The SINTEF Group is the largest independent research organisation in Scandinavia. Our vision is “Technology for a better society”, and we aim to contribute to growth in value creation and improved quality of life.

SINTEF sells research-based knowledge and related services, based on deep insight into technology, natural science, medicine and the social sciences. Our basic values are honesty, generosity, courage and solidarity. SINTEF aims to become one of the most respected research institutions in Europe.

The SINTEF Group comprises the SINTEF Foundation, five limited companies and a holding company. We are a competitive research group with significant potential to make a positive contribution to societal development at regional, national and international level.

The role of SINTEF is to reinforce Norwegian and European competitiveness in a globalised world. We help to develop existing knowledge-based jobs and to create new ones. Our business concept is to build a business culture that is closely integrated with our research culture.
Organisation as of 1 January 2006

**Basin Modelling**
We assist oil companies in quantifying exploration uncertainties. By developing, testing, and applying new concepts and modelling technologies we are able to improve significantly quantitative predictions of hydrocarbons in prospects prior to drilling.

**Wellstream Technology**
Our research enables cost effective and safe transportation of unprocessed production fluids in wells and long distance flowlines. R&D areas cover multiphase flow and cold flow technology including hydrates, scale formation and solids transportation.

**Formation Physics**
Our research covers a number of areas within petroleum related rock mechanics. The activity embraces a combination of theoretical understanding and modelling, experimental investigations in our advanced rock mechanical laboratory, as well as specialized numerical simulations. Throughout our work we benefit from a close cooperation with NTNU.

**Drilling and Well Construction**
We focus on R&D and Advanced Technical Services within drilling, completion and well intervention. Our activities include modelling of the processes, small and large scale experiments, real time simulators for use in operations and development of holistic process control systems combining real time data, modelling, visualization and diagnostics.

**Production Technology**
We work on optimising well productivity through R&D and expert services related to well diagnostics and treatment.

**Seismic and Reservoir Technology**
This department consists of two technical groups. The main activities of the Reservoir Technology group are experimental and numerical modelling of reservoir processes with emphasis on methods for improved oil recovery, and aquifer deposition of CO2. The Seismic group focuses on the development of new methods for processing seismic data, based on the theory of wave propagation in acoustic and elastic media.
SINTEF Petroleum Research performs R&D and offers advanced technical services and laboratory services within its particular fields of activity.

We concentrate on technologies for the exploration and production of petroleum resources, both nationally and internationally. The institute develops solutions for exploration, field development and production. Our knowhow and technology support the creation of value in one of Norway’s most important industries.

We have a 35-year-old track record in petroleum research and we have made considerable contributions to Norwegian exploration and production technology. These are recognised all over the world for their high quality and standards.

The institute collaborates with other research institutes, with a number of universities and in particular with NTNU (The Norwegian University of Science and Technology). We are organised in six departments and are located in Trondheim, Bergen, Stavanger and Houston.

SINTEF Petroleum Research is fully owned by the SINTEF Foundation, the parent company of Scandinavia’s largest research organisation. We are associated with SINTEF Energy Research under the name of SINTEF Oil and Energy.

The number of employees as of 31 December 2005 were 105, and our annual turnover is NOK 130 million (2005).
High demand for research and services

The petroleum industry is enjoying a period of strong development, with a high level of investment and considerable optimism regarding the future. This optimism is based on continuing high oil prices and reflects a long-term shortage of petroleum-related energy. Such a situation has a positive effect on our range of research activities and services.

In 2005 the political majority was in favour of opening up the Barents Sea for offshore activity. This will present us with major professional challenges, which we look forward to taking up. We will now be able to show the world that we are capable of making a significant contribution to technological know-how in offshore activities in the Arctic. The Barents Sea is an area in which SINTEF Petroleum Research can point to a considerable amount of previous experience. Our many years of work on shallow stratigraphic coring for the purpose of mapping the geology of the region has already provided the petroleum sector with valuable knowledge regarding the challenges and potential presented by this complex area.

Our close cooperation with NTNU experienced a considerable boost in August 2005, when Thorhild Widvey, then Minister of Petroleum and Energy, opened our new joint Gemini Centre for Better Resource Utilisation (BRU). The Centre will be an important means of advancing our joint research interests nationally as well as internationally. Collaboration with NTNU also reinforces our ability to recruit scientific personnel, currently a scarce resource.

The past year has also demonstrated that the decision to open offices in Stavanger and Bergen was correct. Our effort to establish activities in the vicinity of our clients has been well received by the industry. We have a clear ambition to expand in these two cities.

SINTEF Petroleum Research continues to place great emphasis on international activities. Our Houston office plays an important role in this respect, and it has already helped us to acquire a number of contracts in that region. The Brazilian oil company Petrobras has been an important client for many years. In 2005 Petrobras displayed a growing interest in our services and four of our departments are currently working on projects for this company.

All in all, our Institute is enjoying a positive trend in developments, although last year put us in a demanding situation as a result of the accusation of corruption related to our contracts in Iran. This situation has placed both management and staff under great stress. I would like to offer my special thanks to all my colleagues who have continued to deliver excellent professional results in spite of this situation, and to our clients, who have offered us their confidence and support in connection with this affair.
Wheel of fortune

This wheel is used to characterise the integral flow properties of real unprocessed hydrocarbons at real temperatures and pressures. The wheel has saved the offshore sector millions of dollars, because it reveals problems that can occur during multiphase transportation of oil and gas under extreme pressure and temperature conditions. The simulator has brought us clients from all over the world.

You can read more at:
www.sintef.com/petroleum/wheel
A great deal of oil may have leaked out of Barents Sea reservoirs 30 to 40 million years ago and during the more recent Ice Ages. A new report from SINTEF Petroleum Research tells us which parts of the basin may have been emptied of their petroleum resources and which parts that still have potential.

“We still believe that more effort should be put into exploratory drilling in the Barents Sea, and that new technology ought to be adopted in seismics, geology and drilling,” says Project Manager Kjell Øygard, a senior scientist at SINTEF’s office in Stavanger.

Although large quantities of oil and gas are lost, a great deal is still stored in special structures, for example in Snøhvit and Goliat. We must remember that the Barents Sea is huge, and so far only a small fraction of the total area has been explored.

However, in many parts of the Barents Sea, mankind is millions of years too late to become rich from the black gold that used to lie beneath the Arctic seafloor. Some 30 to 40 million years ago, Greenland began to move westwards, and the North Atlantic started to widen. In this process, new areas became seabed, and the uppermost layers were ‘scrubbed away’ by erosion, allowing the underlying layers to rise. In many places this led to fracturing of the cap rock, i.e. the geological layers that had kept the reservoirs under seal until then.

During the Ice Ages, further repeated phases of erosion and seabed uplift occured, accompanied again by fracturing of the cap rock.

The SINTEF Petroleum Research study simulated the amount and timing of the erosions and their effect on the petroleum systems. The study showed that the probability of finding oil and gas is highest in the areas that had suffered the least erosion.

“The study has contributed significantly to our understanding of the petroleum systems and play types in the Norwegian part of the Barents Sea, and has also provided input for the debate on petroleum resource estimates in this area,” says Øygard.

So far seven oil companies have purchased the study, which was completed in September 2005 and which was carried out in collaboration with the Norwegian companies PEGIS, Geolab Nor and PGS.
What happens is very much what takes place in porous oil and gas reservoirs when fluids are extracted. The reservoirs are compressed as a result of changes in mechanical stresses deep below the seabed, and this can lead to the surface subsiding – just like at Ekofisk in the North Sea, but it has also happened elsewhere. Such stress changes affect the reservoir in many different ways, not least in leaving ‘fingerprints’ that can later be traced in what is known as ‘4D’ seismic data (i.e. data acquired repeatedly over time).

In the course of the past few years the petroleum industry has shown a growing interest in understanding how changes in stresses affect reservoir characteristics. Such knowledge would improve our ability to estimate the amount of subsidence that is likely to take place at the seabed surface, to interpret 4D seismic data and to enhance the recovery of hydrocarbons from the reservoir.

This problem also attracted the attention of senior scientist Rune M. Holt some years ago. In the course of a research project entitled PETRUS (‘Petrophysics under stress’), SINTEF Petroleum Research and NTNU have developed new methods of predicting how reservoir rock reacts to changes in dynamic mechanical stress. They started quite simply at the bottom – at the level of individual grains of sand.

How do grains of sand stick together, how strong are the bonds between them, and what forces are necessary to pull them apart, were some of the questions the scientists asked themselves.

On the basis of two- and three-dimensional micrographs, Holt and his colleague Liming Li managed to reconstruct reservoir rocks in the computer.

“In our numerical laboratory we simulate how sandstone is deformed or fails by estimating the deformation and potential fractures at the points of contact between individual grains of sand,” Holt explains.

The commercial software package was developed in the USA. “We have modified it and adapted it for our own use. Not least, we have carried out controlled laboratory experiments in order to see how good the model calculations are.”

The research group at SINTEF has established a new measurement technique based on scratching the surface of a rock sample. This process loosens particles such as grains of sand, either individually or in small clusters. The forces needed to loosen the grains are measured, enabling the scientists to estimate the strength of the bonds between individual particles. This in turn provides them with important basic data for their numerical calculations.

“This is absolutely a technology for the future,” says Holt. “The more powerful computers become, the more particles we can deal with. In 1976 one could simulate one hundred grains of sand; thirty years later the number is closer to one million. Who knows, in another thirty years we may be able to simulate a whole reservoir in this way.”
Brazil has football, samba and oil! And with SINTEF Petroleum Research’s knowledge of the last of these, the Institute has gained a serious foothold in the Brazilian petroleum industry. The Brazilian state oil company Petrobras is a member of no fewer than eight projects, into which it is investing a total of NOK 15 million. The 19 members of the Institute’s Department of Formation Physics have shown the way across the South Atlantic. The department won its first contract with Petrobras in 2001, since when cooperation has steadily increased. Today, the Brazilian company is one of the department’s major customers.

“This is a feather in our cap,” says Research Director Johan Tronvoll, who leads SINTEF Petroleum Research’s Formation Physics group. But Brazil is not the only destination for the knowledge of the Norwegian scientists. Venezuela, Southern and Central Europe, the USA and the Middle East are other interesting areas.

“Most of our contracts with Petrobras are ‘Joint Industry Projects’, where several companies can buy into a research project. We have done a good deal of work using this model,” explains Tronvoll.

But what really happens when fiery Brazilians meet solid Norwegians? Do they have a similar understanding of their subject?

“Brazilians are actually not so different from us Norwegians. Although there may be a certain language barrier now and then, we get on well both in the meeting-room and elsewhere. Like us, they are relatively informal, direct and open-minded.”

The Norwegian-Brazilian cooperation in formation physics covers a number of different fields research.

“One of the topics we are working on is wellbore stability, for example when drilling in shale. This is a well-known problem in the North Sea. We also have projects that deal with problems of sand production, and with the deposition and removal of filter-cake, which is deposited on the walls of the wellbore in order to reduce drilling fluid losses during drilling. Without filter-cake the drilling fluid would simply flow into the formation because of the overpressure in the well. Loss of drilling fluid may lead to loss of well control, which in turn may lead to collapse of the well and the possibility of a blow-out.”

SINTEF Petroleum Research’s Multiphase Laboratory, which is one of the largest of its kind in the world, also has Petrobras on its list of clients. Once again, the keyword is sand. At the giant laboratory at Tiller outside Trondheim, the Brazilians have invested NOK 2 million into a project on dealing with sand in pipeline systems for oil and gas transport.

We do not know whether football also contributes to the good cooperative atmosphere, but one thing that is sure is that meetings have been cut short in order to watch Brazil play World Cup matches.
Some experts estimate that as much as 80 percent of the world’s unexploited oil and gas reserves are located in deep water. This means that in the future, we will have to go even deeper to exploit these resources, which will also bring us face to face with both economic and technological challenges.

These challenges are already being tackled in Bergen, where Research Director Rolv Rommetveit is in charge of SINTEF’s work on drilling and well construction.

“Setting up an office in Bergen has been a success. We have launched several projects in collaboration with international and national oil companies as well as with local industry,” says Rommetveit.

The problems often faced with while drilling at great water depths are high pressure and extremely narrow operating margins. Together with the local company AGR Subsea, SINTEF Petroleum Research’s scientists are in the process of developing the ‘Controlled Mud Pressure System’ (CMP), which uses a powerful pump located on the seabed, or somewhere between the seabed and the surface, to pump drilling fluid up to the surface, thereby reducing the well pressure. This allows the well pressure to be continuously adjusted during drilling operations, thus providing better control and lower costs because fewer materials are needed for well integrity.

Our technology deals with all the conditions and equipment components related to pressure, in accordance with correct physical principles. The CMP method will also make it possible to exploit oil and gas reserves that would not be profitable at present.

“AGR has patented the method, while our contribution is to test it using our unique simulation tools which qualify the customer’s system. This is our way of improving the economics of deepwater field development, and consequently, to help our clients to create value,” claims Rommetveit.

The Brazilian oil company Petrobras and Hydro from Norway are also members of the project. The Brazilians have invested NOK 3 million into the project, which is also supported by the Research Council of Norway via their Petromaks programme.
Our Research Scientist Ane Elisabet Lothe has won the prestigious 2005 Norman Falcon Award for the best article in the journal Petroleum Geoscience. The article was written together with Senior Research Scientist Hans Borge, SINTEF Petroleum Research, and Professor Roy H. Gabrielsen, University of Bergen. The jury said that: “This is an integrated study that focuses on geomechanical modelling methodology. By means of a combination of simulation and subsequent verification against real pressure data within an overpressured petroleum basin, the authors have ably and effectively dealt with the complicated problem of predicting hydraulic fracturing and leakage over a geological time scale.”
You can read more at:
www.sintef.com/falconaward

Congratulations, Ane!
When members of the Dietzia family become sufficiently numerous, residual oil slips more easily out of a reservoir when it is flooded with water.

Dietzia is a type of bacteria which has the ability to reduce the oil/water interfacial tension, a physical factor that prevents oil and water from mixing.

This somewhat exotic aspect of Bård Bjørkvik’s daily research, also known as ‘Microbial Improved Oil Recovery’ (MIOR), is expected to do just that; improve oil recovery.

“From laboratory studies, we know that stimulating the growth of certain types of bacteria in sandstone cores can increase the production of residual oil by water flooding, and now we want to demonstrate this,” says Bjørkvik.

The story goes back to the 80s, when there was a great deal of interest in adding soap-like substances known as surfactants during water-flooding of reservoirs in order to produce more oil. In a reservoir the residual oil may lie in the form of tiny drops in the pores, and water-flooding presses this oil out. On their way, the oil droplets are forced to change their shape as they pass through the bottlenecks between the pores. Surfactants are chemical compounds that reduce the oil/water interfacial tension, making it easier for oil droplets to change their shape and allowing more oil to be produced.

“In the 1980s we began to collaborate with the Department of Physics at NTNU on building an instrument to measure low oil/water interfacial tension at high temperature and pressure. Our aim is now to demonstrate that these bacteria really reduce the interfacial tension enough to make a difference.”

The bacteria, which live in water, utilize oil as a source of carbon and energy, while they obtain oxygen and nutrients from the water in order to grow. This means that the feeding bowl of these tiny helpers lies on the ‘wrong’ side of the oil/water interface. In order to get at their food more easily, they produce biosurfactants that lower the interfacial tension.

“And with the help of the instrument we did manage to do it. To put it simply, we illuminate the interface with a laser and measure the light diffused from the surface. Since there will always be tiny thermal movements on the interface, a small percentage of the light will be diffused. The characteristics of this diffused light can tell us something about the movement of the interface and thus about the size of the interfacial tension,” says Bjørkvik. When the interfacial tension is high the movements resemble ordinary waves on the surface of a fjord, spreading out in the form of damped oscillations. When the interfacial tension is low they are damped without oscillations.

“Our measurements show that when the bacteria are stimulated they reduce the interfacial tension by three to four orders of magnitude. So we can afford to let them eat a little bit of the load.”

This may be an inexpensive means of increasing the production of residual oil. Although its potential is great, it is also uncertain. Even though we have demonstrated that these bacteria can reduce interfacial tension in the laboratory, field experiments remains to be done.
SINTEF Petroleum Research AS is a research and development company located in Trondheim, Stavanger and Bergen. The company also has a marketing office in Houston, Texas.

The company achieved an increase of 13% in turnover in 2005. Basic company operations produced a good result, and the negative operating result is due to the special costs of the Iran affair.

On 24 June, 2005, the company was reported by the NOPEF trade union to the Norwegian National Authority for Investigation and Prosecution of Economic and Environmental Crime (ØKOKRIM) for complicity in corruption. ØKOKRIM opened its investigation of the case on 15 August 2005, and this investigation is still ongoing.

In connection with this affair, the Board engaged the legal company Schjødt AS to evaluate interactions between the company's management team, the Board and the SINTEF Group. Schjødt's main report on these aspects has already been published. The conclusions of the Schjødt report have been used as a basis for improvements in corporate governance processes within the SINTEF Group.

Activities

The petroleum industry is enjoying a period of positive development, and interest in investment is high. Optimism regarding the future is based on continued high oil prices and reflects a long-term trend of shortages of petroleum-related energy. Both exploration in demanding areas and the recovery of marginal field reserves are in focus, and are clearing the way for new competence and technology. One consequence of rising optimism in this sector is anxiety regarding the availability of competent personnel in both the short and the long run. This is also true of the oil companies, and we can see a growing willingness on their part to outsource both R&D projects and services. This has made it easier to obtain contracts, as has been clearly observed by our Stavanger office in particular, which is closest to most of our clients.

At the same time, it has become a greater challenge for SINTEF Petroleum Research to find new well-qualified staff. In Trondheim we have the advantage of being close to NTNU.

An important advance was made in 2005 in our collaboration with NTNU, which was profiled by the establishment of a joint Gemini Centre for Better Resource Utilisation (BRU). The Centre was opened in August by Thorhild Widvey, then Minister of Petroleum and Energy, and it is an important means of advancing our joint research interests. Several projects have already been launched within the framework of the Centre.

Relationships with other Norwegian research institutions have also been strengthened over the past year. One example of this is our relationship with the Institute for Energy Technology (IFE). In cooperation with IFE and NTNU, SINTEF Petroleum Research has applied to the Research Council of Norway to be allocated two Centres for Research-driven Innovation (SFI), one of them in multiphase technology and the other in integrated operations (e-fields). IRIS (earlier Rogaland Research Foundation) is also participating in the latter.

The development of our offices in Stavanger and Bergen has also been positive in 2005. The Stavanger office now has a staff of six in three departments. The Bergen office has ten employees, eight of them in the Department of Drilling and Well Construction. This department achieved a positive operating result in 2005, its second year of operation.

In 2005, we invested in collaboration rooms in Stavanger, Bergen and Trondheim. This investment is an important means of improving project work processes and ensuring closer communication with our clients. These rooms will also help to draw our individual offices closer together.

International activities

SINTEF Petroleum Research continued to focus on international efforts in 2005. Our proportion of international activi-
ties is now 33%, which is lower than in 2004 (45%) but at the same level as in 2003.

In order to improve our success rate in the international market, a programme was launched in the autumn that aimed to improve our international business culture. This has now been given high priority throughout SINTEF.

We have won several contracts in 2005 via our Houston office. Marketing is now concentrating on a limited number of products which have proven to be of interest in the market. In October we held a successful seminar on the subject of optimised drilling. The seminar was well attended and several important clients participated.

The Brazilian oil company Petrobras has participated in SINTEF Petroleum Research projects for many years. In 2005 Petrobras displayed a growing interest in our research, and four of our departments currently have projects under way for the company. We are at present working on plans to increase our involvement with Petrobras.

Our many years of activity in Iran have given us valuable experience regarding differences in business cultures and business ethics. Our future operations in the Iranian market will be securely based on the SINTEF Group’s improved guidelines and policy for international contracts, as well as on clearer ethical guidelines. It shall not be possible to question the ethical standards of SINTEF or SINTEF Petroleum Research.

SINTEF Petroleum Research has experienced positive trends in a number of areas during the past year. Even in the face of last autumn’s major challenges in connection with the corruption charge, we have continued to focus on projects and contact with our clients. The qualities that these activities have revealed give us reason to believe that SINTEF Petroleum Research will succeed in continuing the current positive trend, and will emerge from the Iran affair stronger than ever.

**Personnel and organisation**

The company performed 107 person-years of work in 2005. At the year’s end, the company had 105 employees, of whom 81 are research scientists, 37 of whom (46%) hold doctorates. A further six are currently working on their doctoral theses. A total of 15 colleagues left the company in 2005, and nine new members of staff joined us.

The President of SINTEF Petroleum Research requested to be relieved of his duties and left his position in August in the wake of the Iran affair. In November, he decided to resign. The acting President was appointed on 23 August, and has functioned in that position since then.

At the end of 2005, the organisation of SINTEF Petroleum Research comprised seven scientific departments plus administrative functions, which consist of the central staff and the data-processing department. In the autumn of 2005 a decision was made to close the Department of Solutions Oil and Gas, and its staff were transferred to other departments. It was also decided to establish Production Technology as a separate department. The former departments of Seismic and Reservoir Technology were merged into a single department. Since 1 January, 2006, the company has thus consisted of six departments.

Annual appraisal interviews with each individual member of staff are an important element of the company’s organisational development strategy.

**Equal opportunities**

At the end of 2005, SINTEF Petroleum Research had 105 employees, of whom 27 were women. The proportion of women among the research staff is 16%, and in the company as a whole, 26%. The Board has ten members, two of whom are women. One of the goals of the Board is to raise the proportion of women among its members. The acting President and two Research Directors are women. The company’s management team consists of 11 persons, six of whom are women.

**Work environment**

The Iran affair itself and the fact of being reported to ØKOKRIM made 2005 a particularly demanding year. The Institute has had to put up with a great deal of negative attention in the media, and the affair has naturally been a great strain on both management and staff. The fact that the President and two Research Directors resigned in the autumn has also brought management challenges. Measures aimed at strengthening our organisation at management and departmental level have therefore been in sharp focus in 2005, and will continue to be given high priority in 2006.

Apart from the human resources and organisational work environment measures taken in connection with this affair, most of the HSE measures suggested in 2005 have been implemented. As a result of two laboratory incidents, laboratory safety has been a particular focus of attention in 2005. The two undesirable incidents did not result in sick-leave being taken. Laboratory courses have been organised for all members of staff who work in departments with laboratories, and first-aid courses have been held for all members of staff. Fire protection courses have also been held, concentrating in particular on roles and tasks for protection and contingency personnel. HSE training for management personnel will be given high priority during the first half of 2006. Protective equipment was a high-priority topic in the laboratory courses, and will continue to be so in the coming round of personal protection activities in 2006.

In 2005, sick-leave was 4%, as against 1.9% the previous year. This increase is due to the situation of a number of individual persons on long-term sick leave. Of the total,
The cash-flow analysis shows a negative net cash flow of total of MNOK 9.2.

Investments and acquisitions of scientific equipment in 2005 amounted to MNOK 8.1 and MNOK 1.1 respectively, i.e. a total of MNOK 9.2.

The cash-flow analysis shows a negative net cash flow of MNOK 27 from investment activities. The largest investment was the purchase of shares in Reservoir Laboratories AS (ResLab). The Company wished to enter into a strategic cooperative agreement with ResLab and purchased 9.9% of the company's shares. A further MNOK 8.1 has been invested in long-term operating assets. Our cash holdings have been reduced from MNOK 91.1 in 2004 to MNOK 63.5 in 2005. Company liquidity is lower than the previous year, but is still good, with grade 1 liquidity equal to 1.8. No measures to modify the company's liquidity risk are to be introduced.

SINTEF Petroleum Research is exposed to fluctuations in exchange rates, in that its project revenues are in other currencies, while most or all of its costs are in Norwegian kroner. This exposure is largely against EUR and USD. In order to reduce the exchange rate risks involved, the company utilizes foreign exchange futures contracts. The company is also operating in an international competitive market in which several of our competitors are located within the Euro zone. Like the rest of the SINTEF Group, SINTEF Petroleum Research set up a joint scheme for placement of the Group's considerable liquid reserves. The portfolio is placed in accordance with the 'Guidelines for Financial Management' of May 2005.

The accounts as submitted, which comprise the balance sheet, profit and loss account and notes, offer a true overview of the company's results and development, and of its position at year's end. Central risk and uncertainty factors for the company are related to the market, the personnel situation and the company's reputation.

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 company, apart from the results of ØKOKRIM's investigations.

Disposition of the result
The result for the year of MNOK -3.882 will be transferred from the company's equity capital.

Publications
In the course of participation in national and international conferences, our scientists presented 37 contributions, while 13 articles published in refereed journals included SINTEF Petroleum Research staff among their authors. This is equivalent to 0.2 publications per year of scientific work (0.2 in 2004).

Future developments
There are good prospects across the spectrum of petroleum-related industry for several years ahead. The Arctic region offers a series of new, exciting challenges, while a greater focus on enhanced recovery from mature fields will demand major investments and research efforts. Optimism regarding
the future is also noticeable at international level, and this underpins continued high demand for research competence.

In view of this situation, the Board expects that it will also be easier to acquire projects in 2006, although it will also be more difficult to recruit new staff and to keep them. We will therefore focus on recruitment throughout the company, and particularly on bringing the staffing of our Stavanger office up to a sustainable level.

In 2006, we will continue to develop our cooperation with NTNU, with a view to strengthening our scientific and market position. The Institute will also make efforts to strengthen its relationships with its other partners, particularly Norwegian research institutes in the petroleum sector.

The Board wishes to focus on developing the company even further via a process of internationalisation. Our efforts regarding the Houston office will continue, and we will concentrate in particular on a limited range of products that have turned out to be of interest in that market. We will also take steps to satisfy a growing demand for the Institute’s R&D projects in Brazil. The SINTEF Group’s improved guidelines and policy for international contracts, clearer ethical guidelines and the experience we have gained from our involvement in Iran provide a good foundation for our future commercial activities in this region.

Acknowledgements

The Board wishes to thank all of SINTEF Petroleum Research’s clients and partners for the cooperation in 2005. The Board also wishes to thank members of staff for their efforts in carrying out the tasks facing the Institute in the course of the past year.
A demon’s guardian angel

Can the little demons on the western wall of Trondheim’s Nidaros Cathedral have anything to do with petroleum research?

Of course they can! With our help, a geological tool developed for the offshore industry has saved irreplaceable cultural artefacts, not only in Trondheim, but all over the world.

You can read more at: www.sintef.com/petroleum/formphys
## Income statement

for the period 1 January – 31 December (figures in NOK thousand)

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating income</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External projects</td>
<td>101 858</td>
<td>96 524</td>
</tr>
<tr>
<td>Project funding</td>
<td>23 750</td>
<td>13 943</td>
</tr>
<tr>
<td>Basic funding</td>
<td>4 500</td>
<td>4 500</td>
</tr>
<tr>
<td>Other income</td>
<td>158</td>
<td>76</td>
</tr>
<tr>
<td>Gross project income</td>
<td>130 266</td>
<td>115 043</td>
</tr>
<tr>
<td>– Direct project expenses</td>
<td>30 153</td>
<td>26 463</td>
</tr>
<tr>
<td><strong>Net operating income</strong></td>
<td>100 113</td>
<td>88 579</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating expenses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wages and social expenses</td>
<td>76 962</td>
<td>64 752</td>
</tr>
<tr>
<td>Ordinary depreciation</td>
<td>3 040</td>
<td>2 832</td>
</tr>
<tr>
<td>Other operating expenses</td>
<td>27 375</td>
<td>21 372</td>
</tr>
<tr>
<td><strong>Total operating expenses</strong></td>
<td>107 376</td>
<td>88 956</td>
</tr>
<tr>
<td><strong>Operating result</strong></td>
<td>–7 263</td>
<td>–377</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Financial income and expenses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest</td>
<td>3 597</td>
<td>3 292</td>
</tr>
<tr>
<td>– Financial expenses</td>
<td>216</td>
<td>433</td>
</tr>
<tr>
<td><strong>Net financial income</strong></td>
<td>3 382</td>
<td>2 859</td>
</tr>
</tbody>
</table>

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Annual result</strong></td>
<td>–3 882</td>
<td>2 482</td>
</tr>
</tbody>
</table>

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dispositions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transferred from/to the equity</td>
<td>–3 882</td>
<td>2 482</td>
</tr>
</tbody>
</table>

## Balance sheet

as of 31 December (figures in NOK thousand)

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed assets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scientific equipment</td>
<td>8 266</td>
<td>3 975</td>
</tr>
<tr>
<td>Office equipment</td>
<td>2 338</td>
<td>1 908</td>
</tr>
<tr>
<td>Fixed assets</td>
<td>10 604</td>
<td>5 884</td>
</tr>
<tr>
<td>Share investments</td>
<td>19 275</td>
<td>22 275</td>
</tr>
<tr>
<td>Deposits, companies within the SINTEF Group</td>
<td>3 000</td>
<td>3 173</td>
</tr>
<tr>
<td>Pension reserve</td>
<td>–</td>
<td>97</td>
</tr>
<tr>
<td><strong>Financial long-term assets</strong></td>
<td>22 275</td>
<td>3 173</td>
</tr>
<tr>
<td><strong>Total fixed assets</strong></td>
<td>32 879</td>
<td>9 057</td>
</tr>
<tr>
<td><strong>Current assets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accounts receivable</td>
<td>1 973</td>
<td>2 276</td>
</tr>
<tr>
<td>Accounts receivable, companies within the SINTEF Group</td>
<td>46 127</td>
<td>29 294</td>
</tr>
<tr>
<td>Other accounts receivable</td>
<td>1 642</td>
<td>714</td>
</tr>
<tr>
<td>Receivables</td>
<td>48 405</td>
<td>31 560</td>
</tr>
<tr>
<td><strong>Bonds and other securities</strong></td>
<td>58 065</td>
<td>63 140</td>
</tr>
<tr>
<td><strong>Cash, bank accounts</strong></td>
<td>5 463</td>
<td>27 952</td>
</tr>
<tr>
<td><strong>Total current assets</strong></td>
<td>113 906</td>
<td>124 928</td>
</tr>
<tr>
<td><strong>Total assets</strong></td>
<td>146 786</td>
<td>133 985</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Equity and liabilities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equity</td>
<td></td>
<td></td>
</tr>
<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>76 158</td>
<td>80 039</td>
</tr>
<tr>
<td><strong>Total equity</strong></td>
<td>85 158</td>
<td>89 039</td>
</tr>
<tr>
<td><strong>Liabilities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pension liabilities</td>
<td>652</td>
<td>–</td>
</tr>
<tr>
<td>Long-term liabilities</td>
<td>652</td>
<td>–</td>
</tr>
<tr>
<td>Delivery liabilities</td>
<td>7 942</td>
<td>4 224</td>
</tr>
<tr>
<td>Liabilities, VAT, tax deductions, social security, etc.</td>
<td>9 414</td>
<td>9 227</td>
</tr>
<tr>
<td>Payment in advance</td>
<td>26 594</td>
<td>19 937</td>
</tr>
<tr>
<td>Liabilities, companies within the SINTEF Group</td>
<td>6 487</td>
<td>4 530</td>
</tr>
<tr>
<td>Other short-term liabilities</td>
<td>10 539</td>
<td>7 028</td>
</tr>
<tr>
<td><strong>Current liabilities</strong></td>
<td>60 976</td>
<td>44 946</td>
</tr>
<tr>
<td><strong>Total liabilities</strong></td>
<td>61 628</td>
<td>44 946</td>
</tr>
<tr>
<td><strong>Total equity and liabilities</strong></td>
<td>146 786</td>
<td>133 985</td>
</tr>
</tbody>
</table>
### Key financial ratios

<table>
<thead>
<tr>
<th>Year</th>
<th>Result</th>
<th>Balance</th>
<th>Profitability</th>
<th>Liquidity</th>
<th>Financial strength</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gross project income</td>
<td>Net project income</td>
<td>Operating result</td>
<td>Annual result</td>
<td>Fixed assets</td>
</tr>
<tr>
<td>2005</td>
<td>130,266</td>
<td>100,113</td>
<td>–7,263</td>
<td>–3,882</td>
<td>32,879</td>
</tr>
<tr>
<td>2004</td>
<td>115,043</td>
<td>88,579</td>
<td>–377</td>
<td>2,482</td>
<td>9,057</td>
</tr>
<tr>
<td>2003</td>
<td>113,517</td>
<td>87,289</td>
<td>8,418</td>
<td>14,308</td>
<td>6,287</td>
</tr>
<tr>
<td>2002</td>
<td>108,372</td>
<td>73,960</td>
<td>2,752</td>
<td>8,139</td>
<td>8,460</td>
</tr>
<tr>
<td>2001</td>
<td>79,125</td>
<td>59,502</td>
<td>1,336</td>
<td>5,983</td>
<td>4,696</td>
</tr>
</tbody>
</table>

### Distribution of gross operating income

- National projects
- International projects
- The Research Council of Norway projects
- The Research Council of Norway strategic programmes
- The Research Council of Norway basic grants
**Distribution of employees by position**

- Administrative staff (10)
- Technical staff (5)
- Engineers (9)
- Researchers (81, of whom 37 hold Doctorates)

**Distribution of gross operating income by project duration**

- Short term commissions 42 595
- R & D programmes < 2 years 16 818
- R & D programmes > 2 years 70 853

Figures in NOK thousand

**Equity/Equity ratio**

Equity and Equity ratio % over the years 2001 to 2005.
Laboratories

SINTEF Multiphase Flow Laboratory
SINTEF’s Multiphase Flow Laboratory in Trondheim, Norway was established in 1982 as the world’s largest industrial scale multiphase flow laboratory. Today, the laboratory has been developed into a complete Multiphase Flow Assurance Laboratory with the following facilities: The Large Scale Flow Loop, The Medium Scale Flow Loop, The Gas Hydrate Laboratory, and the high pressure real fluid Flow Characterisation loop (The Weel Laboratory).

The laboratory’s main activity is flow assurance related research for the petroleum industry. It has contributed significantly to the development of multiphase flow simulators, and this is still an ongoing activity. Development of hydrate cold flow technology and sand transport studies are currently also main topics.

The laboratory is available for multiphase flow and flow assurance research. In addition, it is well suited for testing of process equipment and instrumentation, and for concept and pilot studies.

Reservoir Laboratory
Since 1977, SINTEF Petroleum Research has performed flooding experiments and fluid studies related to petroleum production. Our laboratory holds high technological standards. We use advanced equipment both in standard experiments for service work, as well as in completely new set-ups for research.

Our laboratory is particularly well equipped for reservoir condition services within special core analysis, pVT characterisation, IFT measurements and other fluid studies. Numerical and analytical modelling can increase the value of laboratory experiments. This is also offered as a service.

Our laboratory facilities and experimental equipment is based on commercial components, but we continuously improve the precision and reliability of our measurements by improving the equipment itself, and the methods applied. New high pressure instruments are being designed and built for special purposes.

Formation Physics Laboratory
The Formation Physics Laboratory provides laboratory services covering all aspects of petroleum rock mechanics and related areas. We do testing for external clients and testing as a part of the Formation Physics Department’s research projects.

Experiments include constitutive tests, physical model experiments and strength index testing. The flexibility of the laboratory opens for combinations of various physical and mechanical measurements, and we try to meet any requests.

SINTEF’s Organic Geochemistry Laboratory
The Organic Geochemistry Laboratory is integrated into the Basin Modelling Department. Activities concentrate on artificial maturation experiments to investigate processes of formation and cracking of petroleum fractions in source rocks and their expulsion. The models developed from the results of these experiments are used to simulate these processes in the geological history. The laboratory also carries out carbon and sulphur analyses, solvent extraction and analyses of liquid hydrocarbons (GC-FID and GC-MSD) and natural gases (GC-FID/TCD).

SEM-XRD Laboratory
Scanning electron microscopy (SEM) and X-ray diffraction analyses (XRD) are, together with traditional optical microscopy, currently applied for characterisation of sedimentary rocks, and for examination and visualization after rock mechanic experiments. The analyses are offered to external clients both separately and integrated in larger projects.

X-Ray CT and NMR Laboratory
Reservoir Technology and Formation Physics departments collaborate with NTNU on a x-ray CT instrument. We also have two low field NMR units with compatible core holders.

Scale Build-up Laboratory
A special laboratory has been developed together with NTNU for experimental work of scale build-up in the near wellbore area and production tubing. Studies include precipitation kinetics and porosity-permeability damage experiments on cores.
# Employees as of 1 January 2006

## Administration Support
- Myhr, May Britt (President)
- Berg-Hanssen, Harald
- Flo, Rune
- Fossum, Berit
- Pålche, Elin
- Sagmo, Mette A.
- Schel, Grethe
- Sneen, Marit
- Aaen, Anita
- Li, Liming
- Lund, Hans
- Nes, Olav-Magnar
- Øjala, Ira
- Papamichos, Euripides
- Skjetne, Tore
- Stavrum, Johannes
- Steinebråten, Jørn
- Sænsteøe, Eyvind F.
- Tiller, Ingunn
- Tronvoll, Johan (RD)

## Basin Modelling
- Graver, Arnt
- Guldseth, Bodil
- Hamborg, Martin
- Helset, Hans Martin
- Klepe, Vegard
- Lind, Kristin
- Lothe, Ane Elisabeth
- Mann, Ute (RD)
- Ritter, Ulrich
- Tammerås, Are
- Vinge, Torun
- Weiss, Hermann M.
- Zweigel, Janine
- Øygard, Kjell

## Well Stream Technology
- Dahl, Arne Morten
- Gustavsen, Karl G.
- Habelinova, Eva
- Helland, Sylvi
- Jacobsen, Kjell Arne (RD)
- Kjelaas, Jørn
- Kristiansen, Olav
- Krog, Espen
- Ladam, Yves
- Larsen, Roar
- Larsen, Rolf Erik
- Lund, Bjernar
- Onsrud, Grisle
- Rekkebo, Arne Erik
- Sneeggen, Cecille
- Straume, Erlend
- Unander, Tor Erling
- Warvik, Hilde
- Welden, Marita
- Ytrehus, Jan David M.
- Øyangen, Terje

## Production Technology
- Abdollahi, Jafar
- Balov, Mohsen K.
- Carlsen, Inge Manfred (RD)
- Gustavsen, Øyvind
- Harrang, Ingrid
- Mjaaland, Svein
- Randhol, Preben
- Stolz, Anne Kristine

## Well and Production Technology
- Bjærkevoll, Knut Stein
- Frøyn, Johnny
- Halsey, George
- Horvei, Mona
- Hult, Øystein
- Jaising, Hitesh Y.
- Kolnes, Øyvind
- Larsen, Hans Freddy
- Petersen, Johnny
- Rommetveit, Rolv (RD)

## Seismic and Reservoir Technology
- Akervoll, Idar
- Alerini, Mathias
- Bergmo, Per Erik
- Bjørkvik, Bård
- Bjørseth, Eva Kristin
- Darvish, Gholam Reza
- Dillen, Menno
- Drysdale, Robert
- Duveneck, Eric
- Frigård, Oddmund
- Georgescu, Sorin
- Ghaderi, Amir
- Grimsrud, Alv-Arne
- Hestholm, Stig
- Idris, Yagoub Mohamed
- Lescoffit, Severine P.
- Lindeberg, Erik G. B.
- Mark, Atle
- Nag, Steinar
- Olivier, Marie-Laure (RD)
- Polak, Szczepan
- Riede, Matthias
- Traub, Bärbel
- Utne, Svein Arild
- Wessel-Berg, Dag

## Legend
- S: Scientist
- E: Engineer
- T: Technical staff
- A: Administrative personnel
- D: Director
- RD: Research director

---

**Basin Modelling**
- S: Søren Grøver, Arnt
- A: Aaen, Anita

**Well Stream Technology**
- S: Søren Grøver, Arnt
- A: Aaen, Anita

**Production Technology**
- S: Søren Grøver, Arnt
- A: Aaen, Anita

**Well and Production Technology**
- S: Søren Grøver, Arnt
- A: Aaen, Anita

**Seismic and Reservoir Technology**
- S: Søren Grøver, Arnt
- A: Aaen, Anita

---

**Formation Physics**
- S: Søren Grøver, Arnt
- A: Aaen, Anita