strong>Long-term liabilities</strong></td>
<td>711</td>
<td>1,407</td>
</tr>
<tr>
<td>Delivery liabilities</td>
<td>1,349</td>
<td>2,025</td>
</tr>
<tr>
<td>Liabilities, VAT, tax deductions, social security, etc.</td>
<td>3,715</td>
<td>3,749</td>
</tr>
<tr>
<td>Liabilities, companies within the SINTEF Group</td>
<td>3,673</td>
<td>2,811</td>
</tr>
<tr>
<td>Payment in advance</td>
<td>22,113</td>
<td>19,473</td>
</tr>
<tr>
<td>Other short-term liabilities</td>
<td>5,759</td>
<td>9,445</td>
</tr>
<tr>
<td><strong>Current liabilities</strong></td>
<td><strong>36,610</strong></td>
<td><strong>37,503</strong></td>
</tr>
<tr>
<td><strong>Total liabilities</strong></td>
<td><strong>37,321</strong></td>
<td><strong>38,910</strong></td>
</tr>
<tr>
<td><strong>Total equity and liabilities</strong></td>
<td><strong>95,449</strong></td>
<td><strong>94,225</strong></td>
</tr>
</tbody>
</table>
Net profit/Net operating income

![Graph showing net profit and operating profit over years]

Operating profit in % of net income

Employees wages and social expenses

![Graph showing employees wages and personnel cost over years]

Employees wages and social expenses
Employees as of 1 January 2001

Lysne, David (President)

Administration Support
● Berg-Hanssen, Harald
● Flo, Rune
● Fossum, Berit
● Olden, Laila S.
● Pålche, Elin
● Sagmo, Mette A.
● Sneen, Marit

Flo, Rune
● Fossum, Berit
● Olden, Laila S.
● Pålche, Elin
● Sagmo, Mette A.
● Sneen, Marit

Employees as of 1 January 2001

Seismic and Formation Physics
● Bøe, Reidar
● Causse, Emmanuel
● Cerasi, Pierre
● Fjær, Erling
● Hokstad, Ketil
● Holt, Rune Martin
● Larsen, Idar
● Lothe, Ane Elisabet
● Lund, Hans
● Lynum, Ingunn
● Maas, Frank
● Nes, Olav Magnar
● Papamichos, Euripides
● Schei, Grethe
● Sollie, Roger
● Stavrum, Johannes
● Sylta, Øyvind
● Sønstebe, Eyvind F.
● Unander, Tor Erling
● Waldum, Arnstein
● Zweigle, Peter
● Ostmo, Svend

Subsea and Well Technology
● Andersen, Asbjørn
● Andersson, Vibeke
● Borthne, Gunnar
● Carlsen, Inge Manfred
● Dahl, Arne Morten
● Gustavsen, Karl G.
● Jacobsen, Kjell Arne
● Jønsen, Hans Peter
● Kristiansen, Olav
● Larsen, Roar
● Larsen, Rolf Erik
● Lervåg, Johan H.
● Mjaaland, Svein
● Nakken, Erik I.
● Nyhavn, Fridthjof
● Onsrud, Gisle
● Sneeggen, Cecilie
● Straume, Erlend
● Sørvik, Atle
● Wanvik, Hilde
● Wullf, Angelika
● Øyangen, Terje

Reservoir Technology
● Akerovoll, Idar
● Bergmo, Per Erik
● Bjørkvik, Bård
● Bjørseth, Eva Kristin
● Frigård, Oddmund
● Ghaderi, Amir
● Holt, Torleif
● Hustad, Odd Steve
● Lindeberg, Erik G. B.
● Moen, Arild
● Mørk, Atle
● Stavseth, Arnt
● Vassenden, Frode
● Wessel-Berg, Dag

Employees legend by % as of 1 January 2001

Legend
● scientist
● engineer
✦ technical staff
※ administrative personnel
Organisation as of 1 January 2001

Management

David Lysne .......................... President
Grethe Schei .......................... Research Director, Seismics and Formation Physics Department
May Britt Myhr .......................... Research Director, Basin Modelling Department
Erik Iversen Nakken ................. Research Director, Subsea and Well Technology Department
Torleif Holt .......................... Research Director, Reservoir Technology Department

BOARD OF DIRECTORS 2001

Nils Spidsøe (chairman) ............... Managing Director, SINVENT AS
Roar Arntzen .......................... President, SINTEF
Karl Andreas Berteussen .............. Director, PGS Reservoir AS
Hans Borge (from February 2000) ... Scientist, SINTEF Petroleum Research
Bodil Guldseth (until February 2000) Project Secretary, SINTEF Petroleum Research
Erik-Sverre Jønnes ..................... Director Norsk Hydro ASA
Jon Kleppe ............................ Professor IPT, NTNU
Jofrid Klokkehaug ..................... Sector Manager, Statoil
Erik Lindeberg ......................... Scientist, SINTEF Petroleum Research
Ole Lindefjell (from June 2000) ...... Sr. Technical Development Coordinator, Norske Conoco AS
Fridtjof Nyhavn (from April 2000) ... Senior Scientist, SINTEF Petroleum Research
Bjørn Sund (until June 2000) ........ Senior Vice President, Norsk Hydro ASA
Tor Inge Waag (until April 2000) ... Scientist, SINTEF Petroleum Research
SINTEF Group

The SINTEF Group performs contract research and development for industry and the public sector in the fields of technology, medicine and the natural and social sciences.

With 1800 employees and an annual turnover of NOK 1.5 billion, SINTEF is one of Europe's largest independent research organizations. Contracts from the public and private sectors provide 90% of the operating revenue.

SINTEF is a non-profit organization and any earnings are allocated to research or the acquisition of scientific equipment.

SINTEF operates in close collaboration with the Norwegian University of Science and Technology (NTNU). Our experts cooperate in projects and share laboratories and equipment. Together, the two institutions form a center of expertise of high international standard. We also cooperate with the University of Oslo.

Our task as a foundation is to ensure that knowledge is used to promote sustainable value creation in society. The results of SINTEF’s work should be reflected in the competitiveness of Norwegian industry and the productivity of the public sector.

The SINTEF foundation consists of eight research institutes:
- SINTEF Applied Chemistry
- SINTEF Applied Mathematics
- SINTEF Civil and Environmental Engineering
- SINTEF Electronics and Cybernetics
- SINTEF Industrial Management
- SINTEF Materials Technology
- SINTEF Telecom and Informatics
- SINTEF Unimed

The SINTEF Group also includes four research companies:
- SINTEF Energy Research
- SINTEF Fisheries and Aquaculture
- SINTEF Petroleum Research
- MARINTEK – Norwegian Marine Technology Research Institute