from the source to the consumer.

Hydro is an energy company which has started from producing electricity from waterfalls. Hydro has always been in energy industry. What we have now is exploration and production going all the way from exploration till the production and downstream. But we are not contractors. We have our own contractors which are specialist companies for performing subcontracts.

● There is now a closer relation between gas and electricity in the energy sector.

- Not in Norway. We are producing electricity power from water. But we are discussing to see whether we can also start producing it from gas. There are many dams and lots of waterfalls in Norway. They want us to use water as long as we have sufficient water because of the pollution from the gas-fired power stations.

● So there is no need to generate electricity from gas in your country?

- There will be a need. We are importing electricity from other countries. We are also selling it. So we think there will be a need for electricity to be made from gas in Norway.

● Is there a consensus about this in your country?

- There in no consensus yet about this subject in Norway.

There is one field where these two major companies of Statoil and Hydro probably can contribute a lot to Iran, that is the field of enhancing oil recovery. In Norway at the moment the average recovery factor is about 47 percent and the government's aim is to get 50 percent, but there are fields operated by these companies having a

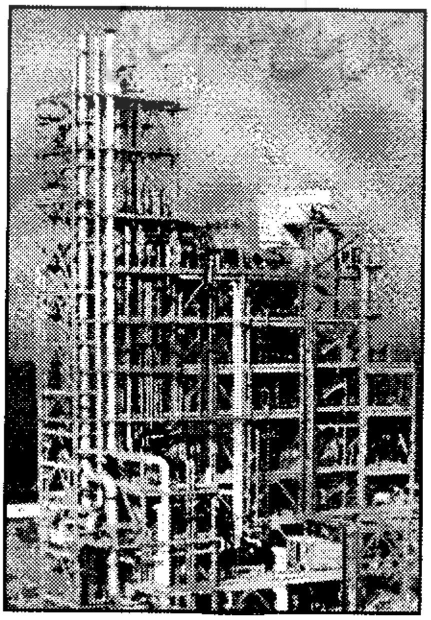
Today it is possible to steer your drilling bit within a plus and minus 2 to 3 meters. Using this method, we are actually producing now from a zone which is 10 to 15 meters thick

recovery factor of more that 70 percent.

Of course it depends on what kind of reservoir we have. Some are better for the enhancement of recovery factor and some others are more difficult. These figures are about the average recovery factor of different wells of a field.

● Is it possible to have such recovery factors in Iran's wells?

- It depends on the geology charactristics. You can not say that you will be able to recover at 75 percent which is an exceptional case where you have very permeable porous layers like



some reservoirs in Norway. You have to use very sophisticated and advanced methods like gas-water injection, you have to use the latest technology in this field. Today it is possible to steer your drilling bit within a plus and minus 2 to 3 meters. Using this method, we are actually producing now from a zone which is 10 to 15 meters thick. The most sophisticated equipment in Norway and perhaps in the world is being used in Norwegian fields for having these high rates of recovery factors. Beside technology, the nature of reservoir is very important in recovery factor.

We have very different reservoirs from yours in Iran. The Statoil company has increased recovery factor to 66 and even 70 percent by using gas injection in a field where there is sand stone and it is relatively homogeneous. In Iran reservoirs are carbonate and oil can be locked in very different places because it is not evenly distributed.

● How do you see the prospects of cooperation between Iran and Norwegian oil companies?

- It should be mentioned that we are inviting a delegation from Iran to one of the most interesting exhibitions and conferences worldwide which is going to be held in Norway in August with 2,000 exhibitors and attended by 700 to 800 participants. We are also organizing a special week for the Iranian delegation together with sponsoring companies. I hope there will be a senior delegation from Iran coming to Norway for the August conference.

One more thing is that we have just signed an agreement with NIOC for the exploration of Anaran block which we are looking forward very much to do and to have further cooperartion with Iran in the future.

Thank you very much for the interview. ■

There is a lot of experience in Norway related to gas production.

We don't sell the equipment, we sell the services more than the equipment itself. We have developed in terms of technology to actually produce gas and transport it and measure it and so on.

Norway is the world leader in management of offshore gas pipeline transport system including management operation and technical aspects of this system. Statoil is the biggest operator of offshore pipeline system in the world.

● About the environment, what is Norway doing in that respect?

- The first point to be mentioned is that in Norway, you are not allowed to develop an oil field until you have shown that the gas can be disposed of either through pipeline or reinjection in the reservoir. We can not flare it up. The flaring gas is decreasing and we have more and more close systems. There is a Norwegian company which is specialist in zero flaring technology and has taken part in this exhibition. You can not develop an oil field with associated gas by just flaring up the gas. You have to find a way to dispose of the gas without burning it.

Beside the emission into the air, the emissions of oil into the water is also very important. We have some of the most sophisticated equipment for zero emissions into the sea from oil processing. Today there is a new technology in drilling with zero emmission into the water.

Another point is that we have co2 injection at one of our reservoirs. That is of course a very special case because of the huge volume of co2 in that field.

The question of decommissioning is a widely debated topic. Norway under an agreement is committed to remove instalations from the offshore area after abandoning a field. This is also an environmental challenge.

In Norway at the moment the average recovery factor is about 47 percent and the government's aim is to get 50 percent

Another point is our floating production ships which are multi-purpose vessels. That is a kind of neat system because when you use up a field, instead of having to remove a big steel and concrete structure, you just remove the ship and go to another field or mayby another country. With this neat system, the production capacity can be very high. We have at least two ships of this type in the North Sea which produce over 200,000 b/d.

● What is your viewpoint about the buy-back agreements?

- They have both positive and negative aspects. Because an oil company prefers somehow to be part of the production after it has developed the field and then you can say that you have a certain amount of oil in the reservoir. But in buy-back contracts you are only developing the field and then leave it. That is the negative part. On the other hand you may have a good return of capital if you are lucky. We are also negotiating buy-back contracts that we think is very interesting. We are used to other methods where we know what we are doing. However we think we like that idea just as much.

● About the mergers, how do you see this ongoing trend in the oil industry?

- We have the experience of mergers because in Norway, North Hydro has merged with Saga to become a stronger company. There is a tendency that the players become bigger and stronger. For us as suppliers we just recognize that there are less players than used to be and there are some super giants which tend to monopolize the international markets. There will be some super majors which will be together with national oil companies. That is something important to bear in mind. These companies will be setting the agenda. And then what we don't know is how it will affect the business. Will there be a sort of second league of smaller more specialized companies like niche players which will also be important to have a creative environment? And this is something we watch very carefully. But there is a radical change in oil business which we will just have to follow closely. In Norway you can see one example that Hydro acquires Saga just because they want to become a stronger entity which they now are.

In the case of Statoil as a state company in Norway, we have made a decision to remain an integrated oil company, because when things are bad on refining side, they may be good on the upstream side and so we believe that these cycles will cancel each other. Therefore it makes sense to be involved in everything from upstream to downstream.

● It means that you want to keep the chain?

- Yes, we want to keep the chain. Of course we don't want to get involved in supply business or subsea christmass tree production or things like that. That is not our business. We buy these components. So that is the way with Hydro as well. We are both involved

proper for bilateral cooperation?

- There is no such a special thing. We are not a member of OPEC as you know. So it will be more consultations between the two countries rather than any commitment. We have had two official delegations who came to Iran during the last 6-8 months. The first visit was by the State Secretary within the Ministry of Foreign Affairs in September last year. Just after the opening of our embassy here in August. Then we had another delegation here late November when the State Secretary within the Ministry of Trades came to Tehran. And now the Iranians are to repay the visit soon.

● **Can one think of a cooperation in production level with OPEC members for stabilizing the markets within a reasonable band of price?**

- This is an extremely important matter to both countries because both economies are very dependent on oil price. So we are interconnected, whether we like it or not. A dialogue is therefore very important. When it comes to gas market, the gas prices are quite different because they are based on what the local market is going to pay. And here in Iran the export of gas is zero and that is quite frustrating, because Iran's gas reserve is only second to Russia. In Norway we are the second largest exporter to Europe, number 2 after Russia. But all our customers are in Europe. We export our gas through pipelines to Germany, France, U.K. and others.

● **Have you done any LNG projects?**

- No, it is just natural gas through pipeline. And the question of pricing of gas is the question of what are the alternative prices of energy. So, that is affeced by the price of oil, nuclear energy and that of coal. But it is quite satisfactory to see that in Europe there has been a strong increase in the consumption of gas for electricity production. We had actually persons from NIOC here last autumn to explain how we organize the gas in Norway. We have special body consisting of Statoil and Hydro which is a negotiating body which negotiate on behalf of all the gas owners. So we can exchange information obviously at government level about our experience on being a major gas exporter, about whatever difficulties we encounter in the gas field. The main difficulties are obviously to open a market and find a buyer.

Norway is the world leader in management of offshore gas pipeline transport system

● **Have you got any proposals about Iranian gas because of its being very far from many markets?**

- I hope, like you do, that you can supply Pakistan and India with gas because there are so many people in this region and you have vast resources but there has to be someone that commits to invest in the pipeline. That is the main trouble.

Our experience is that it takes a long time to materialize a gas project. In Norway from the time you make a gas discovery till it is on production takes twenty years. So you have to be very patient in the gas business, unlike oil where you can actually find something in some five years.

● **Gas trade is always on a bilateral agreement basis. There should be a customer on the other end of the pipe. But what about the LNG market?**

- That is diffferent because you can transfer it by ship. With gas you have to have an infrastructure.

● **So there are always long-term agreements on gas.**

- That is right. In Norway there are long-term agreements on gas. We don't start producing gas unless we know that we have buyers for the gas. So we negotiate for the gas sale before we start the development of the gas fields. Of course the gas market is different in each country. The U.K. for example has a much bigger spot market for the gas. Gas market in Europe is changing quite radically. So you can actually buy gas from different sources in Europe today. As a household you can buy gas from supplier x, y or z. Even with pipeline, you have options in Europe.

● **What is the share of the Norwegian gas in Europe?**

- About 20 percent but it is growing.

● **Do you have enough big reservoirs to increase your production in future?**

- We think so. There is still quite a lot of gas resources in Norway. We have had new customers like Austria, Italy, Spain and Poland in the last few years. Norwegian industry can offer a lot of expertise not only in negotiating gas contracts but also in supplying the equipment to make sure that you have a safe and predictable production of gas. There are many Norwegian companies like Statoil and Hydro which jointly operate the biggest gas fields in Europe.

offer are two eight-week courses we arrange every autumn starting on 28 August this year and we normally have 45 to 47 participants to these two courses together. Last year we had participants from 31 countries. So they are very special courses in the way that only 23 to 24 will attend each of these courses. In addition, we offer tailor-made seminars around the world. Since we started, we have done a total number of 140 tailor-made seminars with a total number of about 6,000 participants among middle and upper level of managers of either national oil companies or government agencies. For instance, we had one seminar recently in Indonesia on the management of gas pipeline systems for the government agencies and the national company Petromina. We are now preparing 3 seminars for Petronas in Malaysia on field development, one in fiscal system and one about the management. we had a meeting here in Tehran with IIES officials to discuss possibilities of doing joint seminars with Iran. According to information we have received, there is a very positive position to have joint seminars with your country. There may be a seminar here by the end of November and the suitable subjects for this meeting are going to be reported back to us soon.

● Have any persons from Iran been selected for your next courses?

- We have also made the offer to NIOC when we had another meeting with them for places at the eight week courses in Norway and hopefully they will nominate suitable persons to take part this year.

● What are the main subjects of your courses?

- Since we tailor make, we really dwell on all subjects of upstream and downstream. They can be anything from petrolium policy and management in the high levels in government situations down to maintainance management, management of gas pipeline systems, petrolium economics, safety and environment. You name it, we do it. As long as we can get our hands on suitable experts, not necessarily only from Norway. We are using a total of about 400 experts in Norway from abourt 100 institutions and about 50 experts from all over the world to help us out.

In Europe there has been a strong increase in the consumption of gas for electricity production

● What do you mean by 100 institutions?

- Companies, operating companies, consultancies, teaching institutions.

● You mean they contribute to your courses?

- Yes, they contribute to the lectures all over the world.

● So, there has been a decision about qualified persons here to come to your country for such courses?

- Selection of qualified persons for these courses is normally done by home organizations, meaning they have already been screened by NIOC and then we wil have to select amongst them. for the 46 positions we normally have about 150 to 170 applicants. Because it is only by invitation, we don't advertise anywhere. We have to cut down 160 to 46 which is a very traumatic process because all these people are very clever people. So it means that we have a process which is repeated over and over until we get down to about 46 to 50 people.

● From Iran, for example, how many people can come this year?

- Maximum of 4 for this year. Part of the learning is the interaction between managers from different countries. So maybe you learn as much from somebody from Russia or from Columbia or Norway. So Norway is a catalyst. While most of lecturers come from Norway, but it is the catalyst between participants that is very important.

● Any thing else about these courses?

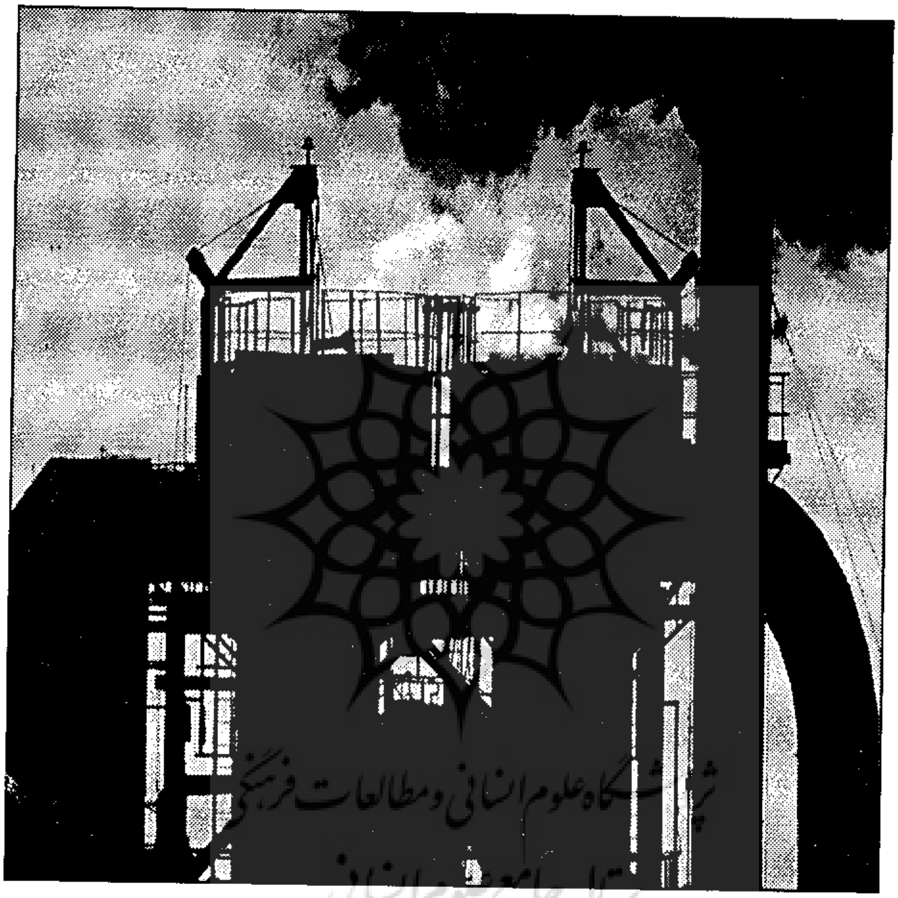
- The 8-week courses we have in Norway are not only courses, they are really 8 weeks of Norwegian experience. We have a very large visit program to industries, we have also social programs, meaning anything from ocean fishing, walking, dinners together, etc. it is a full program for 8 weeks.

● What about prospects of your cooperation with Iran in gas and oil which has been rather weak in recent years?

- Cooperation may take place at various levels. There will be cooperation at bilateral levels between the two governments and there are obviously issues which are of so great importance to both countries and that is the question of the oil price. That is something we have in common.

● What special field do you find

NORWAY, A PIONEER IN GAS INDUSTRY



Statoil and Hydro are two major Norwegian oil and gas companies which showed up at Tehran International oil and gas exhibition held within April 22-25. Energy Economist had an interview with some senior officials and experts of these companies during their presence in Tehran about the companies' activities and prospects of cooperation with Iran. Also present at the exhibition was director of an educational institute Petrad in the field of oil and gas in Norway with whom was conducted the first part of the interview followed by remarks of the officials and experts of those companies.

● Would you please explain about the syllabus of your education program?

- Petrad is a small government foundation established by the ministry of oil and energy in 1989 and the purpose is really to make technical experience in offshore industry available to national oil companies and government agencies around the world. We don't offer any set packages of education. As such, we tailor make to the needs of various organizations and use the best expertise as lecturers. The only set courses we