The Institute of Petroleum

MAY 1992

PETROLEUM REVIEW

Offshore safety

Theory, regulation and practice: inspector, operator and workforce

Abandonment

Abandonment of offshore rigs in the Gulf of Mexico

Concrete platforms

Arnt Knudsen reports on concrete structures for marginal fields

Analysis

Robert Horton's vision of petroleum and politics in the 1990's

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Cover photo of Gannet topside unit. Photo courtesy of Shell Expro

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25 March

A report by Smith Rea Energy and Associates suggests that North Sea pipeline operators could be challenged over the tariffs they levy for transporting natural gas onshore.

Texaco and its partners in the Rhu oil discovery off the east coast of the Malaysian peninsula have completed a successful discovery in block PM-14, located 100 miles offshore Kuantan.

Weir Pumps has won two orders worth £2.5 million to supply seawater injection pumpsets for offshore oilfield use in the North Sea and Middle East.

Swedish owned subsea contractor Stena Offshore is considering expansion of its pipelaying capability through the conversion of a diving support vessel into a pipelaying reelship.

Shipping and oil service company, the George Craig Group, has purchased two supply vessels which are being converted to meet the latest UK regulations for standby vessels.

Australia's Woodside Offshore Petroleum has awarded a $20m contract to Australian Shipbuilding Industries to build a support vessel for the North West Shelf gas project.

Phillips Petroleum is planning to submit an Annex B application for the development of the Judy and Joanne fields in the UK North Sea block 30/7a in the third quarter of this year.

26 March

Statoil has upgraded its assessment of recoverable crude oil reserves in the North Sea Veslefrikk field by 20 percent to 275m barrels.

The International Drilling and Downhole Technology Centre is drilling an experimental horizontal well which will be made available to the equipment and services industry as a testing ground.

27 March

Shell UK Exploration and Production plans to cut its payroll by more than 1,000 during the 1990s in a drive to reduce costs and increase efficiency.

Nortankers, the US shipping investment firm, has sold the very large crude carrier *Normaster* for $6.7 million.

Hydro Oljc, a wholly-owned subsidiary of Norway's Norsk Hydro is to purchase Mobil Oil Norge, Mobil's fuel sales network, for NKr200 million.

UK independent Monument reported a 50 percent increase in its oil and gas reserves over the last year against the backdrop of falling profits for the company.

31 March

US oil company Halliburton has purchased most of the assets of Teledyne Industries company, Teledyne Merla, in order to broaden its energy engineering arm.

The Whitegate oil refinery in Cork requires Punt25m to upgrade it to meet new European Community standards according to the Irish Minister for the Environment.

1 April

Chevron UK overshot its North Sea capital expenditure budget by 27 percent in 1991 but has reported satisfactory profit levels in spite of indifferent world oil prices.

Statoil has signed an agreement with Norwegian Contractors to fabricate the base of the Sleipner East flare tower in steel rather than concrete.

Frontline, the Swedish tanker company, is to concentrate on its large modern oil/bulk/ore fleet operations in the face of a predicted downturn in results for 1992.

One of the world's largest producers of oilfield equipment and machinery National Oilwell has been sold by joint partners USX Corporation and Armco to Mexican manufacturing company Empresas Lanzagorta.

2 April

Oil production from Elf Enterprise's Claymore Alpha platform was shut down briefly after a high-level gas alert on the installation.

The Falkland Islands government has invited tenders for seismic studies in disputed territorial waters in the South Atlantic, in effect excluding Argentina from the initial search for oil in the area.

Dutch energy group Nederlandse Aardolie Maatschappij has placed a $19m order with the offshore division of Dutch construction company Volker Stevin BV for the design, fabrication and installation of the topsides structure for the F-3 oilfield in the Dutch sector of the North Sea.

Britain's Health and Safety Executive's offshore division has issued an operations notice detailing revised requirements for reporting oil and gas releases.

3 April

Occidental has acquired a 50 percent working interest in the offshore Gabes Meridional permit in Tunisia through a farm-in arrangement with BHP Petroleum.

4 April

Oil production by member states of the Organisation of Petroleum Exporting Countries dropped 900,000 barrels a day to 23.5m in March but remains well above their target level of 22.9m according to the International Energy Agency.

Ranger Oil plans to cut its capital spending to about $119m in 1992 from $156.6m in 1991.

Phillips Petroleum has reached an agreement with British Gas to swap interests in the UK North Sea. Phillips has assigned its 35 percent interest in block 47/a to British Gas, which will become operator of the block. In exchange, British Gas has assigned its 7.22 percent interest in blocks 49/6a and 49/11a — excluding the Audrey field to Phillips and also its 7.22 percent interest in that portion of block 48/10a which lies within the Ann field petroleum revenue tax boundary.

7 April

The European Community is to lift the oil embargo against South Africa as a reward for the recent progress towards reform. The oil embargo was the last remaining economic sanction maintained by the EC against South Africa.

The Norwegian Petroleum Directorate has introduced new guidelines for oil companies carrying out high pressure drilling after the blowout in Saga well last year.

Oil exports from the Commonwealth of Independent States are recovering after a short contraction during the winter according to the International Energy Agency.

8 April

The New Zealand government has sold its interests in four onshore oil and gas fields in the Taranaki area for NZ$118.8m as part of a cash-raising exercise.

US House of Representatives merchant marine and fisheries committee chairman Mr Walter Jones has introduced a Bill that places many more new restrictions on oil and gas activities along the country's Outer Continental Shelf.

Pittencrieff is considering the demerger of the company's mobile communications business from its oil and gas interests.

9 April

Chevron has frozen the pay of Mr Kenneth Derr, Chairman and Chief Executive, and other officers and personnel as part of the company's cost-cutting programme.

A Swedish company, Taurus Petroleum, is to help Cuba search for oil off its southern coast.

Cash flow from Amoco projects

Several significant oil and gas development projects — including a major natural gas pipeline in the North Sea — will start producing cash flow for Amoco Corporation next year, according to Frederick Addy, chief financial officer of Amoco.

The Central Area Transmission System (CATS) natural gas pipeline in the UK sector of the North Sea is scheduled to begin operations in the spring of 1993. The 250-mile line, which will move gas from the Amoco-operated Everest and Lomond fields, will have a capacity of 1.4 billion cubic feet of gas per day.

'Eight additional fields are in the area, including the Maggie/Drake field to the north, in which we have an interest,' said Mr Addy.

Turning to liquids, Mr Addy noted that the Scott field in the North Sea — in which Amoco holds a 13 percent interest — should nearly double Amoco's crude oil production in the United Kingdom. The project is the largest new development in the UK sector of the North Sea and is expected to peak at around 200,000 barrels per day.

In The Netherlands, Amoco is developing a number of gas discoveries offshore The Hague that will feed a new pipeline destined for the European grid starting in late 1993.

'It is worth noting that — unlike the United States — natural gas demand and prices in Europe are still strong,' Mr Addy said. 'We are stepping up our efforts to participate more fully in these attractive markets.'

Mr Addy also reported promising prospects in Trinidad, where the company has committed $300 million to develop two major offshore gas fields. The production from these fields is contracted to the state gas company for consumers and industrial users on the island.

In the Congo, oil production from the Yombo field started in 1991, Mr Addy said. Development also continues in Egypt's Gulf of Suez fields, including an oil discovery earlier this year in a new geologic structure adjacent to the company's Badri field.

In the United States in 1991, Amoco added to a string of 12 natural gas discoveries in Oklahoma's Arkoma Basin, proceeded with coal degasification projects in San Juan Basin, and is continuing to develop gas in the Hugoton field in Kansas. Amoco is also participating in the Fairway gas field, located in Mobile Bay, Alabama, which came on stream in late 1991.

Group progress on Clair appraisal

The Clair area co-venturers (Amoco, BP, Chevron, Conoco, Elf, Enterprise, Esso and Mobil) have signed a new 'Joint Appraisal Agreement' which consolidates and expands on the principles of co-operation incorporated in earlier agreements. The new agreement, which will govern future appraisal activity, has been approved by the Secretary of State for Energy.

Following the success of last year's drilling campaign, further drilling and seismic activities are planned:

- BP well 206/8-9: The first of the 1992 wells is to be a high-angle deviated well drilled by BP in Block 206/8, using the semi-submersible *Ocean Alliance*.
- Esso well 206/13a-2: Esso will drill the second well in Block 206/13a, on a distinctive 'horst' feature to the south-east of the central area of the discovery.
- Seismic survey: The extension to the 3D seismic will cover the north-eastern part of Clair in Blocks 206/8 and 206/9. A 3,200 sail-line kilometre survey is planned, with shooting due to start towards the end of this month and to last about two and a half months. BP will operate the 3D survey on behalf of the group.
- Scoping concepts for initial production facilities: The co-venturers have also issued an open enquiry document to a number of contracting companies, inviting them to submit ideas on possible production facilities for a pilot scheme designed to test the longer-term producibility of the reservoir.

A spokesman for the Clair group of companies said: 'There are significant technical and commercial risks associated with Clair. A lot of work has to be done, including the drilling of successful appraisal wells, before Clair could be viewed as a commercial discovery. While it is still too early to say if and how Clair can be developed, we were very encouraged by last year's well results and feel that substantial progress has been made because of the joint approach which has been adopted.'

Pulitzer Prize for 'The Prize'

The 1992 Pulitzer Prize for General Non-fiction has been awarded to Daniel Yergin for his landmark book 'The Prize: The Epic Quest for Oil, Money and Power'. This marks the first time this prestigious award has been given for a book on energy.

Rampside contract

British Gas has awarded a contract worth over £5 million to M J Gleeson Group Plc of Sheffield for civil engineering work associated with the new gas terminal at Rampside near Barrow.

This latest contract marks the second phase of civil engineering construction for the new terminal which is designed to take gas from the North Morecambe gas field.

Thai licence

Kirkland AS with International Petroleum Corporation has signed a concession agreement covering Block B12/32 offshore in the Gulf of Thailand.

The consortium is highly optimistic about the potential of the licence with the development of the neighbouring Bongkot gas field. In addition, oil and gas discoveries lie both north and south of the area.

British Gas topsides contract

British Gas Exploration and Production Ltd has awarded an offshore contract worth £13 million to SLP Engineering Ltd of Lowestoft for the topsides fabrication of an integrated platform deck for its North Morecambe project.

The integrated deck consists of a four-legged steel structure with leg spacings of 25m × 25m and main structural framing of 39m × 25m. The load out weight will be approximately 2,650 tonnes. Contained in the structure are all the wellhead, mechanical, utility and electrical facilities to transport the well fluids to shore for processing.

Work on the contract is planned to start immediately and the completed deck is scheduled to be towed into position on a barge for installation in May 1993.

This latest contract will provide the topsides of a single, not normally manned drilling and production platform to be located in the Irish Sea approximately 40 km south of Barrow and west of Fleetwood.

Plans for developing the North Morecambe field, containing over one trillion cubic feet of gas, are well advanced.

When completed, gas will be delivered via a 36 inch diameter pipeline to the new gas terminal now under construction at Barrow in Cumbria.

Overall, the cost of the project will be more than £500 million, of which £220 million will be spent on onshore construction and installation.

Terry Hazell, Divisional Director and General Manager of Foster Wheeler Glasgow Operations, on behalf of Foster Wheeler Energy Limited, recently presented a six piece model used in the Wytch Farm project to Dr Carl Schaschke, a lecturer in Strathclyde University's Department of Chemical and Process Engineering. The model, showing a gas gathering station and other process facilities, will help provide students with practical examples of one of an engineer's most valuable working tools.

Aberdeen drilling project

A drilling project underway in Aberdeen is seeking to develop new technology and methods that could extend the life of existing fields and sharply reduce future drilling expenditure.

The International Drilling and Downhole Technology Centre is carrying out the tests using high pressure air instead of mud to drill a horizontal well. The project has been funded by Grampian Regional Council and Grampian Enterprise which have lent the centre £225,000 each on a 'less than commercial basis' with another £450,000 in funds, equipment and expertise being supplied by more than 20 oil and service companies.

The well is believed to be the first of its kind in Europe and according to the centre's managing director, Dr David Curry, the 'near-commercial' technology will, for the first time, be used to drill both vertical and horizontal shafts.

By using high pressure air and foam, Dr Curry anticipates that drilling will be much faster — possibly doubling the penetration rate in the vertical mode.

Dr Curry also believes that the new technology will have other substantial benefits for companies including reducing the risk of formation damage and drilling problems associated with fluid when reservoirs are below hydrostatic pressure.

'We are carrying out this trial partly to find out what benefits this drilling method can provide but there is certainly scope for redrilling wells and putting new wells into mature reservoirs. This could improve the production rate which would have obvious benefits for oil companies.'

Further benefits in air and foam drilling include a potential weight saving from not having to store quantities of drilling mud and the ability to use environmentally acceptable surfactants instead of less acceptable chemicals which require more stringent removal techniques.

'The faster rates of drilling in the vertical or near-vertical mode will mean fewer drill bits being required, particularly in the older, harder formations where this type of drilling is likely to be most suitable,' adds Dr Curry.

Mobil sells Norwegian subsidiary

Mobil has agreed to sell the automotive and heating fuels marketing businesses of its Norwegian subsidiary, Mobil Oil A/S Norge, to Hydro Olje as. In addition, the marine fuels business will be acquired by a number of Mobil's marine fuels agents.

'The sale reflects our continuing process of evaluating every part of our business to focus in our areas of strength and ensure we are well positioned for profitable growth' said Graham Ellis, General Manager, Mobil Oil A/S Norge. 'In Norway, our fuels business was at a scale disadvantage relative to our major competitors.'

A full range of Mobil lubricants and special products will continue to be available to Norwegian customers through Mobil Oil AS, a new wholly owned Mobil company. The company has been formed to market Mobil's high quality range of synthetic and mineral oils and special products, backed by strong technical support, to commercial, marine and retail customers. Production of wax emulsions and Special Products will continue at Mobil's Sjursoya plant in Oslo.

In conjunction with the Norwegian fuels sale agreement, Mobil has concluded exclusive lubricant supply arrangements with Norsk Hydro affiliates in Norway, Sweden and Denmark. This will ensure the long-term availability of Mobil's passenger car engine oils, including Mobil 1, at Hydro stations in the three countries.

Namibia venture

The Ministry of Mines and Energy in Namibia has awarded three Norwegian oil companies — Norsk Hydro, Saga Petroleum, and Statoil, the first exploration licence in the first licensing round in Namibia. Norsk Hydro will act as operator for the group.

The licensing round was announced in May 1991, 14 months after independence. The deadline for applications was 1 November and the Ministry announced that there had been a good response to the round by the international oil industry. The government has finished negotiations for this area, and the final agreement will be signed shortly. There were six contenders for the area now awarded.

The licence area to be awarded is Area 1911, approximately 11,000 square kilometres in the northern offshore waters of Namibia. The water depth is between 300 and 1,200 metres.

This is the first time that three Norwegian companies have made a joint venture for international exploration.

Chevron sale

Chevron UK (CUK), and Repsol Exploration (UK) have agreed the sale of CUK's one third interest in Blocks 9/18a and 9/19 to Repsol.

This sale continues CUK's strategy of concentrating its efforts and resources in areas of high exploration potential and core development/ production areas.

For Repsol, the acquisition is part of its ongoing policy to increase its presence in the United Kingdom Continental Shelf.

In 1989 Repsol acquired 5 percent of Blocks 211/7a and 211/12a in which the Magnus field is located, and it has also been successful in its UK Licensing Round applications, in particular during the last two where the majority of the licences awarded to Repsol were with Chevron as its partner.

Blocks 9/18a and 9/19 are operated by Conoco and contain a number of discoveries including the Buckland oil field and parts of the Forth-Gryphon complex.

Dr Subroto criticises carbon tax

Speaking at the OPEC seminar on the environment in Vienna last month His Excellency Dr Subroto said in part: 'The most disturbing environmental measure from the oil producers' point of view, is the proposal to introduce a carbon energy tax. If this were to go ahead, it would mean nothing less than a net transfer of funds from the developing to the developed countries. It would lead to higher end-use energy costs, which would translate into increased prices of exports from industrialised to developing countries. Already the governments of the major consuming countries enjoy far more economic rent from oil than do those of the oil producers themselves.

This suggests that the prevailing international crude price is far too low for the final consumer, otherwise what justification can be adduced for the punitively high tax imposed on oil by some countries, whilst coal — which is much more pollutive than oil — is even subsidised? If we look at the European Community, for example, we see that by the third quarter of 1991, the weighted average final selling price of a barrel of oil sold to end-users in the 12 EC member states was 83 dollars a barrel, compared with 78 dollars a barrel in Japan and only 38 dollars a barrel in the United States. Already 54 percent of the final selling price of a barrel of oil in Europe is made up of taxes imposed by consumer governments, compared with 33 percent in Japan and 29 percent in the United States.

All this raises the fundamental question in OPEC minds of whether the true aim of the proposed measures is to meaningfully reduce carbon dioxide emissions in a rational manner, or whether it is not rather to strike at oil, especially oil imports from OPEC. If this latter suspicion is without a basis in fact, why not rename the present tax on oil as an 'environment tax' and distribute it fairly among the other fossil fuels alleged to contribute to global warming?

And last but by no means least of the possible, undesirable consequences of an energy/carbon tax is the attitude OPEC member countries might be forced to take in the light of consumer-government policies we consider harmful to our interests. If the tax is implemented in the OECD countries with the objective of stabilising their carbon dioxide emissions at 1990 levels by the year 2000, and subsequently to reduce them by 20 percent by the year 2010, OECD potential energy demand will also decline substantially, making deep inroads into OPEC's oil revenues and cutting into its real GDP. I ask you, what kind of incentive does such a tax offer our member countries to commit scarce financial resources to increasing and maintaining oil production capacity in order to meet the future increases projected in world oil demand? This is no basis for the co-operation between producers and consumers I thought we were all agreed should be our common objective!'

Queen's Awards

Applications for this year's Queen's Awards for Export and Technological Achievement were the highest since 1979. In total 165 Awards were granted with a number going to companies associated with the oil industry.

Winners of Export Awards include British Gas plc, On Line Inspection Centre which carries out pipeline inspection services for its parent and oil, gas and petroleum product companies worldwide; ICI Katalco Purification Processes which supplies the PURASPEC range of purification processes to remove impurities from gases and hydrocarbon liquids and OIL Limited which provides supply and specialist vessels for offshore operations and marine support for oil terminals. Other winners were Orbit Valve plc which designs and manufactures custom-built valves and integrated valve systems for the offshore and associated onshore oil and gas industries; Pasminco Europe (Impalloy) Ltd which manufactures cathodic protection systems used to project jetties, platforms, drilling rigs, ships and pipelines against corrosion by sea water and Vikoma International Limited which specialises in the design and manufacture of equipment for the control, recovery and recycling of marine and industrial oil pollution.

In the Technological Awards Amerada Hess Limited won with the development of a floating production facility for the offshore production of crude oil and associated gas by extensively converting an existing semi-submersible vessel.

Another Technological winner was Andergauge Limited which developed a downhole adjustable stabiliser for controlling inclination in deviated high angle and horizontal wells. This development means it is possible to change and control the inclination of the well.

This year The Queen's Awards scheme will launch a third Award 'for Environmental Achievement'. The new award will be a fully integrated part of The Queen's Award Scheme, alongside the existing Awards for Export and Technological Achievement.

Ministerial changes

Mr Michael Heseltine the new Trade and Industry Minister has appointed Mr Tim Eggar as first minister of state for energy, following the abolition of the Department of Energy.

Mr Eggar has been given responsibility for coal, electricity, nuclear power, oil and gas, the offshore supplies industry and the environment. Mr Eggar, MP for Enfield North, will have similar responsibilities as former Energy Secretary John Wakeman.

Saxony gas

The utility companies of the cities of Glauchau, Crimmitschau and Werdau, Saxony have signed long-term supply contracts on the purchase of natural gas with Wintershall Erdgas Handelshaus, Berlin.

Long-term contracts have been signed by a utility company in each of the three cities, which have a total population of 70,000. The supply is scheduled to start from 1 October this year, via the Stegal pipeline (Saxony Thuringia natural gas pipeline).

Incident Report rules revised

The HSE Offshore Safety Division has issued an Operations Notice detailing revised requirements for the reporting of hydrocarbon releases offshore, effective from 1 April 1992.

The revisions are being made in the light of Lord Cullen's recommendation that the regulatory body should be responsible for maintaining a hydrocarbon release database.

The Notice explains changes to certain definitions contained in the current form.

Orion appraisal

British Gas Exploration and Production Limited have completed a successful appraisal well on its Central North Sea Orion field, 180 miles east-south-east of Aberdeen.

The well was drilled by the *Dundee Explorer* to a total depth of 11,000 feet. The 30/18-5 well, drilled downflank of the earlier 30/18-1 discovery tested at a maximum rate of 1389 barrels of 43.9 API oil and 1.35 million cubic feet of gas per day on a restricted choke from a Paleocene Forties Sandstone reservoir.

New direction for offshore safety

The Health and Safety Executive appointed Dr Allan Sefton as its Director of Operations in the Offshore Safety Division in January. He was formerly an area director for West and North Yorkshire and between 1986 and 1990 he led the HSE's National Interest Group specialising in hazardous installations and the transportation of hazardous substances. In particular, he was responsible for developing the mechanism for assessing safety cases for top tier major hazard installations.

In an exclusive interview with *Petroleum Review* Dr Sefton explains how the reorganisation that is about to sweep through HSE's field operations will provide 'centres of excellence' for the industry.

Robert Mcleod: What is your role as Director of Operations?
Dr Sefton: I am charged with setting up a new branch in the Offshore Safety Division (OSD) which is being formed from a combination of existing branches within the OSD structure which HSE inherited from the Department of Energy. The inspection branch, the pipelines inspectorate, the well operations section and the diving section are being combined into a single operations branch.

We are currently reorganising to produce a more multi-disciplinary approach which is clearly dictated to us by the safety case regime. Instead of having specialist branches we will divide them up into management units so that each unit will contain expert elements and can deal with all aspects of the safety cases.

This mirrors the existing HSE philosophy which is a triangular approach with policy, technology and operations.

What programme have you mapped out over the next 12 months?
I have spent the last two months looking at the current organisation and have consulted with all the staff and agreed a planned programme for re-organisation of the structure of the operations branch. That will start in May and we plan to complete it by 31 March 1993.

There will be a number of senior appointments in the branch shortly. We will divide into five management units with an operations manager in charge of each unit. All units will have operational inspection duties and national topic responsibilities to provide guidance to inspectors, the policy branch and industry on particular areas, such as diving, evacuation, escape and rescue, etc. They will be centres of excellence that will provide consistent advice and expertise.

Is your experience in developing safety cases for onshore installations going to be a help to you in your current position?
Yes, I can certainly see lots of parallels even in terms of the stage we are at. Many of the queries and problems that were raised by manufacturers, chemical plants and refineries onshore and by inspectors themselves who are put under considerable pressure by the safety case regime are being raised again.

How many inspectors can you put into the field at the present time?
I like to refer to all professional operational staff as inspectors whether their skill is in diving, well operations, pipelines or elsewhere.

In the new operations branch we have 63 people I would call inspectors and I am planning to get that number up to around 113 by April next year. Under the Department of Energy system of counting inspectors we have 28 compared with the eight or so in position when we took over responsibility.

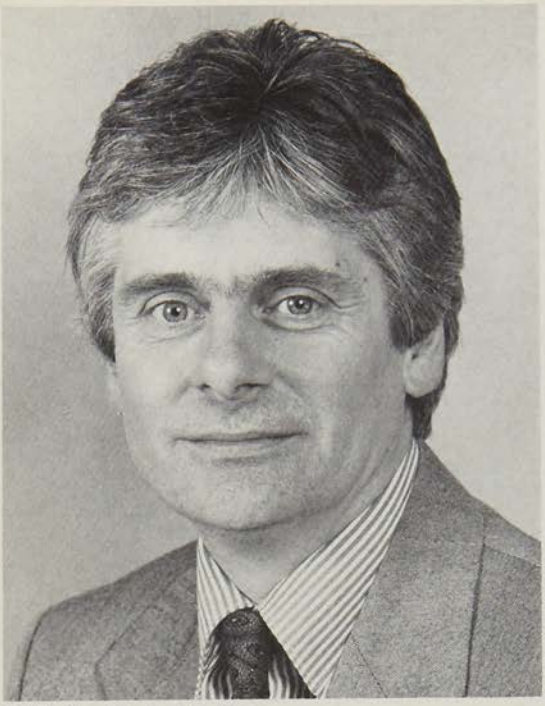
Do you think the HSE has firmly established its presence in Aberdeen?
Yes I am utterly sure of that. We have a new building which we have refurbished and we have brought a substantial number of staff to Aberdeen. So much so that our building is now full and we will be extending into the neighbouring building from next year.

These people are becoming a focal point because they are the people spending a lot of time offshore. They are in the front-line of our work and they inevitably attract back-up staff.

Apart from safety cases, which are going to occupy much of your time over the next two to three years, are there any particular areas of offshore safety that cause you concern?
There are clearly a number and they are related to the topic responsibility teams we are setting up. It is fair to say we have some concerns over well operations because we are having some difficulty in recruiting staff with that particular skill.

I am very aware that the industry and many of the inspectors are going to have to go through a cultural change from a prescriptive system. Those prescriptive regulations still exist, but having to rethink in terms of safety cases is something which both sides are finding difficult.

Similarly with the acceptance of safety cases. I have a team working on the framework and structure within which we will devise the handling arrangements. At this stage I would like to make it clear to the industry that I don't see acceptance as the end point of a process. I don't see the safety cases as passing an exam. It is a demonstration by the industry that what they are



Dr Allan Sefton, Director of Operations.

currently doing and plan to do in terms of their structure and arrangements are as safe, and the risks as low, as reasonably practicable. The actual acceptance of that case should simply be seen as one part of our overall inspection strategy and will probably come quite early. We will look at every part of the safety case and interrogate those parts that give rise to any particular concerns and then if we are satisfied with the prima-facie case that will be the point of acceptance. We would then, through quite formal agreement with the companies, be looking at a two to three-year period of carefully selected, programmed inspections which would be entirely driven by the evidence they have presented in that particular case.

During that initial process, operators would have come to agreement with us about changes or new approaches that they will be introducing or testing. The acceptance process is seamless and is a long-term continuing process that will only end when the installation is abandoned. It must be made clear to the industry that the safety case is not a dead document because that is not the way we would see it at all.

How many safety cases have you received and how useful have they been?

We have come to an agreement with companies for an initial six safety cases and that is actually quite enough at this stage. These are doing two particular jobs for us as well as being useful to the companies.

From our point of view we can test our handling arrangements for safety cases against fairly savage time constraints. Secondly, we can begin to develop the acceptance model, the process we will go through in technical and operational terms testing the model they have presented to us.

There is obviously a lot of comparative work in that process as companies operate differently, but there is clearly common ground in the operations they do and the procedures that they use. We can also examine the way they represent their evidence through the safety cases.

When will companies that haven't been asked to submit safety cases but have already prepared them be able to submit them?

They can submit them legally when the regulations come into force. We haven't asked for them to be prepared before that because we cannot handle them in the developing stage we are in. Secondly, these are legal documents presented as a result of statutory requirements and will only have that status once the regulations have been made.

How many investigations are you currently carrying out at the moment?

We have got 11 criminal cases that are in the hands of the Procurator Fiscal office in Scotland or in England awaiting on decisions as to whether action will be taken. There has been a delay in some of these cases for various reasons but now the Procurator Fiscal's office in Aberdeen has got one Deputy Procurator Fiscal who deals entirely with offshore cases.

Is there one area where you could improve safety offshore without spending vast amounts of money?

All the evidence of recent disasters, including *Piper Alpha*, suggests that it wasn't the hardware that went wrong: it was the management systems and structures that were wrong. I am very aware that in the offshore sector are some of the most skilful managements in the world; it's not surprising with the job they do and the amount of money wrapped up in what they do. I think they are facing up to the challenges of preparing safety cases very well and in improving their safety management systems but that is the area where the improvements have to be made.

In part it is about accepting that they must accept risks for themselves and make decisions about risk control themselves rather than believing that safety is about achieving technical standards or getting things certified. That is only half the battle. The other half is saying 'we know the technical standards are okay but how do we relate that to the way in which the people use it and the way in which the people handle it' and 'how do we get back information from the people that things are not how we planned them or designed them to be'.

There is a lot of emphasis on lost-time accidents and in an objective driven industry it is a very simplistic objective to have. If the objective is improved safety and improved risk control, then this might be a very poor performance measurement.

What is a good performance measurement?

You need a monitoring system which is based on inspection of the software as well as the hardware and encourages above all else the reporting and discussion of problems, incidents, near-misses and minor accidents. If an industry wishes to improve its risk assessment, then it must get as much information as it can about the hazards and potential hazards and therefore it must encourage above anything else that if there are problems then those problems are brought out into the open and discussed.

Can you be assured that companies can get this information?

This is a problem. There is not doubt that NRB is a very potent threat. I know that it is very difficult to prove either one way or the other just how that threat is applied or if it is applied at all. I have to say, though, that the industry as a whole has a reputation that the person who raises problems associated with health and safety, which may or may not be legitimate, is a problem. If the person who raises these issues is seen as a problem, then the industry has the wrong culture. Once you have a bad reputation you really have to do an awful lot to recover the situation.

There are perhaps two areas which the companies will find particularly difficult to handle in their safety cases which we will certainly be looking at very closely. One is their relationship with contractors because if contractors' employees are very frightened of their jobs because, for example, they don't understand what they are doing, they think their instructions are inadequate or don't understand the risks and are unhappy about reporting problems or near-misses, then clearly the information on which the company can base their improvements or precautions is lacking.

The other area is the whole question of employee relationships because if the employees are not totally involved in the reporting of incidents and accidents then the whole mechanism of two-way information structures is corrupted and no company in that position can maintain to have an efficient safety management system.

I would like to think the HSE brings to this area an atmosphere of openness which is part of its culture. The obvious example is that we recently met with 250 safety representatives at the University of Aberdeen and spent the whole day talking to them about their concerns and explaining to them the changes to the legislation and our approach to inspection. The week before that we were talking to a similarly-sized group of employers. That demonstrates that we do want to be particularly open and co-operate with both sides of industry because that is what makes enforcement and the other aspects of our work happen. ■

Conference report

Developing a safety culture

Delegates at an offshore safety conference in Aberdeen have been told that in order to reduce the possibility of accidents, major changes to workforce involvement in health and safety, command and control training and systems for installation managers and methods for alleviating stress in the offshore working environment need to be considered.

In a keynote speech, the director general of the Health and Safety Executive, Mr John Rimington, stressed that the responsibility for health and safety rested with the whole of the industry in collaboration with the regulatory authorities and that the companies must involve their workforces more in constructing an effective safety management system.

'When I refer to the industry I mean not just the companies, but also the contractors and the people who work for both,' he said. 'It is the latter whose safety we are all talking about and their voice has to be heard in the arrangements. That must include some involvement in the case made out for the safety of each installation, just as for the nuts and bolts of day-to-day safety.'

Mr Rimington pointed out that he understood the problems facing companies working with roving populations and the limited representation of the unions offshore but insisted that 'nothing less than an open admission of the workforce to counsel with management and a seeking out of the help they can give in safety matters will do for us and we shall be acting up to that'.

The HSE has been encouraged by the relations it has been able to develop with the United Kingdom Offshore Operators Association (UKOOA) and this has been shown by the immediate and strong endorsement of the recent legislation to tackle victimization of the offshore workforce.

'I am quite unwilling,' added Mr Rimington, 'to believe that this problem, however defined, is not a reality in parts of the industry. I think it is for contractors and companies to ensure that as little use as possible had to be made of the remedies that are provided for those who find themselves in difficulty after they have raised genuine health and safety problems.'

There is real worldwide interest in the restructuring of the safety systems in the North Sea but Mr Rimington acknowledged some of the reservations that exist about further European interest in legislating alongside the UK authorities but stressed that although this interest was 'less welcome' it could not be 'shirked'.

The conference also heard a number of speakers addressing the problem of command and control systems on offshore installations.

Mr John Morgan of BP Exploration stated that the prescriptive nature of 'command and control culture' in the industry had a deficiency where the people who 'wrote the rules', despite being dedicated and highly qualified, where quite often removed from front-line experience of offshore operations. 'These systems,' he said, 'are clearly not likely to encourage thinking or learning for most of the people in the organisation.'

This issue was taken up later in the conference by former naval officer, Rear Admiral Jeremy Larken, who quoted Lord Cullen's report — 'The post of Offshore Installation Manager (OIM) . . . demands a level of command ability which is not a feature of normal management posts'. Management calls on the intelligent and disciplined application of common sense, advice, guidance, judgement and knowledge but command is the successful application of all these principles where some or all of the supporting features of optimised structures are either inhibited, seriously impaired or totally absent.

The two should be compatible but he suggested that management must become more rigorous in its training and selection regimes to ensure that only those with an aptitude for command are developed. Admiral Larken stressed that the ability to set up a command structure in which the workforce has confidence was vital to the safe operation of offshore installations.

This point was underlined by Mr Roger Wilson of Marathon Oil who stressed the critical role of the OIM in any emergency situation offshore. In controlling an emergency the OIM must be able to demonstrate that he has the ability, both technical and physical, to be able to maintain communications and delegate authority to act to contain any scenario.

'What we must ensure,' said Mr Wilson, 'is that in the event of a communication breakdown all our systems do not collapse. Our procedures and training must not be solely based on having reliable communications so often enjoyed during exercises.'

The importance of training was underlined by Dr Valerie Sutherland of the Manchester School of Management when she demonstrated the relationship between stress and safety performance particularly in identifying the strengths and weaknesses of the workforce and the implications for training needs, recruitment and career development.

A survey was carried out by the school over a 12-month period with more than 300 people working on 97 drilling and production installations operating in European waters to assess their levels of stress.

This indicated that offshore workers were markedly less satisfied than their onshore counterparts and that there were significant differences between 'company' workers and those employed by contractors who generally believed they had poorer working conditions.

Stress-related conditions were also measured in response to the actual working conditions and the physical climate in the North Sea.

'Since these states [of stress] were also associated with vulnerability to accident involvement, there are implications for safety performance,' said Dr Sutherland. 'Ultimately the organisation can respond by making changes to reduce potential stress in the workplace or they can help the individual learn to cope with the strains and pressures that cannot be altered.'

The conference on 'Health and Safety in the Offshore Oil and Gas Industries' was organised by the Health and Safety Executive and the Institution of Chemical Engineers.

Building safety on a rock of confidence

Chevron UK has successfully projected safety as an integral part of its corporate image. During a visit to the company's Ninian North platform, *Petroleum Review* spoke to staff and contractors about their perception of Chevron's safety culture.

Chevron has three platforms in the mature Ninian Field and is currently undertaking an engineering scheme that will include developing three smaller fields in the region and incorporating them into the existing infrastructure. In order to convince other operators to put their faith in Chevron, the company has to demonstrate that its systems and the people that run them are safe and reliable.

Last year the company's Ninian operation set a record low figure of just 0·16 lost-time accidents per 200,000 hours worked amongst employees and 1·77 accidents for contractors. The performance by employees is the best ever in the history of Ninian and the company claims that it is unsurpassed by any other major operator in the North Sea or in Chevron Overseas Petroleum Inc. This 'hard won' record is recognised by the people who work at the sharp end of Chevron's activities.

Safety officer

The safety officer (SO) on board the Ninian Northern platform leant back into his seat, held his arms up and said 'I have nothing to fear'. It is perhaps indicative of the general perception of the safety officer's position in the industry that the irony of such an opening remark goes unmentioned.

He continues, 'I obviously have to work close to the OIM but I report directly to the beach. The OIM doesn't report on my position so I don't ever feel it is being compromised and if an issue needs pursuing, I can do it.'

Having joined Chevron less than six months ago, after 12 years as a fire officer, including working in the Gulf and North Africa, and two years as an SO on a platform in another field, he claims to have never felt more comfortable about his role and is impressed by the openness of management in the company.

'When a draft document is issued by the Health and Safety Executive or is being prepared by the company, we [the SO and safety representatives] get a copy sent to us, held in the safety reps' library on the platform, which we are then able to consider at a grass-roots level. We are kept very well informed and encouraged to give feedback.'

The safety reps are seen as an integral part of safety management on the platform and this, he maintains, is in contrast to his previous employer where it 'was a fundamental flaw in their management system that safety reps were seen as a trade union problem'.

According to the SO, safety is firmly established as a separate profession in Chevron which gives it an extra level of confidence when tackling issues raised by the workforce. The company ensures that safety officers are rotated through the different operations, including drilling, diving, etc, so they can confidently assess every job. Through a series of constituency and platform meetings the workforce, including contract staff, are encouraged to raise their concerns and every problem is pursued until a satisfactory answer is forthcoming.

Safety representative

A safety rep, now in his second term as a contractor for Chevron, readily concedes that the company is very

Chevron's Ninian Northern platform.

approachable and confirms that answers are easy enough to get. 'Questions raised that can't be answered at a constituency level are then taken to platform meetings. If they aren't answered straight away a time limit is put on to report back. You almost always get an answer or explanation within that time.'

'If anyone in my area has a query, they will raise it with me and I, or they, can take it further. To be honest, we don't have to complain because so many of these things are sorted out at a lower level, before the job starts. You read your permit-to-work first and if you are happy, you sign it. We've got time to iron out problems before getting on to the job.' He does express concern that not everybody realises the amount of time taken up with paperwork and meetings in relation to safety and differing systems amongst operators means that it can take a couple of weeks to become familiar with permit-to-work procedures.

Offshore installation manager

Having the safety officer outside the reporting line of the OIM does not mean the installation manager can divorce himself from health and safety issues and Chevron's recent adoption of the International Safety Rating System (ISRS) has placed additional responsibilities on this position.

'The company utilizes the OIMs' experience, safety and otherwise, when developing projects and you are expected to maintain a high profile amongst both the company staff and contractors.

'Under ISRS we are required to have a high profile safety regime and try to have at least one high-visibility tour of the platform each day — picking a theme, getting out, talking to the workforce and asking questions. We encourage contract staff to ask questions and go to the foreman if they have a problem rather than have an accident. Although safety is a responsibility of specific individuals it is vital that everyone knows their own responsibilities because you have to rely on people doing their job.'

The OIM admits that problems can occur when routine or complacency sets in but is adamant that these difficulties can be avoided by stressing

'You have to rely on people doing their job.'

professionalism in assessing each job.

The platform can be shut down and production halted by any person who fears the installation is in immediate danger and the staff certainly seem to appreciate the confidence those on the beach have in their judgement. There would be questions asked — quite rightly — but Chevron's claim that safety is paramount tends to have gained acceptance in the field.

'I think there could be cases in the North Sea where people do have fears about raising safety issues. I like to think that is not the case with Chevron.'

Concrete structures for marginal field developments

By Arnt Knudsen, General Manager, Norwegian Contractors (UK) Ltd

Concrete platforms are often thought of as being synonymous with large and expensive platforms. It is important to recognise that the reason for the size of these existing platforms was not the concrete, or concrete as a substructure. Most of these platforms have large topsides with large crude oil production capacities (sometimes over 300,000 barrels per day). This together with crude oil storage requirements on the platform and in-shore hook-up of the topside governed the size and shape of the concrete platforms. In fact, they were the most cost-effective field development solution.

As fields become smaller or more marginal, operators try to minimize or reduce the size of the production facilities (read topside). As the deck gets smaller, so will the substructure. This paper describes examples of concrete substructures supporting smaller topsides.

Another trend in the development of offshore fields is the move towards deeper water. Floating production systems become a natural choice. This paper will also discuss developments with respect to concrete floaters.

Smaller fixed platforms

The trend towards smaller platforms in the North Sea is due mainly to smaller fields being developed. Also less equipment is used on the topside and these factors have a significant impact on the concrete substructure. Also the use of heavy lift vessels for offshore installation of topsides has also had a significant effect on the design of concrete substructures. Substantial quantities of concrete (read cost) in earlier concrete platforms were there to give enough buoyancy to tow the platform out with the deck mated inshore. Lifting on the deck offshore removes the need for this 'extra' concrete and enables the substructure to be reduced in size.

Reduction in the size of concrete platforms means that wave loads are reduced, which again can reduce the need for foundation area. Thus by installing the deck offshore the concrete substructure can be substantially reduced in size.

This is both a reduction in construction cost and construction time. In relative terms, the use of heavy lift barges and offshore installation of topsides has possibly made a larger impact on concrete substructures than on steel jackets. For a deep-water fixed platform, there is less or possibly no saving by using offshore topside installation.

Below are specific examples of this 'slimline' concrete platform approach.

Example 1: concrete monotower

The first example consists of a concrete monotower supporting a flare tower in a water depth of 80 metres. Concrete platforms are often linked with heavy topsides but this 300 tonne flare tower must represent one of the lightest 'topsides' supported by a concrete substructure. The monotower concept is the concrete equivalent of a slimline steel jacket. The tower diameter is slimmed down as far as possible from a structural point of view. For such light topside loads, ship impact loading will govern tower diameter. By reducing the tower

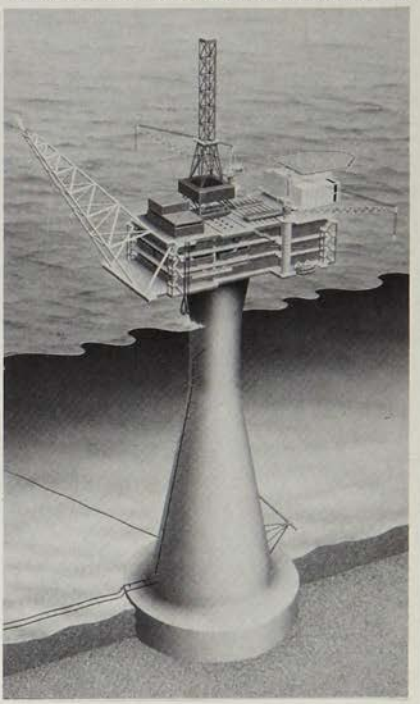


Figure 1: Concrete monotower supporting PDQ topside.

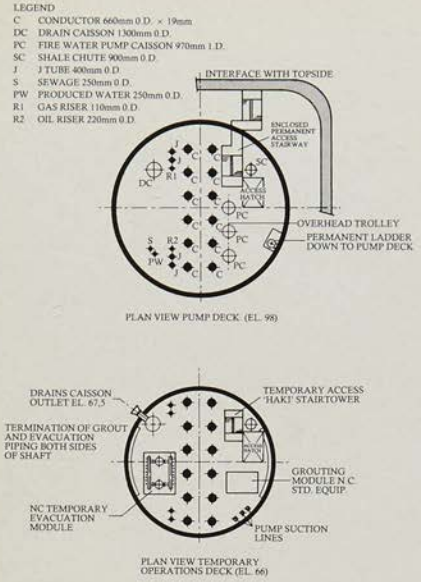


Figure 2: Mechanical outfitting (conductors) inside a concrete monotower.

diameter, the wave loading will be reduced which again enables the foundation area to be reduced. Construction of such slim concrete substructures requires a conventional two-stage approach. The base part of the structure is constructed in a dry dock.

The tower slipform is completed while the structure is floating in an inshore construction mooring. If the structure had been totally completed in the drydock, it would not have been stable during tow and installation.

Key data:

Water depth:	82 metres
Topside weight:	300 tonne
Concrete volume:	4,600 m^3

Example 2

The platform concept in a water depth of 90 metres, shown in **Figure 1**, is based on the same principles as the monotower in example 1. However, in this example the topside is a full production, drilling, quarter (PDQ) type deck with an operating weight of some 14,000 tonnes. The well bay is in the centre, which allows all the conductors to be inside the monotower. The diameter of the monotower in the splash zone is governed by the space required for the conductors, J-tubes and seawater caisson inside the tower and also by the support requirements for the deck. This is illustrated in **Figure 2**.

Modern slipforming techniques allows the concrete tower to be flared out at the top to meet the support points in the deck. The concrete platform is shown to have skirts due to the soft soil conditions. The depth of such concrete skirts will vary depending on the strength of the soil.

The construction of such a monotower will be in two stages; construction of the base section in a drydock and then completion of the structure while floating at an inshore construction site. The mechanical outfitting is also completed

Concrete platforms worldwide

Operator	Location	Design	Water depth	Concrete vol m^3	Year
Phillips	Ekofisk	Doris	70m	80,000	1973
Mobil	Beryl A	Condeep	118m	52,000	1975
Shell	Brent B	Condeep	140m	64,000	1975
Elf	Frigg CDP1	Doris	104m	60,000	1975
Shell	Brent D	Condeep	140m	68,000	1976
Elf	Frigg TP1	Sea Tank	104m	49,000	1976
Total	Frigg MP2	Doris	94m	60,000	1976
Shell	Dunlin A	Andoc	153m	90,000	1977
Elf	Frigg TCP2	Condeep	104m	50,000	1977
Mobil	Statfjord A	Condeep	145m	87,000	1977
Shell	Cormorant A	Sea Tank	149m	120,000	1978
Chevron	Ninian Centr.	Doris	136m	140,000	1978
Shell	Brent C	Sea Tank	141m	105,000	1978
Mobil	Statfjord B	Condeep	145m	140,000	1981
Mobil	Statfjord C	Condeep	145m	130,000	1984
Statoil	Gullfaks A	Condeep	135m	125,000	1986
Statoil	Gullfaks B	Condeep	141m	100,000	1987
Norsk Hydro	Oseberg A	Condeep	109m	120,000	1988
Statoil	Gullfaks C	Condeep	216m	240,000	1989
Phillips	Ekofisk PB	Doris	75m	105,000	1989
Hamilton Bros.	N. Ravenspurn	Arup	45m	10,000	1989
NAM	F3, Holland	HBG	43m	16,000	1992
Statoil	Sleipner A	Condeep	82m	75,000	1993
Shell	Draugen	Condeep	250m	83,000	1993
Shell	Troll	Condeep	305m	221,000	1995
Mobil	Hibernia	Doris	80m	180,000	1995
Conoco	Heidrun	Condeep	350m	52,000	1995

Table 1

while the structure is floating.

Key data:

Water depth:	90 m
Topside weight:	14,000 tonne
Concrete volume:	12,000 m^3

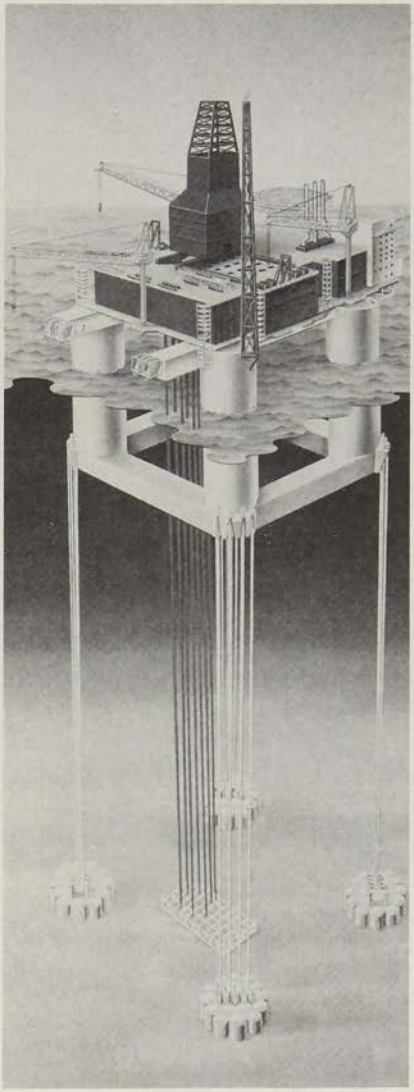


Figure 3: Concrete TLP.

Example 3: concrete TLP

Figure 3 shows the Heidrun concrete tension leg platform (TLP) in 350 metre water depth. The award of the Heidrun concrete TLP contract by Conoco means a great step forward for concrete floating platforms. This paper will not describe the Heidrun TLP but rather some typical design issues regarding concrete TLPs.

The key to the cost-effectiveness of the concrete TLPs over steel ones is the simplicity of the design. Floating steel structures are characterised by substantial amounts of internal partitioning and stiffeners. This leads to careful detailing and fabrication to avoid fatigue problems.

The simple shape and configuration of the concrete hull leads to shorter construction time, reduced cost and reduced fatigue problems.

The additional weight of the concrete hull compared with steel hulls means that the draught is greater for the concrete TLP. This increased draught leads to increased hydrostatic loads. However, with a circular shape, the compressive loads on the concrete is moderate relative to capacity. Further the increased draught leads only to a nominal increase in the tether loads. Motion characteristics are similar to steel TLPs.

Another possiblity with a concrete TLP is to use part of the hull for oil storage.

Typical key data:

Waterdepth	300 metres
Topside weight (incl. riser tension)	23,000 tonnes
Draft	50 metres
Column spacing	65 × 65 metres
Concrete volume	22,000 m^3
Tethers (4 × 4)	16
Natural periods	
surge	95 sec
heave	2 sec
pitch	2 sec

Example 4: concrete semi submersible

The fourth example consists of a hull for a typical concrete floater. The principal difference between a steel floater and a concrete floater is in the detailing of the hull.

Construction in concrete offers a much simpler arrangement which again translates into shorter construction time and lower cost (similar to the TLP's).

The requirements of IMO-MODU and the Norwegian Petroleum Directorate (NPD) differ in terms of compartments. In short, the NPD rules require double hull in the splash zone only, whereas the IMO-MODU rules require double walls throughout the height of the column.

A concrete floater can also be designed to have oil storage in the pontoons. An active water ballasting system will maintain a constant waterline during crude oil production and export.

Typical key data:

Waterdepth	350 metres
Topside weight (incl. deck steel)	25,000 tonnes
Draft	35 metres
Column spacing	70 × 70 metres
Concrete volume	20,000 m^3
Mooring lines	16
Natural periods	
surge	—
heave	20 sec
pitch	65 sec

Concrete platforms under construction

Name and operator	Waterdepth	Concrete volume	Installation year
F3-NAM	43m	16,000 m^3	1992
Sleipner A — Statoil	82m	85,000 m^3	1993
Draugen — Shell	250m	85,000 m^3	1993
Hibernia — Mobil	80m	180,000 m^3	1995
Troll A — Shell	305m	220,000 m^3	1995
Heidrun — Conoco	350m	50,000 m^3	1995

Table 2

Design issues for fixed concrete platforms

Concrete platforms differ in several ways from steel jackets.

As gravity-type structures the foundation design and requirements are different. Previously, concrete platforms were only considered possible on competent (firm) soil. However new foundation design solutions such as skirts penetrating through the upper softer soil layers down to stronger soil have changed concrete platform foundation requirements. In short, by using concrete skirts the foundation area can be reduced, which again reduces the overall size of the structure. Gullfaks C, Draugen and Troll A are platforms with skirt depth ranging from 10 to 36 metres into the seabed. The penetration into the seabed is achieved either by the self-weight of the platform or underbase suction (suction pile principle) or a combination of both.

The size and shape of concrete platforms depend partly on the methods of construction and installation. As a self-floating structure, the temporary phases such as float-out and installation become important and indeed may govern the overall geometry of the structure, rather than the requirements in the permanent operating phase. The float-out phase requires a certain weight to buoyancy ratio to satisfy draft limitation out of the dry dock. The towing phase requires a minimum hydrostastic stability. This stability requirement usually drives much of the shape of the concrete structure. The towing and installation phases also subject the concrete structure to hydrostatic pressures which often govern large parts of the structure in terms of wall thickness and reinforcing steel densities.

Construction of concrete platforms has always taken place in dry docks. For small concrete platforms such dry docks can be a large cost; for that reason other construction methods should be considered. One alternative could be to replace the dry dock with a submersible barge. A certain amount of the concrete structure could be built on a barge and then floated off either when the whole structure is completed or part of it. The platform structure in Example 1 will indeed be constructed this way.

For concrete platforms to be competitive with steel jackets it is necessary to use 'new' ideas to some degree. The above example of the construction method is one case.

Ship impact loading is normally a local design issue with concrete platforms. As long as wall thickness in the waterline is more than 500 mm, ship impact loading has only been a reinforcing steel detailing issue. For small concrete platforms the ship impact loading becomes much more important, as it could well be governing over wave loading in the global sense.

Concrete as a material has developed significantly since the early 1970s. Both in terms of strength (high strength resulting in less concrete) and durability. This development is also helping to make small concrete platforms more competitive.

Advantages of concrete platforms

- Large topside load capacity
- Not sensitive to changes (increases) in topside weight
- Low maintenance, no corrosion
- Simple removal and abandonment
- High impact load resistance
- No fatigue problems
- Crude oil storage possibilities
- Possibility of inshore hook-up and commissioning of topside

Table 3

Advantages of concrete platforms

By the nature of concrete as a material it is very flexible to be shaped and sized to match the requirements of the deck, the mechanical outfitting, the soil conditions and the construction methods. This flexibility is important as it reduces restraints placed on the platform designer.

Concrete as a material in the marine environment is superior to steel. The number of concrete platforms in the North Sea have proved that there is very little deterioration of the concrete and that inspection and maintenance can be kept to a minimum. This operational cost becomes relatively more important for small platforms than large.

Concrete structures are flexible with respect to foundation design. Both hard soil (with rock/boulders) and soft soil can be accommodated.

Removal of concrete platforms is simply a reversal of the installation process. Concrete platforms could easily be designed to be relocatable. For platforms with small topsides the relocating could take place without removing the deck. This could be a significant cost advantage for staged development of a field.

Concrete platforms are flexible with respect to topside weight. The weight of the deck does not normally govern the overall design of the substructure. This means that additional equipment can be placed on the topside later in the platform's life should that be required without any penalty.

For smaller topsides it is possible to lift on or make the deck inshore without significant changes to the substructure geometry. This could eliminate the need for a crane vessel offshore.

Concrete structures are also ideal for storing liquids. Crude oils, diesel and other liquids have successfully been stored in structures. This could eliminate some heavy tanks on the deck.

Smaller concrete platforms do not need the traditional dry dock/gravity dock construction site. The possibility of using submersible barges or ship dry dock means that construction can take place at a location which is most suitable for the civil contractor. It also means that such structures can more easily be built in other parts of the world.

By having the appurtenances such as conductors, risers and J-tubes inside the concrete structure through the splash zone, they are naturally protected from ship impact. This is another advantage with concrete platforms.

Conclusion

Concrete platforms offer a competitive alternative to steel platforms. In addition concrete as a material can also allow the platform designers to use other solutions, which overall will enhance the profitability of the field development. ■

Acknowledgement

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Petroleum and politics during the 1990s

By Robert Horton, Chairman, British Petroleum plc

'Petroleum and politics' have enormous potential to make each other's job more difficult. Daniel Yergin reminds us in his recent book *The Prize,* that oil is a commodity 'intimately intertwined with national strategies and global politics and power; .... Today, oil is the only commodity whose doings and controversies are to be found regularly not only on the business page but also on the front page'.

But political problems, pressures and priorities do change over time. The politics of oil in the 1990s are very different from those of the 1960s and 1970s. With hindsight, we can now see that the 1980s was a decade of transition; suspicion and unease between 'politics and petroleum' gave way to a greater sense of interdependence. Something else happened in the 1980s as well. Whether as a cause or a consequence is not too important; but I think that many governments now feel that petroleum companies pose a far smaller threat to the public interest than once was widely supposed.

I am glad they are reaching this conclusion; although I have to say that, for the industry, this is not all good news. From our perspective, the risks facing use are as great as ever — not least because we are now expected to assume some of the risks formerly shouldered by governments.

Less risky world?

I believe that there is less risk today of price explosions and major supply disruptions than for some time past. The risk has not disappeared. But oil markets are, on balance, less vulnerable to political embargo and manipulation.

One reason for saying this is the relative stability of the Middle East. I emphasise the word 'relative'. Even now, some expect hostilities to break out again against Iraq; there are some fairly substantial tensions between Saudi Arabia and Iran; and, of course, Israel's relations with her neighbours remain a source of major international concern. Neither should we forget the long-term significance of Islamic fundamentalism.

But from the petroleum perspective, the balance of probabilities has changed. We used to say that a combination of improbable circumstances was required for there to be no oil price 'shocks', we would not say that any longer.

Today, there is a greater sense of partnership. Producers seem to understand that there is nothing to be gained from throwing the world economy into chaos by firing off the oil 'weapon', similarly, consuming governments realise that a policy of confrontation does nothing to deflect producer governments from their own, chosen policies.

Thus, both feel at ease in developing their mutual interests — particularly since there is no longer a quarrel over 'who owns the oil'. This issue has been resolved once and for all, in favour, I have to say, of producer governments. The division of producers' rent between governments and companies has generally stabilised too, in the same direction.

In any case, even if a breakdown in understanding did take place, the world economy is now much better able to ward off the consequent disruption. The existence of stockpiles and supplies away from the Middle East has given markets greater confidence. Both exporting and importing governments have learnt how to handle crises in a constructive and cooperative manner.

Not that my thesis is dependent upon more effective crisis-management. The major point is there is no longer any need to talk the language of conflict or mistrust. The Middle East states know they can afford to be reasonably sanguine over their economic prospects. As the era of spare capacity ends, and even at current prices, these countries can look to expansion of revenue from rising volumes.

Saudi Arabia is a case in point. Even without an increase in price, Saudi Arabia's export revenues will, by 1995, have increased by more than a half over what they were in 1989. And in other countries of the region, expansion of volume depends, to some degree, on adding foreign investment and technology to the resources of their national oil companies.

Putting all this together, I believe there is at least reason to hope for a securer economic and political environment in the Middle East, with less risk of macroeconomic shocks emanating from this part of the world. A more stable Middle East means greater stability in oil markets generally.

Less risky oil world?

But if the public has reason to feel relaxed over energy supplies and prices, can the same be said for the petroleum industry when assessing its own level of risk?

'I am moderately optimistic about the 1990s'

Not to the same extent. So far as the petroleum industry is concerned, there are new risks arising from tax structures which are insensitive to rising costs; from uncertain environmental taxes and regulations; and from an increasing proportion of cross-border trade and investment.

We are witnessing a shift in private sector investment from the United States and the North Sea towards Latin

America, the Middle East and, in the longer term, Russia.

Figures from the US petroleum industry emphasise the point well. In 1989, US petroleum companies invested some $13.1 billion abroad, at current prices; in 1990, $16.7 billion; and last year, as much as $20.5 billion — an increase in just three years of nearly 60 percent.

This increased cross-border activity and foreign investment — which is expected to accelerate — is underpinned by a strong commercial logic. International companies have built up a sizeable degree of technical, financial and trading strengths as a result of their success in the United States, the United Kingdom and other accessible regions. As a result, they have a major contribution to make in the development of new resources around the world.

The downside, however, is that oil companies now encounter risks of a different and less familiar kind; and sometimes, these are unnecessary risks, in the sense that they arise from the actions of governments.

I am not for one moment questioning the commercial logic of cross-border investment; and, for the recipients, I think it is indisputable that it carries enormous benefits.

After all, it was 'foreign' investment that helped to develop the oil exporters of today, including Norway and the United Kingdom. In the past decade, cross-border direct investment has increased at more than double the rate of growth of cross-border trade. It is, moreover, cross-border investment that will preserve, if anything can, Russia as a long-term exporter.

But history cannot be forgotten. The experience of nationalisation in exporting countries and of foreign investment controls in Canada and Australia have left their mark. Petroleum companies feel, in some respects, uncomfortably exposed as more and more of their investment enters new areas of growth.

So, here we have a classic case where public and private risk is out of balance. Governments feel less suspicious of foreign investors, particularly as their ability to 'pick and choose' partners is increasing. Private investors, on the other hand, feel more at risk as a greater proportion of their resources is devoted to cross-border investment.

These private risks are compounded still further when such investments carry additional technical difficulties — for example, through the desire for ever higher environmental standards.

The oil industry is used to facing risk, and there is nothing new in that. But what has deteriorated are the rewards from facing up to these risks. For example, in the marketplace, downstream average returns have generally been at, or just marginally above, the cost of capital. Today, they are barely covering cash costs.

Robert Horton

Let me cite two examples to give some idea of the size of the problem. Take the building of a new refinery in South East Asia, widely perceived as one of the few areas of the world where there is considerable growth potential. It costs some $2 billion to build a new grassroots refinery in the Far East; and if one assumes the cost of capital to be some 8 percent over 15 years, this would point to margins of some $8 per barrel to justify the investment. But in Singapore, margins are currently around $6 per barrel; and these are expected to fall to some $3 to $4 per barrel by the mid to late 1990s.

Or, take an example from the downstream as a whole. A comparison was made recently in the United States between the downstream majors and the US non-petroleum manufacturing sector. During the 1980s, US return on total capital employed post tax amounted in the non-petroleum manufacturing sector to some 7 percent. The corresponding downstream return for the oil majors was the same — between 6 and 7 percent. But this modest figure, to put it politely, makes no acknowledgement of the massive investment challenge or uncertainties facing the oil industry. These are on a far higher scale to anything facing other manufacturing companies — who, incidentally are not exactly finding things easy. Equally serious, this return leaves very little leeway for government caprice. And yet, let us look at a classic example of government caprice — tax.

Tax structures

There are now, in many parts of the world, tax structures which eliminate not only 'rent', but normal profits. And

the reason for this is that in many countries, a substantial portion of the tax is based on revenue, rather than costs. Many fiscal regimes still assume a world of high prices and containable costs. Ten years ago these may have had some justification; today, the reality is of low prices and increasing costs.

This is a problem for state oil companies as well as the private sector. In four of the developing countries where we are now considering investment, there are tax regimes which in one way or another impose penalties on development because the tax does not fully allow for costs incurred.

In such countries, fields costing up to $7 per barrel to develop and which — with normal taxes — could yield normal profits, must in fact be ignored. The tax regimes dictate that only developments costing less than $5 per barrel are feasible. The difference between $7 and $5 is a fiscal wedge which separates the pre-tax and post-tax economics.

The worry for state and private oil company alike is that the prospective profit will not be large enough to pay the taxes which arise from a tax structure based on revenue rather than costs. And the consequence is that a double blow is dealt against marginal investment. The after-tax economics are so different from the pre-tax economics that it is impossible to proceed on a sound commercial basis; foreign investment will hardly be attracted by projects which even local state companies find uneconomic.

In the longer term, this will also be detrimental to the public interest, since countries making this fiscal choice will deny themselves many of the expansion opportunities of the next decade.

Fortunately, tax structures are relatively easy problems to overcome, given government understanding and determination. It is, for example, a sign of ultimate confidence in political good sense that BP is seeking actively to invest in both Venezuela and Russia, where current fiscal and political problems are acute.

Environmental costs

Environmental issues, however, do not lend themselves so readily to government fiat. This is another area where there is tremendous scope for politics and petroleum to come 'unstuck'. It is also another area where public risks are becoming private risks, as the petroleum industry and its shareholders accept more and more responsibility on behalf of their employees, customers and communities at large.

Looking at it purely from the cost side, there is no doubt that our stakeholders expect us to spend significant sums to improve our operations and to reduce existing emissions and effluents. These expectations are integrated into our decision making process, and we accept them as part of doing business.

Unfortunately, however, the costs of environmental compliance and controls are increasing all the time, and sometimes unnecessarily — particularly when scientific and technical assumptions underpinning the laws and regulations are later found to have been incorrect.

When you consider that, in 1989, total US environmental expenditure was $91 billion, you get some idea of the magnitudes involved. On this basis, the US petroleum industry could be accounting for some 25 percent of total US environmental expenditure.

But at least this is an area where technical improvements are possible, given the resources. Not so with global warming, where there is widespread disagreement on the extent and seriousness of the problem; and where there is precious little available in the

'This return leaves very little leeway for government caprice'

Of course, to remain competitive, these costs must ultimately be passed on to the consumer — at least to the extent permitted by the marketplace. And in the long run, I think that the industry as an aggregate will be able to do this. Some individual companies may not fare so well; the ability to recover costs is dependent on how successfully management has positioned its company with regard to environmental controls. That is our private risk.

But as a whole, the costs will be passed on. I am sorry to disappoint politicians but there is no way that these bills can be miraculously hidden from their voters for ever. Eventually, they will hit the pockets of us all. If you want some idea of the magnitudes involved, take reformulated gasoline. We estimate that this alone could add at least 15 cents a gallon at the pump to every consumer.

Unlike global warming, 'clean air' is mainly a local problem. Though common to many urban areas, the nature of the problem differs from place to place. That is why there is no reason why different countries and areas should not adopt different policies to achieve satisfactory results. Additionally, improvements in 'clean air' can normally be achieved through the application of technology and in a relatively short space of time.

But there is a price to be paid. If, for example, you take the US Clean Fuels Programme — and add to this other major environmental requirements such as double-hulled vessels for US tankers, the handling of toxic wastes and controls on underground storage — the total annual cost for the oil industry is expected to rise to $15–$23 billion by the late 1990s.

way of practical technology to eliminate the concerns caused by the release of CO_2.

The world economy runs on fossil fuels and for many activities — such as transport — the use of carbon based fossil fuels is inescapable for the foreseeable future. Thus, massive cuts in consumption would have to be imposed for there to be any noticeable effect on emissions, and these would be very painful, involving major changes in lifestyle.

No single nation, not even a group of nations, can hope to have an impact upon this problem single-handed. It requires the cooperation of many; and even if such 'global' agreement were possible, it is not sufficient without technical alternatives.

Actually, I exaggerate a little. There is an alternative to fossil fuels when it comes to electricity generation; it is called nuclear power. But as we all know, there are problems and risks here as well.

Does this mean, then, that we do nothing? Fortunately not; because there are certain measures, like higher efficiency in the use of fossil fuels which make sense in their own right, and which will help reduce CO_2 emissions at the same time. We are constantly seeking to achieve such improvements.

But the scientific uncertainties all militate against taking other steps which are based solely on global warming concerns.

Carbon/energy tax

In my view, the proposed European carbon and energy tax falls into this category. It would impose huge costs on fuel users — over £100 per person by the year 2000 in the European Community. Yet it is far from clear

what the effect on CO_2 emissions would be. There is a grave danger that the desire to take rapid action in advance of the UNCED meeting in Rio in June will lead to a hasty and wholly inappropriate outcome.

Even if there were technology which allowed a carbon tax to have its desired effect upon consumer behaviour without undue hardship, special care would be needed to ensure that the costs did not outweigh the benefits; that it was equitable between different fuels; that it was revenue 'neutral'; and that it was correctly aimed at sources of CO_2 emissions.

At present, the energy component of the EC proposals, because it is not based on carbon, is certainly not equitable. In addition, we have no idea how the revenues from such a tax would be re-cycled. There may be some superficial attractions to politicians of a tax which, by the year 2000, might raise some £50 billion per annum — or nearly 2 percent of the EC's GDP. But even if this money were to be returned to consumers in other directions, it implies a change in tax structures which make our current debates on the hustings mere sideshows.

So, in the environmental field, we have many examples of risks shifting from public to private; a shift which is additional to the uncertainties of oil prices and the risks of producing oil which, of course, we accept as part of our normal business.

Does this matter? Are there, in fact, risks to the long-term welfare of nations as a consequence of imposing additional and more onerous risks upon the petroleum industry?

Not necessarily, provided that higher risks carry the prize of higher returns. But the petroleum industry must now be extremely careful where, and on what scale, to invest — not because we're skint or incompetent, but because high risks demand commensurate returns.

We have to reward our shareholders for trusting us with their wealth; if we cannot add value to this wealth, they will take it elsewhere. That is the industrial equivalent of a democratic election; if returns fail to match risk, shareholders will vote with their feet.

This could make it very difficult to ensure that adequate energy supplies are forthcoming to meet rising demand in the second half of the 1990s. There is a critical requirement for continuing investment in new production capacity. Indeed, we need to add or replace an amount which is equivalent to over 25 percent of existing worldwide capacity today.

That can be done; but it needs renewed effort by both the industry and governments to reach an understanding on the new agenda — with tax; the environment; and cross-border investment as its major items.

European Energy Charter

Cross-border investment is encouraged when there is confidence that governments will allow market mechanisms to operate and flourish. That implies, in particular, realistic taxation in order to provide a sustainable balance between investor and national interests; the ability to remit dividends; and safeguards against arbitrary or discriminatory expropriation. In short, we need to have in place an agreed framework for private investment.

'The European Energy Charter is a source of great encouragement'

The European Energy Charter is an example of a process designed to achieve this, and BP has strongly supported the concept. The charter's investor protection code provides many of the assurances I have mentioned. And the second part of the charter allows governments to demonstrate their commitment to the rules, disciplines and rewards of a genuine market. For example, it commits signatories not to obstruct the flow of products across international boundaries — a particularly important matter for companies looking to export products from Russia or Kazakhstan across neighbouring republics.

Other important features of the charter include protection against the abuse of monopoly power; the prohibition of preferential state aid; and assurance of non-discrimination between commercial entities from different signatory states.

Now, of course, the charter signed last December is a 'political' rather than a 'legal' commitment; and much effort is now being given to the drafting and negotiation of legally binding protocols to actually implement the charter's principles. Not surprisingly, in view of the complexity of the subject and the novel and ambitious scope of the undertaking, it is taking time to reach agreement.

Nevertheless, it is a source of great encouragement that some 46 governments, including most of the former Soviet Republics, have committed themselves in principle to measures which promote the efficiency of the market.

This is not a case of industry and government colluding to rig the rules for their mutual convenience; it is an example of governments and industry working out how best to provide a framework for business in the new markets of the Commonwealth of Independent States and East Europe. If persevered with, the charter approach will result in their greater integration into world markets and the world trading community. And for industry, the benefits will be felt in the more effective management of risk in many vital areas of the petroleum business.

There are many good examples in the charter of how investment can be promoted; and this is what any 'producer/consumer' dialogue ought to be about.

I am moderately optimistic about the 1990s. The conditions could exist to allow petroleum companies to make really worthwhile investments on behalf of their shareholders, and the countries concerned. The need for these investments is inescapable; the question is whether they will be forthcoming in a timely manner.

I also believe we have made enormous progress in our relations with governments and state oil companies, so that 'politics' and 'petroleum' are no longer a source of inevitable conflict, where both sides lose out; rather, this is an area where mutual understanding brings mutual benefit.

But all this calls for long-term perspectives, which brings me back to the domestic political scene. Very often, the politics of energy are difficult to reconcile with the immediate need of pleasing voters. Despite this, all of us today — whether in politics or industry — must cope as well as we can with the present pressures, without jeopardising our long-term future.

I do not see any reason why we should not help each other in the task that lies ahead; and if we do, both public and private risk can be put firmly on a falling trend. The result will be to increase petroleum supplies, security, and prosperity for producers and consumers alike. ■

This address was given at a joint meeting of the Royal Institute of International Affairs and the British Institute of Energy Economics.

Managing fire-fighting foams in the environment

By Jonathan Brittain, Product Manager, Angus Fire

'A rapidly spreading fire broke out in the despatch warehouse of a tyre dealer on 17 December. Despite using large volumes of water, the fire service were unable to bring the blaze under control. The officer in charge therefore decided to make an attempt to extinguish the fire with synthetic multigrade foam. 15,000 l/min of foam/water mixture had to be used to bring the fire (which had in the meantime taken hold of a wide area) under control. A total of 25 tons of foam compound was consumed in the process. *The mixture of water and foam ran into a stream passing close by destroying virtually the whole of its fish stocks.*'

Events like this incident in Switzerland in 1987 are presenting fire professionals with the new challenge of minimising the impact of fire-fighting foam concentrates on the environment.

Dilution is no answer

The potential for any substance to interact with the environment depends largely on the quantities involved, or as Paracelsus, the 15th century father of toxicology, put it, 'All substances are poisons; the dose is the only difference between a poison and a remedy'.

There is a tendency sometimes to assume that foam in the environment must always be so heavily diluted that it could never pose an environmental risk. This is understandable given that the percentage of foam concentrate required to make up foam premix solutions is typically only 1–6 percent by volume and that most foam that ends up in the environment is to be found in large bodies of water such as sewers, rivers, streams, lakes and estuaries. However, it is the way in which foam is discharged into the environment that explains how such a comparatively harmless material can sometimes affect the environment. The discharges of most man-made substances (eg domestic detergent) into the aquatic environment are predictable and therefore carefully controlled. Their concentrations tend to be quite low, usually well below 0.1 percent (1,000 ppm).

Conversely, foam used at emergency fire incidents can be discharged into the environment in unpredictable and uncontrolled circumstances. Moreover, the very high water capacities of modern fire-fighting equipment can produce flow rates that are comparable to small rivers! Foam premix can run off from the fire and gush into the local water environment at levels much higher than those normally expected by water authorities. In the incident related earlier for example, it was a foam 'raft' with an estimated concentration of 10,000 ppm being swept downstream that caused the fish-kill.

So when considering the probable environmental concentration of foam at any particular fire risk, it is advisable to give the benefit of any doubt to the environment itself rather than to assume that high levels cannot be reached. Dilution of pollution is no solution!

FOAM TYPES

Protein based	Synthetic Detergent based
Standard Protein*	Synthetic Detergent (Syndet)
Standard Fluoroprotein*	Aqueous Film Forming Foam (AFFF)*
Film Forming Fluoroprotein (FFFP)*	

*Alcohol Resistant (AR) grades available.

Meeting the challenge

In facing up to this new challenge it is necessary to ask whether foam is really needed. This is perhaps the easiest question to answer! Professional fire-fighters know that there are certain types of fire that threaten human lives and property which can only be tackled successfully and reliably with foam. These include flammable liquid fires at aircraft crashes, refineries and petrochemical plants.

A fundamental principle of environmentalism is to avoid using excessive quantities of any material that puts a strain on the environment. Using as little foam concentrate as is needed to extinguish and secure the fire has in fact always been standard procedure for fire-fighters, given the cost of foam concentrates. Furthermore advances in technology over the years have made possible dramatic reductions in usage levels. The development of film-forming foams has meant lower extinguishment times and correspondingly lower usage levels. Also modern fixed foam systems now provide greater operational efficiency and so lower foam consumption.

Another preventative measure that has already been taken up by fire-fighters is to channel foam into collecting basins after it has been used. Retaining foam in this way is of course only appropriate where the location of the fire risk is well defined; it has the drawback of high installation costs.

More recently fire-fighters have taken the step of selecting the more environmentally favourable types of foam concentrate. The environmental properties of foam concentrates currently on the market vary enormously. While this fact did not attract much attention in the past, it is becoming increasingly important to today's environmentally aware foam users.

Environmental jargon

Aquatic toxicity tests provide information on how poisonous a foam is. The result is usually an 'LC_{50}' which is the lethal concentration at which 50 percent of the test organisms die within a fixed time period. Values are usually available on a selection of organisms to

simulate the links in the food chain. Generally speaking the higher the LC_{50} the better. However, given the very high levels which foam can on occasions reach in the environment, it should be at least the 1,000 ppm which is sometimes quoted and preferably much higher.

The 'biodegradability' of a foam is a measure of how readily it is broken down by bacteria in the environment. The bacteria digest the foam and extract oxygen from the surrounding water in the process. The biodegradability is determined by carrying out two different tests and comparing the results. The first test measures the 'Chemical Oxygen Demand' (COD), which is the total amount of oxygen required to degrade a standard amount of foam. The lower the COD the better because less oxygen will be stripped from the environment. The second test measures the 'Biochemical Oxygen Demand' (BOD). This is a measure of the foam's propensity to consume that oxygen within a specified time period. The biodegradability is the BOD expressed as a percentage of the COD.

Environmentally favourable foams

There are two generic foam types — one based on hydrolysed protein, the other on synthetic detergents. Major technological advances have been made in both over the years. Synthetic detergent based Aqueous Film Forming Foam (AFFF) was developed 25 years ago. It was the first type of film-forming foam, and as such provided a significant improvement on the extinction performance of the products then on the market. More recently in the 1980s Film Forming Fluoroprotein (FFFP) was introduced, offering not only film-forming capability but also the superior burnback resistance of protein-based foams. From an environmental standpoint this fundamental difference in composition between the two generic types of foam is critical.

Perhaps not surprisingly foams produced from natural protein have been found to be much gentler on the environment than those based on synthetic detergent. A major independent study undertaken by German government scientists in 1989 subjected 16 commercially available foam concentrate products to a host of rigorous toxicity and biodegradability studies. Protein-based foams were found to be both substantially less toxic and more biodegradable than those based on synthetic detergent. Protein-based foams were found on average to be less toxic to every organism by factors ranging from 9 for fish to 40 for water flea. Of all the protein based foams tested, FFFP emerged as the most environmentally favourable of all. In one test a FFFP gave an LC_{10} of 7,500 ppm compared with a value of only 0.6 ppm for a Synthetic Detergent (Syndet) foam, making it a remarkable 12,500 times less toxic!

Fire-fighter applying fire-fighting foam

It is worth emphasising that the latest FFFP type foams that have demonstrated the lowest environmental impact are also, based on the best information available, the fastest growing foam type in modern industry.

The environmental superiority of protein-based foams is not difficult to explain. Hydrolysed protein occurs naturally in the environment as a result of the breakdown of animal and plant proteins, and is so low in toxicity that it is commonly used in human foodstuffs. Protein based foams can actually enhance the plant growth of legumes. In contrast synthetic detergents do not occur in nature and are not used in human foodstuffs!

In addition protein-based foams contain more environmentally benign foam boosters. Foam boosters are added to both generic types of foam to enhance the foaming properties of the base materials. Most protein-based foams contain the glycol foam booster Hexylene glycol at low levels, while synthetic detergent based foams need either of the two glycol ethers, Ethylene glycol mono-butyl ether or Diethylene glycol mono-butyl ether, at somewhat higher levels. Hexylene glycol is about 10 times less toxic than either of the two glycol ethers, giving protein-based foams another significant environmental edge.

Think globally, act locally

Fire-fighting foam is used in industry above all else to save lives and protect valuable assets but the implications of it escaping into the environment can no longer be ignored.

Arguably the most important principle to emerge from the public debate on the environment is best summed up in the simple phrase 'think globally, act locally'. We can all do something, no matter how small, to help protect the environment. Today professional fire-fighters are uniquely placed to make a major contribution to protecting the environment. Not only can they continue to reduce the environmental risk posed by flammable liquid fires but they can also use those fire-fighting foams which are gentler on the environment to do it.

The environment is already benefiting from the research which has been carried out in this area, with foam users in certain countries already switching to environmentally sound protein-based foams. This can only continue however if more foam users gain an insight into the real opportunity which now exists for them to help the environment and help themselves at the same time. All other things being equal, fire-fighters can now make choices on ecological grounds about which product they use. ■

A platform for change

By Kevin Murphy, Consultant, Environmental Resources Limited

Oil companies have long recognised the importance of conducting their operations in a responsible manner which will not cause long-term environmental damage and undue risk to the safety of those involved.

Although the impact to the environment from exploration and production operations has historically been minimal, many companies have adopted formal policies and programmes in recognition of emerging public concerns.

The industry considers itself to be environmentally responsible. A positive image is promoted by everything from television advertising to consultation/communication with industry and government groups on the environment. Less high profile but substantively more important are the environmental and risk assessments which are undertaken to ensure that the activity will not adversely affect the environment.

Offshore E&P activities, notably in the North Sea, are increasingly being affected by environmental considerations. To meet these challenges, many companies have adopted a proactive approach towards environmental issues. A case in point is Marathon Oil U.K. Ltd.'s East Brae platform which is due to come onstream in 1993 and will be located some 270 kilometres to the northeast of Aberdeen.

Marathon has carried out Environmental Assessment (EA) work for all its developments. East Brae is the first platform to be subject to an environmental assessment at an early stage in the design phase of the development project. The aim was to highlight any environmental issues that could be addressed as the project progressed and to do so prior to operations.

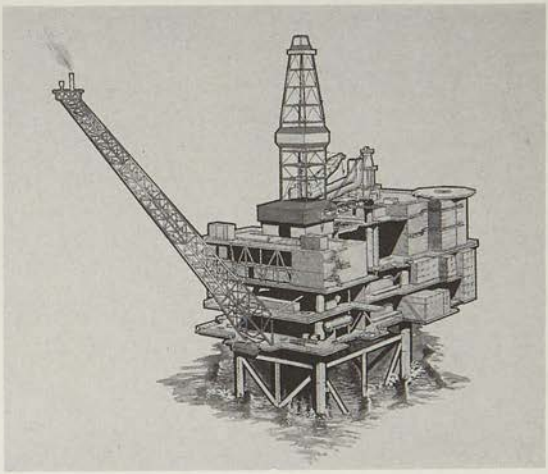
In carrying out the EA on behalf of Marathon, Environmental Resources Ltd (ERL) worked closely with Marathon's own Safety and Environmental Group to address key environmental issues. The scope of the study was not limited to the assessment of impacts arising from day-to-day operations but also those which might result from accidents.

From the outset, Marathon appreciated the need to give likely future requirements and regulations a high priority, a fact summed up by Scott Hudson, a Marathon Brae Projects Engineer, who co-ordinated the assessment.

'The East Brae EA went above and beyond current regulations and was a good opportunity to ensure that what we were doing was responsible from an environmental perspective. While there is no actual regulatory requirement to do an EA, it is Marathon's philosophy to do such work where necessary to address environmental issues,' commented Mr Hudson.

This attitude provided the consultants with a highly responsive and proactive client, prepared to tailor operational factors to a good deal of the environmental advice being thrown at them. For instance, in the area of produced water discharges, Marathon has been in a position to take future as well as current limits on oil in produced water into account. The treatment technology on East Brae has been designed to satisfy not only existing regulatory discharge limitations but also lower limitations now being considered.

Part of the study comprised a formal EA approach using methodologies formulated for onshore developments. The baseline environment was described and certain sensitive features of it were highlighted. The activities proposed by Marathon, including template and platform installation, drill-



East Brae, subjected to an environmental assessment in the design stage.

ing, production operations and abandonment, were reviewed and possible sources of impact were identified.

In addition, pollution control, loss prevention and other ameliorative measures proposed by Marathon were also assessed in the context of their effectiveness to prevent or reduce impacts and to ensure regulatory compliance. In each case, the East Brae design was found to be in line or ahead of current industry standards, with many recommendations falling into the 'above and beyond the call of duty' bracket. Following this the significance of residual impacts, primarily to the marine environment, were assessed in terms of accepted criteria.

While the study generally followed established methodology applied to numerous onshore developments, it departed from the norm in three key areas. Firstly, the consultants relationship with Marathon was very much as part of the team rather than — as is so often the case — acting as external consultants brought in to do a specific job. In the second respect, the client was determined to look not just at the environmental issues which directly affected their business but also at longer term areas of global concern. The third area was to use established safety/risk assessment techniques to examine the environmental consequences of accidental spills and releases.

The issues of global concern included items such as chlorofluorocarbons (CFC) usage and the phasing out of ozone depleting chemicals like halon. According to Mr Hudson: 'Rapidly emerging issues like halon were highlighted in the EA report. We therefore had time to consider the information at an early stage of the platform's design.' As a result, halons have now been designed out of East Brae.

The East Brae EA also made a detailed study of other activities such as onshore waste disposal. It highlighted the new 'duty of care' responsibilities under the Environmental Protection Act (1990). Existing procedures established by Marathon for the Brae 'A' and 'B' platforms will be applied to East Brae. These include the use of established companies to handle the onshore disposal of waste generated offshore, along with regular audits of waste disposal practices.

In the case of accidents, ERL worked closely with an associate company, risk assessment specialists, Four Elements Ltd, to carry out an environmental hazard assessment of the development. This assessment focused on various possible accident scenarios and their potential impact. Accidental events evaluated included both spills and emissions to the atmosphere. The overall level of risk to the environment from such events was based on their expected frequency and potential consequences. The assessment found that, in general, risks were well controlled. Systems and procedures will be in place to minimise the likelihood and severity of these types of event.

Procedures adopted by oil companies to protect life, equipment and the environment are a result not only of new regulations but also of strong and responsible management.

FORTHCOMING EVENTS

May

7th–10th

Istanbul, Turkey: 'Chem-Turkey 92' and 'Instrumentation-Turkey 92'. Details: Overseas Exhibition Services Ltd, 11 Manchester Square, London W1M 5AB. Tel: (071) 486 1951. Fax: (071) 935 8625.

11th–12th

Singapore: Conference on 'Oil and Money: Asia and the Pacific'. Details: Brenda Hagerty, Conference Coordinator, International Herald Tribune, 83 Long Acre, London WC2E 9JH. Tel: (071) 379 4302. Fax: (071) 836 0717.

11th–13th

Amsterdam, The Netherlands: Course on 'Cost/Planning/Economics for the Offshore Oil and Gas Industry'. Details: The Center for Professional Advancement, Box 1052, East Brunswick, New Jersey 08816-1052, USA. Details: (908) 238 1600. Fax: (908) 238 9113.

11th–15th

London: Course on 'Exploration, Appraisal and Marginal Field Economics'. Details: DCA Consultants Ltd, Haughend Farm, Bridge of Earn Road, By Dunning, Perthshire PH2 9BX. Tel: (0764) 84664. Fax: (0764) 84665.

13th–14th

London: Course on 'Introduction to the Petroleum Geology of the North Sea'. Details: The Administrative Secretary, JAPEC, c/o The Geological Society, Burlington House, Piccadilly, London W1V 0JU. Tel: (071) 434 9944. Fax: (071) 439 8975.

14th

London: Lecture on 'Pipe Freezing. Technological Developments and Improvements in the Offshore Oil and Gas Industry'. Details: Mr A A Reed, The Pipeline Industries Guild, 14/15 Belgrave Square, London SW1X 8PS. Tel: (071) 235 7938.

14th

Geneva: Joint aviation/oil industry seminar on electronic data interchange. Details: International Air Transport Association, Maria Guinevan, Data Automation Services, Route de l'Aeroport 33, PO Box 672, 1215 Geneva 15 Airport, Switzerland. Tel: 41 22 799 2707. Fax: 41 22 799 2683.

14th

London: Conference on 'Energy in the Single Market'. Details: Conferences Department, The Institute of Energy, 18 Devonshire Street, London W1N 2AU. Tel: (071) 580 0008. Fax: (071) 580 4420.

14th

London: Conference on 'Sharing Facilities — The legal, financial and commercial aspects'. Details: European Study Conferences, Douglas House, Queen's Square, Corby, Northamptonshire NN17 1PL. Tel: (0536) 204224. Fax: (0536) 204218.

14th–15th

London: Conference on 'The Financing and Economics of Gas and Electricity Projects'. Details: Sue Cockburn, IBC Financial Focus Ltd, 57/61 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383. Fax: (071) 323 4298.

18th

Cranfield: Course on 'Human Factors and Human Reliability in Offshore Safety Assessments'. Details: Short Course Manager, Cranfield Institute of Technology, Cranfield, Bedford MK43 0AL. Tel: (0234) 75011. Fax: (0234) 751206.

19th

London: Conference on 'Petroleum Retailing in Europe — A Single Market?' Details: Miss C Little, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Tel: (071) 636 1004. Fax: (071) 255 1472.

19th

London: Evening meeting on 'The International Impact of Marine Engineering Offshore (Oil and Gas)'. Details: Mr David Long, Technical Secretary, Institute of Marine Engineers, The Memorial Building, 76 Mark Lane, London EC3R 7JN. Tel: (071) 481 8493.

19th

London: Conference on 'Offshore Oil and Gas — The impact of the internal market'. Details: Roberta Henry, CBI Conferences, Centre Point, 103 New Oxford Street, London WC1A 1DU. Tel: (071) 379 7400. Fax: (071) 497 3646.

20th–22nd

Kuala Lumpur, Malaysia: 'Asian Natural Gas IV: Development of the Domestic Industry'. Details: Asian Natural Gas IV, Institute of Gas Technology, 3424 South State Street, Chicago, Illinois 60616, USA. Tel: 312/567-3881.

21st

London: Conference on 'The Safe Handling of Gas Cylinders'. Details: Conference Department, RIBA Services Ltd, 39 Moorland Street, London EC1V 8BB. Tel: (071) 251 5885. Fax: (071) 253 1085.

21st–22nd

Moscow: 'First Oil and Gas Projects '92 Conference'. Details: International Trade & Exhibitions Limited, 31 Warrington Crescent, London W9 1EJ. Tel: (071) 266 1986. Fax: (071) 286 0177.

22nd

London: Conference on 'Environmental Management Systems'. Details: Hawksmere Ltd, 12–18 Grosvenor Gardens, London SW1 W 0DH. Tel: (071) 824 8257. Fax: (071) 730 4293.

27th–28th

London: Conference on 'Liability and Insurance in the Oil Industry'. Details: Elizabeth Thomas, Centre for Petroleum and Mineral Law & Policy, University of Dundee, Dundee DD1 4HN. Tel: (0382) 307299. Fax: (0382) 22578.

28th–29th

London: Conference on 'Control and Instrumentation in Power Plants'. Details: Liz Hyde, IBC Technical Services Ltd, Gilmoora House, 57-61 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383.

June

1st–2nd

London: Conference on 'The condition monitoring and corrosion prevention in refineries and petrochemical plant'. Details: Lisa Bilby, Brintex Ltd, 32 Vauxhall Bridge Road, London SW1V 2SS. Tel: (071) 973 6401. Fax: (071) 233 5054.

1st–3rd

Trondheim, Norway: 'European Applied Research Conference on Natural Gas'. Details: The Norwegian Institute of Technology, SEVU Conference Office, N-7034 Trondheim, Norway. Tel: (47) 7595267. Fax: (47) 7517226.

2nd–4th

Aberdeen: Seminar on 'Financial Management and

FORTHCOMING EVENTS

Accounting for the Oil and Gas Industry'. Details: MD Consultancy, 18a Carden Place, Aberdeen AB1 1UQ. Tel: (0224) 626268. Fax: (0224) 626950.

2nd-5th
Espoo, Finland: '5th World Conference on Continuing Engineering Education'. Details: Ms M Suvanto, Conference Director, c/o Helsinki University of Technology, Revontulentie 6, SF-02100 Espoo, Finland. Tel: (358) 0451 4078. Fax: (358) 0451 4086.

3rd
London: Conference on 'Design and Implementation of Effective Safety Management Systems for the Offshore Industry'. Details: IIR Ltd, 28th Floor, Centre Point, 103 New Oxford Street, London WC1A 1DD. Tel: (071) 412 0141. Fax: (071) 412 0145.

3rd-4th
Aberdeen: 'Subsea Europe 92'. Details: Ms J Heddle, PR Consultants Scotland, 52 Queens Road, Aberdeen AB1 6YE. Tel: (0224) 325326. Fax: (0224) 325303.

7th-12th
Moreton-in-Marsh: Course on 'Handling of Emergencies in the Petroleum Industry'. Details: Ron Cameron, Marketing Manager, The Fire Service College, Moreton-in-Marsh, Gloucestershire GL56 0RH. Tel: (0608) 52156. Fax: (0608) 51788.

7th-8th
Birmingham: 'European Retail Engineering Conference'. Details: Blenheim Pel, Blenheim House, Ash Hill Drive, Pinner, Middlesex HA5 2AE. Tel: (081) 868 4466. Fax: (081) 868 9933.

8th-10th
London: Course on 'Land Pipeline Engineering'. Details: Nadia Ellis, IBC Technical Services Limited, 57/67 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383. Fax: (071) 323 4298.

8th-12th
Oxford: Course on 'The Refinery—Power Generation Interface—Residue Processing and Integration for Power Production and Cogeneration'. Details: The College of Petroleum and Energy Studies, Sun Alliance House, New Inn Hall Street, Oxford OX1 2QD. Tel: (0865) 250521. Fax: (0865) 791474.

9th-11th
Birmingham: 'Forecourt Marketing and Equipment Show'. Details: Blenheim Pel, Blenheim House, 630 Chiswick High Road, London W4 5BG. Tel: (081) 742 2828. Fax: (081) 742 3183.

10th
Birmingham: 'Petrol Pump Ball'. Details: Tina Steele, BEN, Lynwood, Sunninghill, Ascot, Berkshire SL5 0AJ. Tel: (0344) 20191. Fax: (0344) 22042.

11th
London: Conference on 'A Fully Unified EC Oil and Gas Market'. Details: Miss C Little, The Institute of Petroleum.

11th-13th
Aberdeen: Course on 'Oil and Gas Metering'. Details: John Fyfe, IITS (UK) Ltd, Caleb Brett Division, Wellheads Crescent, Dyce Industrial Park, Aberdeen AB2 0GA. Tel: (0224) 722324. Fax: (0224) 722894.

12th
London: Conference on 'Liberalising the European Gas Markets'. Details: Miss C Little, The Institute of Petroleum.

15th-16th
Hamburg: 'The 1992 European Oil Refining Conference'. Details: Wefa Energy, 60/62 Margaret Street, London W1N 7FJ. Tel: (071) 631 0757. Fax: (071) 631 0754.

15th-19th
Abuja, Nigeria: Conference/ Exhibition — Petro Expo '92 — 'Petroleum Fuelled Economic Development'. Details: Data League Ltd, PO Box 144, Ilford, Essex 1G2 7NU. Tel: (081) 518 3917. Fax: (081) 513 3917.

16th
London: Conference on 'Offshore Safety — The Response to Cullen'. Details: Miss C Little, The Institute of Petroleum.

16th-17th
London: Conference 'Cut Costs by Maximising Energy Efficiency'. Details: IIR Industrial Ltd, 28th Floor, Centre Point, 103 New Oxford Street, London WC1A 1DD. Tel: (071) 412 0141. Fax: (071) 412 0145.

17th
London: Seminar on 'Financial Management and Accounting for the Oil and Gas Industry'. Details: MD Consultancy, 18a Carden Place, Aberdeen AB1 1UQ. Tel: (0224) 626268. Fax: (0224) 626950.

18th-19th
London: Conference on 'Cost Effective Safety'. Details: Liz Hyde, IBC Technical Services Limited, Gilmoora House, 57/61 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383. Fax: (071) 631 3214.

21st-26th
Wiltshire: Course on 'Natural Gas: The Practical Essentials'. Details: Anita Gardiner, The Alphatania Partnership, 82 Rivington Street, London EC2A 3AY. Tel: (071) 613 0087. Fax: (071) 613 0094.

22nd-24th
Birmingham: Conference on 'Valves and Actuators for Fluid Control'. Details: Mrs J Whitham, BVAMA Valves and Actuators Conference, IT Conference Consultants, PO Box 452, Bedford MK43 9PL. Tel: (0234) 854756. Fax: (0234) 841375.

22nd-24th
Bromley: Course on 'Safety of Electrical Equipment in Potentially Explosive Atmospheres'. Details: Sira Communications Limited, South Hill, Chislehurst, Kent BR7 5EH. Tel: (081) 467 2636. Fax: (081) 467 7258.

23rd-26th
Birmingham: 'Eurochem 91'. Details: Sara Binns, Exhibition Manager, Reed Exhibitions, 26 The Quadrant, Richmond, Surrey TW9 1DL. Tel: (081) 948 1289. Fax: (081) 948 9989.

24th-26th
London: Course on 'Introduction to Oil Industry Operations'. Details: Miss C Little, The Institute of Petroleum.

29th-1st July
London: Course on 'Introduction to Petroleum Economics'. Details: Miss C Little, The Institute of Petroleum.

July

7th
Leeds: Course on 'Engine Emissions Measurement'. Details: Hansa Patel, Continuing Education Building, Springfield Mount, Leeds LS2 9NG. Tel: (0532) 333235. Fax: (0532) 333240.

Iraq: devastation and recovery

By John M Roberts

Iraq's ability to recover from the consequences of two disastrous wars depends on the recovery of an oil industry devastated by Allied bombing during the Second Gulf War and the continuing problems posed by blockage of export routes created or expanded during the First Gulf War with Iran. There are considerable incentives for the industrialised world's oil companies to consider doing business with Iraq should conditions improve. Iraq, after all, has the world's second-largest confirmed oil reserves. These are officially put at 110 billion barrels, while former Oil Minister Issam Chalabi used to add that Iraq also possessed a further 50 billion barrels of 'virtually proven' reserves. Moreover, Baghad has now offered what it clearly conceives to be the ultimate enticement: production-sharing.

But Iraq's problem is that the barriers to the recovery of its oil industry are not only technical and financial, but political. Whatever Baghdad thinks — and there is some evidence that President Saddam Hussain believes that sanctions can be progressively eroded — there will be no recovery until sanctions are formally lifted. Even then, recovery will be problematic so long as he himself remains in power.

The political restraints on Iraq are, for the present, the most important element retarding the recovery of its oil industry and the resumption of oil exports. UN sanctions will have to be lifted before Iraq can secure export contracts or replacement equipment to rebuild its refining and petrochemical facilities. Nonetheless, Iraq has already made considerable progress on its own since the Second Gulf War's ceasefire was declared on 27 February last year. Its production capacity is now officially stated to have reached actual pre-war output levels, though the assertion is disputed by some Western observers and, of course, remains irrelevant so long as the country cannot export the bulk of its produce.

Extent of the destruction

The oil industry was severely damaged during the Allies' six-week bombing campaign. One post-war survey reported that the Allies conducted 518 sorties against oil targets, dropping 1,200 tons of explosive against 28 oil targets. The *Washington Post* cited US Air Force sources as saying that the intent was 'the complete cessation of refining' — but without damaging most crude oil production.

Nonetheless, there were unconfirmed reports during the fighting of Allied attacks on well-heads, a number of gas separation units were destroyed or damaged, while during the March 1991 Kurdish uprising there may have been damage when the Kurds briefly extended their power into the Kirkuk oilfields.

The British commander in the Gulf, Sir Peter de la Billiere, claimed during the conflict that 75–80 percent of Iraq's refining capacity was destroyed. Certainly the flow of refined product was stopped.

Pipelines were hit. The line carrying crude from the southern fields to Yanbu was ruptured. Pumping stations on the strategic pipeline that can carry oil from the south to the north, or vice-versa, were damaged, though it appears that the infrastructure for carrying crude from the northern fields up to the Turkish border and the pipeline to Yumurtalik escaped serious damage.

The overall impact was certainly massive. Baghdad claimed during the war that Iraq sustained $100 billion worth of damage and that it would cost $5–10 billion to rebuild or repair damaged refining and petrochemical plants. But although the Basra refinery was heavily bombed, the damage caused at some of the country's other major refineries was repaired quickly. Baghdad's 92,000 b/d Dawra refinery was supposedly wrecked by Allied bombing with at least one and probably several of its processing units totally destroyed. But it was back in action by May with full production slated to resume a few weeks later. According to one account, this was achieved by drawing on large stocks of spare parts and cannibalising damaged machinery. But the kerosene plants and half the lubricant producing plants were said to be in ruins. The 200,000 b/d Baiji refinery was hit but was not disastrously damaged. Production resumed six weeks after the fighting ended and the plant was reported to be operating at close to full capacity shortly thereafter. The small 30,000 b/d Nasiriyah refinery was producing at one-third capacity by June 1991. By February 1992, the Basra petrochemical complex, designed to produce polyethylene PVC and sodium hydroxide, was reported to be resuming production of ethylene, chloride and sodium hydroxide.

'There is a limit to how much Iraq can do on its own'

Restoring oil output

As refining capacity was restored, so was basic oil output. Three months after the 27 February ceasefire, Iraqi

production was back up to 450,000 b/d, enough to meet routine domestic demand. By December, Baghdad was claiming it possessed a 1.6 million b/d output capacity. In February, the Southern Oil Company was said to be capable of producing 2.0 million b/d, while the northern oilfields were reported capable of producing at their full 1.45 million b/d capacity. In effect, Baghdad was claiming that it could now produce at close to the 3.6 million b/d required to meet both domestic commitments and its pre-crisis OPEC quota of 3.14 million b/d.

On 12 March Foreign Minister Tariq Aziz, in an interview with the BBC, claimed that Iraq had repaired most of the damage to its oil industry. Iraq was then claiming it possessed the ability to export no less than 1.5 billion b/d — two-thirds of it through the Turkish pipeline and one-third via its Gulf terminal at Mina al-Bakr. Three loading terminals at Umm Qasr, the newly developed Iraqi port whose southern districts were almost certainly built in Kuwaiti territory, were also said to have been completed.'

Such claims may well be exaggerated. Iraq first reported Mina al-Bakr to be operational in late 1991, a time when most analysts were fairly sure it was still out of action for significant oil loading. Likewise its actual sustainable production capcity may well be lower than 3.0 million b/d.

But this is not particularly important. The strides made toward recovery have been major; the statements of capacity may be inaccurate to begin with, but provide an accurate guide to the state of affairs a few months later. They should thus be regarded as a sign of Iraq's determination, and success, in overcoming immense problems to restore its oil production and export capacity. In saying it can produce at a certain level, or that specific outlets can export specific volumes, Baghdad is sending political signals. It hopes these will be heeded, so that should sanctions be lifted (a process that always seems to be some months away), by then it will be able to produce and export at the previously-claimed level.

Bearing this in mind, it is probably significant that the actual level of crude which Iraq appears to contemplate exporting under current circumstances is much smaller, around 900,000 b/d, than its claimed export capacity. Such a level is implicit in its demand to the United Nations in March that it be allowed to export $2.6 billion worth of crude — by comparison with the UN $1.6 billion offer — over a six-month period.

Almost certainly, there is a limit to how much Iraq can do on its own, particularly in the face of UN sanctions. Last November, Oil Minister Osama Abdel Razzak al-Hithi accused the West of using sanctions to prevent Iraq returning to the international oil market. 'I think for some reason or another they are trying to stop us from getting back onto the oil market and giving it (Iraq's oil market share) to countries such as Saudi Arabia to pump as much as they want, he said.'

So far as sanctions are concerned, the minister was wrong: there has been no indication that that was the aim of UN sanctions. It has been Iraqi obstinancy, as much as UN concern that it control the flow of both oil and oil receipts, that has blocked efforts to secure a partial lifting of sanctions.

Yet there is an element of truth in Mr al-Hithi's charge. Much of the destruction wrought by Allied bombers during Desert Storm was engineered, Pentagon officials subsequently acknowledged, to secure post-war leverage over Iraq. The planners said that the intention, particularly in some of the later bombing sorties, was to damage key facilities so that they could only be repaired with foreign assistance.

Judging by Iraqi interest in securing such assistance in recent months, it would appear that this strategy was particularly applied with regard to oil industry targets.

When he accused the United Nations of trying to redistribute Iraq's share of the oil market, Mr al-Hithi went on to say that even if Iraq were to return to the market it would still need foreign currency to import spare parts for machinery and chemicals in order to sustain oil output at the level of 1.5 million b/d he believed was then possible. Shortly after the fighting stopped, Mr al-Hithi had acknowledged that damage to Iraq's petrochemical plants meant that new turbines, pumps and compressors would have to be specially imported.

In this respect, what may ultimately prove more important is that as long ago as last September, Mr al-Hithi twinned the concepts of offering more favourable terms to foreign companies than were available before the Second Gulf War with Iraq's goal of taking its crude oil capacity up to 4.0 million b/d by the end of 1993. Mr al-Hithi appeared to realise then — and his confirmation in March that talks were indeed being held with Western companies provides further evidence of this — that Baghdad fully realises that despite its best efforts, it will still need foreign expertise, and external finance, if its oil industry is to make the best use of the country's reserves. Put simply, Iraq's accumulated financial problems and its need for industrial regeneration require it not merely to produce as much crude as Iran, but to exceed Iranian export levels by a significant margin — a policy that will further dampen oil prices (thus reducing potential revenues) in an era when oil prices are already comparatively low.

Officially, and thus for OPEC and OPEC quota arranging purposes, Iranian capacity now stands at 4.0 million b/d and is set to rise to 5.5 million b/d by March 1994 — although Western analysts generally believe about half a million barrels should be shed from these totals. Iraq wants Western help so it can exceed these totals, and production-sharing is probably the most practical solution since that puts pressure on the oil companies to find secure outlets for the extra crude Iraq hopes to produce.

'The re-introduction of production-sharing would be particularly ironic'

Politically, Iraq is therefore in a race against time. Every month that it fails to produce any significant export volume is a month that sees Kuwaiti exports grow and enables Saudi Arabia and Iran to stabilise output at relatively high levels, while pressing ahead with capacity increase projects. When unrestricted Iraqi exports again become possible, Baghdad will find itself having to fight for a much smaller quota than its former OPEC quota of 3.14 million b/d — unless it simply decides to ignore OPEC quotas altogether.

Post-sanctions opportunities

The confirmation in March that the Iraqi oil ministry had held preliminary talks with two French companies, Elf and Total, on post-sanctions activity probably reflects a need for financial as well as technical input for any rapid post-sanctions recovery in oil output. The most important aspect was not the talks themselves, since UN sanctions do not prohibit discussions about post-sanctions activity, but that they concerned development of two major

southern oilfields, Majnoon and Nahr 'Umar, on a production-sharing basis.

The re-introduction of production-sharing would be particularly ironic. One of the causes of the Second Gulf War was Iraq's inability to agree terms with Western oil companies, particularly those in Japan and the United States, over development of its vast oil reserves. The stumbling block was Iraq's refusal to consider production-sharing. When the Western companies rebuffed Baghdad, President Saddam Hussain sought more drastic means to secure an increase in oil revenues. However, what happened was the opposite. Mr al-Hithi estimated in January that since August 1990 forgone oil revenues had amounted to $26.5–32 billion, based on an OPEC basket price of $18–21 per barrel.

In addition to the French companies, Baghdad is reported to have held similar talks with other West European companies, while Mr al-Hithi has commented that US companies, too, would be welcomed as potential partners in Iraqi oilfield development. 'Iraq has no problem with American companies. We have a problem with the American administration,' he declared.

But while the E & P end of the US industry may yet respond to Iraqi blandishments (on the assumption that sanctions are lifted, of course), it is worth bearing in mind the reports circulating last August, when a partial Iraqi oil sale was first mooted, to the effect that US refiners would probably shun Iraqi imports on the grounds that US motorists would actively boycott service stations selling Iraqi-origin product.

In the end, however, the prospects for developing the Iraqi oil industry depend on the answers given to two fundamental questions. The first is whether UN sanctions will be lifted, even partially; the second is when that will happen. It is now nine months since a partial lifting of sanctions was proposed. That this has not yet happened stems mainly from Iraqi obduracy over a host of issues, notably those related to arms control, the role of UN officials inside Iraq and control of the finances raised from the proposed oil exports. But other issues (such as the Kurdish question) will probably have to be settled before oil exports resume.

In the north, Iraq does not want to export crude through the Turkish pipeline so long as part of the Iraqi section of the line is under Kurdish guerrilla control. Baghdad is currently waging an economic, as well as a military, war against the Kurds. Kurdish control of a pipeline that was back in use for crude oil exports would constitute a powerful counter to Baghdad's current 75 percent cutback (95 percent in some places) in fuel supplies to the Kurdish area.

In the meantime, the Iraqi president seems to believe that he can wait out the United Nations and successfully erode sanctions so that in the end the West tires of their maintenance. Iraq is routinely trucking diesel into Turkey. Turkish officials estimate the volume at 80,000 b/d, but, following personal observation in Iraq of this trade, this writer considers an export total of around 50,000 b/d to be more likely. A similar trade exists with Jordan, though the United Nations has turned a blind eye to this since Iraq receives no cash for its sales, since the oil is offset against Iraqi debt to Jordan. But a recent development, the onpassing via Jordan of around 40,000 b/d of Iraqi crude to Syria, could change matters since there are reports that Syrian refineries are taking the Iraqi product in order to free up extra Syrian crude for export.

Even if the immediate political and technical issues concerning the United Nations' limited oil exports-for-food offer are resolved, the fundamental question of sanctions remains. Sanctions can only be lifted by the UN Security Council and that gives each of its five permanent members the right to veto such a move. In sum, sanctions will only be lifted when the US government believes they should be. Whether President George Bush is President Saddam Hussain's nemesis, or whether it's the other way round, has still to be determined. But the continuation of sanctions so long as President Saddam Hussain remains in power — particularly since the US ability to pursue a military option will diminish if it carries out the expected withdrawal in June of its aerial strike force in Turkey — seems probable. ■

Annual survey of the average lead and sulphur contents of petroleum products delivered into the UK market in 1991

	Petrol lead content (grams/litre)					Sulphur content (% mass)						
				Premium motor spirit								
	2-Star	4-Star	Un-leaded	Leaded	U/Leaded	Regular kerosene	Aviation kerosene	Auto diesel	Gas oil	Fuel oil (1) Light	Medium	Heavy
1987	0.140	0.142	—	0.02	—	0.06	0.04	0.22	0.29	1.7	1.8	2.1
1988	0.138	0.143	0.002	0.04	—	0.03	0.03	0.19	0.25	1.4	1.8	2.0
1989	—(2)	0.143	0.002	0.05	0.03	0.04	0.03	0.19	0.21	1.8	2.2	2.2
1990	—	0.143	0.002	0.05	0.04	0.04	0.03	0.19	0.21	1.7	2.0	2.2
1991	—	0.145	0.001	0.04	0.03	0.03	0.04	0.19	0.21	1.4	1.8	2.1

Based on weighted average figures provided by UK Petroleum Industry Association.

Notes:
(1) Fuel oil figures exclude deliveries for export, bunkers and public authority electricity generation.
(2) Following the duty increase imposed in the 1989 March Budget 2-Star petrol rapidly disappeared from the market.

Workforce shrinks as technology takes over

Shell Expro will shed more than 2,000 jobs in the North Sea over the next decade as a result of technical developments associated with the operation of its installations.

A further 2,000 job losses could be expected among staff employed by offshore contractors as major restucturing is carried out in the mature oil region.

According to Shell Expro Managing Director Dr Chris Fay, the cuts are part of a drive to reduce costs and increase efficiency in order to develop some of the more marginal fields in this high-cost province.

Dr Fay stated that up to one quarter of the workforce employed on the UK Continental Shelf would be lost through natural wastage, though which disciplines would be affected was, he said, 'an open issue.' Manning levels offshore were likely to decrease to about 60 percent of current levels by the turn of the century.

The company's latest project, the Gannet field due to come onstream in August, is at the forefront of what the company believes is the best way forward in continuing its operations.

The first proposal to develop the field (actually a cluster of four fields) was made in 1984 but the oil price collapse two years later forced the plans to be shelved. Since then, technical developments in design, materials, construction and operation have meant that the project was able to be re-initiated with much lower 'lifetime' costs. The initial development cost, at £700 million, is around half of the planned costs in the original proposal.

Three fields — Gannet B, C & D — will be tied back to a central platform over the Gannet A field by subsea developments with the oil being fed to the Fulmar Floating Storage Vessel and the gas being transported by pipeline to St Fergus. The three tie-backs and the platform jacket are already in position with the main topside unit, incorporating the radical design changes over earlier Shell platforms, being prepared for transport to the site.

The entire unit has been fully commissioned and tested onshore to avoid any time delays in getting the project started in the third quarter of this year. Shell Expro has also contracted the drilling rig Sedco 704 for tender assisted drilling services for the platform to drill the 17 wells planned for Gannet A. The rig will supply accommodation, storage and drilling mud requirements for the programme.

The use of tender assisted drilling and a radical rethink about the lifetime costs of equipment on the installation have led to substantial manpower and cost savings. The four fields will be operated with only 20 crew, with an additional 20 maintenance staff when required.

The company has incorporated four blast walls in the design of the platform and has done away with non-blast walls at the sides of the platform's collection and transmission areas. This radically reduced both the overall weight of the unit and the requirement for ventilation systems in these areas as well as providing simplified escape routes in the event of an emergency. Shell has also invested in metals and materials that have increased the initial outlay but will result in much reduced maintenance costs over the lifetime of the project.

Many of the design changes are as a direct result of lessons learnt in the aftermath of Piper Alpha as well as modifications made as a result of a re-appraisal of systems on earlier platforms such as Cormorant and Fulmar.

'We now have a far better understanding of the total integration of the structure,' added Dr Fay. 'Quantitative risk assessment has meant that we have a much improved understanding of escalation of incidents. The lessons learnt from Cormorant Alpha and Fulmar Alpha have been applied.'

The company also intends to devote a higher proportion of its capital expenditure on upgrading and developing its existing platforms — so-called 'brown-field' sites — rather than on developing new projects. This will extend the fields' existing life and continue to provide substantial employment opportunities for maintenance and construction companies onshore.

The 9,610 tonne *Gannet* topside unit being loaded onto a barge prior to being moved downsteam to deeper water for final fitout and commissioning. The giant structure had to be moved onto the barge during a narrow weather and tide window which, if missed, could have set the project back several weeks. The final decision for the go-ahead was given at around 4.00 am on the day of the move. The drilling structure, flare tower and accommodation module/helideck will be installed at a later date.

Decontamination by vacuum extraction

By Gerald Licence, Development Manager, Miller Environmental

Vacuum extraction technology is a method of removing decontaminants such as petrol, diesel and solvents from the ground. It is based on creating a subsurface vacuum through a series of wells driven into a contaminated area. Volatile and semi-volatile contaminants are then drawn up through these wells to the surface for treatment.

In this case study we examine the problem encountered by Texaco Limited, which had been leasing and operating a sales terminal alongside Aberdeen harbour where it had handled bulk petrol, diesel, kerosene and gas oil. By this time the site was closed.

By 1990, the Texaco operation by the harbour had become redundant and the decision was taken to close the depot and sell the site.

In line with Texaco policy, an environmental assessment was undertaken and a firm of environmental consultants were appointed to investigate the condition of the site and consider what remedial works would be necessary prior to the sale of the land. The Regional Council and the River Purification Board were also consulted.

The site investigation, undertaken by Environmental Assessment Group (EAG), revealed the presence of liquid, residual and vapour phase volatile hydrocarbons in the subsurface soils, together with a layer of liquid phase volatile hydrocarbons floating on the groundwater.

To complicate matters, the groundwater level was subject to tidal variations which had caused a 'smear zone' between the lowest and highest levels of the water table.

The risks presented by the contamination were evaluated in relation to the future use of the site and the local environment.

Evacuation and disposal of the contaminated soils were quickly ruled out, as the risk assessment identified only the liquid phase product as presenting a risk. Texaco Limited took the decision to remove this product prior to selling the site.

Standard pump and treat methods were rejected in view of the low levels of oil recovery and the unlikelihood of achieving a satisfactory solution in a realistic period.

At this point, both EAG and Texaco Ltd became aware of a technology which was first developed in the United States by Terra Vac Inc and had just been introduced into the United Kingdom by Miller Environmental.

Proposed solution

At the Aberdeen site, because of the relatively high and variable water table and the large amounts of free product, a development of the vacuum extraction technology known as dual vacuum extraction was proposed.

Normally, a boundary to vapour flow exists at the groundwater surface on the top of the capillary fringe. However, by applying dual vacuum extraction, cones of depression can be created around each well lowering the capillary fringe and thereby exposing additional soils to the vacuum extraction process whilst also removing free product.

This was particularly important at the Aberdeen site in view of the fluctuations in the water table and the large 'smear zone' which had resulted. The creation of cones of depression also provided a gradient around each cone down which the product was induced to flow freely towards the extraction wells.

Dual vacuum extraction therefore combines the vacuum extraction of unsaturated soils with groundwater recovery from a single extraction well, simultaneously removing volatile organic compounds from the subsurface and recovering free liquid phase hydrocarbons from the goundwater. The vacuum extraction system also offers the advantage that the whole process is intrinsically safe.

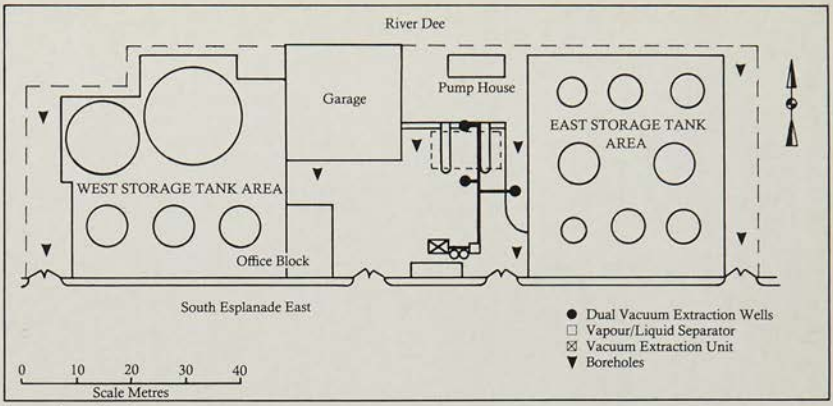
Decontamination process

Limited investigation work had defined the main area of contamination. On the basis of this information, three dual vacuum extraction (DVE) wells were driven through the concrete base of the depot within the defined area. A conventional drilling rig was used, the first metre of each well being excavated by hand to detect any hidden services. During drilling operations, soil samples were regularly logged using modified split spoon sampling methods.

The samples were measured for volatile organic compound (VOC) levels using a gas chromatograph equipped with a suitable detector. The DVE equipment was set up on site and operations commenced.

Each DVE well was operated separately at first to assess its radius of influence, initial hydrocarbon vapour concentration and product extraction rate. At the same time the subsurface vacuum created at each of the non-operating wells was measured. Finally all three DVE wells were connected and the entire system brought into operation.

The first task was the recovery of floating free product by vacuum



Texaco depot, Aberdeen

entrainment, ie the product was skimmed off the groundwater surface from each of the existing borehole wells and the three new DVE wells. The recharge rate for each well was monitored. In the most extreme case over 1 metre of free products was removed in the first fortnight of operations.

The simultaneous removal and treatment of product then began, creating a cone of depression around each well and encouraging the flow of floating free product down towards each well.

At the same time the vacuum extraction process removed volatile organic contaminants and liquid product from the smear zone immediately above the groundwater.

This smear zone of liquid product had become trapped and adsorbed to the soil during the tidal fluctuations and would not have been removed by traditional groundwater pumping.

The mixture of product, water and vapour removed from the wells was passed through a separator. The contaminated groundwater was pumped to an empty storage tank on the site for analysis, prior to receiving regulatory authority approval for its discharge to the sewer.

Primary and secondary activated carbon canisters were provided at the site to ensure that volatile emission levels were acceptable.

The removal of hydrocarbon pollution initially took place at a very high rate as the trapped vapours and more volatile fractions were withdrawn. Approximately 860kg of VOCs were extracted during the initial 14 days of operation from the three wells. Initial vapour concentrations of 9.33, 6.22 and 6.16mg, were reduced to 0.63, 1.57 and 0.28mg/litres respectively.

Results also exceeded expectations in two other key areas. Based on the data and soils geology, the three dual vacuum extraction wells had been designed with 15m overlapping radii of influence but it became clear during operations that the zone of influence of each well was in fact considerably larger.

One of the more important benefits of a vacuum extraction operation is the ability to predetermine criteria for success. In this instance, an appropriate target was agreed at the outset of the project. This target was achieved five months after beginning work and far quicker than any alternative form of treatment could have achieved.

Conclusion

By September 1991, over 3,000 litres of free product had been removed from the soils beneath the site. Two further wells had been drilled at another point within the site to treat a smaller subsurface spill which had been identified.

These two additional wells were connected with the existing pumping system.

At Texaco Limited's request, EAG undertook a validation assessment to confirm that the predetermined risk-based clean-up targets had been achieved. The company sampled the wells after a three week non-operational period. No free product was detected. Total Petroleum Hydrocarbons concentration were reduced from 4.9mg/litres and 170mg/litres in two of the wells to less than 1mg and 1.8mg/litres respectively. The review concluded that a significant improvement in the condition of soil and groundwater at the site had been achieved.

Future developments

Vacuum extraction can also be used with other technologies to deal with subsurface volatile solvent pollution. This involves the use of a specially treated and modified clay to create a powdery material with superior containment and protection properties better than High Density Polyethylene or bentonite.

It can be used in a cut-off trench to prevent the spread of hydrocarbon pollution into an adjacent property or watercourse, thereby containing the pollution phase and buying time in which vacuum extraction operations can remove the contamination source.

Surveys in the United States have shown that significant subsurface contamination exists at over 60 percent of petrol filling stations and oil terminals. For various reasons this figure is lower in the United Kingdom. Nevertheless, cleaning requirements are becoming stricter by the month and there can be little doubt that UK petroleum distributors and retailers will need to respond positively if their good image and ultimately their bottom line is to be preserved.

Vacuum extraction appears to offer a cost-effective solution to a common clean-up problem. ■

Acknowledgement

The author acknowledges the advice and assistance received from Mr R Head, Co-ordinator Environmental Affairs, Texaco Limited in the preparation of this paper.

Abandonment of offshore rigs: experience in the Gulf of Mexico

By Judith Gurney

Of the more than 6,500 offshore oil and gas rigs worldwide, some 4,000 are located in the Gulf of Mexico where the offshore industry had its beginnings in 1947, in 20 feet of water. As the average useful life of an offshore rig is about 25 years, abandonment began in the Gulf in the early 1970s. Some 800 structures have already gone and decommissioning is proceeding at the rate of 60 or 70 platforms a year. Total removal with onshore scrapping has been the general rule but there have been a number of instances of partial removal, platform refurbishment, and the use of old rigs in artifical reef programmes. Although abandonment to date mostly has involved relatively small, steel-jacketed platforms located in shallow waters, the experience has given the industry an insight into problems, technologies and costs which have relevance for the coming decommissioning of larger structures in the deeper waters of the North Sea.

Regulations

Regulatory considerations largely dictate choices and procedures for offshore rig abandonment. International treaties have focused on safety of navigation and pollution of the seas; legislation in coastal states deals also with issues of national security, liability, financial considerations and the requirements of the fishing industry. The 1958 Geneva Convention ruled that disused oil installations had to be entirely removed. This seemed reasonable at a time when the largest offshore structure was situated in 206 feet of water. In 1982, the United Nations Convention on the Law of the Sea recognised that complete removal of some of the massive rigs in deeper waters could be very dangerous, hazardous and expensive. It agreed to consider limited dismantling, if safety of navigation could be ensured and due consideration given to other users of the sea, and instructed the International Maritime Organisation (IMO) to draft the appropriate standards. The IMO's October 1989 Resolution A.672(16) permitted coastal states to allow the non-removal or partial removal of offshore platforms provided that certain considerations were met, including safety of navigation, fishing interests, the effect on the marine environment and the potential rate of deterioration of the structure.

In theory, the United States has not followed the IMO lead and the federal government still continues to subscribe to the total removal of disused offshore rigs from the Gulf of Mexico. Interior Department regulations state that once a rig has ceased to produce, 'the lessee shall within a period of one year thereafter remove from the premises all structures.' A US Geological Survey Order requires that 'all casings and pilings shall be severed and removed 15 feet below the Gulf floor and the location shall be dragged to clear the wellsite of any obstructions.'

In practice, however, the federal government has softened its total removal stance over the years, allowing coastal states some leeway in making their own abandonment policies, particularly with regard to the formation of artificial reefs. The ending of the Cold War has brought further relaxation with the diminishing US Navy concerns that Soviet submarines would hide inside abandoned rig jackets, where they could not be detected by sonar. The Minerals Management Service, the Interior Department's oversight agency for offshore platform operations, now advises on partial removal and reuse as well as on total removal.

Disposal options

Most abandoned Gulf of Mexico rigs have been totally demolished, although some have been partially removed down to a preselected, government-approved depth. Many topside structures, including decks, have been salvaged for reuse. A few platforms have been cut in half and toppled on site to make artificial reefs in state 'rigs-to-reef' programmes. Several have been totally refurbished and re-erected on other offshore sites, while several have been towed to designated artificial reef sites. Dismantled rig debris has been hauled to both deep-water dumping sites and to onshore scrap yards.

The technology used to reduce a rig to manageable sections for removal has been dictated largely by considerations of cost and the scheduling of manpower and equipment. The general procedure on smaller rigs has been to remove the topside equipment and then to lift and remove the deck in one piece. Removal of topside facilities is generally similar for steel and concrete platforms. It is not simply the reversal of the installation process, however, as topside facilities have usually required substantial modification, such as equipment removal and strengthening, before they could be safely lifted.

Dismantling of the substructure, however, differs significantly between steel and concrete platforms. The removal process for steel platforms is

basically the same, regardless of the size of the platform. In the Gulf, it has been found necessary to cut steel structures into sections of 500 to 1,000 tons before lifting them onto barges. While crane capacity is substantially higher, a wide safety margin is needed due to such factors as the weight of fouling material, enclosed water, hydrodynamic-added mass and dynamic effects. Cutting thick wall tubulars creates problems. To date, the most widely used techniques are oxygen/acetylene above water and explosives below water. Alternative methods which have been tried, with success and failure, include mechanical cutting, abrasive cutting, diver cutting, waterjet cutting, chemical cutting, remote-controlled arc gauging and laser cutting. Experience in the Gulf has highlighted the need to develop technology and equipment for cutting and handling thicker and heavier steel, such as that used in most North Sea structures.

Abandonment in the Gulf of concrete rigs has been limited to a few instances where disposal on site of the substructure was permitted; in these cases, the concrete columns were detonated at a required depth and toppled in a controlled manner. In theory, concrete structures could be fully removed by reversing the installation process by which the substructure, following removal of the topside, could be refloated and towed, preferably to an acceptable deep-water disposal site. Such an approach would require techniques which have not been tested to break the structure free from the seabed and to install a new ballasting system if the old system was found to be no longer workable or safe.

Costs

Because all rig removals in the Gulf of Mexico to date have involved small structures in relatively mild environments, extrapolations of removal costs for larger structures in less favourable environments must be considered tentative. Historical experience has shown that where major new technology and operations are necessary, initial estimates have tended to underestimate final costs, often by very substantial amounts. Recently, the cost of removing all 6,000 worldwide oil and gas rigs from the seabed has been estimated as $35 billion and the cost of removing the 4,000 in the Gulf as $8 billion. The first Gulf rigs, which were small and close to shore, cost $200,000–$300,000 to remove. The average platform removal cost now is around $1 million. Removal costs rise dramatically with increased water depth, increased rig weight and hostile environmental conditions. Estimates of the average cost of total removal for larger rigs in deeper waters in the relatively friendly Gulf environment range around $4 million, broken down into $2 million for structure removal, $50,000 per well for plugging, and $1 million for raking up the debris on the seabed.

The US government insists that removal expenses should be borne by industry as a cost of doing business. This has not been a serious burden for the major oil and gas companies as these costs are tax deductible, chargeable against taxes in the year the costs are incurred. Recently, however, concerns have arisen over the liability for the costs of platform abandonment. As fields in the Gulf reach the end of their productive lives, the major oil and gas companies have been selling their wells and platforms to smaller independent companies which are hoping to eke out a few more years of production from them. It has been estimated that over half the 1,000 companies currently qualified to own offshore wells in the Gulf are small companies with insufficient financial resources to meet removal costs. Concern over this situation escalated in December 1989, when a small New Orleans oil company, Alliance, declared bankruptcy. The federal government may now have to bear the removal costs, estimated at $30 million, for the rigs Alliance had purchased. It plans, however, to try to recover these costs from the companies that sold Alliance the rigs.

Platform salvage

Several steel rigs in the Gulf of Mexico have been removed to shore, rebuilt to new production site specifications and regulations and re-erected as new rigs. Decks often can be recycled; jackets, however, are depth specific and their reuse is only possible in similar depths where production requirements resemble those of their original sites. Jackets of most older rigs cannot be reused as they do not meet the strength of materials standards legislated in the early 1980s. Where it has been possible to salvage jackets, this has been done by cutting the platform legs some 14 feet above the water line and then hoisting off the stripped deck. Explosives have then been placed through the legs 20 feet below the mudline and the jacket stubs blown free of the seabed. Jacket salvage involves oversight by the National Marine Fishery Services, given the danger that the energy impact of the detonation might kill sea turtles and dolphins, which are protected by the Endangered Species Act.

The advantages of refurbished rigs are cost, which is often 20–40 percent lower than that required for a new build, and a quick turnaround time. Several recent Gulf refurbishments are noteworthy. In 1987, Phillips Petroleum removed the deck and jacket of a disused rig from the seabed, refurbished these, and installed them as a new rig in approximately 90 days, at a saving of $2.3 million over the estimated cost for a new platform. At about the same time, ARCO removed two rig decks and jackets, refurbished these and reconstructed two new rigs at different sites, switching over the jackets and decks of the original rigs, at a cost saving of $3.5 million.

'Rig to reef' programmes

Artificial reefs are intended to meet the same marine life basic needs as natural reefs: a safe hiding-place and, in warm waters, abundant food. The Japanese government, which has done extensive research into fish behaviour, ocean dynamics and the life history of different fish species, has spent millions of dollars constructing artificial reefs for aquaculture and commercial fishing.

Offshore rigs and marine life

The size, shape, design, profile, density and openness of offshore oil and gas rigs in the Gulf of Mexico provide a basis for the development of an interactive food web for marine life. Their underwater frames attract the attachment of sessile invertebrates such as barnacles, oysters, mussels, bryozoans, hydroids, sponges and corals. (The species composition of these sessile invertebrate assemblages depends on water depth.) These encrusting organisms, in turn, serve as shelter for free-living invertebrates, such as lobsters, crabs, snails, and shrimp which then, in turn, serve as a source of food for large communities of fish. The rigs also provide a habitat for fish which feed on the seabed and return to the rig for cover. In addition, the rigs attract transient species for periods of a few hours to a few days, including predator fish which prey on their residents.

Taiwan, France, Australia, Puerto Rico, the Philippines and several US coastal states have built artificial reefs for sport or commercial fisheries out of automobiles, rubble, barges, scuttled ships, tyres, clay pipe, purposely fabricated structures — and offshore oil and gas rigs.

Offshore rigs in the Gulf of Mexico function as artifical reefs throughout their productive years, attracting marine life and, consequently, frequent deepsea recreational fishing trippers. Commercial fisherman also regularly harvest offshore rig surrounds. Since rigs appear to be ideal artificial reefs, arguments were raised in the early 1980s that they should continue this function once their productive life in the oil and gas industry was finished. In 1984, a National Fishing Enhancement Act provided a legal framework for coastal states to deploy offshore platforms, either toppled on site or moved to other locations, as artificial reefs. The National Artificial Reef Plan, administered by the Minerals Management Service, was set up to provide guidance on artificial reef development and management, and to serve as a technical reference regarding standards for reef permitting and management. In 1986, the Louisiana Artifical Reef Program was created and in 1989, the Texas Artificial Reef Programme. California, North Carolina, New Jersey, Alabama, Florida and Mississippi also have artifical reef programmes.

Artificial reef sites selected by coastal states must be agreed by the US Corps of Engineers, which takes safety of navigation and commercial fishing interests into consideration. Commercial fisherman are concerned with having as much trawlable bottom as possible, so that the sites of artifical reefs need to be clustered. Sites are not permitted in heavy shrimp-harvesting areas where sunken platforms could damage nets. Offshore rigs forming artificial reefs must be able to withstand water depth and wave conditions to ensure stability. Permits are required from the US Coast Guard, the Environmental Protection Agency, the National Marine Fisheries Services and from various state agencies for each rig-to-reef project.

Among the more dramatic early rig-to-reef projects was the removal from offshore Louisiana waters, by Exxon and Tenneco, of several rigs which were then towed some 900 miles to sites off the coast of Florida. Marathon Oil also towed a dismantled platform 220 miles to a site off the coast of Alabama. Phillips, Arco, Chevron, Mobil, Occidental, Cities Service Oil & Gas, Transco and ODICO are some of the other companies whose rigs now serve as artificial reefs, either toppled on site or at other selected sites.

An oil or gas company which donates a rig to a coastal state artificial reef programme must also provide funds approximately equal to half of the savings it will realise by not scrapping the rig. These savings have ranged in the past from $50,000 to $500,000. The monetary donation is intended to cover the cost of buoys placed to mark the artificial reef's location and maintenance of the reef. Coastal states do not assume liability for incidents arising out of the dismantling, transportation or placement of donated rigs and do not assume ownership or liability until the rigs are *properly* placed on the ocean floor. In the US litigious society, the insertion of this qualification could open the door to future litigation against a former owner of a rig for unforeseen consequences arising from an artificial reef. If oil and gas companies become concerned over this possibility, rig-to-reef programmes could suffer.

Although rigs in the cold waters of the North Sea do not attract the same kind of marine life as the warmer waters of the Gulf of Mexico, the re-use of rigs, particularly those in the southern North Sea, to form artifical reefs is worth consideration. Questions that need to be looked at carefully are locations for effective artificial reefs, liability and towing costs. ■

New emphasis on Bass Strait exploration

By William Scholes

Esso-BHP are to spend $A650 million on the development of two new oilfields in Bass Strait as part of a major exploration and development programme in Australia's largest oil province. The joint venture partners have also committed themselves to the largest seismic survey ever undertaken in the province in order to delineate existing discoveries and identify new areas for exploration.

The partners will proceed with the Bream B and West Tuna fields; the West Tuna platform will cost $A500 million, while the smaller Bream field will cost about $A150 million to be developed. Recoverable reserves for West Tuna are put at 85 million barrels while Bream B has about 15 million barrels.

It remains a difficult field to develop because of its complex structure and will involve 48 wells being tapped into the production platform, compared with a maximum of 27 wells for the existing Bass Strait platforms.

The West Tuna field was discovered in 1984 but development under the tax regime applying until 1990 was prohibitive.

'With Resource Rent Tax (RRT) now the law of the land, it pays us to go ahead and optimise our activities under this new tax regime,' said John Schubert, Chairman and Managing Director of Shell Australia Ltd. 'A concrete, gravity-based design is being evaluated alongside conventional steel platform designs for both West Tuna and Bream,' he added.

'There are a number of existing gravity-based structures — some very, very large in the North Sea. Already in Bass Strait there are the two much smaller Perch and Dolphin monotowers which are steel but gravity-based, each with a large bin at the bottom filled with iron-ore that keeps the structure in place,' he said. 'To date all our platforms have been built in Australia and they'll continue to be as long as this is the most efficient place to construct them. We would prefer that but, in the end you've got to do it where it can be done most economically.'

Esso and its equal partner, BHP Petroleum Ltd, had held off from development of up to 300 million barrels of recoverable reserves in Bass Strait pending an assessment of the impact of the newly-imposed RRT. This has now been completed and paves the way for large new developments.

Recent developments

Esso's 1990 report gave some hint of things to come. It said an exploration taskforce had also 'generated a number of new exploration plays and prospects' which will lead to the shooting of additional seismic and drilling of more wells in the next few years.

The programme is being awaited with much interest, especially in view of Esso's declining discovery costs during the past decade. From a high of just over $A7 a barrel in 1982 they have fallen to just over $A2 a barrel in 1990 when more than 20 million barrels were found, the fourth highest annual discovery level since 1981. The average cost of discovery was, however, nearly double the previous year's level when nearly 60 million barrels of oil were found — the highest level in the past decade.

Daily output in Bass Strait rose by an average 3,000 barrels a day to 314,000 barrels a day in 1990 as a result of a range of developments. This occurred despite a lengthy industrial dispute between August and November 1990.

The new unmanned platforms at Seahorse and Tarwhine were brought on line during the year and added output of 4,100 barrels a day. Esso said that all five unmanned platforms were shown to be reliable and 'development of future marginal resources will build on this foundation of experience'.

Drilling on Bream field was completed. Twenty-seven wells were put down at a cost of $A105 million and are expected to recover 55 million barrels of oil at rates as high as 35,000 barrels daily. The programme included five horizontal wells, a first for Bass Strait.

Discoveries

The biggest discovery was in the West Tuna field with proven reserves estimated at 42 million barrels. The project may require appraisal wells before proceeding. The project is likely to involve a fixed satellite platform connected to the existing Tuna A platform. Project features are expected to include:

- A 48 slot, eight-leg steel piled jacket with three pipelines to the Tuna A platform
- Additional compression, separation and power generation facilities on the host or satellite
- Accommodation quarters on the satellite for platform drilling.

The second biggest discovery was in the Bream B field. The project is likely to be composed of a fixed satellite platform connected to the existing

Bream A Platform. Project features are likely to include:

- An 18 slot, three-leg steel piled jacket, with a pipeline to the Bream B platform
- Minimum facilities on the satellite platform (eg test separator, gas scrubber) as spare processing capacity/equipment is available on the host platform
- Jackup drilling of satellite platform.

Another discovery in the Yellow Tail/South Mackerel field has proven reserves of about 6 million barrels. The project is likely to be made up of a fixed satellite platform connected to the existing Mackerel platform. Project features are likely to include:

- A five slot, gravity based mono-tower, with two pipelines to the Mackerel platform
- Minimum facilities on the satellite platform (eg test separator, gas scrubber) as spare processing capacity/equipment is available on the host platform.
- Jackup drilling of the satellite platform.

Another discovery was in the Turrum field with proven reserves of 10 million barrels of oil and gas. The project may require appraisal wells before proceeding. Project timing is dependent on the gas market. The project is likely to comprise a fixed platform, bridge-connected to the existing Marlin platform. Project features are expected to include:

- An 18 slot, three-leg steel piled jacket, bridge connected to the existing platform
- Additional compression, separation and power facilities on the new platform
- Jackup drilling of the new platform.

Although new developments will be much smaller than those developed originally in Bass Strait, they will still be significant. The new developments will almost certainly be unmanned as both the capital and operating costs must be kept to a minimum if they are to proceed.

In addition to West Tuna and Bream B, Esso is also looking hard at the discoveries made over the last few years to decide which of the new discoveries will be developed.

Future prospects

Esso is contracting for a rig to begin a drilling programme of between seven and nine wells costing about $A2 million each. Three of these will be wildcats. Others will be drilled to delineate previous discoveries or around the edges of existing fields. These wells each take about a month to drill, so the programme should last from seven to nine months. The 3D seismic now running should give a much clearer picture of the structures under the ocean floor.

Pipelaying barge *Stena Apache* in Bass Strait

Esso does not expect to find any more Kingfishes or Halibuts. What they have been finding — the very much smaller Breams, Whitings and West Tunas — need that extra quality, as do the detailed assessments undertaken around the currently producing fields. This additional seismic information, together with what has been learnt from the wells in the technical studies, will be used to develop a new list of prospects. The best of these would then be ready for drilling in the 1993–94 time-frame.

The last campaign of drilling in Bass Strait discovered the Blackback and Terakihi fields which are quite close together and are likely to be developed concurrently. They are in about 400 metres of water, compared to the deepest development so far which is in 93 metres at Flounder.

Esso will drill another well on Blackback to delineate further what has already been discovered. Blackback and Terakihi will need to have a different development mode and the partners are still looking at that.

Mr Schubert suggested it might possibly be a subsea development tied into a platform in shallower water up the continental shelf, which is very steep.

Some delineation drilling will also be done around the Kingfish field and on Turrum, a gas and oil reserve very close to Marlin. The rig that finished drilling the Bream wells will drill more development wells off the West Kingfish platform. These will 'infill' the wells already there and recover additional oil. Then Esso will consider moving the rig to one of the other platforms. Altogether Esso expects to add a total of about 20 thousand barrels/day through this infill drilling programme.

If these possible developments turn out to be economic and proceed, the fall-off in Bass Strait production will be reduced fairly significantly. In any case, by 2000 production is still likely to be over 100,000b/d — more than any other producing region in Australia. Bass Strait will continue to be the most significant oil-producing region in Australia. ■

. . . technical report

Exploration and Production

Tenders have been invited from five selected contractors to undertake an analysis of the structural integrity and pressure maintaining capability of the subsea equipment deployed from a floating drilling rig during normal drilling and drill stem testing operations. A scope of work for the non-routine case, when harsh weather conditions occur whilst drilling deep water and/or high pressure wells, will be developed.

A technical writer is to edit the eighth draft of the Code of Practice on 'Well Control during the Drilling and Testing of High Pressure Offshore Wells'.

Discussions on the Drilling and Production Safety Code for Onshore Operations which was published in 1986 have been held with the United Kingdom Onshore Operators Group (UKOOG). UKOOG in conjunction with the International Association of Drilling Contractors (IADC) is undertaking a review of the code.

Refining and Marketing

IP Guidance Notes on the general principles of Work Permit Systems in the refining and marketing sectors are about to be published.

The draft Fire Precautions Code was reviewed by the Working Group in January 1992. The document is now complete with the exception of two important sections.

Preparatory work on a code dealing with Bulk Storage and Transfer Facilities has commenced. This may be issued as a stand-alone document or be incorporated into the Fire Precautions Code.

Electrical Committee is sponsoring a study of the issues relating to the safe use of electrical energy in the various devices in modern on-board truck instrumentation.

Witnessed testing of filter equipment is being undertaken in the United States and Germany by Aviation Committee and the Chairman has attended the recent annual API ATSC meeting. These visits are sponsored by the committee whose members contribute equally to the travelling costs. Work is being undertaken to find a fuel/additive system to replace ASA3 without altering the performance characteristics of elements during API and IP testing.

The first meeting has taken place of an operating level working group of Marketing Committee to consider in practical terms the pollution problems at marketing installations.

The Vapour Recovery Panel, DOC-4-D, has prepared comprehensive guidelines for the design and operation of gasoline vapour emission controls covering all downstream activities from the refinery to the service station, including Stage 2 customer filling of cars. This document to be published this month is believed to be the first one anywhere in this field.

DOC-4-A, (service station panel), held the inaugural meeting with HSE, APEA and three service station contractor organisations, aimed at establishing safety standards for contractor work at retail outlets and developing the Institute's draft contractor safety code.

Measurement

Petroleum Measurement Paper No 5: *Guide to Coriolis Direct Mass Flowmeters:* is being issued for general ballot following a ballot of the Direct Dynamic Mass Measurement Committee (PM-D-5) and other experts.

Balloting of PMM Part II, Section 7: *Calibration of Vertical Cylindrical Tanks by the Optical Reference Line Method* will take place after agreement has been reached with API on additional appendices dealing with recommendations for the re-calibration of tanks. Publication should be towards the end of this year.

Test Method Standardization

At a recent meeting it was proposed that the name of the standardization committee be changed to the Test Method Standardization Committee. This is considered a better description of its scope and activities.

The meeting was held in conjunction with the BSI PTC/13 test method committee.

The need for the IP to look at producing a standard method for estimating the flammability of residual fuel oils has been identified.

It was agreed to progress the phasing-out of chromic acid and those halocarbons listed in the Montreal Protocol from IP and BSI test methods where practical.

Current test method standardization activity centres around the revision of existing methods and the rewriting of methods into ISO format. Also the production of methods for the 1993 Test Method Book.

Health and Environment

A presentation of the results of the Institute's Epidemiological Study was made to senior executives of OILC companies by Dr Lesley Rushton of Nottingham University together with Dr Alex Grieve, Chairman of ACH, and Dr Charles Binns, Chairman of the Study Steering Committee. Proposals for the development of the study into a second stage in the 1992/93 budget received approval from the meeting.

A Code of Practice for the Safe Handling of Drilling Fluids has been published.

Project definition for an independent technical review of published papers on the human effects of benzene has been completed.

A research project has been commissioned to carry out a critique of the fate and effects of marine oil pollution in UK waters and the effect on the environment in the long term. As part of this study the contribution of all IP sponsored research in this field will be assessed.

A planning group is well advanced in its preparations for a conference on 'Life Cycle Analysis and Eco-Labelling in the Oil Industry' on 19 November 1992.

A first draft of a Code of Practice for the Investigation of Possible Contamination of Land by Petroleum Products is being developed. ■

John Hayes, Technical Director

Institute News

Council Symposium 14 April 1992

The lecture theatre at the Institute of Petroleum was crowded with IP members, representatives of committees and staff together with specially invited visitors from a wide spectrum of the industry, both upstream and downstream. They came to hear reports from committee chairmen on key technical issues and from staff on the Institute's progress in developing membership services and attracting new members. While the meeting was largely concerned with a review of the last 12 months, plans for the future regarding new technical projects and additional services were also outlined.

The Symposium programme included 16 detailed committee reports but only six were presented, in order to prevent the day being too long.

After a welcome by IP President, Mr BRR Butler OBE, and an introduction by the Director General, Mr Ian Ward, the audience listened to a comprehensive address by Mr DW Brown, Chairman of the new Downstream Operations Committee (DOC) formed last year. Its terms of reference are to identify areas where the Institute can play a useful role in developing codes of practice for the downstream business and to ensure that the Institute plays a full part in contributing to the formation of European legislation in this sphere.

Mr Brown highlighted the work and recent achievements of the committees within the DOC structure — new codes, revisions of existing codes, guidance notes, input into European and HSE draft legislation and contributions to projects of other organisations, such as BSI and CEN, both in the United Kingdom and abroad.

He appealed to companies to make resources, both human and financial, available for this time-consuming but very valuable work carried out by IP committees.

This message was repeated several times by subsequent speakers including Dr AM Grieve, Chairman of the Advisory Committee on Health, who summarised the committee's activities during the year, while concentrating his remarks on the study on 'The Health of Refinery and Distribution Workers' — which he considered to be the most important achievement of the year. The details of this epidemiological study, carried out by Dr Lesley Rushton, were fascinating — it is probably the largest study of its kind in the petroleum industry, covering causes of death for an unusually large number of workers over a period of 25 years. Dr Grieve reported that the study was 'generally reassuring'. However, it left open other associated factors such as diet, smoking and alcohol which need to be studied at a future date.

Mr BS Goodland, Chairman of the Environment Committee, described its achievements during 1991, including conferences, meetings and work on a proposed Code of Practice for Site Investigations of Petroleum-based Contamination, which it hopes to publish this year. Two IP sponsored research projects were completed — the transfer of pollutants via suspended particulate matter and the chronology of pollutant inputs to Sullom Voe and Southampton Water. Research on seabed fauna around oil production platforms was now being carried out.

Mr DR Brown, Chairman of the Petroleum Measurement Committee, emphasised that his subject was not dull, while elaborating on the varied and very valuable work achieved by the working groups and panels on measurement.

The last part of the morning was allocated to IP staff. Mr Bob Edmondson, the new Education Liaison Manager, outlined the work he is doing to promote careers in the oil industry. He was followed by Mr Roger Sparrow, the new Director of Membership Services, who reported on the work of Conference Department, Editorial Department and Library and Information Department.

The morning ended with two lively presentations — Ms Caroline Nutt, IP Membership Secretary, outlined IP moves to attract more members, both collective and individuals and the success of these efforts. She described plans to provide extra benefits for members and possible uses of the membership data base.

Mrs Lyn Nevin, IP Information Officer, gave the final presentation on 'the jewel in the IP's crown' — library and information services. She gave a colourful insight into the variety of enquiries and customers. Even so there still appeared to be members who did not appreciate what the IP Library had to offer them.

Around the Branches

Aberdeen
12 May: 'Technical and Operational Aspects of Piper Re-development', Michel Romieu, Chairman and Managing Director of Elf Enterprise Caledonia.

Humber
13 May: 'Pilot Operations Past and Present', Mr C Wilkin, Pilot Operation Manager, ABP.

London
20 May: 'Integrated Pollution Control', Dr J Marshall, HM Inspectorate of Pollution.

Yorkshire
17 June: Golf Tournament.

New Fellows

Mr D A (Alan) Higgins

After 10 years at sea with BP, Mr Higgins joined Chevron in 1970 as Chief Officer, prior to achieving command. Rising through positions of increasing responsibility within the company, he became Ninian Field Manager for Chevron UK Ltd in 1988 and succeeded to his present position as Alba Field Manager in 1991, with responsibility for managing preparations for the Alba Field, due to start production in November 1993.

Mr Higgins is a member of the IP Aberdeen Branch Committee.

Dr M J (John) Price

Dr Price has a BSc in Applied Chemistry and a PhD in Physical-Organic Chemistry. Following various technical/management assignments at the Esso Research Centre between 1970 and 1981, he undertook management assignments with Exxon Research and Engineering in the United States. On returning to the United Kingdom he became Lubricants Divisional Manager, Esso Research, in 1984. In 1986 he succeeded to his current position as Manager, Esso Research Centre, with responsibility for the provision of petroleum product technology, product development and technical service requirements of Exxon affiliates in Europe and worldwide.

Dr Price has served on the Institute's Technical Committees, Council and Management Committee. He was a Vice President from 1987 to 1990.

Eur Ing C W E Lee

Eur Ing Lee is a Chartered Engineer and a Fellow of the Institution of Mechanical Engineers, the Institute of Marine Engineers and the Society of Consulting Marine Engineers and Ship Surveyors. He holds two positions — Consulting Engineer with Ajax Engineers and Surveyors Ltd and Shipyard Manager with Ocean Shipbuilding & Engineering Limited. In the former he is responsible to the Hong Kong Government for the examination of boiler/pressure vessel/petroleum tank installations, lifting appliances etc and in the latter he is in full charge of a shipyard with a workforce of 110, plus subcontractors and casual workers.

Mr Glenn F Tilton

Mr Tilton gained a BA in International Relations from the University of South Carolina. He became General Manager, Marketing, for Texaco Europe in 1983, Vice-President, Marketing, for Texaco Europe, in 1987 and President of Texaco Refining and Marketing Inc, Houston, in 1988. In his present position as Chairman of the Texaco Group of companies in the United Kingdom, he has responsibility for operations, including exploration and production, marketing, manufacture of chemicals and lubricants and shipping.

Mr J M (Michael) Stinson

Joining Conoco after acquiring a BSc in Industrial Engineering from Texas Technological College and an MBA from Arizona State University, and progressing through positions of increasing seniority, Mr Stinson became Vice President and General Manager, Exploration and Production, for Conoco Inc, Houston, in 1990. In 1991 he became Chairman and Managing Director of Conoco (UK) Limited, responsible for the exploration and production function in the United Kingdom and a service/support organisation for both upstream and downstream units in the United Kingdom and Europe. He is also a Vice President of Du Pont, Conoco's parent company.

Dr John P McKinnell

Following a degree in Chemistry and a PhD in Biochemistry from Heriot Watt and Edinburgh Universities respectively, Dr McKinnell joined Shell in 1961. After 24 years in the chemicals sector, ultimately as Manager, Chemical Manufacturing at Shell's Stanlow Refinery, he moved to Shell Expro in 1985, where he became Engineering Manager and then Gas Plants Business Manager. Since 1989, he has worked as Manager, Academic Liaison, with Shell Expro, responsible for seeking opportunities for mutually beneficial liaison between Shell and academia.

Dr McKinnell is a Fellow of the Royal Society of Chemistry and has been member of the IP Aberdeen Branch Committee since 1987.

New Collective Members

Breezevale Services, Suite 24, 140 Park Lane, London W1Y 3AA. Tel: 071 629 4033

IP Nominated Representative: Mr P Taylor, Consultant

Breezevale Services, in association with a number of companies in the Group based in the United Kingdom, USA, Lebanon, Spain, Brazil and Gibraltar, is involved in a diverse range of activities, principally in African and Middle Eastern markets. In particular in West Africa, it is concerned with the supply and distribution of additives, lubricants and other petroleum-derived chemicals. The Group has also recently expanded into the field of exploration services.

IPCO Trading SA, Rue Viollier 4, CH 1207 Geneva, Switzerland. Tel: (022) 786 21 81

IP Nominated Representative: Mr U Bettini, Trading Executive

IPCO Trading SA specialises in the supply and marketing of crude oil and petroleum products throughout the world.

Steel Support Systems plc, 115 Bagot Street, Aston, Birmingham B4 7BA. Tel: 021 556 9977

IP Nominated Representative: Mr J H P Hardwick, Director

Steel Support Systems plc, a subsidiary of Richards Group plc, manufactures service support systems designed for the support of electrical and mechanical services and used extensively on both on and off-shore installations.

Geophysical Consultants Limited, Nelson House, Axminster, Devon EX13 5AX. Tel: 0297 34656

IP Nominated Representative: Mr G Fitton, Group Managing Director

Geophysical Consultants Limited offers consultancy, project management and quality control in exploration and development to oil companies, government, funding agencies and service companies. Associate companies provide environmental monitoring, research, impact studies, health and safety consultancy and audit, engineering consultancy and quality control.

Granherne Limited, Chester House, 76/86 Chertsey Road, Woking, Surrey GU21 5BJ. Tel: 0483 729661

IP Nominated Representative: Dr J M Stacey, Chairman/ Managing Director

Granherne Limited provides engineering and management consultancy services to the international oil and gas production and refinery industries, with particular emphasis on field development planning, feasibility studies, conceptual engineering, process design, safety/integrity analysis and cost estimating.

New Members

Mr FO Aisida, Nissco Ltd, Bouyges Offshore Group, PO Box 322, Warri, Delta State, Nigeria
Mr JA Ajienka, University of Port Harcourt, Dept of Petroleum Engineering, PMB 5323, Choba, Port Harcourt, Nigeria
Ms J Armstrong, 107 Crown Road North, Glasgow, Scotland
Mrs EPR Bennett, Soverign Oil and Gas, The Chambers, Chelsea Harbour, London SW10 0XF
Mr L Bernard, 43 Terront Road, London N15 3AA
Mr JA Blackwell, 41 Craigpark Place, Ellon, Aberdeenshire AB42 9FG
Mr MC Boylan, Independent Laboratory Ltd, Unit 37, IDA Enterprise Centre, Eastwall, Dublin 1, Ireland
Dr F Brangwin, 2 Fosse Way, Cosheston, Pembroke Dock, Dyfed SA72 4UW
Mr C Brown, Cookson & Zinn Ltd, Station Road Works, Hadleigh, Suffolk IP7 5PN
Mr PG Brown, Air Foyle Ltd, Halcyon House, Luton Airport, Luton LU2 9LU
Mr D Burry, 14 Shaw Circle, Westhill, Aberdeen AB32 6UH
Dr PF Chatterton, Daedalus, 38 Dinsmore Road, London SW12 9PS
Mr D Cole, American Express Europe Ltd, Portland House (21st floor), Stag Place, London SW1E 5BZ
Mr JP Cunningham, 106 Cinnamon Wharf, 24 Shad Thames, London SE1 2YJ
Mr DV Constanti, 26 Binney Court, Pound Hill, Crawley, West Sussex RH10 3UZ
Mr MS Curtis, Conoco Ireland, Conoco House, Deansgrange, Blackrock, Co Dublin, Ireland
Mr FP Doxey, Timsah, Charlwood Drive, Oxshott, Surrey KT22 0HD
Dr MJ Doyle, Flat 4, 39 St Hildas Avenue, Ashford, Middlesex TW15 3RG
Mr MJ Dunn, 162 Kingsway, Sunniside, Newcastle NE16 5XA
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Mr DE Fortet, 32 Linkway, Court Moor, Fleet, Hants GU13 9UP
Mr AW Gibbs, Meon View, Spring Lane, Swanmore, Southampton SO3 2PT
Mr RE Goodson, Mobil Oil Company Ltd, The Clockhouse, Frogmore, High Wycombe, Bucks HP13 5DB
Mr IS Gray-Taylor, Drumligair House, Drumligair, Newmachar AB5 0BP
Mr M Horiguchi, 4-3-41 Hamatake, Chigasaki-Shi, Kanagawa Pref, 253 Japan

Institute News

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Mr JA Jones, Greenhill, Drefach, Llanybyther, Dyfed SA10 9SX
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Mr J Kearney, Earl & Wright, 5–9 Hadden Street, Aberdeen AB1 4GD
Mr JM Kellock, Kelyon Engineering Ltd, 24 Union Wynd, Aberdeen AB1 1SL
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Mr GF Saddler, Gulf Oil International, Peregringasse 4, A-1090 Vienna, Austria
Mr DM Sausman, Arthur D Little Inc, PO Box 9251, Jeddah 21413, Saudi Arabia
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Miss L Whelan, Planned Business Development, 68 Old Brompton Road, London SW7 3LQ
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Mr AJ Williams, 17 Dorian Drive, Cheapside, Ascot, Berkshire SL5 7QL
Mr H Wright, 14 Aromillan Gardens, Bangor, Co Down, Northern Ireland BT20 4NF
Mr CH Yu, Associated Consultants & Surveyors, 38–40 Man Wui Street 2/F, Man King Bldg, Ferry Point, Kowloon, Hong Kong

Student Prize Winner

Mr SYS Al-Rawahy, Department of Geological Sciences, University of Durham, Science Laboratories, South Road, Durham DH1 3LE

Students

Miss EA Adewunmi, Centre for Petroleum Mineral Law & Policy, Park Place, Dundee DD1 4HN
Mr K Barrs, 26 Edinburgh Road, Nuneaton, Warwickshire CV10 9HF
Mr M Fayad, 37 Bartholomew Road, London NW5 2AH
Mr R H Ficken, 70 Stanley Street, Bedford, Beds MK41 7RU
Miss SN Jackson, Leeds University, 19 Claremont Avenue, Leeds LS3 1AT
Mr RA Vivian, 19 Claremont Avenue, Woodhouse, Leeds LS3 1AT

UK Deliveries into Consumption

February 1992 — Tonnes

Products	*Feb 1991†*	*Feb 1992**	*Jan–Feb1991†*	*Jan–Feb 1992**	*% change*
Naphtha/LDF	288,140	181,560	683,520	475,720	−30.4
ATF—Kerosine	393,920	447,250	839,730	917,890	9.3
Motor Spirit	1,685,770	1,840,800	3,618,700	3,738,780	3.3
of which unleaded	651,480	817,240	1,387,560	1,649,380	18.9
Super unleaded	72,670	100,680	158,520	201,440	27.1
Premium unleaded	578,810	716,560	1,229,040	1,447,940	17.8
Burning Oil	249,930	251,250	591,020	549,100	−7.1
Derv Fuel	780,420	852,560	1,704,880	1,727,860	1.3
Gas/Diesel Oil	816,670	703,110	1,742,230	1,507,370	−13.5
Fuel Oil	1,213,820	970,070	2,131,480	2,122,070	−0.4
Lubricating Oil	52,840	67,650	124,130	138,510	11.6
Other Products	437,220	561,610	804,690	1,142,790	42.0
Total above	5,918,730	5,875,860	12,240,380	12,320,090	0.7
Refinery Consumption	456,910	483,340	998,240	982,930	−1.5
Total all products	6,375,640	6,359,200	13,238,620	13,303,020	0.5

†Revised *Preliminary

High performance mass flow measurement

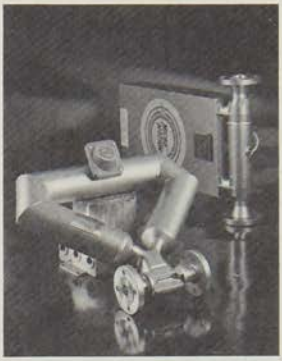
The direct measurement of 'mass flow' and density in process applications such as petroleum, petrochemical and pharmaceutical production, has received a significant boost with the launch by Rosemount of a new version of the Micro Motion mass flow metering system, called ELITE and based on Coriolis direct measurement principles.

The new ELITE system features a lower pressure drop, an accuracy of +/− 0.15 percent over a wide flow range, plus better zero stability and full secondary containment. The latter relates to safety and is important in processes where hazardous or damaging fluids need to be metered with absolute security.

A new sensor shape is used to improve performance over the conventional Micro Motion U-tube design. In the smaller sizes up to one-inch bore, the shape resembles a deltoid, increasing the distance between the electro-magnetic pickups to increase mechanical 'gain'. In the larger sizes the U-tube is retained but squared off, again to increase 'gain' from the sensor.

The mechanical changes mainly enhance sensitivity but also reduce the pressure drop across the sensor, generally allowing a smaller unit to be used in pressure drop sensitive applications. Both factors contribute towards better accuracy, especially at low flow rates, as does zero stability which is also enhanced by the new design.

Other changes include improvements to the tubes' electro-magnetic detectors and the introduction of advanced digital electronics in the device's associated transmitter to utilise fully the increased performance of the sensor.



Visually, the sensor's housing has completely changed. To give total in-process security the sensor's U-tubes are now fitted inside a welded enclosure, designed to contain any leakage of process fluid in the unlikely event of a tube failure.

The Coriolis sensor is basically a U-shaped tube that is caused to vibrate. Fluid flowing in the tube induces a Coriolis force at right angles to the flow, as a result of which the tube twists in proportion to the flowing mass. Electro-magnetic sensors detect this twist and produce signals that are processed electronically to derive measurements. The frequency of the vibrations gives a measure of mass flow; a spin-off benefit is that the relative phase of the vibrations can be used to derive density, giving 'two measurements for the price of one'!

Escape route lighting system

Exitpath, an escape route lighting system for hazardous areas is the result of a collaboration between the MTL Instruments Group of Luton, and Loctite Luminescent Systems of Lebanon, New Hampshire, USA. Marketed initially to the oil and gas recovery industries, Exitpath has applications wherever safe evacuation of personnel from hazardous areas may be necessary in an emergency, particularly in darkness or smoke conditions.

The system consists of electroluminescent (EL) strip lamps supplied by explosion protected power supplies based around intrinsic safety (IS) techniques. EL lamps, well-proven after many years in the aircraft industry, are noted for clear visibility in smoke while the IS power supplies, based on the internationally preferred explosion protection technique for low-power applications, permit installation of the lamps in hazardous areas where flammable materials may be present.

The provision of reliable escape route lighting is one of the recommendations of the Cullen report while low level illuminated escape signs are a requirement of the Offshore Design, Construction and Certification book (Green book).

The EL strip lamps are slim enough to be flush mounted to walls and floors without causing an obstruction and are used with certified IS power supply units, each of which can drive up to 64 lamps covering up to 60m of track length.

EL Exit signs and directional arrows are also available as required.

Ceramic rotary control valve

A series of wafer-type reduced-bore control valves, designated the E1-series, has been launched by Neles-Jamesbury. The series will suit a wide variety of applications in the processing industries — especially where erosion and abrasion resistance are key factors.

The design of the new valve includes two ceramic bushes and a ceramic ball inside a one-piece stainless steel body. The ceramic used for the bushes and ball is high purity sintered zirconia oxide in the form of partially stabilised zirconia (PSZ). The design for the new E1 ceramic valve was developed in conjunction with the process industry trend towards longer uninterrupted operating cycles and reduced maintenance demand.

PSZ is a high strength ceramic, manufactured in Australia by an ICI subsidiary, with an exceptional fracture resistance (12 to 15 MPa — compared with 4 to 7 MPa for other ceramics). The material also exhibits a high thermal shock resistance and a built-in toughening mechanism which produces a tensile strength of 450 MPa and freedom from the brittleness to which most conventional ceramics are subject.

Because of the E1 series' flexibility and its multi-purpose nature, stock requirements can be considerably reduced. When used in conjunction with Neles-Jamesbury actuators, positioners and limit switches, the E1 can form a complete control-valve package.

Safety systems design tool

Kennedy & Donkin Systems Control has recently re-launched an improved version of the SC500 design and documentation tool for use on Fire and Gas and Emergency Shutdown Systems.

SC500 runs in the 'Windows' environment on an industry standard PC, enabling engineers speedily and accurately to design safety systems, starting from the company safety policy or statutory regulations and going through to detailed designs with large reductions in engineers' and drawing office time.

The product has a well established base within the UK oil industry with recent additional overseas orders for the Newfoundland and Norwegian fields.

Atmospheric solvent detector

The SOLVALERT is a low cost detector for solvents in the atmosphere based upon the proven Cavendish photo-ionisation detector which requires no maintenance.

The only control is the power on/off switch. An alarm level is provided for long-term exposure levels with a visual and an audio output. A contact closure connection is provided for operation of a remote alarm.

Hazardous area pallet weighing

A new explosion-proof design that integrates a hand pallet truck with an on-board weighing system has been launched by Stevens AWS Ltd.

The unit combines the accuracy of digital weighing with the flexibility and usefulness of manual pallet handling.

The ER1 (HD Ex) Pallet Weighing System is certified for use in many hazardous areas. It enables the same handling efficiency standards, common in other areas of the plant, to be implemented, for the first time in hazardous areas.

The design meets and exceeds standards for Zone 1 and 2 Hazards, Gas Groups 11A and 11B and Temperature T1 to T4. A full statement on INIEX certification and methods of protection is available on request.

Based on a standard BT Rola Truck, the unit is available in mild or stainless steel. A brass-clad option eliminates ferrous (steel on steel) contact by the pallet forks and other vulnerable parts.

The weighing system will cope with loads up to 3000 kg and accuracy to 0.2 kg is optional. The pallet handling components are all to standard 'stock' dimensions and include a choice of fork width. Twin front rollers and special electrostatic conducting wheels are standard.

How to get water to rigs — fast

A new approach to pipeline deployment has quadrupled the speed of laying water lines for Petroleum Development Oman.

Developed by Angus Flexible Pipelines, the approach combines purpose-made flexible layflat hose with powered and motorised deployment. It has enabled six men to lay up to 4,000 metres of pipeline a day across difficult desert terrain.

Before adopting this technique, the company used steel or glass-reinforced plastic pipes to supply flushing water to the mobile drilling rigs used in Oman.

Angus proposed constructing the long-range water lines from continuous 200 metre lengths of a flexible hose, Armourline, laid by a powered reel from a moving flatbed lorry. The company believed that the hose could be deployed quickly from its layflat coils with minimum demand on transport and handling resources.

The six-inch diameter synthetic rubber hose transfers raw, sour and often contaminated water — at temperatures around 50°C — from wells to drilling sites up to 16 kilometres away.

It is formulated and constructed to provide high immunity to ozone and ultra-violet degradation together with good resistance to corrosion, abrasion and scaling.

Operating at a working pressure of 250 lb/in^2 (with a minimum burst pressure of 600 lb/in^2), the hose is designed to remain dimensionally stable in conditions that can include surface temperatures up to 85°C and intense ozone and UV exposure.

As each 200 metre length is completed the sections are joined by quick-release couplings. Further hose is provided by a single support vehicle carrying up to 15 200-metre coils.

The laying speeds attained by the system have provided better assurance of the availability of water supplies before drilling operations begin.

Pipeline construction, transportation and storage costs have also been reduced since the six-inch diameter Armourline replaced the previous four-inch diameter pipework.

Additionally, the use of synthetic rubber hose has minimised pipeline repair and overhaul, both the hose and the couplings being virtually maintenance-free.

Minor punctures can be repaired quickly by vulcanising patches over the holes. More serious damage can be put right by simply replacing the affected section in the field.

Portable multi-function instrument calibrator

The new TRX intrinsically safe calibrator from Elcon Intrinsic Safety both measures and sources thermocouple, RTD, millivolt and 4–20mA loop signals from a small, lightweight unit CENELEC certified EEx ia IIc T6. TRX is able to perform temperature transmitter calibrations in IS areas without additional equipment by simultaneously providing power to the transmitter, simulating an accurate thermosensor signal to provide the calibration input and measuring the resulting transmitter output current.

All-in-one pressure monitor/switch/transducer

A new range of pressure monitors has been introduced combining monitor, switch and transducer in a single housing. E-T-A's DRW 1 and 2 series provide measuring ranges from 4bar to 100bar, with analogue voltage/current outputs as well as relay contacts.

The combined unit saves cost, installation and set-up time in applications such as compressors, boiler systems — wherever the need is for measurement and control of gas or liquid pressures.

Versatility for a range of user requirements is met by model variants such as stand-alone housings with integral monitoring head and easy-fit rail-mounted units with remote head. The sensing element is a robust IP65 protected unit containing a network of thick-film resistors mounted on a steel diaphragm.

Variations in pressure cause a linear change in diaphragm curvature, which is measured as a changing value of resistor circuitry. Upper and lower set-points can be fixed in 0.1 bar steps using preselector switches on the unit, avoiding the need to simulate limit conditions. There is clear visual indication of out-of-limits pressures, shown by LEDs that go from green to red when these thresholds are crossed.

High speed flow measurement

Liquid Controls Corporation has announced the introduction of a two-inch, high performance flowmeter for refined petroleum products. The new model M-10 meter is a highly accurate and cost-effective solution for high speed, liquid measurement applications requiring up to 150 GPM.

Custody transfer applications, including: bulk delivery truck, bulk plant, aviation, marine and barge fueling are among the targeted markets.

Rated at 350 PSI, the M-10 provides increased safety margins for over-pressurisation in a normal 100–150 PSI operating system. In addition, the new meter incorporates an all O-Ring Seal design which eliminates the potential for leakage and drastically reduces maintenance cost.

New use for fire-fighting foam

Light Water foam — one of the aqueous film forming foams, known as AFFFs — was originally developed in the United States and later introduced into the United Kingdom as a fire-fighting foam. Now its uses have been extended to environmental protection including landfill and the remediation of landfill waste sites.

For instance, foam can serve as temporary 24-hour cover for landfill sites, instead of soil. Foam is preferable because it is less bulky, does not fill up the hole and collapses to form a thin film, thus preventing dust and material from blowing around.

For fire-fighting purposes the first use of AFFFs was at airports and by the Royal Navy but subsequently the oil industry, particularly offshore operators, adopted it.

It has a dual effect — the foam carries a film, forming a layer to cut off oxygen, while also having a high cooling effect.

The effectiveness of Light Water foam is based on the fluorochemical surfactants which give the foam solution the ability to create a film of water solution that floats on top of non-polar flammable liquids.

3M, the manufacturers of Light Water AFFF, maintain that their foam solutions are more efficient than protein-based foams.

Recently, the company introduced an all-purpose foam. This latest addition to their range adds another polymeric layer to the foam, for use in low-risk areas such as paint stores, garages and plastics factories.

Removal of sulphur from liquefied gas

Sulzer-Chemtech, the process engineering division of Sulzer (UK), has applied its structured mixer packing, SMVP, in processes for removing sulphur from liquefied gas. This was found to offer significant cost and weight advantages for refineries and offshore installations.

The sulphur is present mainly as hydrogen sulphide which is traditionally extracted with amine solutions in columns containing sieve trays or random packings.

However, Sulzer retrofitted two columns up to 2.5 metres in diameter with its structured SMVP packing. The company claims this achieved higher extraction performance than sieve trays or random packings while using less amine solution. This means that existing columns can be repacked with SMVP mixer packing to increase both capacity and extraction efficiency whilst at the same time reducing regeneration costs and amine losses.

The changes required to the column were small, so conversion time was short. Based on this experience and the hydrodynamic characteristics of the structured packing for this application, an improved performance is expected from a retrofitted column.

For new installations the higher capacity of SMVP enables the same throughput to be achieved with much smaller columns, saving cost and weight. This makes SMVP particularly suitable for use in offshore installations as well as refineries.

Contact List

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Elcon Intrinsic Safety	0243 841815
Rosemount	0243 863121
Cavendish Applied Technology	0223 210105
MTL Instruments Group	0582 23633
Kennedy and Donkin Systems Control	061 228 6282
3M	061 236 8500

. . . people

Mr John Orange, above, is the new Chief Executive of BP Oil UK. He has succeeded **Mr Viv Thomas** who retired from the company after 33 years. Mr Orange joined BP in 1967 and was later seconded to the Iranian Oil Consortium. He was the BP Group's legal adviser for two years from 1980 and then became regional coordinator for the Middle East. He was appointed Managing Director of BP Denmark in 1985 and two years later became Managing Director of BP New Zealand. He returned to BP Oil in 1990 to manage the introduction of the company's new culture change before taking up his present appointment.

Textron Specialty Materials have appointed **Mr Austen Slattery** as Regional Sales Manager for the company's fire protection systems. Mr Slattery was previously Regional Sales Manager for Pall Europe Limited.

Following the acquisition by Neste Oy, the Finnish energy and chemicals company, of Sovereign Oil and Gas Plc, **Mr Peter Youngs**, below, has been appointed Vice President of Neste's combined UK upstream activities, including Sovereign. Mr Youngs has eighteen years experience in the offshore industry.

Kirkland Resources (Holdings) plc has appointed **Mr Graeme Thomson** as Director of Finance. Mr Thomson has been Group Finance Director and President USA Operations of the AmBrit oil group for over two years. Previously he worked at Baring Brothers on oil related acquisitions and mergers, and at Ultramar Plc on finance and business matters.

Mr Chris Hough, above, Technical Manager for Aggreko Generators Ltd has taken on the task of heading up a Special Projects department at Aggreko's new production facility in Dumbarton. The Special Projects department designs, builds, installs and commissions units ranging from bespoke power systems for sale to the oil industry to high quality conventional industrial generating sets.

Salamis (Marine & Industrial) Ltd, a subsidiary of Maersk Company have announced a management restructuring. **Mr Bill Allan** becomes Managing Director, **Mr Dave Thomson** moves from General Manager Human Resources to General Manager Marketing and Sales and **Mr Roy Nudd** becomes Manager Logistics and Planning. **Mr Charles McLaughlan** continues in his position as General Manager Operations.

Siemens Nixdorf Information Systems Limited has appointed **Ms Vivienne McGavin** as account manager for energy, a branch within its retail division. Ms McGavin came to Siemens Nixdorf from Siemens Data Systems where she was account manager to third party resellers.

Trafalgar House plc has appointed **Mr Ian Robinson** as a Director. He will assume special responsibility for the process engineering and construction operations of Trafalgar House Engineering, which includes John Brown and Davy. Mr Robinson is a chemical engineer, with 28 years experience in the petrochemical and oil and gas industries.

Mr Michael Kerr, above, has been appointed Managing Director of Ciba-Geigy Additives in the United Kingdom. He was formerly General Manager of Ciba-Geigy's UK Pigments Business.

British Borneo, the independent oil and gas exploration and production company, has appointed **Mr William Colvin** as its first Finance Director. Mr Colvin, a chartered accountant, was previously with Arco International Oil and Gas as Chief Accountant.

Katalistiks International Research and Development have appointed **Dr Borgstedt** as a research engineer. Dr Borgstedt will be responsible for the development of new fluid cracking catalysts for reformulated products.

Mr Tony Davis has joined the London office staff of Rush Johnson Associates, the offshore loss adjusters, appraisers and surveyors. He is a chartered engineer with extensive design and project management experience in the offshore oil industry.

Dr John Spokes, above, has been appointed Manager, Systems Engineering Group of Foster Wheeler Petroleum Development Limited. Dr Spokes joined Foster Wheeler in 1981 to work on detailed designs of topsides for platforms in the Norwegian sector of the North Sea. Foster Wheeler Petroleum Development have also appointed **Mr Tony Drew** as Divisional Director of Engineering. Mr Drew will be responsible for the Systems Engineering, Facilities and Structural Groups as well as CAD.

CMG, the IT management consultancy, has appointed **Ms Judith Plant,** a Senior Management Consultant with expertise in strategic planning for IT, quality management and change management.

Lasalle Engineering Limited has appointed **Mr Alastair Simpson**, below, to the new post of Production Technology Consultant. Mr Simpson will have a key role in developing the partnering relationships which Lasalle, in conjunction with Reda Pump, have begun with a number of North Sea oil companies.

Irish Branch

Like most branches, the Irish Branch was formed around oil company activities but it has two elements which, in combination, make it almost unique in character.

Firstly it encompasses an independent state — the Republic of Ireland — and secondly its area of activity embraces all aspects of the oil business from exploration and production through to marketing and sales.

When the branch was established in the 1970s particularly thanks to the hard work of its fine secretary the late Bryony Berry who ran the Bank of Ireland's oil desk, the oil industry in Ireland had no forum to talk out its problems and the government attitude through the Petroleum Affairs Division (PAD) of the Department of Industry and Commerce (later to be hived off as the Department of Energy) was quite dictatorial. Exploration in the Celtic Sea was just beginning; everyone expected a bonanza in oil discoveries and the establishment wanted no advice or lobbying of any kind from industry. Instead it took its guidance from overseas governments, particularly from Norway. Within 10 years this situation changed through the efforts of the Irish Offshore Operator Group (IOOG) and the IP Irish Branch. Gradually the PAD and the Department of Industry and Commerce came to realise that an input to its decision-making from the oil industry was a positive contribution and brought much better results all round.

The fact that the Irish scene is small and compact with only 3.5 million population led to the branch membership being heavily interwoven with the IOOG membership and in both bodies many chief executives of local oil companies were active together.

In the past five to eight years the branch has endeavoured to attract downstream interests into its programme and again this has brought authority into the branch which is fully recognised by the establishment.

The branch has 'arrived' in every sense of the word. Its chairman functions for two years and is usually an oil company chief executive. Relations with government departments are excellent and the IP has become a reference particularly from the PAD on many petroleum affairs.

The highlight of the branch's events is the Annual Dinner. This is a black-tie affair with over 250 persons attending and the main speaker is always the Minister for Energy, with a national character from the arts, politics, church or judiciary to reply for the guests.

As elsewhere, the programme includes technical papers on oil related matters such as vapour loss, unleaded petrol, exploration offshore Ireland and lubrication. The branch also promotes 3rd level student interests via the Bryony Berry Prize each year for the best paper on any oil topic, from all Irish 3rd level colleges and universities. Many of these prize winners have joined the oil industry — and the IP!

But it is not all work! The branch has an excellent, well-supported Golf Society meeting twice a year in Dublin (June) and in Cork (September).

In the early years the branch used to seek a little financial help from London to balance its budget but recently it has used its influence to raise funds locally from various functions which more than cover costs so that happily, the branch is now self-financing.

Throughout its short life the branch has maintained excellent relations with the Institute in London and has hosted three branches' meetings in Dublin in the 1950s, the 1970s and in 1991.

By tradition the branch operates mainly through its secretary which is a long-term appointment (usually three to four years) until he or she wants a rest but there have been some excellent chairmen making their mark on the branch development.

Another tradition has been to appoint to the committee, a notable oil technologist, not necessarily from an oil company. For years one of the branch's best technological contributors was our treasurer, the late Hugh Munroe. Hugh was a brilliant oil consulting engineer on a wide range of subjects. Like Bryony Berry, he also died a relatively young man and is sadly missed in the branch and in the Irish oil industry. The value of a committee member with this background to the branch is inestimable in preparing yearly programmes.

Dusty Miller

Dusty Miller

. . . consultants' services

The Institute of Petroleum

OFFSHORE SAFETY — THE RESPONSE TO CULLEN

Tuesday 16 June 1992

A one day conference to be held at the Cavendish Conference Centre

Lord Cullen's report of the Public Inquiry into the Piper Alpha disaster was published on 12 November 1990 and 10 days later the Institute of Petroleum held a conference 'Offshore Safety — The Way Ahead' in order to examine the implications of the report's recommendations for the management of offshore safety in North Sea oil and gas operations.

Since the publication of the report, all those with responsibility for safety in the offshore oil and gas industry have been considering how best to implement the recommendations regarding safety cases. The issuing of the HSC consultative document 'Draft Offshore Installations (Safety Case) Regulations 199-' in February has provided proposals for regulations and guidance to implement the introduction of a safety case regime.

The conference will examine the implications of the draft regulations and the steps which have been taken in implementing the recommendations of the Cullen Report. A concluding paper will review the way in which offshore safety is regulated in Norwegian waters in comparison with the proposed new UK offshore safety case regime.

For further information and a copy of the registration form, please contact Caroline Little, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Telephone: 071-636 1004. Telex: 264380. Fax: 071-255 1472.

PERSONNEL EDUCATION & TRAINING
DISCUSSION GROUP
EVENING MEETING

Thursday, 11 June 1992

5.15 for 5.45 p.m.

Richard Ayres
(Petroleum Training Federation)
and
John Fuller
(Petroleum Employers Skills Council)

will give a presentation on

UNDERSTANDING NVQ's

National Vocational Qualifications based on standards set by industry are now being introduced into the oil and gas industry and will affect all areas of work ranging from the simplest tasks to post-graduate and professional occupations.

Come and hear how this will affect you, your staff and colleagues, and your company.

Please let Bob Edmondson at The Institute of Petroleum (071 636 1004) know if you or your colleagues plan to attend.

INSTITUTE OF PETROLEUM – LONDON BRANCH

The next meeting of the London Branch will be on

Wednesday, 20 May 1992

at the Institute of Petroleum
at 18.00 hours.

The speaker will be Dr J Marshall, Branch Head of Regulatory Standards Division, HM Inspectorate of Pollution. His talk is entitled:

'INTEGRATED POLLUTION CONTROL'

The presentation will cover the regulatory framework of integrated pollution control and experiences to date of its implementation.

The meeting is preceded by tea and biscuits at 17.15 hours and will be followed by light refreshments.

THE INSTITUTE OF PETROLEUM

BACKGROUND AND INTRODUCTORY COURSES

INTRODUCTION TO OIL INDUSTRY OPERATIONS

WEDNESDAY 24 JUNE to FRIDAY 26 JUNE 1992

This course is designed as a general introduction to the upstream and downstream activities of the oil industry and may be particularly valuable to companies who do not hold their own in-house induction courses covering these subjects. It is likely to be appropriate for:

Participants from within the oil industry whose experience is limited to one function of the industry and who require a wider perspective of the industry's activities.

Participants from financial institutions, government, other energy industries and the supply and service industries who require to obtain an informed and concise 'bird's eye view' of the oil industry. Topics to be covered during the three days will include:

Changing Perspectives in the International Oil Industry
Basic Concepts of Drilling
Petroleum Production
Supply
Refining
Petrochemicals
Research Activities in the Oil Industry
Introduction to Marketing and Distribution
The Retail Market

This is a self-contained course but is followed by:

INTRODUCTION TO PETROLEUM ECONOMICS

MONDAY 29 JUNE to WEDNESDAY 1 JULY 1992

This course is designed as a general introduction to the economics of the oil industry and may be particularly valuable to companies who do not hold their own in-house induction courses covering this subject. It is likely to be appropriate for:

Participants from within the oil industry whose experience is limited to one function of the industry and who require a broader perspective of the economic factors affecting the industry.

Participants from financial institutions, government, other energy industries and the supply and service industries who require to obtain an informed and concise introduction to the economic and commercial background to the industry.

For copies of the registration forms for both courses, please contact Caroline Little, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR, UK. Telephone: 071-636 1004. Telex: 264380. Fax: 071-255 1472.

CONSULTANT LIST

Members of the Institute of Petroleum offer consultancy services in a wide range of petroleum industry subjects. A list of consultants in any category will be provided free of charge on application. Currently about 400 members offer 52 different categories within which we can identify other areas of expertise.

Additives Technology
Corrosion Technology
Custody Transfer Arrangements
Energy Efficiency
Environment — General
Environment — Marine Pollution
Expert Witness Services
Finance
Fuels & Fuel Technology
Government & EC Relations
Health and Hygiene
Heat Transfer
Industrial Relations
Information Technology
Laboratory & Test Method Advice
Legal Advice
Loss Prevention
Loss Prevention — Marine
Lubricant Technology
Maintenance & Inspection
Management Organisation
Marine Operations
Market Research & Analysis
Marketing — General
Marketing — Operations
Measurement & Fluid Flow
Microbiology
Oil/Gas Economics & Pricing
Oil & Gas Explorations
Oil & Gas Production
Oilfield Chemicals
Oilfield Development
Oilfield Machinery & Equipment
Oilfield Sub-sea Development
Petrochemicals
Petroleum Information Services
Pipeline Planning & Management
Planning & Economics
Plant Design
Project Services & Engineering
Public Relations
Quality Management & Assurance
Refinery Operations
Risk Analysis
Risk Analysis — Financial
Safety
Site Selection & Investigation
Supply & Distribution
Technical Writing
Telecommunications & Networks
Trading & Shipping
Training

(Requests for lists of more than two categories may involve an administrative charge)

Anyone interested in obtaining this list should contact
Jo Howard-Buxton at the IP. Tel: 071 636 1004

The Institute of Petroleum

Two One-Day Conferences at

The Cavendish Conference Centre, London

A FULLY UNIFIED EC OIL AND GAS MARKET?

Steps the Commission and Industry Still Have To Take

11 June 1992

This conference is designed to address two fundamental questions:

- What administrative business still has to be concluded before all obstacles to a unified Single Market will have been removed?
- How should companies be restructuring their operations to be fully prepared for the new market conditions?

Chairman: Baron Pierre Snoy, formerly Public Affairs, Shell Europe

Objectives for the Single Energy Market
Mr J M Maters, Oil and Natural Gas, Directorate-General for Energy, Commission of the European Communities

Fair Competition and the EC Court
Mr I Johnson, Partner, Ashurst Morris & Crisp

The Licensing Directive — New Opportunities
Mr Richard Vernon, Director, External Affairs, Phillips Petroleum Co. United Kingdom Ltd

01.01.93 European Procurement Legislation — Upstream, Downstream
Mr Paul H Hopwood, Chief Supplies and Contracts Officer, European Procurement Affairs Branch, British Gas

Excise Tax Policy — Harmonisation and Consequences
Mr Keith Myers, Partner, Arthur Anderson

Implications of Single Market on Company Operations and Organisation
Dr David W Bennett, Management Consultant, McKinsey & Co.

Organisational Implications of Operating in the New Europe
Mr G Cardinal, Manager, Marketing Support and Development, Mobil Europe

LIBERALISING THE EUROPEAN GAS MARKETS

Transit, Third Party Access and Cross-Channel Link

12 June 1992

The EC draft proposal, 'Common Rules for the Internal Market in Natural Gas,' is designed to take the gas industry towards a fully unified market. In parallel heady strides are being taken in the United Kingdom including the release of significant quantities of British Gas' contracted supplies to its competitors and the study of a cross-channel link.

Will such measures achieve their stated goals of greater competition, more efficiently functioning gas markets and increased supply security? Or, is there the risk that the outcome could be counter-productive?

Chairman: Mr James Allcock, Director of Gas Supplies, British Gas plc

The Latest EC Proposal and Potential Relevance of the British Liberalisation Experience
Mr Graham Weale, Manager, WEFA Energy

Greater Access to the Market for Producers?
Ms Elizabeth Berge, Natural Gas Marketing Manager, Statoil

Improved Purchasing Power for Consumers?
Mr Alan Wilson, Head of Fuels Purchasing, Dow Chemicals

Opportunities for New Utility Operations
Mr H Martin, Vice President, Strategic Planning and Product Support, Enron

The Future Role of Gasunie in a More Strongly Integrated European Gas Market
Mr J ter Gast, Head of Gas Purchase Department, NV Gasunie

The Wintershall Natural Gas Project — A New Challenge
Mr Eike Müller-Elschner, Head of Joint Ventures, Wintershall AG

The Consequences of T P A on Supply Security, Prices and Future Investment
Dr Wolf Pluge, Managing Director, BGW (Federal Germany Association of Natural Gas and Water Industries)

For futher information and copies of both registration forms, please contact Caroline Little, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR, UK. Telephone: 071 636 1004. Telex: 264380. Fax: 071 255 1472