

OCTOBER 1991

The Institute of  
Petroleum



# PETROLEUM REVIEW

## North Sea

The development of  
the T-block, Agip's  
first UK-operated  
field

## Subsea

Steve Sasanow  
reviews the latest  
subsea production  
projects

## Evacuation

Offshore emergency  
escape systems  
under scrutiny

## Man-made stars

New satellite  
system starts  
offshore navigation  
and positioning  
revolution





## NEW DEVELOPMENTS IN INFORMATION TECHNOLOGY FOR THE ENERGY INDUSTRIES

14 November 1991

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Tony Hendley, Technical Director, Cimtech

**Online Energy Information — A survey and up-date of databases**

Stephen Culshaw, Information Officer, British Library, Science & Technology Information Service

**Document Image Processing — applications for the oil & gas industry**

Nada Zdravkovic, Account Manager, Energy Sector, Integrated Documatics Ltd.

**CD ROM versus Online Access**

Dan Re'em, Specialist Publisher and Consultant

**Applications of Interactive Video and Multimedia Technology in Safety Training**

Dr Peter Chatterton, Daedalus

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Telephone: 071-636 1004. Telex: 264380.  
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Peter Stief-Tauch, Head of Unit, Directorate General X1, Commission of the European Communities

**Reformulated Gasoline in Europe — What should it be and what will it cost?**

Steve McArragher, Fuels Technical Affairs, Shell International Petroleum Co. Ltd.

**How to meet diesel fuel quality in the future European scene**

Joachim Brandt, Senior Advisor EC Affairs, Mobil Europe

**Growing problems with the quality of bunker fuels**

Professor RV Thompson, Dean — Faculty of Engineering, University of Newcastle upon Tyne

**Processing the bottom of the barrel for best environmental results**

Stuart Simpson, Manager, Marketing Services, UOP Processes International Inc.

**Cleaner fuels — The impact on European refining**

Chris G Peacock, Principal, Chem Systems Ltd.

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This is an important and timely conference, of major interest and value to all those engaged in the fuels business. It would be unwise to miss it.

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, UK.**

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Cover photo of a hand-crafted stained glass panel, specially commissioned from Stoney Parsons, a London-based artist, for a conference room door.

# Progress on Cullen safety issues

New regulations on offshore safety management and safety cases could be in place by the autumn of next year, according to the Health and Safety Commission (HSC). The Commission has issued a statement on progress with implementing recommendations in Lord Cullen's report on the 1988 Piper Alpha disaster, including a preview of future plans.

Speaking in London, HSC Chairman Sir John Cullen emphasised the commitment to securing full implementation of the report's 106 recommendations.

'Lord Cullen's comprehensive report set a challenging agenda for the industry, the Commission and for HSE as the regulatory body,' he said. 'There is a strong public and political expectation that his recommendations should be implemented as soon as possible — and rightly so.'

Sir John stressed that HSC's highest priority remains the development of new offshore safety case regulations. 'This will be done in close consultation with all sides of the industry, and informal discussions are already advancing well,' he said.

The key features of the proposed regulations are likely to include:

- an effective safety management system, including arrangements for audit and review;
- demonstration through the safety case that major hazards have been identified, risks assessed and adequate controls

applied;

- demonstration of adequate emergency provisions, including the full and safe evacuation, escape and rescue of personnel;
- appropriate use of quantified risk assessment to support the safety case.

Sir John indicated that HSC plans to publish a consultative document early in the New Year and — subject to the consultations — to submit proposed regulations and supporting guidance for Ministerial approval in the summer. On this timescale, it should be possible, if Ministers and Parliament agree, to have the new regulations in place by the autumn of 1992 and in force by the late spring of 1993.

A further six months will be allowed for the submission of safety cases for existing installations. An absolute deadline, probably in 1995, will be set beyond which no installation will be able to operate without its safety case having been accepted by HSE.

'We recognise that the introduction of the safety case regime is a substantial task requiring considerable industry investment,' said Sir John. 'Companies are already well embarked on the work and we hope that a number of safety cases will be submitted to HSE ahead of the 1993 deadlines. This statement should help industry to plan with greater confidence.'

## UK group wins Kuwait contract

The Kuwaiti British Group (KBG) has won one of the largest single contracts awarded by the Kuwaiti government to fight up to 80 oil well fires in the country.

The contract which covers the neighbouring Sabriyah and Bahra oilfields will involve the dousing of all fires, controlling oil flows, replacing the damaged wellheads and returning the wells to previous production levels.

The KBG partnership of Geo Wimpey, Amec and Taylor Woodrow are to sub-

contract the firefighting work to the Houston-based specialist Neil Adams (see *Petroleum Review*, April 1991).

Mr Adams is sending a team of 14 firefighters and expects to put out the fires within five and a half months.

The KBG will also be providing civil engineering services to include the setting up of workshops, offices and accommodation for up to 800 people in the fields as well as rebuilding the basic infrastructure.



## Oseberg C production starts

Oil production from Norsk Hydro's Oseberg C platform began on September 2, marking the completion of one of the world's largest offshore oil fields.

With a production capacity of 110,000 barrels of oil per day (bpd), the Oseberg C platform brings total production capacity at Norway's Oseberg field up to around 450,000 bpd. The field is expected to reach this production level during the fourth quarter of this year, making it the second largest oil producer in Norwegian waters.

First oil production from Oseberg started in December 1988 from the field centre consisting of the platforms Oseberg A and B. The C platform is located 14 kilometres (km) north of the field centre. The oil is brought ashore through a 115 km long pipeline to the Sture terminal on Norway's west coast just north of Bergen.

## Fourth onshore licensing round

In the fourth onshore licensing round 37 areas were opened up for exploration and 20 exploration licences were awarded to 26 companies.

Eight of the new licences are concerned with the extraction and exploitation of methane gas which occurs in and around coal seams — a new

departure for the United Kingdom. The technology has been tried successfully in the United States but has not been tested here before. Mr Colin Moynihan, Energy Minister said, 'Successful exploitation of such a resource could represent a valuable addition to future energy supplies.'

# UKOOA guidelines on the environment

The United Kingdom Offshore Operators Association (UKOOA) recently published a set of environmental guidelines to be adopted by member companies engaged in developing UK offshore oil and gas resources.

The guidelines are intended as a framework under which companies can conduct their business. Dr Harold Hughes, UKOOA Director General said: 'With these guiding principles the UK offshore industry pledges to carry out its activities with maximum respect for the sensitive environment in which it operates'.

The UKOOA guidelines are in addition to UK environmental legislation and good oilfield practice. It is intended that they will be given a high priority in the definition and implementation of corporate strategies, and in developing environmental management systems appropriate to each member's overall operation.

The guidelines are as follows:

- Adopt appropriate procedures, industry practices and other operating guidelines with the objective of protecting the environment.

- Promote among employees and contractors an individual and a collective sense of responsibilities for protecting the environment, incorporating the principle of line management responsibility.

- Endeavour to conduct operations and handle all materials, products and waste in a manner that protects the environment and conserves energy; providing advice to suppliers, contractors and others where necessary.

- Develop and maintain procedures to minimise the risk of all accidental spills and emissions and maintain appropriate emergency response procedures in case of accidents.

- Develop, implement and monitor programmes to manage overall emissions and waste generation and disposal to minimise environmental impact.

- Co-operate with government and European authorities to help develop laws and regulations and review issues to safeguard the environment.

- Support research and development programmes to study the effects of the industry's activities on the environment and any associated risks, leading to improvements in environmental protection practices.

- Contribute to the environmental debate and discussion pertaining to the offshore industry.

- Undertake appropriate reviews and evaluations of operations to measure progress and ensure compliance with the above principles.

## West Brae success

Marathon Oil UK Ltd, on behalf of the Brae Group, has tested a successful West Brae appraisal well 16/7a-32. West Brae is located 155 miles north-east of Aberdeen and is around five miles north-west of the Brae 'A' platform.

The semi-submersible drilling rig *Dundee Explorer* drilled the well and tested two productive intervals.

Following the success of Marathon's Central Brae multi-well subsea development, which came on-stream in September 1989, it is anticipated that West Brae will be another subsea development tied back to existing Brae infrastructure.

## Pakistan award

Tullow Oil plc has signed an agreement in Islamabad with the Pakistan Ministry of Petroleum and National Resources to explore for hydrocarbons in the East Badin Concession.

This will give the company a further three blocks in Pakistan, these are located in the districts of Jacobabad, Dadu, Thatta, Hyderabad, Sukkur and Khairpur in the province of Sindh, and in the districts of Rajanpur and Rahimyar Kahn in the province of Punjab.

## Direct gas sales

Amerada Hess Limited has announced the formation of a new UK gas marketing subsidiary. Amerada Hess Gas Limited. The new company, will market gas directly to industrial and commercial gas users in the United Kingdom.

Onshore transportation of the gas will be via the British Gas transmission system.

## Amoco gas find

The Amoco Netherlands Petroleum Company, in conjunction with its partners, have discovered gas in the second successful exploratory well on the P/15c licence in the Netherlands sector of the North Sea.

## Ultramar exchange deal

Ultramar Exploration Limited has reached agreement, subject to Department of Energy and partner approval, to exchange its 21.25 percent interest in the Franklin field with Elf UK Plc for Elf's 54.5 percent interest in Markham West and a cash payment to Ultramar of £45 million. The boost to Ultramar's North Sea production and elimination of costs on the Franklin field will produce a cash benefit to Ultramar of about £120 million over five years.

Mr John Darby, Chairman of Ultramar Plc, said: 'The exchange of a longer term asset such as Franklin for Markham, which starts production next year, is an important step towards reaching two of our principal objectives — increasing earnings per share by bringing reserves into production as quickly as possible and reducing gearing'.

The exchange of interests with Ultramar strengthens Elf's position in the North Sea as the Franklin field lies adjacent to Elf UK's recent gas/condensate discovery in Block 22/30c. The deal adds to the North Sea assets Elf acquired from RTZ in 1988 and in its joint deal with Enterprise Oil to purchase the UK oil and gas assets of Occidental.

## Sunderland drilling

Shell is to drill an exploration well 21 miles east of Sunderland in the summer of 1992.

The well to be drilled by Shell UK Exploration and Production, will take between five to eight weeks and is estimated will cost up to £4 million.

The announcement of the drilling plan was made at the launch of an environmental report on the north-east coast produced for Shell UK Exploration and Production by the Dove Marine Laboratory of the University of Newcastle upon Tyne.

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## 12 August

**Hydrocarbon production** from the North Sea could reach 4 million bpd in 1996/7, according to a study carried out at Aberdeen University's Economics Department.

**Conoco Norway is to use Det Norske Veritas** to carry out engineering verification services for its Heidrun field development.

## 13 August

**A record 791 oil spills occurred** around Britain's coasts in 1990, according to a survey for the Advisory Committee on the Protection of the Sea.

**British Petroleum and Atlantic Richfield** have raised, by almost 7 percent, the amount of recoverable oil from the Prudhoe Bay field on the North Slope of Alaska by expanding an enhanced oil recovery programme.

## 14 August

**In the UK sales of cars fitted with catalytic converters** comprised 17.9 percent of new registrations in the second quarter of this year compared to 5.7 percent for last year.

## 15 August

**Italian oil company Agip** announced that it had awarded a contract to pipeline contractor Allseas for the installation of pipelines on the Tiffany field.

**Powergen has joined forces with British Rail** to redevelop a power station site near Birmingham as a Channel Tunnel rail terminal for the Midlands and a European business park.

**The Liberal Democrats** have become the first major UK political party to propose an energy tax to make people save fuel, recycle goods and reduce pollution.

**US oil and gas independent Oryx Energy** has announced first gas production from its new Gulf of Mexico platform on High Island block 384, and additional production from a subsea well on Garden Banks block 224.

## 16 August

**The Soviet Union** was the leading supplier of oil to the united Germany during the first half of this year.

## 17 August

**National Power, Britain's largest electricity generator**, is to close

its main research laboratory at Leatherhead.

**US Army tanks went into action** against Kuwait's blazing oil wells firing high-velocity rounds into rock-hard coke on well BG-93 in the Burgan field.

## 19 August

**BP Shipping is planning a major new stage of fleet modernisation** — the requirement is for three vessels similar in capacity to the recently built 41,000 dwt BP Admiral products carrier class.

**The UK government expects to approve 30 new oil and gas projects worth £6.9bn** this year, according to energy minister Colin Moynihan.

## 20 August

**National Power is seeking consent to convert its 2,000 megawatt oil-fired plant at Pembroke to burn Orimulsion.**

**After a six year dispute Norway's share in the giant Statfjord field** is going to be increased by 1.15 percent to 85.24 percent. Accordingly, the British share comes down to 14.76 percent from 15.91 percent.

## 21 August

**US oil company Union Texas** announced the sale of its domestic onshore oil and gas business to Burlington Resources for \$260m.

**Shell has announced that it is withdrawing the Brent Spar offshore tanker loading facility** from service in the UK North Sea later this year.

## 22 August

**Britain's first commercial wind farm** is to be built on a farm at Delabole, north Cornwall, and will supply enough electricity for 3,000 homes.

## 24 August

**Norway's Statoil suffered a major setback** when the concrete platform support structure for its Sleipner East offshore gas development sank in deep water in the Gandisfjord outside Stavanger.

## 27 August

**Kuwait's biggest refinery, Mina al Ahmadi**, is to restart production for the first time since the Gulf War.

## 28 August

**Scottish Enterprise is to lead an oil and gas industry trade mission to the Soviet Union in November.** **Burmah Castrol, the specialist lubricants group**, is paying \$30 million for Dryden Oil Company, the biggest independent commercial lubricants company in America.

## 29 August

**Nigeria's leaders have ordered the release of the former oil minister, Tam David-West**, who was jailed for 10 years for writing off a debt of \$57 million owed by a foreign oil company.

**Phillips Petroleum has awarded a contract for a new accommodation platform for the UK's Hewett field** to US offshore services company, McDermott.

## 30 August

**Mobil is expected to invest \$2bn in exploration and production in Nigeria** following the signing of a new joint venture operating agreement.

**Elf has announced an oil and gas discovery in Norwegian waters** located between the Heimdal and Frigg producing fields.

## 2 September

**Romania doubled petrol prices** in an effort to move closer to international prices in line with its economic reforms.

**The Institute of Directors** has teamed up with British Gas to produce a guide to fuel efficiency.

## 3 September

**US oil company Phillips Petroleum** is looking towards the early development of the Julia prospect in the UK sector of the North Sea following successful exploration drilling.

**Braspetro, the international arm of Brazil's state oil company Petrobras**, is considering pulling out of the North Sea as part of reassessing its worldwide exploration prospects.

## 4 September

**UK Petroleum Products** has been fined £7,000 for polluting Poole Harbour, Dorset with diesel oil spilled from a tank last April.

## 5 September

**Petrobras, the Brazilian state oil company**, launched a major oil clean up operation after the 50,150 dwt tanker *Theomana* was holed while carrying out loading operations in the Albacora field, 150km off the coast of Rio de Janeiro.

## 6 September

**Oil company Amerada Hess** announced an oil discovery just four miles from its Ivanhoe/Rob Roy complex in North Sea block 15/21a.

## 7 September

**The Marine Spill Response Corp** has awarded contracts of more than \$185m to two shipbuilders to build 16 offshore response vessels — Trinity Industries Inc and Bener Shipbuilding & Repair.

## 9 September

**Esso Resource Canada, PetroCanada, Shell Canada and Ultramar Canada** have opened a joint oil spill response centre in Dartmouth, Nova Scotia.

## 10 September

**Shell — the largest foreign investor in Singapore** — has become the first recipient of the newly-created Distinguished Partner in Progress award from the Singapore government.

**Mobil is holding talks with PetroVietnam**, the state oil company of Vietnam, about possible exploration opportunities in the South China Sea.

**Liquefield natural gas** accounted for 68 percent of total energy supplies in Japan last year, according to the Institute of Energy Economics (Japan).

## 11 September

**Norwegian oil independent Saga Petroleum** has completed the successful mating of the Snorre platform deck and hull, making the project nearly 85 percent complete.

## 12 September

**National Wind Power, a joint venture company** aimed at becoming the UK's premier wind farm developer, has been set up by National Power, British Aerospace and Taylor Woodrow.

## 13 September

**Finland's state-owned oil and chemicals group Neste Oy** has unveiled a bid for Sovereign Oil and Gas which values the UK energy independent at £84.3 million.

**Statoil, the Norwegian state oil company**, has bought a 5 percent stake in Verbundnetz Gas, former East Germany's gas monopoly, for about Nkr 195 million.

**Petrobras said that production from its oilfields** had been cut by about 35 percent as a result of the first day of a nationwide strike by oil workers.

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**British Gas** 

# Offshore Europe 91 — great success

By Mark Scruton

The traffic jams in Aberdeen caused by the Offshore Europe 91 were the worst ever seen as people crammed into the North Sea oil capital to take part in this year's buoyant celebration of the mini UKCS 'oil boom'.

The roads to the Scottish city's purpose-built Exhibition and Conference Centre were clogged with cars of some of the record 33,000 visitors attending the event — more than 10 percent more than the last show in 1989.

Another record of 1,500 exhibitors ensured the Bridge of Don site was full to capacity, and throughout the halls the gathered crowds basked in a mood of optimism which radiated just as strongly as the sun during a surprise heatwave outside.

According to Mr David Stott, chairman of Spearhead Group, which organised Offshore Europe in partnership with the Society of Petroleum Engineers, the event was the most successful since it was launched in 1975.

The almost strident confidence as the result of record levels of offshore activity over the past 18 months added to the general feeling of well-being in the crowd about the bright future of the North Sea.

A report by Scottish Enterprise published just before the exhibition backed up the sense of optimism with a predicted bullish future for the UKCS over the next five years. But despite the rosy prospects, possibly wiser heads were predicting that the challenges ahead could prove to be a lot more difficult than people think.

The report said that expenditure on the UKCS is expected to reach a record £8.5 billion next year but it warned that from 1992 to 1995 this will gradually reduce to a level of around £5.7 billion in 1995.

During that same time, worldwide expenditure is set for significant growth.

Over the next five years the spend forecast is expected to grow from over £43 billion in 1992 to a peak of about £52 billion in 1995.

## New fields

Closer to home, the report predicted that 58 new fields will come onstream during that period. This is higher than

at any other period in the UKCS's history, but the report states 'many of these developments will be relatively small in terms of recoverable reserves.'

1993 will see a surge in the UKCS field developments with 27 new fields coming onstream. New subsea fields will also peak in 1993 with 11 forecast, while 1994 will see six and there will be seven in 1995. In all 30 new subsea fields are expected during the period 1992-95.

However, exploration and appraisal (E&A) drilling on the UKCS is set for a steady reduction back to 1989 levels. Last year saw E&A activity peaking at 214 wells. By 1995 this type of drilling will fall by around 20 percent to 172 wells.

Mr Crawford Beveridge, Chief Executive of Scottish Enterprise, said: 'This year's spend estimates show that the UKCS is currently going through an incredibly busy period. What is borne out by our findings is that if Scottish and UK companies wish to expand their market share they will have to seek new business internationally.'

'Subsea markets are a key area for growth and it is clear from our findings that decommissioning work will increase markedly over the next few years, creating what is essentially a new market opportunity.'

## Subsea group

Interestingly, the eve of Offshore Europe saw the launch of a group of companies to promote their subsea

expertise worldwide.

The Scottish Subsea Technology Group is made up of 29 companies which aim to increase their market penetration in the United Kingdom and worldwide. Under the chairmanship of Mr Jimmy Hay, BP Exploration's former General Manager (UK), the group also intends to achieve standardisation of equipment within the industry.

Mr Hay echoed the Scottish Enterprise report when he said: 'Demand for subsea technology worldwide is increasing markedly. Estimates indicate that over £4.5 billion will be spent on the UK Continental Shelf alone over the next five years, with an even larger international market available.'

'By combining the talents of each of our constituent members and pooling market resources we can, as a group, sell Scottish technology worldwide in a cost-effective manner and compete with the larger international players.'

## Complacency

Energy Minister John Wakeham shared the optimism shown in Aberdeen but he warned the offshore supply industry not to be too complacent.

He urged the UK offshore supply industry to be alert to a three-point challenge; overseas competition, a rapidly expanding international offshore market and an unduly 'pessimistic' view of North Sea development costs.

Speaking in Aberdeen, Mr Wakeham said that a record 106 new E&A wells were drilled in the first half of this year — an increase of nearly a fifth over the previous year.

'This momentum still shows no obvious signs of slowing down. There now appears to be every prospect that the total value of new development projects approved by my department during this year will comfortably exceed last year's record of £4.8 billion. And only last week Scottish Enterprise forecast a new peak in offshore spending during next year of £8.6 billion.'

Despite this optimistic appraisal Mr Wakeham also warned that there were three main challenges ahead for the offshore industry.

'Firstly, the very vibrancy of the sector and the suddenness with which activity has taken off during the past 18 months has clearly taken many in the supply industry by surprise, and left some companies struggling to cope with the sheer volume of the work involved. Partly in consequence a growing number of major orders have recently been going overseas — predominantly to the European yards.

'As the title of this event implies, continental Europe is now very much involved in the development of the UKCS. The real test for UK companies is going to come when the boom starts to slow down and the struggle to regain market-share intensifies.'

## Offshore market

'Secondly, however full order books may be at present, it is clearly in all the supply companies' interests not to neglect the rapidly growing world offshore market beyond the North Sea — already thought to be worth between £30 to £35 billion a year.'

Mr Wakeham said that the Soviet oil and gas industry could prove to be an important market and offered immense opportunities to the UK supply industry. 'Thirdly, and more worryingly, there is a current widespread perception — which the oil majors have been fairly prominent in publicising in recent months — that North Sea development costs are escalating much faster than general inflation, to the point where the viability of some of the more marginal fields is now being threatened.

'I have to tell you bluntly that the evidence available from my department doesn't wholly support that view. It suggests that for oilfields actually in production last year the average costs per barrel were around £10, whilst for fields still under development at that



The Institute of Petroleum's stand, manned by volunteers from all the Scottish Branches and IP staff, was kept busy all through Offshore Europe. Pictured here is IP Director General Ian Ward (left) and Aberdeen branch member John McKennell, while Technical Officer Alan Lodge talks to a visitor.

time the costs per barrel were estimated at £7. In other words, there was actually a significant fall in oilfield development costs last year, largely as a result of continuing technological innovation.

'That is not to argue, of course, that unit costs have not been rising quickly during this year as suppliers have sought to take advantage of the high levels of demand to restore their profit margins. The industry's contention that costs have been rising particularly sharply may be due to a combination both of an underestimation of the original costs and of market forces at work in response to rising demand.

'What is clear, however, is that the more marginal fields will only be developed if costs are held down, which is surely in the interests of everyone here. It is important the UK supply industry should not be tempted by the present high level of activity into maximising profits at the expense of future orders. That could prove a suicidal policy in an increasingly international market.'

But Mr Wakeham said there is still plenty of good news about the UKCS to come adding that the prospects for the North Sea undoubtedly remain bright. 'Leaving aside the Southern Basin, over 90 new fields are likely to begin production over the next two decades,' he said.

## Safety costs

During the exhibition, however, it was made clear that in one area of the

industry costs were not the issue.

Dr Harold Hughes, Director General of UKOOA, in a keynote address, said the oil industry would spend whatever was necessary to ensure North Sea safety. He said that the industry was a long way down the road in implementing the recommendations made by Lord Cullen. Over £1,000 million had been invested on safety improvements since the Piper Alpha disaster and individual companies were preparing installation safety cases for audit by the Health and Safety Executive.

Talking about the HSE he said that: 'Offshore workforce had fully embraced the new safety regime. Over 1,000 worker safety representatives have been elected to office by their colleagues. As a result the offshore industry is now second-to-none in terms of highly trained across-the-board workforce involvement in safety.'

He added: 'The offshore oil and gas industry is a bright sector in the UK industrial economy. It is imperative for the 4,000 companies involved that offshore activity is maintained at the highest possible level.'

Touching on the cost inflation problem he said: 'UK offshore operations must become more cost effective to achieve the fullest development of vital offshore oil and gas resources. The prospects for the UK offshore industry are still healthy, however the future should not be oversold on the basis of the exceptional present.'

# Subsea review

By Steve Sasanow

Anyone in the upstream oil sector who still thinks that subsea production is 'new', ie not mainstream, technology for all operating companies in every oil province worldwide should have been at the North Sea Oil & Gas conference, organised by the *Financial Times*, in early July this year.

Senior managers — not engineers, research and development specialists nor other technologists — from big and small companies, majors and independents alike, eg Texaco Europe, Norsk Hydro, Shell UK Expro, Lasmo North Sea, and Statoil all mentioned the importance of subsea production to current and future developments that their companies expect to be involved in. There can be no greater indication that subsea has 'made it' than when speechwriters put 'subsea' into the presentations of management with the expectation that everyone will understand what they are talking about.

It has been yet another eventful year for the subsea industry, particularly as the size of projects, and thus orders for production hardware and other equipment, has grown gradually bigger. Last year's order by Amerada Hess for 24 subsea xmas trees for Scott (16/21) remains the biggest, but this year came orders for 20-plus trees by Statoil (to Kongsberg Offshore/FMC) for its Statfjord (33/9, 34/7) Satellites Project (SSP) plus the Sleipner satellite, Loke (15/9); 19 by Texaco (to Cameron Iron Works (CIW)) for Strathspey (3/4a); and 13 by Conoco (also CIW) for Lyell (3/2).

During the last year, though, there have been concerns expressed by some operators about the manufacturing capacity of the production hardware companies — ABB Vetco Gray and National Oilwell and others — and their ability to bid competitively on all projects. If there is anything that operators dislike, it is lack of competition amongst suppliers.

The other major constituent of subsea projects, electro-hydraulic control systems, has also seen a change in the marketplace. The dominance of FSSL, formerly Ferranti Subsea Systems, has diminished as Kongsberg Offshore (KOS) won two more big contracts — Norske Shell's Draugen (6407/7) and Statoil's SSP — in its home Norwegian market and GEC Avionics has shown a remarkable revival with contracts from Total for Alwyn North Extension (3/9), Conoco for Lyell and from Exxon for its Gulf of Mexico Zinc project.

So far, it has also been a good year for the flexible pipe market, or at least for the French manufacturer Coflexip. It was awarded two of its biggest contracts to date in the spring — 50km of pipe worth Nkr270 million for Draugen and 33km worth £24 million for Agip UK's Toni (16/17) development — and then followed that up with an Nkr190 million order for 13km of jumpers, tails and lines for SSP.

## UK North Sea

Away from the marketplace, there are a number of projects, some new and a few long in gestation, that are still in the planning stages. In the UK sector, Shell UK Expro has just begun work on Nelson South, the subsea satellite portion in Block 22/11 of the main Nelson development. When this project comes on-stream in 1993, it, along with Scott, will be one of the new generation of big projects.

This project, following on from Lyell and Strathspey, will feature a production manifold and a maximum of 11 clustered wells — eight for production and three for water injection. Strathspey, Texaco's second big subsea project following Highlander which came on-stream in 1985, will have one of the largest manifolds, with 18 slots for 16 nearby wells and two satellites.

Strathspey is also notable for the amount of pipelining associated with a project that does not have a new export line to shore. Stena Offshore, with its

reelship *Apache*, has just won a £35 million, 145km pipeline installation job which includes six lines — 8in and 10in production, two 8in test, a 4in utilities and 3in methanol — from the manifold to Ninian Central 15.5km distant; a 12in 20km water injection line from Ninian Southern to the manifold; 6in production and 2in methanol lines from the manifold to each of the two satellites (1.5km), P-9 and P-14; and a new 26km gas export line from Ninian Central to Brent A.

What Strathspey, Lyell and Staffa (3/8b), a two-well subsea development which is Lasmo's first operated project in the North Sea, have in common is that they are all taking advantage of spare processing and transportation capacity within Chevron UK's Ninian complex. This is often cited as a key element in the future of subsea developments in the North Sea — the ability to develop small and medium-sized reservoirs without the high cost of new processing platforms and main pipeline systems. An alternative is Amerada's Angus (31/26a), where a pair of already drilled (but suspended) subsea wells will be produced to the production ship *Petrojarl I* later this year.

Other UK sector projects that are on various steps of the development ladder include Arco's Blenheim, a two or three well satellite development to Sun's Balmoral floater (15/21a); Shell's Pelican, a Cormorant satellite; Amerada's Hudson (210/24), due to be a floater with subsea wells; Phillips' Ann (49/6), a gas satellite to Audrey,

one of the first UK finds going back to 1966; and Mobil's Nevis, a Beryl satellite.

There is little talk in the United Kingdom about deepwater drilling, except for the multi-company Clair project which is seeing several wells drilled this year by BP and Elf, the latter horizontal. The reason that it creates interest in the subsea world is the enormous extent of the reservoir, which crosses at least five blocks in Quadrant 206. At least one scenario suggested for the development of the field would see 50-60 subsea wells.

## Norwegian developments

In Norway, there is much activity as well. Statoil's SSP, which saw the first contract awarded in early May, was the biggest subsea EPC (engineering, procurement and construction) contract at NKr1.4 billion to KOS with big subcontracts to FMC (wellheads and subsea trees), Kaldnes de Groot (structures) and Alcatel Kabel Norge (umbilicals).

Next up in Norway is Lille Frigg, another Frigg complex field to be developed by Elf Norge, following Northeast and East Frigg. What makes this gas/condensate project significant is that it will employ 11,000psi subsea wellheads and production xmas trees, thought to be the highest rated equipment ever used in the North Sea.

Another Norwegian first is expected at Saga's Tordis (34/7) development, which will see the first use of a manifold and clustered wells. Even more recently it has been heard that Saga was considering putting the subsea equipment in submudline silos for protection.



Assembly of part of the subsea valve for the Alwyn North Extension project, at the FMC factory, Dunfermline.

There has never been a permanently moored fully equipped floating production system with subsea wells in Norway — the closest is at Veslefrikk where a floating process unit is linked to a wellhead platform — but there are likely to be at least two in the coming years. A combination of water depth beyond 300m and difficult reservoirs have pushed at least one operator — Norsk Hydro — into a hard look at floaters.

Hydro, as phase two operator for the Troll (West) field oil phase, has an ambitious plan that could see 20-30 subsea horizontal wells used to drain two very thin oil zones that lie adjacent to the giant gas structure. Further

north, in Haltenbanken, Hydro is looking hard at a shipshaped concept for the development of Njord (6407/7 & 10). Under review are the Tentech 850C vessel currently under construction in Spain and *Petrojarl II*, which is to be built in Germany.

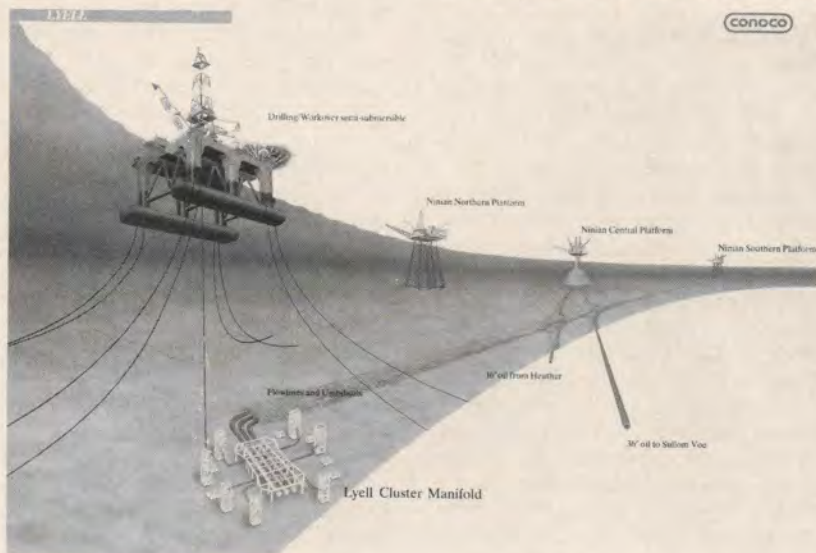
## Worldwide

Elsewhere around the world, subsea is being used both in shallow and deep water. In Brazil, Petrobras has drilled, completed and is now producing from the two deepest production wells in 721m and 752m as part of the Marlim Pre-Pilot project. The subsea xmas trees were the first guidelineless (GLL) units ever installed.

In the Gulf of Mexico, Exxon has moved its Zinc project forward with equipment awards to GEC and National, while Enserch, which was a partner with Placid on the ill-fated Green Canyon 29 project, has used some of its experience on that deepwater field for the development of Mississippi Canyon 441. This new project will see three gas production templates in water depths to 460m.

While on the subject of deepwater gas, Shell is taking a hard look at developing a find off the Philippines first made by Occidental.

In shallow waters, Woodside will be developing its Cossack field, off Western Australia, with three or four subsea wells tied back to a floating production tanker, while Oryx, Exxon and others still find uses for the odd simple subsea tree for developing gas in the Gulf of Mexico. ■



Conoco's Lyell development — one of the world's largest subsea satellite oil installations.

# Subsea standardization

By Steve Sasanow

A significant part of the impetus in the last decade to use subsea production systems for field development has been economic, ie cost saving reasons.

The logic is obvious: it must be cheaper to put a small structure or even just a few single subsea xmas trees on the seabed and transport the crude oil or gas to a nearby existing platform for processing than to build a new platform. While the logic is mostly faultless, it is better in theory than in practice.

Firstly, it is acknowledged that operating expenditure (OPEX) for subsea wells is higher than for topside wells, because of the need to charter in a floating drilling rig or specialist monohull vessel to carry out even the most basic of maintenance work. The only alternative, in some cases, is the use of through-flowline (TFL) tools, which can carry out some well maintenance procedures, but bring with them higher capital costs in the form of additional flowlines and more complex subsea equipment plus the cost of the TFL equipment and tools themselves.

So if the savings on subsea projects are to be significant, they must be on the capital expenditure (CAPEX) side. But this has not always been possible, because many of the early subsea systems were the products of research and development (R&D) work and were seen as prototypes or experimental.

But operators' increased experience with subsea completions has begun to reshape thinking. Firstly, the reliability of subsea production equipment, primarily xmas trees (well control equipment), has proven to be much higher than originally thought. A survey\* of operational and maintenance experience with subsea completions revealed that availability of over 200 subsea wells sampled was above 90 percent. Of the less than 10 percent downtime, just 10 percent of that, or less than 1 percent of the total, was the result of problems with subsea xmas trees.

No less a respected figure in the oil industry than Jacques Bosio of Elf Aquitaine, recently elected president of the Society of Petroleum Engineers, stated at a conference\*\* in Norway last year that subsea production hardware

was the most reliable equipment ever produced by manufacturers and suppliers to the oil industry.

## Repeatable technology

Secondly, the confidence that operators have developed has convinced them to engineer and use repeatable technology. An irony is that two good examples of this come from Norway. The Norwegians, who still view themselves as relative newcomers to offshore technology, were notorious for over-designing some of their early subsea systems and knew it.

For example, a Statoil engineer said at a conference\*\* in 1990 that the cost of each subsea well on the Gullfaks field was NKr210 million, or over £20 million, not including drilling and completion (d&c). The expected cost of each well on Statoil's current Statfjord Satellites Project (SSP) is NKr150 million including d&c. This is still high by Brazilian, Gulf of Mexico or even UK sector standards, but a major improvement for Norway.

And yet two interesting developments have occurred in Norway. On SSP, Statoil is using repeatable technology for the design of the six identical four-slot templates that will be used on the Statfjord North and East fields and a seventh that will be used on Loke, a satellite to the Sleipner East platform. At one time, Statoil almost had to separate the North and East developments, because the latter crosses two licences and there was a conflict between the licensees and the government. This would have defeated the purpose of using 'cookie cutter' engineering.

The other Norwegian example actually came out of the hardware supplier KOS, which with FMC had won the supply contract for SSP and Norske Shell's Draugen project. It has suggested to the operators that similarity in the subsea xmas trees would allow them to have a single completion riser owned by KOS and rented out to the operators instead of having one each. A completion riser, an expensive item, can often sit in a warehouse for years between uses. Such an idea certainly has its merits.

## Industry debate

All of these ideas are part of what is now a debate in the industry about 'standardization'. There has been a major effort, going on now for at least five years, by Committee 17 of the American Petroleum Institute (API) to develop some recommended practices and some standards for the subsea sector covering systems, flexible pipe, TFL equipment, well control equipment, umbilicals, control systems and completion risers.

The biggest effort has been in the area of well control equipment and the 17-D subcommittee has investigated this complex issue from all angles and is about to finish its work.

Its aim, according to subcommittee spokesman Pat Rickey of Exxon Production Research, was to try to make available 'safe, functionally interchangeable subsea wellhead and xmas tree equipment'. It wanted to set down a minimum number of safety barriers, recommend types of flanges, specify safety standards for valve actuators and establish performance verification testing.

Despite industry agreement that 'standardization' is a good thing, there remain disagreements. At a seminar\*\*\* in June this year on subsea standardization, Hans Hopper of BP, one of the industry's innovators who was heavily involved with the development of the universal wellhead and the concentric tubing hanger, admitted that the very idea of 'standardization' meant something different to every engineer.

## Umbilicals

The other area that has attracted a great deal of attention is umbilicals, the combination of hydraulic and chemical fluid lines and signal and power lines used on subsea projects. Last year the UK Offshore Supplies Office (OSO) commissioned the Engineering Research Centre (ERC) to look at historical failures in subsea umbilicals and it came back with some startling results.

Of the 180 umbilicals studied, more than half had suffered some failure either by poor design or manufacture, or was damaged during installation or while *in situ*. The upshot was that the 17-E committee, originally intended to cover control systems, was now to look at just umbilicals and was joined in its work by a committee of the E&P Forum and by a study group of ERC/NEL. With these groups working together, the aim is to develop guidelines for all phases of the umbilical development process.

Despite the seeming importance of this work, there are those, primarily engineers from operating companies, who are intrinsically against it. Some do not want to be dictated to on equipment specification, others would not mind as long as they had the right to change equipment if they wanted to, thus defeating the aim of standardization.

What seems clear, though, is that while there will be moves towards standardizing equipment, as long as oil company engineers specify particular equipment, then hardware suppliers will supply it. ■

\*A survey of operational and maintenance requirements for subsea wells, Subsea Data Services, Houston.

\*\*UTC 1990, Bergen, Norway, March 1990.

\*\*\*Subsea Standardisation: Trend for the 1990's?, Aberdeen, June 1991.

Copies of the survey and proceedings from the seminar are available from Knighton Enterprises Ltd, 2 Marlborough St, Faringdon, Oxon SN7 7JP. Tel: 0367-242525. Fax: 0367-241125.

## New umbilical design

The ERC report on subsea umbilical failures highlighted a number of the more common problems — methanol fouling and damage during installation, for example, were just two of them. Statoil and Alcatel Kabel Norge hope to reduce, if not eliminate, some of them with a new design.

The umbilicals ordered by Statoil for its Statfjord Satellites Project, which includes the Sleipner satellite Loke, calls for the use of duplex steel lines instead of the usual thermoplastic type. Alcatel had been working on the design for two or three years and had manufactured a prototype section for testing, while at the same time Statoil had also been looking at such a hose replacement concept and specified it for the project.

The design calls for ten steel lines — for hydraulic control and chemical injection fluids — around the perimeter of the umbilical with the power/signal line in the middle. Such a design will make the umbilical stiffer, less fragile and more resistant to hose collapse. It will also be heavier (2–3kg/m) than a comparable conventional line, although in size it will be roughly 20 percent smaller in diameter. The exact dimensions of the line have not yet been fully worked out, but the test umbilical was 100mm as compared to 120–130mm for a similar number of hydraulic lines in thermoplastic.

According to Alcatel, the smaller diameter will make it easier to handle, while the increase in weight will improve its stability on the seabed. And all this for a price differential of no more than 5 percent, Alcatel said.

Alcatel admits, though, that it is not likely that umbilicals with steel lines will become the industry standard in the short term. Workover umbilicals, direct hydraulic umbilicals and those in which the umbilicals are used as accumulators will continue to employ thermoplastic hoses for the time being, but this is yet another 'new' subsea idea whose time has come.



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The course fee will be £825.00 plus 17.5 percent VAT per person, excluding accommodation.

For further details and a copy of the registration form, 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.

# Progress on Tiffany and Toni

By J L Stretch, Assistant Managing Director Agip (UK) Ltd

Approval for the Tiffany field development was given in July 1990, the first UK field to be operated by Agip. The termination of a long term joint venture agreement in the mid-1980s enabled the company to apply for acreage as operator and, more particularly, in March 1986 to acquire the greater part of Phillips interest in Block 16/17 the 'T-Block'. Following this acquisition, Agip (UK) became operator on behalf of its partners — Fina Exploration, Century Power and Light Ltd (now British Gas Exploration and Production) and Lasmo.

Block 16/17, which forms part of a production licence awarded in March 1972 in the fourth licensing round, saw extensive drilling activity prior to Agip assuming the operatorship. In the period to March 1986 15 wells had been drilled and the presence of four fields established, Tiffany, Toni, Thelma and SE Thelma (Figure 1). However, at that time only Tiffany could be considered as fully appraised and with a level of reserves which might justify development.

Geologically, the block is located within the tectonically active South Viking Graben and the field traps are a combination of structural and stratigraphic elements. The reservoirs, in the main, comprise the Upper Jurassic Brae Formation conglomerates and sandstones, sealed by Kimmeridge Clay Formation shales which also form the source rocks.

## Tiffany field

The discovery well on Tiffany was drilled in 1979; subsequently, six appraisal wells have been drilled, the most recent in 1989 which delineated the western reservoir limit. Recoverable reserves are estimated to be approximately 127 million barrels with a plateau production rate estimated at approximately 66,000 barrels of oil per day, sustainable for three years.

Preliminary engineering studies for development began in 1986. These studies were wide-ranging, initially investigating the feasibility of construction, transportation and installation of large modules and alternative export options, in order to gauge the effect on platform facilities of the oil and gas specifications associated with those options. These results were then carried forward to a screening study, which reviewed a number of development options both in terms of platform type and secondary recovery method. Fixed and floating platforms were con-

sidered in combination with water and gas injection and from the results we concluded that gas injection was not a viable means of reservoir pressure maintenance.

However, the case between a fixed and floating platform was not clear cut and it was decided that both needed to be studied in more detail. In particular, to obtain weight and cost estimates from an engineering contractor as opposed to those from a statistical data base. As a consequence the conceptual design of three different platform options was contracted:

- 1) A fixed platform option consisting of a steel jacket supporting an integrated deck comprising an upper module drilling substructure, accommodation/helideck, waste heat recovery/exhaust stack and flare boom.
- 2) A floating production option based on a semi-submersible floating unit. This would be anchored above a template with subsea completed wells connected to the surface

facilities by means of a flexible riser system.

- 3) A hybrid option consisting of a fixed wellhead platform and a floating production vessel anchored nearby. The two installations would be interconnected by a bridge, with flexible catenaries for the transfer of fluids, electrical power and other systems. The fixed wellhead platform would comprise a steel jacket supporting the drilling facilities and the floating production unit, based on a closed ring pontoon with six circular columns fixed by a plate girder deck, would contain the production, utility and accommodation facilities.

Each of the options was then evaluated and ranked with respect to:

- Safety
- Technical risk
- Reliability, availability and maintainability
- Cost and schedule

The reliability and cost and schedule ranking were readily achieved because

of the quantitative nature of their evaluation. However, for safety and technical risk it was necessary to identify the major activities of the development and the risk elements within those activities. This enabled a systematic approach to the evaluation of the relative criteria and their degree of influence on a particular option, thus allowing options to be ranked according to the relative degree of inherent risk. The fixed platform was judged the safest option and ranked first or equal first for the other factors and this option was carried forward for further study.

The contracts for conceptual design were carried out early in 1988 and the configuration produced for the fixed platform comprised compact topsides having a generally cubic shape with an integrated deck supported by four legs of a lightweight jacket. However, on 6 July the North Sea suffered the Piper Alpha tragedy. This disaster led to the reconsideration of the topsides layout to see how it might be improved.

A Concept Safety Evaluation of the selected option was performed to NPD guidelines and this, together with earlier results from the safety and technical risk evaluation, gave focus to the following design parameters:

- Locate gas compression at the top level of the process module.
- Position non-hazardous utilities between the accommodation area and the process module.
- Locate accommodation as low as possible and away from the well-head process.
- Divide process areas and wellhead from the rest of the installation by blast/fire walls.
- Protect escape routes from blast and heat.
- Provide a control room within the accommodation complex.
- Position escape craft to allow ease of access from accommodation and away from hazardous areas.

Accordingly, it was decided to move away from the concept of an integrated deck with living quarters on top to a revised topsides configuration (Figure 2), incorporating a longer, lower layout with the living quarters located at one end of the platform at the lowest possible level. The resulting re-design confirmed that the topsides deck area could not be accommodated by a four-leg liftable jacket and, therefore, an eight-leg jacket was adopted. This jacket retains the features of the latest generation of jackets, with vertical piles and a self-upending capability.

Contracts for basic design were placed in February 1989 and at the same time we carried out an in-depth appraisal of expected offshore construc-

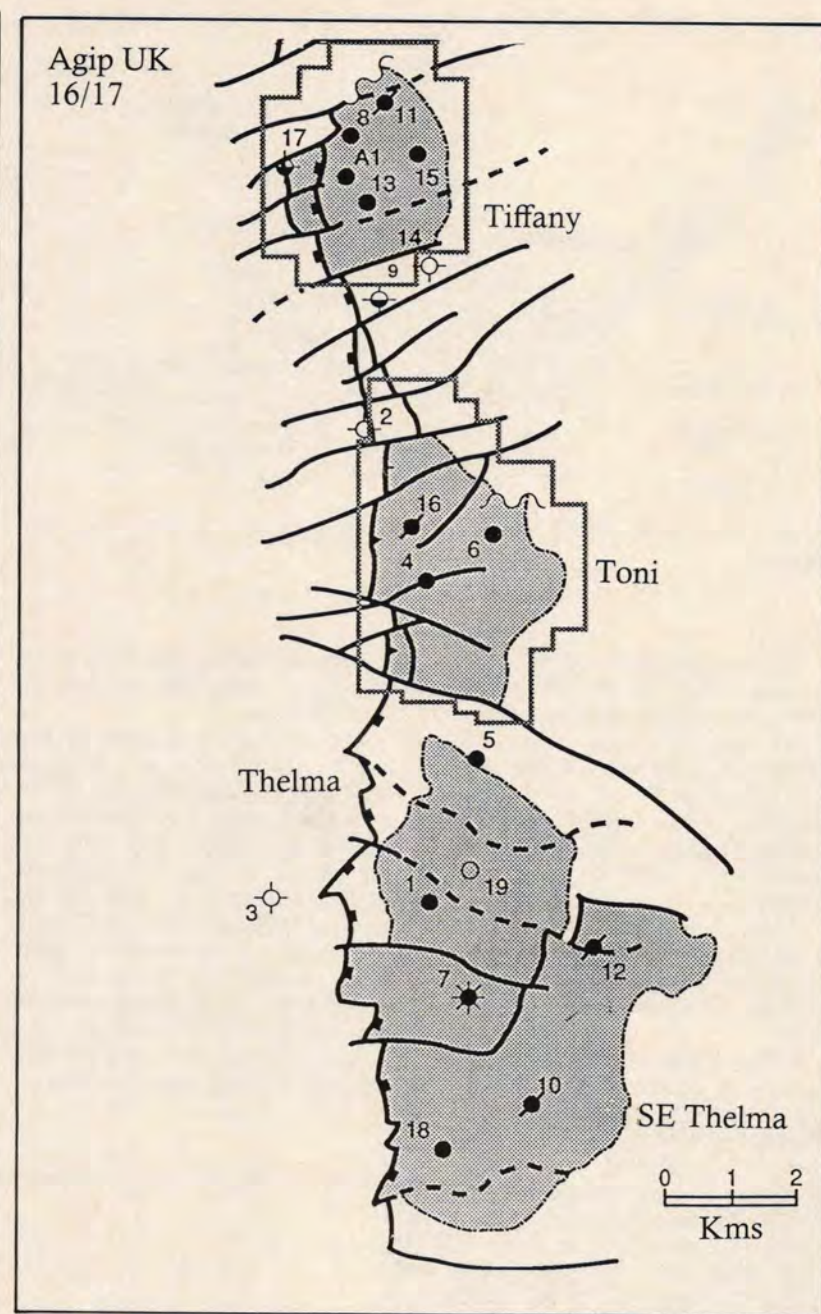


Figure 1

### Block 16/17 Tiffany, Toni, Thelma and SE Thelma Fields

tion projects and the availability of construction resources during the period of the development programme. As a result we decided to tender and award a single contract for the engineering, procurement, installation and commissioning of the Tiffany platform.

Such contracts are not new but present a challenge when conducted on the scale of the Tiffany contract. An

extensive, pre-qualification exercise was carried out and invitations to tender documentation was dispatched to three consortia in mid-November 1989. In the meantime, one of the results of the basic design was the identification and specification of major equipment, with a view to placing orders where necessary for long-lead items in advance of the award of the contract.

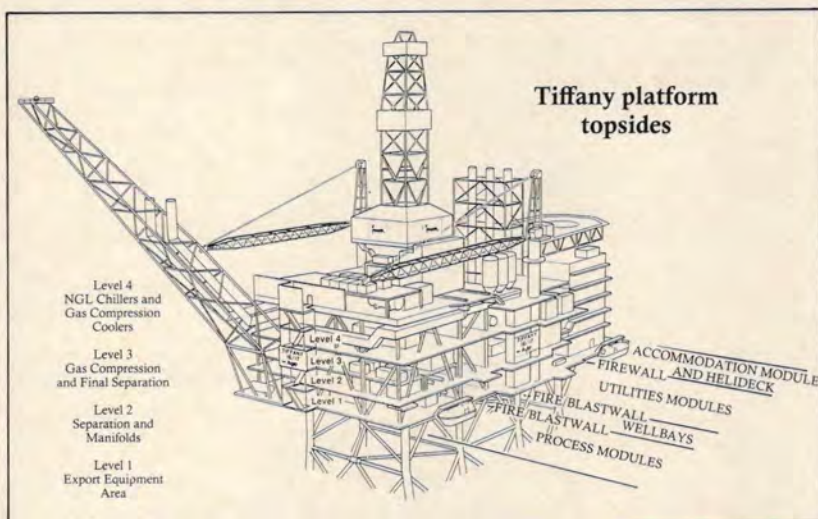


Figure 2

Tenders were submitted by all three consortia on 20 March 1990 and following clarification meetings, a letter of intent to award the contract was issued to Tiffany Contractors on 11 July 1990. The contract is for a lump sum with elements on a reimbursable or measurement basis and estimated to amount to approximately £450 million.

Annex B approval for the development was given by the Department of Energy on 20 July 1990 and a letter of contract award followed on 8 August 1990.

Tiffany Contractors is a consortium comprising Matthew Hall Engineering, Press Offshore and Saipem (UK). Matthew Hall Engineering is responsible for the detailed design of the process and utilities modules and the flare boom supported by Snamprogetti and Tecnomare, who carried out the basic design. Press Offshore is undertaking the fabrication of the process and utilities modules at its Hadrian West yard, near Newcastle, and the design and fabrication of the accommodation module and helideck have been sub-contracted to SLP Engineering. Saipem is responsible for the detailed design and construction of the drilling module. The jacket is designed by Tecnomare and is being fabricated by Consorzio Ital Offshore.

The eight-legged jacket and platform will be installed over a pre-drilled template in a water depth of 125 metres. The dry weight of the jacket, modular support frame and piles will be approximately 26,000 tonnes and the topsides approximately 20,000 tonnes. Transportation and installation of the structures will be by Saipem/Micoperi with hook-up and

commissioning by a joint venture sub-contractor comprising Saipem and Press Offshore.

The template is an eight-slit steel structure, weighing some 120 tonnes secured by four drilled foundation piles and incorporating a docking pile system for the accurate emplacement of the jacket. It was fabricated by McNulty Offshore Services Ltd and installed in February by the drilling rig Sedco 710 on charter from Sedco Forex International. The Sedco 710 is now pre-drilling production wells and will continue until the installation of export pipelines and Toni/Tiffany flowlines in the middle of next year.

First production from the Tiffany field is expected in the second quarter of 1993. Oil export will be via a five kilometre pipeline to tie into the Brae/Forties oil line while gas will be exported via a 34 kilometre pipeline to tie into the intra-field gas line between North and South Brae.

## Toni

While development work was proceeding on Tiffany, efforts were continuing on studying the possibility of producing the Toni field. Although discovered in 1977, at the time that Agip (UK) assumed the operatorship in 1986, only one appraisal well had been drilled on the field. Consequently the appraisal well, 16/17-16 drilled on Toni in 1988, was important and its success critical to the development of the field.

In the event, incorporation of the well results into the field data indicated recoverable reserves of the order of 40 million barrels of oil. This prompted preliminary screening of a number of development scenarios which, in view of the modest reserves and their proximity to Tiffany, were based on wells completed subsea and tied back to the Tiffany platform.

The conclusion was to adopt two subsea well clusters spaced approximately 160 metres apart, one for production wells and one for water injection wells and each with a dedicated protective structure (Figure 3). The protective structures, each of which will be pinned by four piles

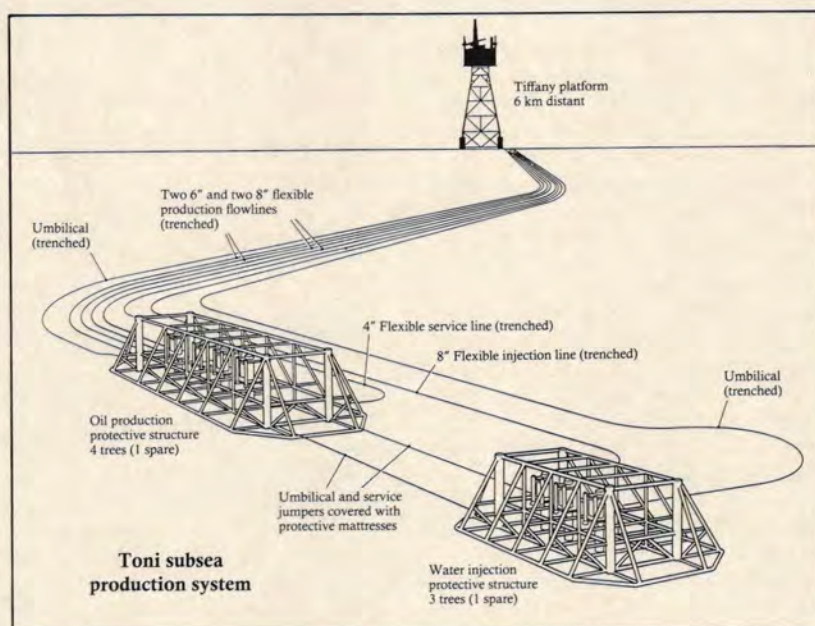


Figure 3

driven to a depth of 21 metres, will carry manifold facilities for the connection of flowlines and a common service line to the Christmas trees. Individual flowlines will transport Toni fluids to the Tiffany platform approximately six kilometres to the north.

In line with the contractual strategy adopted for Tiffany, it was decided to place a single contract for the engineering, procurement and construction of the Toni production system, the main equipment supplier being the main contractor with sub-contracts for other elements. Following an extensive pre-qualification exercise, tenders were solicited and submitted in May last year, resulting in the issue of a letter of intent to award a contract for a lump sum amounting to approximately £30 million to Cameron Offshore Engineer-

ing Limited. This contract was confirmed following government approval of the development in November last year.

The contract for the intra-field flowlines connecting Toni to the Tiffany platform was placed with Coflexip UK Limited in April. This contract, which is for a lump sum (but with elements on a reimbursable basis) amounting to approximately £24 million, is for the engineering, supply and installation of two eight-inch and two six-inch flexible production lines and a water injection line and a service line.

Toni production will be commingled with Tiffany production and is planned to commence late in 1993. Initially, production is expected to be at the plateau rate of 20,000 b/d for approximately three years.

## **Thelma and Southeast Thelma**

The first discovery well drilled in Block 16/17 in 1976 was in fact drilled on Thelma and it is typical of the geological complexity of the area that, despite five successful appraisal wells on Thelma and SE Thelma, further appraisal drilling is necessary. This summer has seen the spudding of 16/17-19, a further appraisal of Thelma, although concurrent with this are studies of various development schemes for these fields.

With further exploration drilling planned later this year, there seems no doubt that development activity in Block 16/17 will extend for several years beyond that already in hand for Tiffany and Toni. ■



## **SAFETY/STANDBY VESSELS THE NEW REQUIREMENTS**

**26 November 1991**

**A One-Day Conference to be held at  
The Institute of Petroleum**

This conference is co-sponsored by the Joint Offshore Group of the Institute of Marine Engineers and the Royal Institution of Naval Architects.

Safety/standby ships have been one of the essential services supporting the offshore oil industry for the last 20 years and yet their development has attracted little attention within the oil companies.

This has now changed with the publication of a new Code for such vessels developed in the light of criticism of the role and capabilities of standby ships in the Cullen Report.

The Institute of Petroleum has arranged this conference to bring together oil company marine and safety staff, vessel operators, shipbuilders and designers and other interested parties to consider the requirements of the new Code and other technical, commercial and operational developments relating to the standby vessel market.

The conference will also include presentations by five shipbuilders and marine consultants of their proposals for newbuilding designs which meet the requirements of the new Code and of oil company charterers.

For further details 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.**

# Platforms in the 1990s — smaller by design

By John Howes

If the history of the oil industry has shown one thing, it is that there is no such thing as an off-the-peg platform design. Each has to be specially tailored to suit the field throughput, reservoir management strategy, political climate and the latest advances in materials technology.

The most recent survey of the UK sector of the North Sea by the Offshore Manufacturers and Constructors Association details 26 platforms as presently being constructed in the United Kingdom with a further 11 being carried out in overseas yards. Another 13 projects are definitely destined to be carried out (two of which are actively being submitted or bid) and 15 projects are termed as *probably* feasible, with a further six *possibly* going ahead.

These figures account for the UK sector of the North Sea alone. When considering the Norwegian Sector, the Far East, the Gulf of Mexico, Brazil and so on, the scale of platforms that need designing can clearly be recognised.

Of these future platforms, it is likely that a majority of them will be used for the development of small, marginal deposits. These platforms will therefore tend to be small and of low cost themselves. This could be in the form of a small unmanned satellite to an existing platform, or alternatively, the platform could be manned, but could save money by using the same structure for drilling and for production. The ability to remove the platform after the relatively shorter economic life of the marginal field and to relocate it elsewhere is an important point in the minds of many platform designers.

In the past, designers of these small platforms have conventionally looked to steel as a material for these designs. However the use of concrete, for a long time a popular choice in the Norwegian sector, is looking to make a resurgence of interest in the United Kingdom. In the early years of the offshore industry, concrete was selected for the large platforms on Cormorant, Brent B, C and D, Dunlin, Beryl A and Ninian Central.

More recently, Hamilton have chosen concrete for their Ravenspurn North field, Amerada Hess were strongly considering concrete for their Scott field and Ultramar look set on concrete for Gryphon.

'Concrete is an integral part of a

number of new generation platform designs being proposed, one such is the Sea Urchin. This is aimed at shallow marginal fields in water depths of 30–35 metres with an extreme storm wave of 16 m. It is intended for areas where no technical problems in providing a conventional platform exist, but where reserves are so meagre that exploitation would be unfeasible unless costs are kept to a minimum,' said its designer Jim Bunce.

## Concrete platforms

'Concrete is an ideal material. It is cheap, durable and can be built without a particularly skilled labour force. Additionally, it does not require the same in-service inspection and maintenance costs as a steel structure. A steel jacket with complicated joints is fatigue prone, and requires the removal of marine growth for wave loading. Sea Urchin does not have any fatigue prone joints, just straight tubulars,' said Mr Bunce.

The Sea Urchin design consists of a 7,000-tonne reinforced concrete gravity base which is divided into a discrete lower and upper part, four steel support caissons and a 400-tonne steel superstructure. The base was to be small enough to be constructed in dry dock without the need for high level craneage.

'Construction could also be carried out in a sheet piled beach area, on a slipway, or alongside a quay,' said Mr Bunce.

The design had to have sufficient floating stability that it could be towed out to sea, sunk onto the sea bed complete with fully equipped superstructure and remain stable through all the stages of operations. It had to be slender enough not to attract too much wave loading and yet have sufficient weight ballast capacity and base width to remain stable on the sea bed with no tendency to uplift under design loads or ship impact.

Lastly, the platform geometry required a superstructure containing the production equipment at an elevation above the sea. The dimensions of the base had to allow for a jack-up rig to approach, leaving sufficient space between the base slab and the slip cans. Similarly, the basal slab had to be small enough for the platform to be built in a readily available dry dock with shallow draught for tow-out.

## Design needs

'These design requirements were somewhat contradictory,' said Mr Bunce. 'While floating stability requirements dictated a stocky shape, these would attract large wave forces. Furthermore, the on-bottom stability

and clearance demands required a slender shape which would be difficult to install and keep stable during operations.'

The novel part of the design is the method of installation. The platform is held on station by the towing tugs while the lower part of the base is flooded in broadly the same manner as the large Norwegian Condeep structures. While the lower base is flooded and sinks, the steel superstructure would remain sitting on the buoyant upper base, which itself would stay floating on the surface. After this lower base is settled on the sea bed, steel lifting lines, two on each caisson, would be passed from padeyes on the concrete upper base, over the pulley blocks on the top of the caisson, and down to padeyes on the lowerdeck of the superstructure.

The floating upper base would then be flooded, sinking to its resting position on top of the now submerged lower base. Because of the pulleys, this would act as a counterweight, lifting the steel superstructure to the top of the steel caisson.

The superstructure would then be latched and the lifting lines and pulley blocks removed.

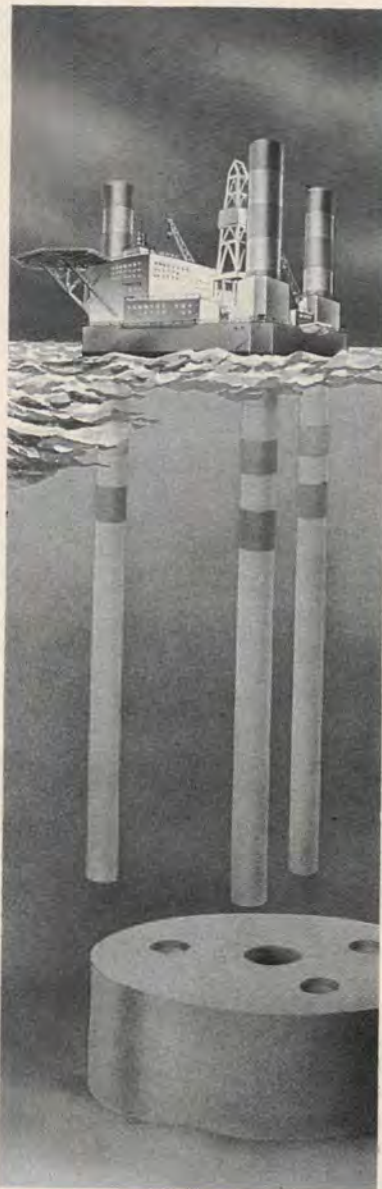
## Arctic system

Another novel concrete design is provided by Rauma Repola's Flexible Economic Mobile Arctic Production System (FEMAPS). This essentially consists of three watertight cylindrical legs attached at the bottom to a recessed concrete storage tank. The production risers are carried through one of the legs for extra security.

A key part of the design is the mechanism by which the legs are lowered and the platform is installed.

The storage tank is initially located immediately beneath the platform. The dimensions of this tank can be customised to meet varying requirements for transit, stability, storage capacity and seafloor stability. The combined unit is towed to the field.

The legs, positioned in the recesses of the tank, are jacked down, which lowers the tank to the seabed while raising the platform deck above the waterline. If this is used in an ice-prone environment, for which it was principally designed, production can be shut down and the legs disconnected. The platform can then be floated away to allow icebergs to pass by. If necessary, the storage tank can be dug into the seabed to limit its vulnerability to icebergs.



FEMAP Arctic system.

## Seagull concept

One design that is receiving considerable interest from the offshore industry, is the Seagull concept. Like the Sea Urchin, it is removable and can store water in its lower base. Instead of being installed by counterbalance however, the system works in a similar manner to a conventional jack-up rig.

At the centre of the platform is a 30 metre by 30 metre steel tower which supports a 78 metre by 75 metre steel hull. The hull has a maximum topside design load of 22,000 tons. The base of the tower is set in a 65 metre diameter concrete base. This base can store up to 160,000 barrels of oil.

The platform is suitable in 60-150 metres water depths, in areas with a 100 year wave of 30 metres and a wave period of 17 seconds. The Seagull can be used in drilling mode, either cantilevered over a template or with tender assisted drilling operations. When used in production, the Seagull would be able to produce 30,000 b/d of oil.

All these production systems have a large 'footprint' afforded by the concrete base which stops the legs penetrating into the substrate. This is the reason that jack-up rigs have not been used for production (although the jack-up Omnikron said that its extended area spud cans would provide increased stability). One answer could be in the form of Technip Geoproduction's TPG 500 design.

## Platform conversion

TPG 500 can drill year-round under North Sea conditions in water depths down to 120 metres by resting on conventional spud cans. For production, however, the TPG500 rests on patented pods which are piled to the bottom. This increases the maximum operating water depth to 150 metres in North Sea conditions.

The conversion from 'drilling' to 'drilling-production' can be made by simply installing skid-mounted production equipment on the deck of the platform which has been designed for this purpose.

The design of the TPG 500 complies with all rules and regulations applicable to drilling and/or production platforms along with joint industry guidelines including safety and has an operational fatigue life of 30 years.

All the above platforms have one thing in common: they can be removed easily after use. The same is true of the STAR design because, while being a fixed platform, it is small enough to be installed or removed by a jack-up rig.

STAR — Slimline Tripod Adapted for Rig — is an unmanned platform which has already been installed on the Danish Dagmar field and Maersk also plan to use this method to develop Valdemar. They are understood to be choosing between a STAR and a concrete design for Harald and Svend.

The STAR tripod leg and topsides are placed on a barge and floated out to the field, the derrick of the jack-up is cantilevered out and a line from the drawworks is used to lift the platform off the barge and install it in its correct position. The STAR concept is suitable for 30-50 metres. ■

# First, close

By W S Ballingall, Central Safety  
BP Exploration,

*'A Totally Enclosed Motor Propelled Survival Craft (TEMPSC), which is stowed parallel to the side of an installation and with a clearance of 5 metres from it, has a 60 percent probability of achieving a satisfactory launch if it is being launched into moderate weather (force 5/6).'*

That is an extract from a Technical Report for the Department of Energy produced in February 1985. Frankly, I am always suspicious of such statements. In order to set up such a computer study, it is necessary to set parameters for the calculations. In the event of a real incident offshore, it is my view that such rigid parameters will break down. Nevertheless, this is a bold statement, and certainly those of us who have spent some time offshore will agree there is 'little guarantee of a TEMPSC successfully clearing an installation in severe weather conditions.

Following the loss of the ill-fated *Ocean Ranger* which went down with all hands, a scale model was built and realistic conditions set up in a wave tank in an effort to find out what went wrong. The model was set at a 15° list, similar to that reported by those on board before she was lost. It can be seen that TEMPSC would have had little chance of being satisfactorily launched — the boat would have struck the structure of the installation.

As probable confirmation of this, two of the *Ocean Ranger's* lifeboats were recovered in a seriously damaged condition, although it is not known precisely where and how they were damaged.

Limitations in the launching of TEMPSC have now been recognised by the Department of Energy, and in their statement of August 1989 they advised that TEMPSC could be launched by any safe system of an acceptable type.

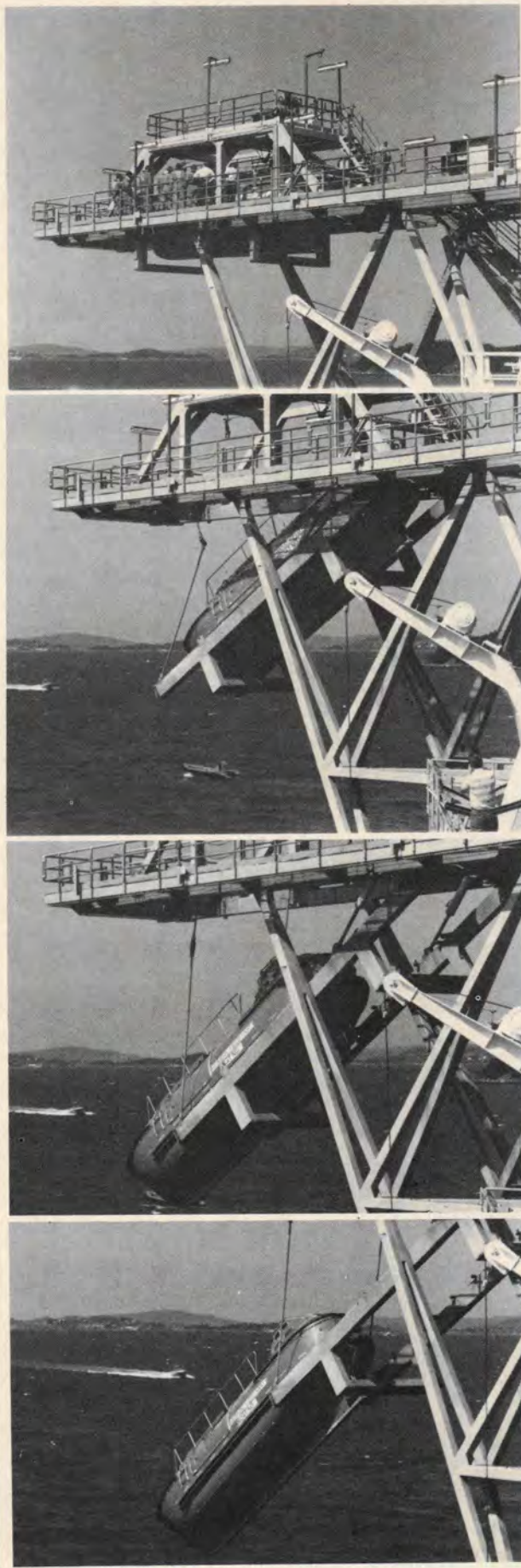
In Norway, the problem has been addressed by favouring freefall lifeboats. The earlier generation of freefall craft were of a type that launched from a slide that slowly tipped 35°, allowing the boat to slip off at an angle. This is similar to lifeboats found on some merchant ships, and it is interesting to note that the authorities do not require conventional boats to be on either side of the vessel, but allow a single ramp launch TEMPSC from the stern. A later generation of freefall boats are of the 'free drop type' and in Bergen, the Nutec Centre has a training facility for the Harding FF48.

Free drop infers that the boat is suspended by a single hook. This hook is opened hydraulically, and the boat makes a straight fall to the sea. It is normally located at an angle of about 45° and this angle is maintained while it falls vertically.

As I have said, this particular boat is a Harding FF48. It is 48ft long, built of steel, and weighs 22 tons — with equipment, but without passengers. With its 72 passengers, the total displacement is around 28 tons. The average 'G' Force in the centre of the boat is about 3.5g, while 7.5g is reached at the stern, due to a whiplash effect.

## Launching

*'The Department of Energy, in consultation with the Department of Transport, has been reviewing the requirements of the Offshore Installations (Lifesaving Appliances) Regulations 1977 SI 486 in the light of lessons learned from the Piper Alpha accident and*



# your eyes . . .

## Operations Superintendent, Aberdeen

*advances in technology.'*

*'Evacuation from offshore installations would be enhanced by amending the regulation to permit launch of TEMPSC by any safe launching system of a type which has been tested and is acceptable to the Marine Directorate of the Department of Transport.'*

'Statements of Intent' issued by the Department of Energy in 1989. They acknowledge developing technology with respect to lifesaving regulations. Several methods of enhancing the chances of TEMPSC successfully being launched from an installation have been proposed, and the Department of Energy Emergency Evacuation Committee have carried out evaluations on several proposals.

### Power Dolphin

This appears to be a cross between a torpedo and a semi-rigid small boat. The vessel has a large electrical battery system which is connected to a power unit. A towrope of 700 metres is incorporated in the device. When the brake for a conventionally mounted TEMPSC is released, the Power Dolphin, which is located beside TEMPSC, is allowed to freefall into the sea.

As it does so, it pays out its towrope and the electrically-driven power unit couples to a guidance system which takes the boat away from the installation at a speed of five or six knots.

By the time TEMPSC has reached the surface of the water, the towrope has a significant effect on the direction of the TEMPSC bows.

When the falls are released, the towrope, pulled by the Power Dolphin, would tend to pull the boat clear of the installation structure. Unfortunately, during drop tests, when Power Dolphin was released from a crane hook at about 100ft, the bow section broke up on impact and the blades of the power unit snapped off.

Modifications were carried out, and further tests to gauge towing effectiveness were held in North Devon. Unfortunately, the guidance system proved erratic, and the Dolphin could not be controlled with any degree of certainty. All in all, the results were disappointing.

**PROD device.** In Canada the question of TEMPSC clearing an offshore installation has resulted in the development of the PROD (Preferred Orientation and Displacement) device. The device is a 20 metre glassfibre flexible boom supported by a 'lazy hinge'. If a load is applied to the tip of the PROD device, the hinge allows the boom to dip, although hydraulic energy is built up in the accumulator. The PROD boom, being flexible, also bends to some degree.

The end of the PROD boom is attached by a tag line to the bow of TEMPSC and as the boat is being lowered to the water, the tag line pulls down the boom. When the boat is in the water, the effect of the tag line is to pull it away from the installation when the falls are released. Tests showed that five knots is achieved before the tag line is disconnected.

The BP Miller Project have placed a firm order for two PROD devices for the installation. These will be the first in the UK sector of the North Sea.

**Seascape.** Another Canadian development is Seascape. It is, in effect, a long, supporting arm from about water level to the boat embarkation position, and supports a cradle, in which



Hands-on familiarisation for the author and the UKOOA Safety Committee at Elf's facility at Bergen.

TEMPSC sits. When it is released the cradle is lowered slowly on the end of the boom to sea level, where the boat floats off. The length of the supporting arm will determine how far away from the installation it is launched.

### Stairways and chutes

Recommendation 84 from the Cullen Report requires the offshore industry and the authorities to investigate the practicability of escape chutes and collapsible stairways.

**Skyscape.** The Skyscape device has been developed in Norway. It comprises a tubular net, segmented by a series of baffles. These baffles allow a person to tumble down the inside of the net with a degree of control. A collecting raft is arranged at the foot of the Skyscape and 'daughter' liferafts may be launched from this collection raft. There are presently 24 units in Norway, two in the United Kingdom, and two have been ordered for a future UK installation.

**Telescope.** This device encompasses a series of conical-like tube sections which allow flexibility of the whole unit. They are interconnected by chains in similar fashion to refuse chutes used on construction sites which lead directly into a skip. A full-scale design for offshore use is presently being developed with support from industry and from the Department of Energy. A computer engineering assessment by consultants, reports that there is a high escape opportunity offered by the system. A land based demonstration into the dock at Lowestoft is planned for early this month with support from the authorities and some major offshore operating companies. This will demonstrate the feasibility of entering a liferaft from the chute.

**Folding Staircase.** A system is being developed by Sir James Lang with support from the Department of Energy. Mathematical design, assessment and model testing is being processed by Strathclyde University and a feasibility study is programmed to be undertaken by RGIT in Aberdeen.

### Descent to the sea

The Department of Energy Statement of Intent (August 1989) and Recommendation 83 from Lord Cullen's Report require industry to evaluate replacements for knotted ropes which are used for emergency escape direct to the sea.

**Donut Device.** This has been developed by Engineering Management and Inspection Limited, and incorporates abseiling techniques used in rock climbing. It is a personal or 'one shot' system, and some operators have already made a number available to their installations.

**Surescue Device.** Manufactured by Perry, there are essentially two systems. One comprises a storage container of several hundred metres of rope. A simple chair device can be clipped onto the rope. The weight of the individual allows the rope to be paid out and it incorporates a brake device. The advantage of this system is that up to about 30 personnel can use one such device, providing there are sufficient chairs available.

Perry have also developed an individual escape device based on a design used by the military for assault descent from a helicopter. This system is also used by electricity generating boards to allow personnel to descend from power pylons in emergency situations. It has recently satisfactorily undergone tests by the Department of Transport.

### Recovery of TEMPSC

TEMPSC is basically a method whereby personnel escape from a hazardous situation to a place of safety. These people then have to be recovered from TEMPSC.

One system proposed is the recovery of TEMPSC, complete with all its personnel, by means of a specially developed crane hook and lifting eye built within the structure of

TEMPSC. Although it would appear impractical, this system of recovering TEMPSC in bad weather was used successfully many times during PROD trials in Canada. However, it must be said that the TEMPSC in question had ballast in place of personnel.

**Recovery of personnel from TEMPSC by means of Search and Rescue aircraft.** Trials were held at RAF Lossiemouth and Ilfracombe, to gain experience in the recovery of personnel from TEMPSC, using SAR helicopters and aircraft, through a hatch specially fitted in the canopy of TEMPSC. The results of the trials proved conclusively the advantages of fitting a hatch within the canopy. It is anticipated that guidelines on lifesaving appliances will incorporate this requirement in future, although some installations may already have TEMPSC canopy hatches.

**'Brunel lifeboat' development.** A recent joint study between the Royal College of Art, Industrial Design Department and RGIT Survival Centre Research Unit identified some design criteria based on operational requirements. A scale model incorporating some of these fundamental design parameters has encouraged full-scale trials. One of the fundamental features incorporated in the novel design is that the power transmission unit is incorporated in the bow of the lifeboat, enabling the cox'n to steer the craft in much the same way as one drives a car. The model tests also suggest such a craft will pull away from the area of the installation much more easily than a conventional propeller-driven vessel. The project is now being developed at the Design Research Centre of Brunel University.

### Personal survival equipment

As a result of work being carried out at RGIT on behalf of the Department of Energy, compatibility problems between lifejackets and survival suits were identified. This led to a specialist group being set up by the Department of Energy to examine the question of personal survival equipment. The group is supported by — apart from the Department of Energy — the Department of Transport, the Civil Aviation Authority, The Institute of Naval Medicine, the British Standards Institution, RGIT and UKOOA.

In general, the group is supportive of the RGIT Mannequin which has been developed for the purpose of testing or evaluating the survival equipment and a method of independently validating the Mannequin has been established. It is expected that the Mannequin will be used to monitor performance characteristics of different survival equipment in adverse sea conditions. Design features of equipment which are seen to be beneficial will be incorporated into recommendations for personal survival equipment.

### TEMPSC in bad weather

It has always been known that a large vessel can offer a degree of shelter to a TEMPSC and recent tests to establish this have been made. It was demonstrated that a large supply vessel, equipped with substantial power and bow thrusters, can give significant lee to a TEMPSC in heavy weather.

### Conclusion

In conclusion, I would like to put forward the following philosophical thoughts.

If you are on an offshore installation, and become involved in an emergency situation, you will become apprehensive. You may not have time to be frightened, nor even fully realise the implications of the situation.

But what is really frightening is that, as in some macabre card game, you must play the cards that have been dealt to you. There is no option to pass; you play or fold.

The object of developing enhancements to evacuation or emergency escape systems is — so to speak — to deal a better hand to those who find themselves in an emergency situation. ■

# Dip-weights and dip-tapes

The *Petroleum Measurement Manual* published by the Institute of Petroleum contains specifications for the materials, dimensions and construction of dip-weights and dip-tapes intended for the manual gauging of petroleum storage tanks.

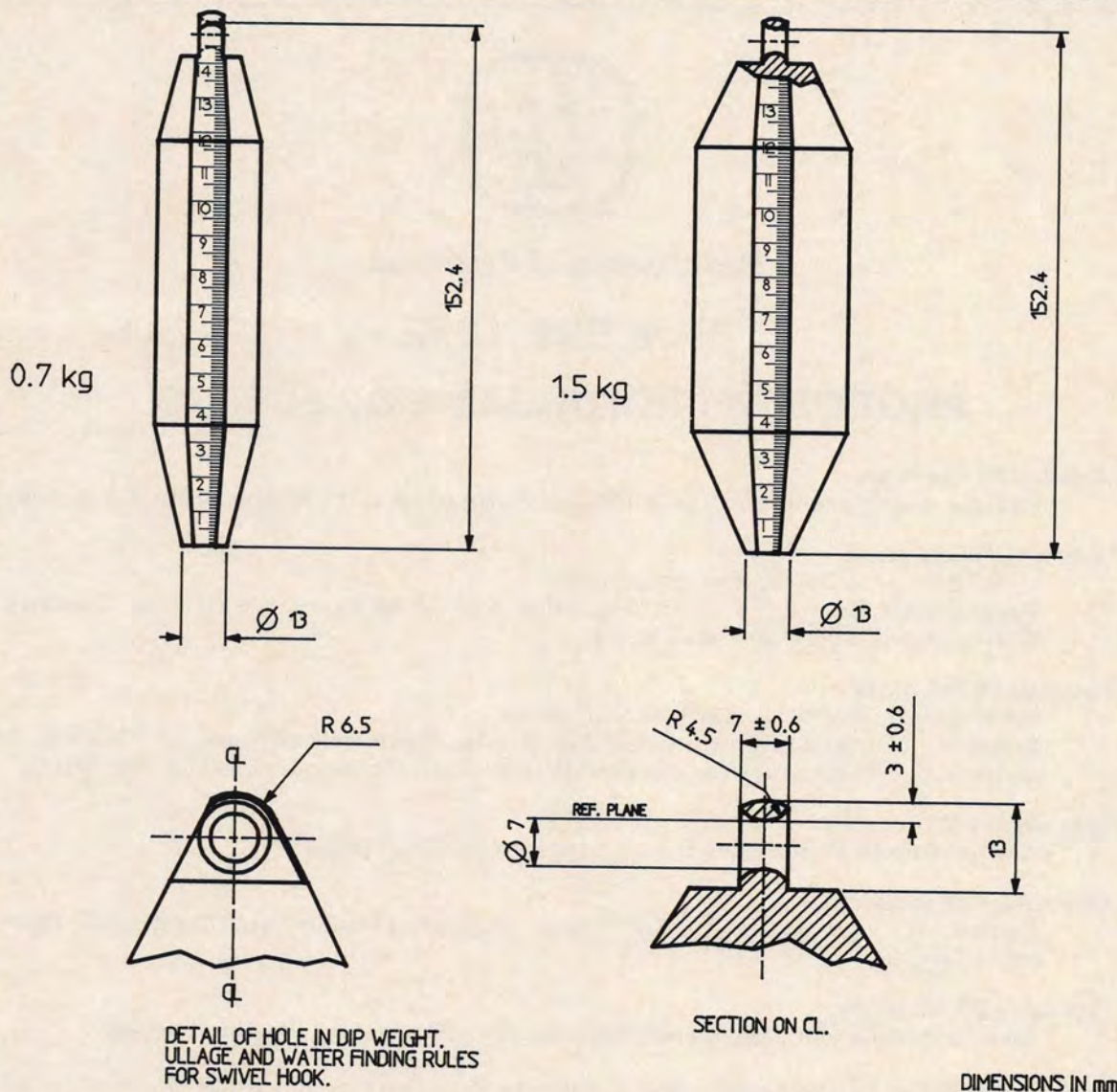
During the revisions of certain sections of Parts II and III of the Manual which are currently being undertaken, it has been concluded that the linear dimensions and masses specified for dip-weights may not always be fully consistent with the brass normally used nowadays for the manufacture of the weights. This has the effect of imposing unnecessarily restrictive tolerances during their manufacture. It has therefore been decided to re-specify the masses and dimensions of the two patterns of dip-weight used in the industry whilst maintaining the features which are critical to measurement accuracy.

Opportunity has also been taken to re-specify the tension applied to dip-tapes during their calibration. The force previously specified (10lbf or 4.5kgf, equivalent to 44N) is inconsistent with the masses of the dip-weights and of the tape when hung in suspension.

The General Specification described in the *Petroleum Measurement Manual*\* is revised as follows:

## Dip-weights

The lengths between the suspension lugs and the conical bases of dip-weights given in Figures 3(a) and 3(b) of Chapter 3 are retained (6" or 152.4mm) because these dimensions are allowed for in the graduation of dip-tapes. The diameters of the truncated cone tips ( $\frac{1}{2}$ " or 13mm) are also retained. The dimensions of the upper and lower conical sections are not critical. They should be as described in the figures but a tolerance of  $\pm 5$  percent is permitted. The diameters of the weights are not specified directly but shall be consistent with the specified masses of the weights (see below). It should be noted that Figure 3(a) describes a dip-weight graduated in Imperial units. Although this type of weight is obsolescent its description is retained for use with tapes still in service which bear Imperial calibrations.



The weight specifications shown in Table VI and discussed in Clause 3.4.2. of the publications shall be altered to:

Type	For use with dip-tapes graduated in	
	SI Units	Imperial Units
Light	0.7kg ( $\pm 0.15$ kg)	1.5lb ( $\pm 0.25$ lb)
Heavy	1.5kg ( $\pm 0.15$ kg)	3.5lb ( $\pm 0.25$ lb)

### Dip-tapes

The existing criteria for Calibration and Tolerance, given in Chapter 3, 3.3.1(e), require that the dip-tape shall be calibrated to be correct at a standard temperature of 20°C when supported throughout the entire length on a horizontal plane surface and under a tension of 10lbf or 4.5kgf. More

recently a force of 50N, equal to 11.2lbf or 5.1kgf, has customarily been applied by manufacturers. Under these conditions the tolerance in the total length shall not be greater than 1.5mm; the same tolerance shall apply at four points distributed at approximately even intervals over the total length of the tape.

The force applied to the tape when in use is that due to the apparent mass in oil of the dip-weight and the mass of the unrolled length of dip-tape. This force is significantly less than 50N.

Clauses 3.3.1(e) in Chapters 3 of the Tank Calibration standards, Parts 1 to 4, shall be amended so that a dip-tape is calibrated under an applied force of 15N.

The full specification for dip-weights and dip-tapes will be contained in the revision of the *Petroleum Measurement Manual, Part II, Tank Calibration, Section 1, Calibration of Vertical Cylindrical Tanks by Measurement Methods*, which will be published in 1992.

\*Sections 1-4 of the IP Tank Calibration standards are available from the publisher, John Wiley & Sons Ltd, Bognor Regis, West Sussex.



The Institute of Petroleum

## IP WEEK 1992

### PROPOSED PROGRAMME OF EVENTS

#### Tuesday 18 February

Half-day morning conference on 'Oil Price Information' at the IP (Catherine Cosgrove)

#### Tuesday 18 February

Luncheon at the Dorchester Hotel, London

Speaker: Mr Kenneth T Derr, Chairman and Chief Executive Officer, Chevron Corporation, USA (Caroline Little)

#### Tuesday 18 February

Evening meeting of IP London Branch at the IP

Speaker: Mr N J Tilling, Paramins Group, Exxon Chemicals on 'Trends in Automotive Fuels and Lubricants' (Edith Walker, Conoco Ltd. Tel: 071-408 6257)

#### Wednesday 19 February

Annual Dinner at Grosvenor House, London (Caroline Little)

#### Thursday 20 February

Conference organised by the IP Energy Economics Group on 'Electronic Data Interchange'

#### Thursday 20 February

Evening meeting of the Exploration and Discussion Group at the IP (Alan Lodge)

For further information, please contact the above named individuals at the IP or Edith Walker at Conoco. Further information will be available shortly.

# FORTHCOMING EVENTS

## October

### 6th-9th

**Dallas, USA:** Society of Petroleum Engineers Annual Technical Conference and Exhibition. Details: SPE, 222 Palisades Creek Drive, Richardson, TX 75080, USA. Tel: 214 669 3377, Fax: 214 669 0135.

### 7th-10th

**Warwick:** Course on 'Managing Major Emergencies'. Details: Petroleum Training Federation, Room 326, 162-168 Regent Street, London W1R 5TB. Tel: (071) 439 2632. Fax: (071) 287 5483.

### 8th-9th

**London:** Course on 'Project Management Techniques'. Details: BPP Technical Training, 2 Tavistock Place, London WC1H 2RA. Tel: (071) 837 6362. Fax: (071) 837 0822.

### 9th

**London:** Conference on 'Automotive Combustion — Environmental and Health Implications'. Details: Caroline Little, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Tel: (071) 636 1004. Fax: (071) 255 1472.

### 9th

**London:** Conference on 'Energy from Waste—clean, green and profitable'. Details: Conferences Department, The Institute of Energy, 18 Devonshire Street, London W1N 2AU. Tel: (071) 580 0008. Fax: (071) 580 4420.

### 10th-11th

**Paris, France:** Seminar on 'Dereglementation des Systemes de Production, de Transport et de Distribution d'Electricité'. Details: Centre de Geopolitique de l'Energie

## Call for Papers

**The Romanian National Energy Conference will be held in Neptun, Romania between 15 and 18 June 1992. Papers are requested on the following broad topic areas:**

- ★ **Development of generation technologies**
- ★ **Transmission and distribution of electrical energy**
- ★ **Energy conservation**
- ★ **Reliability, safety and ecology**
- ★ **Management, operation and maintenance issues**

**Synopses of 250-300 words should be submitted to Rachel de Candole, Europe Energy Environment, 49 Hay's Mews, London W1X 7RT by 11 October 1991. For further details contact Rachel de Candole, Tel: (071) 493 4918.**

et des Matieres Premiers, Institut de Recherches Internationales, Université de Paris-Dauphine, Place du Marechal de Lattre-de-Tassigny, 75775 Paris Cedex 16. Tel: (1) 45 05 14 10 (Poste 24 85). Fax: (33-1) 47 04 76 71.

### 10th-11th

**Warsaw, Poland:** Seminar on 'Oil and Gas in Poland'. Details: Manuel Poupon, Enerfinance Consulting Services, 9 Bd Bonne Nouvelle, 75002 Paris, France. Tel: (33 1) 42211691. Fax: (33 1) 42211692.

### 13th-18th

**Moreton in Marsh:** Course on 'Handling of Emergencies in the Petroleum Industry'. Details: Courses Office, The Fire Service College, Moreton in Marsh, Gloucestershire, GL56 0RH. Tel: (0608) 50831. Fax: (0608) 51788.

### 15th

**London:** Conference on 'Partnering: Contracting without Conflict'. Details: Gina Booth, National Economic Development Office, Millbank Tower, Millbank, London SW1P 4QX. Tel: (071) 217 4108. Fax: (071) 976 5736.

### 16th

**London:** Conference on 'Making Cleaner Fuels in Europe—Their Need and Cost'. Details: Caroline Little, The Institute of Petroleum.

### 16th

**London:** Course on 'Drilling for Engineers'. Details: Society for Underwater Technology, 6 Middleton Circle, Bridge of Don, Aberdeen AB22 8NZ. Tel: (0224) 823637. Fax: (0224) 820236.

### 17th

**London:** Seminar on 'International Offshore Mooring'. Details: Ramnas Ltd, Baltic Chambers, Suite 240, 50 Wellington Street, Glasgow G2 6HJ. Tel: (041) 2214665. Fax: (041) 2042107.

### 17th

**London:** Conference on 'The Future of Nuclear Power'. Details: Alison Riley, OXERA, Blue Boar Court, Alfred Street, Oxford OX1 4EH. Tel: (0865) 251142. Fax: (0865) 251172.

### 18th

**London:** Workshop on 'Auditing Environmental Air Pollution'. Details: Profex,

Buckingham House, The Broadway, Stanmore, Middlesex, HA7 4BR. Tel: (081) 954 9546. Fax: (081) 954 5772.

### 20th-25th

**Moreton in Marsh:** Course on 'Handling of Emergencies in the Petroleum Industry'. Details: Courses Office, The Fire Service College, Moreton in Marsh, Gloucestershire, GL56 0RH. Tel: (0608) 50831. Fax: (0608) 51788.

### 20th-25th

**Buenos Aires, Argentina:** 'The 13th World Petroleum Congress'. Details: Mrs Pauline Ashby, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Tel: (071) 636 1004. Fax: (071) 255 1472.

### 21st

**London:** Evening Meeting on 'Energy Efficiency and Renewables — Opportunities and Obstacles', Dr Mary Archer, Chairman, National Energy Foundation. Details: Mrs M Scanlan, BIEE, 37 Woodville Gardens, Ealing, London W5 2LL. Tel: (081) 997 3707. Fax: (081) 566 7674.

### 21st-22nd

**London:** Conference on 'The Future of Kuwait: A Strategic Perspective'. Details: Mr W Al-Mazeedi, Managing Director, Strategic Investment Forum Ltd, 211 Piccadilly, London W1V 9LD. Tel: (071) 548 9919. Fax: (071) 895 1353.

### 21st-25th

**London:** Course on 'North Sea Economics and Decision Analysis'. Details: DCA Consultants Ltd, Rosewall Cottage, Main Road, Aberuthven, Perthshire PH3 1HB. Tel: (0764) 63936.

### 21st-26th

**Leningrad, USSR:** 'British Trade and Industry



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# FORTHCOMING EVENTS

Exhibition'. Details: British Soviet Chamber of Commerce, 60A Pembroke Road, London W8 6NX. Tel: (071) 602 7692. Fax: (071) 371 4788.

## 22nd

**London:** Conference on 'Remediation of Industrial Sites'. Details: Caroline Little, The Institute of Petroleum.

## 22nd-23rd

**London:** Conference on 'Achieving Maximum Topside Safety Through Design and Modification'. Details: IIR Ltd, 28th Floor, Centre Point, 103 New Oxford Street, London WC1A 1DD. Tel: (071) 412 0141. Fax: (071) 412 0145.

## 22nd-23rd

**Aberdeen:** Conference on 'Water Management Offshore'. Details: Natalie Cox, IBC Technical Services Ltd, Bath House, 56 Holborn Viaduct, London EC1A 2EX. Tel: (071) 236 4080. Fax: (071) 489 0849.

## 22nd-23rd

**London:** Conference on 'UK Fuel Retailing'. Details: Mirela Mangual, WEFA Ltd, 60/62 Margaret Street, London W1N 7JF. Tel: (071) 631 0757. Fax: (071) 631 0754.

## 23rd

**London:** Seminar on 'Oil Pollution—Claims, Liability and Environmental Concerns'. Details: Linda McKay, Legal Studies and Services Ltd, Gilmoora House, 57-61 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383. Fax: (071) 631 3214.

## 24th

**London:** 'Towards a Training Framework for the 1990s'. Details: Alan Lodge, The Institute of Petroleum.

## 24th

**London:** Seminar on 'Managing your Corporate Environmental Image'. Details: Profex, Buckingham House, The Broadway, Stanmore, Middlesex HA7 4BR. Tel: (081) 954 9546. Fax: (081) 954 5772.

## 29th

**London:** Conference on 'Fire — Risk or Reality: Major Accidents, The Role of the Emergency Services and How Smaller Firms Can Cope'. Details: SCI Conference Secretariat, 15 Belgrave Square, London SW1X 8PS. Tel: (071) 235 3681. Fax: (071) 823 1698.

## 29th-31st

**Manchester:** 'ProcAnEx'91 — Process analysis and environmental monitoring exhibition'. Details: David Hewett, Garland International, 178 Battersea Park Road, London SW11 4ND. Tel: (071) 738 8008. Fax: (071) 498 6153.

## 30th

**London:** 'Third North Sea Safety Conference — Progress since Cullen'. Details: Dr R Owen, Technology Forum, Stanley House, Stanley Avenue, Wembley, Middlesex HA0 4JB. Tel: (081) 900 1555. Fax: (081) 900 1134.

## 30th-31st

**London:** 'Subsea Production Training Course'. Details: Eileen Forde, Goodfellow Associates Limited, 124 Belgrave Road, London SW1V 2BL. Tel: (071) 821 1377. Fax: (071) 828 7859.

## 30th-31st

**London:** 'The Fourth Oil Loss Control Conference — Real and Apparent Losses in Refining and Storage'. Details: Caroline Little, The Institute of Petroleum.

## 31st-1st November

**London:** Conference on 'CHP and Combined Cycle modern energy systems'. Details: Liz Hyde, IBC Technical Services Ltd, Gilmoora House, 57-61 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383. Fax: (071) 631 3214.

## 31st-6th November

**Rio de Janeiro:** Course on 'The Global LPG Business and Regional Implications'. Details: The Registrar, The College of Petroleum Studies, Sun Alliance House, New Inn Hall Street, Oxford OX1 2QD. Tel: (0865) 250521. Fax: (0865) 791474.

## November

### 3rd-7th

**Tripoli, Libya:** 'The Fourth Safety Symposium'. Details: Christine Ramsden, Jawaby Oil, 33 Cavendish Square, London W1M 9HF. Tel: (071) 499 0855. Fax: (071) 499 1771.

### 3rd-8th

**Moreton in Marsh:** Course on 'Handling of Emergencies in the Petroleum Industry'. Details: Courses Office, The Fire Service College, Moreton in Marsh, Gloucestershire, GL56 0RH. Tel: (0608) 50831. Fax: (0608) 51788.

### 4th-7th

**Teeside:** Course on 'Managing Major Emergencies'. Details: Petroleum Training Federation, Room 326, 162-168 Regent Street, London W1R 5TB. Tel: (071) 439 2632. Fax: (071) 287 5483.

## 4th-7th

**Geneva:** 'World Clean Energy Conference'. Details: CMDC Zentralsekretariat, Kellerweg 38, CH-8055 Zurich. Tel: 411463 0206. Fax: 411463 0252.

## 5th

**London:** Conference on 'Modern Technology in Pipelaying and its Associated Works'. Details: Executive Officer, Offshore Engineering Group, Institution of Mechanical Engineers, 1 Birdcage Walk, London SW1H 9JJ. Tel: (071) 222 7899. Fax: (071) 222 4557.

## 5th-7th

**Chislehurst:** Course on 'Safety of Electrical Equipment in Potentially Explosive Atmospheres'. Details: Sira Communications Ltd, South Hill, Chislehurst, Kent BR7 5EH. Tel: (081) 467 2636. Fax: (081) 467 7258.

## 5th-8th

**Saigon, Vietnam:** 'Saigon Oil and Gas Expo '91'. Details: Mrs C. Wilden, Director, Enterprise Associates Ltd, 4th Floor, 43/44 Great Windmill Street, London W1V 7PA. Tel: (071) 439 4452. Fax: (071) 437 7233.

## 6th-7th

**Brussels:** 'Second International Conference on the Automotive Industry and the Environment'. Details: IIR Ltd, 11th Floor, Alembic House, 93 Albert Embankment, London SE1 7TY. Tel: (071) 412 0141. Fax: (071) 412 0145.

## 6th-8th

**Singapore:** 'Southeast Asian Energy/Petrochemical Seminar'. Details: Mr Stephen Rothman, Chem Systems Inc, 303 South Broadway, Tarrytown NY 10591-5487, USA. Tel: (914) 631 2828. Fax: (914) 631 8851.

# FORTHCOMING EVENTS

## 7th-8th

**London:** Seminar on 'Electrostatic Hazards in Industry'. Details: Amanda Wright, IBC Technical Services Ltd, Gilmoora House, 57-61 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383. Fax: (071) 631 3214.

## 7th-8th

**London:** Conference on 'Total Quality Management for the Offshore Industry'. Details: Nadia Ellis, IBC Technical Services Ltd, Gilmoora House, 57-61 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383. Fax: (071) 631 3214.

## 7th-9th

**Aberdeen:** 'Subtech '91'. Details: Society for Underwater Technology, 18 Farburn Terrace, Dyce, Aberdeen AB2 0DT. Tel: (0224) 770533. Fax: (0224) 723192.

## 11th

**London:** Seminar on 'Safer Handling, Storage and Transport of Hazardous Chemicals'. Details: Profex, Buckingham House, The Broadway, Stanmore, Middlesex, HA7 4DP. Tel: (081) 954 9546. Fax: (081) 954 5772. Also in Coventry on 26th November.

## 11th

**London:** Conference on 'Joint Operating Agreements'. Details: European Study Conferences Ltd, Douglas House, Queen's Square, Corby, Northants NN17 1PL. Tel: (0536) 204224. Fax: (0536) 204218.

## 11th-12th

**Cobham:** Course on 'An appreciation of aviation fuel quality control in the distribution system — refinery to aircraft'. Details: Dr E. Goodger, RouteSouthWest Ltd, East Anglian Office, 28E Jessopp Road, Norwich, Norfolk NR2

3QB. Tel: (0603) 51842. Fax: (0603) 259950.

## 11th-14th

**The Hague, Netherlands:** Conference on 'Health, Safety and Environment in oil and gas exploration and production'. Details: Society of Petroleum Engineers Europe Ltd, 4 Mandeville Place, London W1M 5LA. Tel: (071) 487 4250. Fax: (071) 487 4229.

## 12th

**London:** Conference on 'Challenges in Energy Statistics'. Details: Judith Higgins, The Institute of Energy, 18 Devonshire Street, London W1N 2AU. Tel: (071) 580 0008. Fax: (071) 580 4420.

## 12th-13th

**Aberdeen:** Conference on 'Minimum Facilities for Offshore Oil and Gas Production'. Details: Nadia Ellis, IBC Technical Services Ltd, Gilmoora House, 57-61 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383. Tel: (071) 631 3214.

## 12th-15th

**Birmingham:** Exhibition and Congress 'Auto Tech 1991'. Details: Automobile Division, Institution of Mechanical Engineers and Centre Exhibitions, The National Exhibition Centre Ltd, Birmingham B40 1NT. Tel: (021) 780 4141. Fax: (021) 780 2518.

## 14th

**London:** Conference on 'New Developments in Information Technology for the Energy Industries'. Details: Caroline Little, The Institute of Petroleum.

## 14th-15th

**Amsterdam, Netherlands:** Conference on 'New Developments in the

International Energy Marketplace — meeting the challenges of the 21st century'. Details: IIR Limited, 28th Floor, Centre Point, 103 New Oxford Street, London WC1A 1DD. Tel: (071) 379 8040. Fax: (071) 412 0143.

## 14th-15th

**London:** Conference on 'Electrostatic Hazards in Industry'. Details: Amanda Wright, IBC Technical Services Ltd, Gilmoora House, 57-61 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383. Fax: (071) 631 3214.

## 16th-19th

**Bahrain:** '7th SPE Middle East Oil Show and Conference'. Details: Overseas Exhibition Services Ltd, 11 Manchester Square, London W1M 5AB. Tel: (071) 486 1951. Fax: (071) 486 8773.

## 18th-19th

**London:** Conference on 'Offshore Safety Cases — Preparation and Implementation'. Details: Natalie Cox, IBC Technical Services Ltd, Gilmoora House, 57-61 Mortimer Street, London W1N 7TD. Tel: (071) 637 4383. Fax: (071) 631 3214.

## 18th-21st

**Cranfield:** Course on 'Instrumentation and Systems for Research and Development'. Details: The Short Course Administrator, Department of Fluid Engineering and Instrumentation, School of Mechanical Engineering, Cranfield Institute of Technology, Bedford MK43 0AL. Tel: (0234) 752766. Fax: (0234) 750728.

## 18th-22nd

**London:** Course on 'Ship Management and Operations'. Details: Merchant Prospect Limited, 20 Victory Road, West

Mersea, Colchester, Essex CO5 8LX. Tel: 206 383593. Fax: 206 383839.

## 19th-20th

**Stavanger, Norway:** 'Offshore Northern Seas 1991'. Details: ONS Advanced Petroleum Conference, PO Box 175, N-4001 Stavanager, Norway. Tel: (47) 4 55 81 00. Fax: (47) 4 55 22 70.

## 19th-22nd

**Malta:** 'Clean Seas 91'. Details: Lesley Ann Sandbach, Spearhead Exhibitions Ltd, Rowe House, 55-59 Fife Road, Kingston upon Thames, Surrey KT1A 1TA. Tel: (081) 549 5831. Fax: (081) 541 5657.

## 20th

**Sheffield:** Course on 'Treatment and Disposal of Chemical Waste'. Details: Mrs K. Wainwright, CCVE, The University of Sheffield, 65 Wilkinson Street, Sheffield S10 2GJ. Tel: (0742) 768653.

## 21st

**London:** Conference 'Is there a future for Independents in the UK North Sea?'. Details: Caroline Little, The Institute of Petroleum.

## 21st-22nd

**London:** Conference on 'Making Energy from Waste Profitable'. Details: IIR Ltd, 28th Floor, Centre Point, 103 New Oxford Street, London WC1A 1DD. Tel: (071) 412 0141. Fax: (071) 412 0145.

## 24th-27th

**Melbourne, Australia:** Exhibition and Conference on 'Offshore Australia'. Details: Mr Bill Hare, Australian Exhibition Services Pty Ltd, Illoura Plaza, 424 St Kilda Road, Melbourne 3004, Victoria, Australia. Tel: (03) 867 4500. Fax: (03) 867 7981. Telex: 39329.

# Venezuela: poised for a more significant global role?

By Philip Algar

Venezuela has announced ambitious plans, which, if successfully implemented, would propel its oil industry and the state company, Petroleos de Venezuela SA (PDVSA) into a more powerful global position. The strategy assumes the opening-up of the domestic sector to both private and overseas interests, for the first time since nationalisation in 1976, and the expansion of overseas ventures. Investment of \$48 billion over the next five years is envisaged.

However, overseas groups, enthusiastic on the potential, remain worried on the long-term Venezuelan government commitment, the relationship between the Venezuelan administration and the state company, following major and very public rows, and the high level of tax rates. PDVSA have also complained on tax levels, warning that there could be dire consequences for the overall plan.

Although company officials play down the major differences between PDVSA President Andres Sosa Pietri and the Minister of Energy and Mines, Celestino Armas, who is also now the OPEC President, this has been complicated by the former's public pronouncements on, *inter alia*, tax levels and OPEC membership. He has seven months remaining in his two-year contract. Equally, government criticism of the company has received wide publicity.

Proposals for new regulations, which prevented the creation of new affiliates and even salary increases in PDVSA without prior government approval, have been withdrawn. Clearly the power of the state company, which some government officials apparently regarded as a state within a state, has been curbed, but most international oil analysts regard PDVSA as an efficient, effective and professional company.

*Petroleum Review* hears that all political parties are seeking a consensus approach to the overall plan, and the investment implications, now that the dispute between the government and PDVSA is over. Tax levels are being reviewed.

One experienced Venezuelan oilman told *Petroleum Review* that, providing PDVSA involves government, in advance, on some key issues, especially the raising of overseas loans, state participation in routine matters would be restricted. Apparently one issue that irked the administration was

that, allegedly, the company was taking a unilateral approach in international finance, which could disrupt International Monetary Fund policy.

Venezuela is attracting considerable interest from leading companies including Amoco, Veba, Elf, ENI and BP. A variety of possible joint ventures involving, *inter alia*, exploration and production, conversion of heavy crude and marketing, in both Venezuela and overseas, are being discussed.

## Geographical advantages

At the end of 1990, Venezuela's 59 billion barrels of proven reserves represented 5.8 percent of the global total. That put Venezuela in sixth position in world ranking and made it the leading country outside the Middle East. Indeed, in recent years, the government and PDVSA, whose relationship has not always been characterised by instant accord, have both stressed their favourable location, far from the troubled Middle East and adjacent to the United States, the biggest oil consumer in the world, Venezuela, keen to exploit such advantages after the Gulf war and the breakdown of the Soviet industry, is determined to maintain and strengthen its position relative to the Gulf countries.

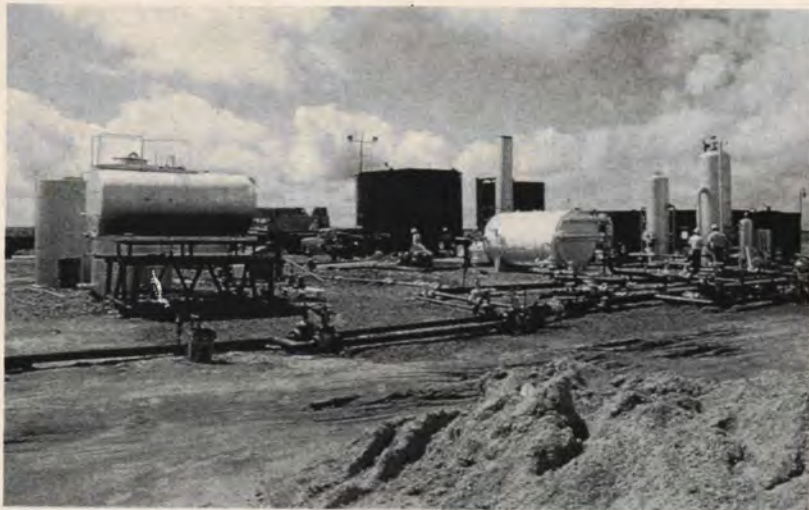
The ambitious PDVSA, one of the first state oil companies to invest in

downstream assets in overseas markets, was recently named as the fifth largest oil company in the world by *Petroleum Intelligence Weekly*. Already employing over 51,000, the group hopes to take oil production capacity close to 4 million barrels per day (mbd) over the next five years. It also plans to develop new gas fields, to double refining capacity and to purchase new tankers to take indigenous oil to market, and to expand the petrochemicals industry.

According to UK government officials, encouraged by what is happening in Venezuela and keen to increase exports, at least a quarter of the investment will come from overseas. This will be through joint ventures, or 'strategic associations', to use the Venezuelan terminology. Secretary of State Peter Lilley intends to visit the country shortly.

## Economic background

A PDVSA delegation addressed a London meeting of the Latin American Trade Advisory Group in early September, Antonio Casale, Manager, New Business, reviewing economic prospects, said that Venezuela had a population of around 19 million, of whom about 39 percent were under the age of 15. Overseas debt was declining and significant changes in the economy were in train. Venezuela had plentiful resources and needed to develop them fast, to expand the economy and to



Emulsification plant at Morichal, Orinoco Belt.

create new employment. Oil would permit this but its role would weaken relatively, and gradually, to allow diversification. Oil provides 80 percent of the country's export revenues, about 23 percent of the national gross national product and 75 percent of government income.

Since 1989, the economy had moved from being protected and subsidised to one that was open and free, with companies being privatised, and state bureaucracy fading. Mr Casale maintained that 'we are past the most difficult stage', as annual inflation had fallen from around 80 percent to below 30 percent. Incentives for foreign investment had been introduced and the government fully accepts the need for private funds.

## Upstream

In 1990, after the outbreak of the Gulf war, crude oil production was raised by some 400,000 barrels a day, to 2.4mbd but, to the irritation of PDVSA, government approval was only forthcoming after being sanctioned by OPEC. The state oil company contends that OPEC membership may not best serve the country's interests but the government remains adamant that Venezuela, a founder member, will remain loyal. Venezuelan President Carlos Andres Perez advocates co-operation between consumers and producers and was prominent in organising the Paris meeting.

Crude capacity last December was 2.77mbd, and this might rise to 2.97mbd by the end of this year and to 3.6mbd by 1996. About \$25 billion has been allocated for this but *Petroleum Review* understands that a large part of this sum is required to maintain exist-

ing production. The target for the year 2000 is 5mbd.

Joint ventures with foreign companies are being sought. Recently, 227 companies each paid \$60,000 to bid for the opportunity to activate 56 marginal or abandoned fields, mainly in eastern Venezuela, and thought to hold about 357 million proven barrels, plus up to another 1.2 billion barrels of probable and possible reserves. Output could be 200,000b/d two years after development approval but the final choice from the 54 foreign and 43 local companies remaining could prove lengthy. Overseas groups will have been encouraged by a recent decision to charge tax at 30 percent on joint ventures, compared with a minimum of 68 percent for PDVSA's own operations.

Proven oil reserves trebled in the 10 years to 1987 but over 70 percent are of heavy crude, which implies both expensive exploitation and refining to yield acceptable products. This has inspired some innovation, not least in the development of Orimulsion, based on bitumen and used especially for power generation. Already, sales have been made in the United Kingdom, Spain, Italy, the United States and Japan, and a marketing joint venture has been secured with BP. Investment of about \$1.5 billion is intended to raise production capacity from the current level of 80,000b/d to 900,000b/d at the turn of the century.

The five-year investment plan calls for \$1.7 billion to be spent on exploration and a further \$16.2 billion on production. Around 150 wildcat wells will be spudded and 54,000 miles of seismic will be shot, about twice as much as in the previous five years. Over 9,000 delineation and development wells will be spudded, including some 1,500 in the Orinoco Belt. Merely to sustain production at current levels is very costly, and about 11,000 workovers are planned.

PDVSA hopes to add some ten billion barrels of light crude: it claims that probable reserves are 85 billion barrels and, if possible reserves are added, the total recoverable might be 200 billion barrels. An additional 271 billion barrels might be recoverable from the 1.2 trillion barrels of extra heavy hydrocarbons thought to be in place in the Orinoco Basin.

Venezuela is keen to build plant to refine its heavy crudes and to raise the

## The Venezuelan Oil Industry in 1990

	Percentage		
	1985	1990	change
Seismic lines shot, in km	16,097	8,947	-44.4
Exploratory wells completed	32	7	-78.1
Development wells drilled	329	287	-12.7
Workovers	1,349	986	-26.9
Crude oil production (000b/d)	1,558	2,098	34.7
Percentage below 22° API	39.0	20.5	
Proven oil reserves (billion barrels)	29.33	60.06	104.8
Proven gas reserves (billion cubic metres)	1,733	3,429	97.9
Reserves to production ratio (years)	52	78	50.0
Refinery capacity (000 b/d)	1,219	1,167	-4.3
Oil exports (000b/d)			
Crude oil	829	1,242	49.8
Products	542	639	17.9
Total	1,371	1,881	37.2
Domestic demand (000b/d)	337	351	4.2

Source: PDVSA and Oil & Energy Trends



Bitumen production — cluster wells at T-20.

proportion of products in its total oil exports, even as aggregate sales expand. It accepts the need for foreign assistance and may ease taxes, in response to complaints from potential partners from overseas. ENI, of Italy, may build a heavy crude processing refinery in Venezuela and other western companies, including Amoco and Veba, are showing interest in heavy conversion crude processing plants.

### Refining at home . . .

The five-year plan calls for two such deep conversion refineries, to be constructed with private companies, possibly from overseas.

Current indigenous capacity, distributed over five refineries, is 1,187mbd and expansion of more than 400,000 b/d, excluding up to 400,000b/d with foreign partners, is incorporated in the plan.

Ten billion dollars have been allocated to the refining sector, \$1.8 billion has been earmarked for four projects at the 290,000b/d Cardon refinery, to enable the plant to process heavy crudes into upgraded products of the right environmental quality to satisfy the key US market.

### . . . And away

Some three-quarters of the 1.9 billion b/d of PDVSA's 1991 international oil sales will be finished products, refined at home or in PDVSA plants overseas. About 700,000b/d is processed in Ven-

ezuela and a further 195,000b/d comes from the leased plant in Curacao, while 570,000b/d originates from refining ventures in the United States and in Western Europe, where PDVSA has interests in Sweden, Belgium and Germany. The Venezuelans are anxious to expand overseas downstream holdings, especially where they can be used to convert heavy crude oil, and, according to analysts, acquisitions of up to 400,000b/d may be made. The company is looking for opportunities in the Far East, the United States and in Europe.

PDVSA is currently studying the possibility of building a new refinery in Malaysia, to process heavy crudes, and may also invest in a refinery in Jamaica. The company also wants to extend its eight-year lease, expiring in 1994, on the 320,000b/d Curacao refinery, where current throughput is 200,000b/d. If the lease is renewed, further upgrading would take place, bringing the plant to US standards — thus permitting the use of heavy crude.

### Natural gas

At the end of last year, natural gas reserves were 3.0 trillion cubic metres, representing 2.5 percent of the global total. Since then, further finds have been made. Current production could be sustained for over 180 years. In 1990, 21.9 billion cubic metres were produced, just under half the volume produced in the United Kingdom.

The country is now trying to go ahead with the \$2.4 billion Cristobal Colon liquefied natural gas project. Last February, a preliminary agreement was reached with Shell, Exxon and Mitsubishi to study the economics of the project but the tax levels will be crucial to a final decision. If the development proceeds, it will include the exploitation of finds off the northeast coast and the construction of a liquefaction plant. Production could reach 735 million cubic feet per day. A decision from the Venezuelan Congress is expected this month.

### Marine transportation

PDVSA wants to expand its fleet for delivering its crude to overseas refineries owned wholly or partly. By 1996, it is hoped to carry 30 percent of all exports in company-owned tankers — currently the proportion is 12 percent.

The fleet now consists of 19 vessels with a combined deadweight tonnage of 768,000 tonnes. Another 22 tankers, together offering another 1.176 million tonnes will be added. A contract for eight 85,000 tonne double-hull crude tankers has just been placed with Hyundai Heavy Industries. One tanker will be delivered every six months, beginning in February 1993. This \$560 million order has been financed by Mitsubishi, with repayment over a 12–14 year period. The vessels will be used to deliver crude to PDVSA affiliates Citgo, Champlin and Unoven, in the United States.

The sum allocated to tanker purchases, over the five-year period, is \$1.3 billion: according to Jaroslav Brcek, president of PDV Marina, the sum saved in freight from the eight new acquisitions, over a 20-year life, is also \$1.3 billion.

### The Investment Programme

	\$ billion
Exploration	1.7
Production	16.2
Refining	10.0
Petrochemicals	5.7
International operations	4.5
Orimulsion	2.5
Cristobal gas project	2.5
Tankers	1.4
Coal	1.9
Domestic market	0.9
Miscellaneous	0.7
<b>Total</b>	<b>48.0</b>

Venezuela is embarking on a brave and expensive venture. Its progress will be closely monitored by western companies, with their access to finance and expertise, and by competing crude suppliers. ■

### Petroleos de Venezuela SA

	1989	1990
Net profit	£2.11 billion	\$2.36 billion
Value of exports	\$10.5 billion	\$13.5 billion

The total value of 1990 sales around the world was \$23.1 billion.

# Satellite system improves accuracy of rig positioning

By Mark Scruton

Over the past decade oil companies have spent millions of dollars on computer technology to provide more and more information about their upstream activities.

Thanks to the tremendous advances made in the electronics and computers industries, virtually every upstream operation from drilling to pipelaying is now monitored, creating immense amounts of data.

But all this increasingly accurate data acquisition, analysis and planning would mean nothing if the companies were unable to place their equipment exactly where they wanted it.

Luckily, behind the electronics revolution has come an equally exciting transformation in navigational accuracy based on new satellite positioning systems.

Using the same technology which guided the allied forces through the desert during the Gulf war, seismic vessels, oil rigs and other equipment can be accurately positioned to within metres of their planned sites by these artificial stars in the sky.

Now oil companies can pinpoint areas of interest, shoot seismic surveys, carry out rig moves and lay pipelines to a degree of accuracy almost unheard of just 10 years ago.

This increased accuracy, coupled with the immense amount of computer generated data, helps to improve the chances of drilling success and gives the companies a greater level of control over their operations, a great boon in the competitive world of oil exploration.

Satellite navigation started with the launch of Sputnik 1 in 1957. American scientists discovered that they could determine their own position on the earth's surface by measuring the Sputnik radio signals, given a knowledge of the satellite orbit.

This eventually resulted in the US Navy developing its own system in 1964. Called Transit, it was initially just a military system, used to accurately update navigation equipment aboard the Polaris submarines.

Although the system was a vast improvement on previous navigational methods, the Transit satellites' low orbit — circling earth at an altitude of about 1,100km every 107 minutes — meant they were only in view for only 10 to 15 minutes at a time.

Because of this, the system only offered users irregular position fixes on average once every 1½ to 2 hours so it is mainly used to calibrate other positioning systems. Transit was rarely used, even as a secondary system, for practical offshore positioning. Because

Transit was not able to give continuous position fixing, a new generation of satellite navigation systems, designed to minimise the number of satellites needed by having a far higher orbit, were planned.

In the United States, about \$11

new era in navigation with the capability of undreamed of plotting accuracies.

Navigation by satellite, however, is not new. It has been used successfully since the 1960s but it always required a combination of different systems to

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**'The investigators could pinpoint their position from somewhere near here to somewhere on the block.'**

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billion has been spent on just such a system, the Global Positioning System (GPS), which is now almost fully operational. This system is so accurate, a GPS receiver can calculate its position to within 100 metres using the signals broadcast by the GPS satellites orbiting 20,200km above the earth.

At present GPS can be used about 20 hours a day for 2D coverage worldwide, but by the end of 1993 this should be increased to 24 hours when the final 24-satellite — 21 in operation plus three spares — configuration is completed. This will mean that along with its 24-satellite Soviet counterpart called GLONASS, GPS will launch a

reach the level of accuracy required by oil companies.

Now, because the new satellites systems can virtually provide continuous coverage, for the first time a reliable system can give the oil companies more confidence that their equipment, often very expensive, is in exactly the right place.

Jim Nagle, Navigation Group Leader of Inmarsat, the 64-member country satellite communication cooperative, said the improvement in accuracy by GPS and other systems meant investigators could pinpoint their position from 'somewhere near here to somewhere on the block.'

## How does it work?

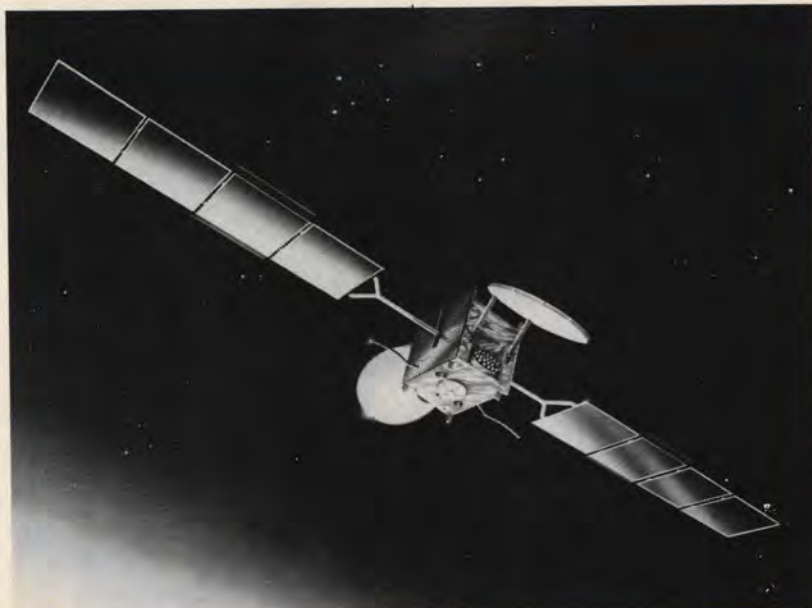
GPS was developed by the US Department of Defence to simplify accurate navigation. The system uses satellites and computers to triangulate positions anywhere on earth. These man-made stars replace the stars traditionally used for navigation, and compliment terrestrial navigation systems.

GPS is based on satellite ranging. A position on earth can be calculated by measuring its distance from a group of satellites in space. If the exact position of the satellites is known and the exact distance from the location, they can be used as precise reference points.

The basic concept behind GPS is simple. If the GPS user is a certain distance from Satellite A (say 18,000km) it must be somewhere on an imaginary sphere from that satellite which has a radius of 18,000km.

Another satellite, Satellite B, 19,000km from the position can narrow the position down even more because the only place it can be 18,000km from satellite A and 19,000km from satellite B is on the circle where the two spheres intersect.

A third satellite measurement can pinpoint the position with even greater accuracy. A satellite C, 20,000km from the position will have a sphere which will cut through the circle that is the intersection of the 18,000km and 19,000km spheres at only two points.



Inmarsat 3.

satellites, it is very important to have a method which can measure that distance. The GPS system does this by timing how long a radio signal from the satellite takes to reach the user and using the velocity times travel-time equation ( $\text{velocity} \times \text{time} = \text{distance}$ ).

Because radio waves travel at the speed of light — 186,000 miles a second — we need to know the exact

Each satellite has its own code — a very complicated pulse sequence which is repeated every millisecond — and which is recognised by the receiver. By comparing and matching up these codes the delay between the satellite time of transmission and the receiver point of reception can be measured.

Incidentally, the pulsed signal code also helps to reduce the system costs. Because of the code GPS signals can be very low power — the signals can be so faint they don't register above the earth's inherent background noise, a varying string of random electronic pulsations, which they resemble.

But because the pattern of the code is known, the receiver can recognise it because it has the same code. Therefore the signal is reinforced or amplified by pattern matching, or correlation. Because of this amplification GPS signals don't have to be very powerful and receivers can get away with very small antennae, part of the original system specification.

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## 'undegraded this basic stand-alone accuracy of GPS position is 15 to 20 metres.'

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To be absolutely technical, a 3D position must be solved by four unknowns; latitude, longitude, height and the unknown clock difference between the user receiver and the satellite system clock. Therefore, trigonometry requires a fourth measurement from another satellite to give an exact location. In practice, however, just three measurements can be used if an assumption is made which can eliminate the need for one of the satellite measurements. By assuming the position is at sea level one of the spheres needed for the calculation can be centred at the earth's centre and has a radius equal to the earth's plus the user's altitude.

### Time signals

The other variable in the GPS system is time. Since GPS is based on knowing the position's distance from the

time a satellite signal is sent and the exact time it was received before the distance or range can be calculated.

This time difference is important, a satellite passing right overhead takes only 6/100ths of a second to send a radio signal to a receiver. Therefore very accurate clocks are required to make the system work.

Luckily, thanks to fast progress in electronics, this is not a problem. Very accurate electronic clocks in both the satellite and receiver can measure down to nanoseconds (0.00000001 seconds).

The trick to measuring the travel time of the radio signal is to know exactly when the signal left the satellite and measure exactly when it arrives at the user receiver. Part of the elegance of the GPS system is that this problem is solved by matching a code signal generated in both the satellites and receivers.

### Signal errors

However, the signals can cause problems. There are three main errors which could affect the signals and create inaccurate answers at the receiver.

Firstly, there could be clock error, common to all users. Obviously the timing of the signal is important; if the satellite and receiver had an uncorrected clock difference of even 1/100th of a second, the distance measurement would be out by 1,860 miles.

To prevent this each satellite has not one but four atomic clocks on board to make sure one is always working. These clocks, costing more than \$100,000 each, work by measuring the oscillations of a particular atom and are immensely accurate.

Unfortunately it would not be economical to insert an atomic clock in every receiver. So to get by with only moderately accurate quartz clocks in receivers trigonometry is used again — by using a fourth satellite range any consistent clock offset between the satellites and the user receiver may be calculated and compensated.

It is this clock offset which introduced the fourth unknown in addition to the user latitude, longitude and height, hence a fourth satellite measurement is required and by using simple pythagorean geometry equations the receiver's computer can calculate the clock error and make the appropriate adjustments to give the position.

Secondly, there can be ephemeris error, where the orbit of satellite is not as predicted. Luckily this is not normally a problem because GPS satellites are so high up, their orbits are very predictable. Even so minor variations in orbit are measured constantly by the US Department of Defence by a network of five ground monitor stations around the earth.

Thirdly, the earth's ionosphere and atmosphere can cause error by delaying the GPS signal reaching the

receiver. Most, but not all, of these effects can be eliminated by applying a correction factor derived from mathematics and computer modelling.

### Corrected positions

Other errors which affect range accuracy include the receivers themselves, and multipath reception (the same signal reflection effect which causes 'ghosting' on television).

A further factor which affects the user position accuracy is the configuration of the satellite constellation at any given time. Entirely predictable, this dilution of precision can be minimised by ensuring the receiver only measures satellites which are well distributed in the sky in relation to the user's position.

All the above errors have to be corrected to make sure the position is accurate. To ensure that the data are as reliable as possible the data from the monitors are sent to the master control station at Colorado Springs, which computes corrections like precise orbit parameters and clock corrections terms for each satellite. Once this information has been collected, upload stations at Ascension Island, Diego Garcia and Kwajalein transmit it back to each satellite three times a day. These minor corrections and timing information are then stored in the satellite's memory and passed onto the user.

Both GPS and GLONASS operate on much the same principles and are

potentially accurate to within a few metres in all dimensions. Unfortunately for GPS, the US military has reserved that level of accuracy for itself.

To achieve this, the military have the capability to degrade the signal further by a technique called 'selective availability' (S/A) — artificially creating a significant error in the satellite ranges.

### Differential GPS

But there is one way civilian users can counteract the effect of degraded or 'tampered' signals — a system called Differential GPS (DGPS).

'The various error sources within the GPS system, inherent and deliberate, render the system insufficiently accurate for the offshore surveyor,' said Giles Mack of Racal Survey, one of the specialist companies which provides DGPS services and equipment.

He added: 'Undegraded, the basic stand alone accuracy of GPS position is 15 to 20 metres, but the Department of Defence had decreed that such a level of accuracy should not be made available to the civil user. Therefore the deliberate range degradation, S/A, may be applied which results in a GPS stand alone position accuracy of 50m at the 1 sigma range standard deviation criterion.'

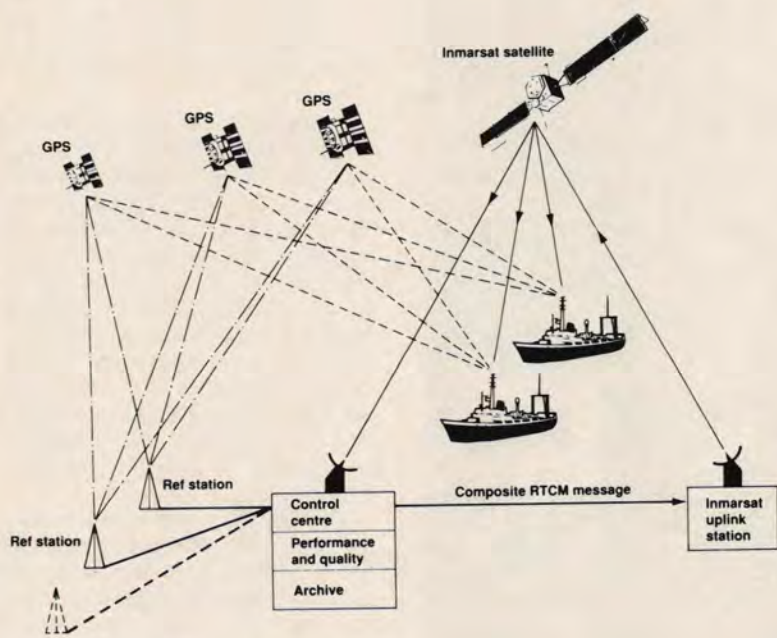
DGPS is based on the idea that if a GPS receiver on the ground is in a precisely known location, then its observations can be used to work out the exact range errors at the point. The reference station can then transmit an error correction message to any other GPS receivers in the local area.

DGPS works because the satellites are so high up that any errors measured by one receiver will be almost exactly the same for any other receiver in the same area. Therefore a network of reference stations covering that area can produce very accurate results.

Mr Mack said: 'This differential GPS technique has proved to be particularly effective and can improve the accuracy figure, even under S/A conditions, to 5 metres or better.'

Differential offshore GPS was first developed in the early 1980s using terrestrial links. By around 1985 it had become a highly sophisticated offshore positioning tool, a proven technique for both navigation and for the relative positioning activities needed to support a whole range of offshore surveying activities.

Users of Inmarsat receivers now have a signal that is available 24 hours



Graphic description of Skyfix network.

a day with navigation information updated every few seconds making it ideal for mobile users.

The accuracy of the corrected signals depends on how far away the user is from the nearest reference station. But tests have shown that a correction made from 300-400km away has provided accuracies of better than five metres and further work by Racal Survey suggests this distance may be extended to 2,000 km whilst still maintaining the 5 metre accuracy figure.

Currently a number of commercial companies are leasing Inmarsat satellite channels from Inmarsat signatories.

Racal Survey launched its SkyFix network last year and has now leased channels in each of Inmarsat's four ocean region satellites, providing coverage over North West Europe, the Middle East and the Asia-Pacific region, all areas of interest for oil exploration.

Racal claims SkyFix has significant advantages over other systems which can only provide a terrestrial link. The new service can provide a lot of new benefits including a wider area coverage, low data error rates and high message update rates.

SkyFix has its own European system of six GPS reference stations;

Maloy and Hammerfest in Norway, Den Helder in Holland, Aberdeen and Scilly Isles in the United Kingdom and Rome in Italy. (A seventh station in Cadiz, Spain is currently being installed.)

proportion of our clients' areas of interest. We can now offer a high level of quality control and a high level of accuracy over a very wide area.'

Racal Survey have conducted extensive trials with SkyFix at long range.

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## 'DGPS can increase the accuracy of the 95 percent confidence that the solution is within 100 metres.'

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With this network, excellent coverage of the North West Europe continental shelf and the Mediterranean is provided with data from the reference stations gathered at the Network Control Centre in Aberdeen. There it is integrity checked and performance monitored prior to being formatted into a single composite message for broadcast by the British Telecom earth station at Goonhilly Downs in Cornwall.

This performance monitoring is part of a service Racal offer to ensure that their corrections are as accurate as possible over the areas covered by SkyFix. Mr Mack said: 'Through SkyFix, we now offer a consistent and complimentary system over a large

The results of those trials and the large amount of operational data show that SkyFix achieves an accuracy of five metres or better at distances of up to 2,000kms from the reference station.

Following the success of SkyFix in Europe, a SkyFix network was introduced in March this year which now provides comprehensive coverage of the Middle and Far East, from Abu Dhabi and Bombay to Hong Kong and stations covering the South China Sea and the entire Australian continent and her surrounding waters. Further extensions will soon include a reference station in northern Japan. This extended network is controlled through a Singapore centre, with the integrity and monitoring facilities identical to those in Aberdeen.



Skyfix antenna on a rig.

### The future

Inmarsat is to launch a third generation of satellites in 1994-95 which will offer an enhanced global navigation capability for international civil users of the GPS/GLONASS systems, making it possible for anyone with a receiver to know exactly where he is at anytime.

The possibilities which will be made available by these satellites in terms of new monitoring methods are enormous. Apart from communication links the satellites will have the capability to broadcast information about the state of health or 'integrity' of all the GPS/GLONASS satellites. They will also be able to transmit a GPS-lookalike navigation signal, thereby enhancing and eliminating any holes in the full 24-hour satellite GPS plan and may also broadcast a DGPS signal to overcome any signal error problems.

'DGPS can increase the accuracy of the 95 percent confidence that the solution is within 100 metres of the true position. It is this 5 percent uncertainty that we want to overcome: the new satellites should give us a 99.99 percent confidence level.' said Mr Nagle. ■

## PERSONNEL, EDUCATION AND TRAINING DISCUSSION GROUP

The next meeting of the Personnel, Education and Training Discussion Group will be held at the Institute of Petroleum on **Wednesday, 27 November 1991** starting at **2.30pm**. (A buffet lunch will be available from 1.00pm.)

### THE ATTITUDES OF FINAL-YEAR UNDERGRADUATES TO THE UPSTREAM AND DOWNSTREAM SECTORS OF THE OIL INDUSTRY — THE 1991 MORI SURVEY RESULTS

*Speaker:* **Ms Michele Corrado**, Associate Director, Market and Opinion Research International (MORI).

If you would like to attend this meeting please contact **Mr AE Lodge**, Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Tel: 071-636 1004.

## EXPLORATION AND PRODUCTION DISCUSSION GROUP

The next meeting of the E & P Discussion Group will be held at the Institute on **Thursday, 17 October 1991** starting at 5.30pm. (Tea and biscuits will be available from 5.00pm).

### Development of Russian Oil and Gas Reserves

*Speaker:* **Mr JD Beer**, Senior Development Engineer for BP Soviets Group, BP Exploration.

If you would like to attend this meeting please contact **Mr AE Lodge**, Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Tel: 071-636 1004 Ext 236.

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# Today's offshore driller

The character of the offshore drilling crew is changing, and in an interview with *Petroleum Review* Bruce (Chip) Keener IV tells why the increasing sophistication of technology requires 'young aggressive school leavers, skilled tradesmen and, particularly, university graduates' to lead the industry into the 21st century.

He is the Chairman of the North Sea Chapter of the International Association of Drilling Contractors (IADC).

Exploration wells are being drilled by IADC members at the average rate of seven a week. The last two years have been the busiest ever. Yet only 25-30 percent of North Sea reserves have yet been produced, Mr Keener points out.

Safety, within a safe working environment for the 10,000 offshore, is the priority. Mr Keener is proud that the North Sea's drilling safety record is higher than that of a large number of industries onshore.

He has been Area Manager, Aberdeen Area Operations, for Global Marine Drilling Company since 1986, during which time he directed rig operations for the semi-submersibles *Glomar Arctic I*, *Arctic III*, *Biscay II* and *BP Sea Explorer*, and the jackups *Moray Firth I*, *Labrador I*, *Baltic I* and *Main Pass I*.

## **Geoffrey Mayhew: How do you see prospects in the North Sea?**

**Chip Keener:** The prospects are much better than the public may be aware. There are now 51 producing oilfields and 30 producing gas fields on the UK Continental Shelf. According to recent statistics from the Aberdeen University Petroleum and Economic Consultants, those figures are projected to about double in the next decade.

## **How long do you expect the industry to be producing in the United Kingdom?**

A conservative assessment of the Department of Energy estimates would suggest that we are only about 25 to 30 percent down on initial reserves of recoverable oil and gas. That being the case, we should expect 30 more years of substantial sustained production and continued activity through the middle of the next century. In fact, in terms of exploration, drilling last year was our busiest year ever, up 60 percent on the previous best. There were more than 400 wells drilled last year in the United Kingdom, and we should equal that mark again this year.

## **What role does the International Association of Drilling Contractors play in this?**

The IADC is an international organ-

isation headquartered in Houston, Texas, representing the interests of drilling contractors around the world. The North Sea Chapter has been active in the United Kingdom since the late 1970s at the inception of the industry. The membership here has swelled to some 50 companies, including all those operating in the United Kingdom.

## **What are the overall objectives of the UK Chapter?**

I can best illustrate that by example, but let me first describe for you the Chapter structure. Most of the Chapter activities are divided between 10 different working parties. These are design and standards, machinery and equipment, marine, training, contracts, safety, drilling practices, human resources, land drilling, and a working party dealing specifically with the Dutch sector. We also have task groups in place addressing weightier matters of topical concern. The five task groups operating at present are dealing with Safety Case format and content, industry database initiatives, mooring guidance, the retrospective application of recent legislation and the Cullen Report. Aside from one part-time technical representative, all our officers and working party participants hold full-time jobs with member

companies, and volunteer their time to Chapter business without compensation.

In way of defining objectives, let me describe some of our present involvements, and a few of our recent achievements.

Two years ago, when the hazards specific to high pressure drilling became clear, the IADC and the United Kingdom Offshore Operators Association cooperated in developing appropriate equipment specifications, procedures, and training.

When evidence of drug abuse surfaced in our workforce, our membership collaborated in a screening programme, eradicating a problem of growing potential.

Three of our present task groups have been spawned to work with the Health and Safety Executive and other industry associations, in developing a new legislative framework consistent with Lord Cullen's vision.

There are a lot of dramatic and exciting changes taking shape on this front, and the IADC is making a very meaningful contribution. We are trying to influence a comprehensive practical premise for mooring guidance.

We are developing an IADC standard Permit-to-Work system for our members. We have three board members on the Offshore Petroleum Indus-

try Training Organisation and subsidiary boards, participating in the development of training standards, and standards of competence for our offshore workforce.

These are only the highlights. We are addressing a spectrum of other matters of less profile.

### **Would you put training as the number one priority?**

The importance of training is substantial. I would say that safety is our number one priority, and that training is prominent among our concerns. Most of our attentions address safety in one manner or another. Our objective is to provide a safe work environment, and to staff our operations with qualified people.

Speaking of safety, I think our industry can be justifiably proud of their record through the last few years.

Our employees fly as much as three hours by helicopters to work offshore, in among the harshest environments in the world.

They work with heavy equipment, and a very volatile product at extreme pressures, yet 11 of 15 industries were judged more severely last year by the Health and Safety Executive, in terms of major accidents. Mining was more dangerous by a factor of 4 to 1; construction was more dangerous by a factor of 2 to 1; and surprisingly, even the food, drink, and tobacco trade was judged to be more dangerous.

That speaks well for the industry's commitment to safety.

### **How many people are employed in your business in the United Kingdom?**

Before I answer that, let me clarify the scope of our industry involvements.

Our members own and operate all of the offshore mobile drilling rigs in the UK sector and that is our principal business.

The mobile drilling rig count at present in the United Kingdom is 46 semi-submersibles and 22 jackups. A typical semi-submersible configuration would be two submerged pontoons, supporting a drilling and accommodation structure on large columns.

Semi-submersibles are generally positioned on eight anchors and operate in water depths of 300 to 2,000 feet, in the central and northern North Sea. Jackups have hulls that are only floated in transit, to be 'jacked' clear of the water on typically three lattice legs before commencing drilling operations. They are for the most part confined to water depths of 300 feet or

less in the southern North Sea.

More than half of our drilling is exploration wells, and the balance are appraisal and development, all of which would be drilled under contract with an oil company for a 'dayrate'. We have no commercial interest in the lease.

Peripheral to this we represent a handful of land drilling operations, and a few of our members operate limited labour contracts on production platforms. I must clarify though that production and production platforms are not the responsibility of our members. These are the exclusive domain of the oil companies.

Getting back to your question, we employ about 10,000 people offshore, and a further 600 or so onshore. Our mobile rigs will accommodate about 90 people on average, about half of whom will be employed by the rig owner. The balance of the bunks will go to our client representatives and their contract drilling services. Our crews work an even time schedule such that the rigours of a 12 hour on — 12 hour off routine through a typical two week hitch are compensated with equal time at home.

### **What skills are required to become a driller?**

Let me start by describing the mix of skills that comprise a rig crew. The contractor's employees divide to the marine crew and the drill crew. The marine crew responsibilities are fairly parallel to those traditional to merchant shipping. Specifics of the organisational mix and the reporting structure vary from one operation to another, but I will make a few generalisations. A master (or barge master) and chief engineer (or rig engineer) would lead the marine crew — in fact a number of our members insist on full marine licences. Subordinate to them would be, as appropriate, ballast operators, rig mechanics, electricians, motormen, welders, crane operators, radio operators, storekeepers, medics and a catering staff.

The drill crew represents a linear progression from the unskilled position of roustabout through to the contractor's senior drilling representative, the toolpusher.

Roustabouts work for the crane operators slinging loads, painting and cleaning up. Aside from rudimentary safety and orientation training, there are no requisite qualifications for the job.

To make it to the driller and toolpusher positions, it takes a good technical mind, sound leadership skills and

a lot of hard work. Those that go the distance will find it to be a rewarding career with generous compensations.

### **As more oil and gas are produced, will there be more opportunities in the contract drilling business?**

I would not think so. I see the North Sea rig count remaining fairly stable for the foreseeable future. Remember, as drilling contractors we are involved only on the front end . . . exploration, appraisal, and development. Continued development should progress at a fairly steady pace.

I will say that the character of our drill crews is changing and will continue to do so. This business has become extremely sophisticated, and our crews will need a strong technical foundation to meet the coming challenges. Today's roustabouts will be tomorrow's toolpushers. We need to draw young aggressive school leavers, skilled tradesmen and particularly university graduates, to lead our industry on to the challenges of the next century.

### **Is this a life that might be upset by stop-starts and redundancies?**

I presume you are thinking of the industry recession in 1986. World oil prices collapsed and North Sea drilling activity diminished by about 30 percent. That event is fairly unique in the 25 year history of North Sea development. I'm sure our business will be punctuated by ups and downs in the coming years but I would not expect a repeat of that scale. It cannot be forgotten that from the mid-1970s, the North Sea has represented the single greatest concentration of capital investment in the world, and present trends continue to be encouraging. About £93 billion has been invested to date on the UK Continental Shelf, in 1990 numbers.

### **Will the move into the frontier areas west of the Shetlands produce unexpected challenges?**

They may come, but for the most part the technologies for drilling and production in deeper waters and harsher environments already exist. There are rigs exploring those leases now.

### **Is another 'big one' going to be found out there?**

That is what we all must hope. We probably won't find another field of the scale of BP's Forties but there are a lot of unexplored blocks, and a lot of oil and gas remains to be found and produced. ■

# Second generation offshore production system

By Bill Edwards, Engineering Manager of BOET Ltd

UK oil production may run out in thirteen years unless the remaining North Sea reserves are developed. 75 percent of these reserves is in small and isolated fields which are not economic by current methods.

Many such fields could be produced by subsea separation which can achieve higher productivity at a much lower capital cost. It can also reduce slugging and hydrate problems, improve well testing and delay abandonment for some existing developments.

The first such system has been successfully demonstrated on the Argyll field.

Present statistics suggest that oil production from developed UKCS fields will be nearly depleted in nine years time. New fields, now being developed will provide a daily UK oil production of 0.75 million barrels which may be only 34 percent of today's production. Significant production could cease about ten years later and Britain may again need to rely on the Middle East for its most essential commodity. This may be a new experience because in the pre-North Sea years Britain had considerably more investments in the Middle East, and more commercial influence than it has now.

At that time subsea step-out fields, as they were called, were usually limited to a 10 km distance range from the host platform. Pressure losses in the multiphase flow from the well and slugging at the riser base provide an economic limit to this step-out distance, particularly if the well productivity is low to start with. With the need to tie in many more fields in the future, over distances up to about 30 km the natural well drive would need to be assisted by mechanical pumping. Multiphase pumps were being developed by Weir and others but subsea commercial units appeared to be a long way ahead. If conventional pumps were to be used the gas and liquids would need to be separated, which led Humphreys & Glasgow Ltd (H&G) to study the concept. Because it would benefit the economics of North Sea oil exploitation the European Commission (EC) was asked to support the development of a subsea wellhead separator and funding



Figure 1: Subsea Storage Separator (SSSU) concept 1987.

assistance for a £2.1 million programme was approved in 1986.

By that time H&G had formed a joint-venture company with Strachen & Henshaw (S&H) a mechanical handling systems company with factories in Bristol. This joint venture company called British Offshore Engineering Technology Ltd (BOET) was and still is dedicated to the commercial development of subsea separation.

With the collapse of the oil price, Operators were already concentrating hard on ways to reduce field development costs if the North Sea was to remain viable. BOET also saw a future situation where the available platforms may not be able to accept the expected number of subsea step-out fields, either

due to distance from the wells or the technical and commercial complications of one platform accepting oil from several different fields with different operators.

The countdown need not be inevitable however since it neglects about 4000 million barrels remaining in smaller fields which cannot be economically developed by current production methods, but could be developed by new generation production systems. These included subsea separation, subsea multiphase pumping, enhanced downhole pumps and subsea booster stations for oil and gas. Of these, subsea separation is nearest to the market because all the components needed are within existing experience. This article describes the

development of the BOET subsea separator which is the only one of these systems to be certified, tested offshore and commercially on offer.

## UKCS decline

As far back as 1984 it was recognised by H&G that the development of major offshore fields in the UKCS would eventually decline, and that UK national oil production would decline also due to the limited number of such fields. Already the platform-based developments had tended to shift from the major fields like Cormorant and Brent in the 500 to 2,000 million barrel (recoverable reserve) range to the 'marginal' fields like Clyde and Tern in the 100-150 million barrel range. Future developments were seen to be in the 'sub-marginal' range of fields below 100 million barrels of which about 130 were published at the time. It was expected then that fields above the 70 million barrel range may justify a floating platform while the great majority, below 50 million barrels may require subsea development, tied back to an existing platform.

Direct tanker loading was seen as the solution, which therefore required the liquid/gas separation to 'dead crude' for safe loading on to the tankers. Oil/water separation and seabed storage of the separated oil and water were also included in the updated concept.

The conceptual design of the subsea storage separator unit (SSSU) was completed in 1987. It was based on a typical UKCS small field with a peak initial production of 10,000 barrels/day and expected economic life of 5 years. This unit is illustrated by **Figure 1**. It comprised a high and low pressure separation vessel, the latter being sized to serve also as a storage of the oil and water. Three similar tanks provided additional storage of the separated oil and water, each one being dedicated to one or the other, according to the water cut of the field at the time. Conventional liquid pumps and separate oil and water risers would connect these tanks to a conventional offshore tanker loading system.

BOET proposed the most basic system comprising a catenary anchor leg mooring (CALM) buoy and floating hoses, similar to the well proven system on the Hamilton Argyll field. The only unique features would be a control cabin on the tanker and umbilicals to the SSSU for control, monitoring and electrical power for the subsea export pumps. These would follow a similar route, via the loading

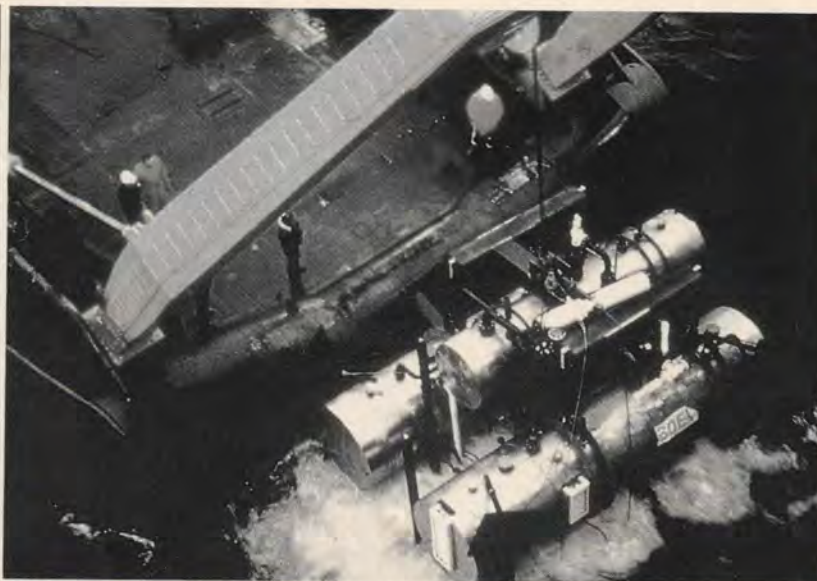


Figure 2: Subsea Separator Pilot Unit (SSPU) being installed in 1988.

buoy, to the export hoses. Gas would follow a different route, passing up a flexible or articulated riser to a floating flare. This flare and the loading buoy comprise the only permanent surface elements of the system, (the only manned element being the actual tankers).

During most operational periods the tankers would be connected and loaded. For an 80,000 dwt tanker as used for Argyll this could be many days during which time the SSSU could be monitored from the tanker. When the tanker is away to unload, or disconnected due to weather the SSSU would operate autonomously and produce into its storage.

This system was conceived as the absolute minimum equipment spread that could transfer crude oil from a subsea well into a saleable product in an oil tanker. Although innovative as a system it could nevertheless be built of technology that was commercially available or readily developed from existing product lines. As such it was attractive to Hamilton Brothers Oil and Gas (UK) Ltd who gave valued assistance and encouragement to the project. Other offshore operators were receptive but two questions needed to be resolved before any commercial order could be considered. Firstly the autonomous control systems needed to be demonstrated. Secondly and equally crucially was whether well fluids could be separated on the seabed to the 'dead crude' specification needed for safe transport by oil tanker. Such questions required a pilot trial demonstration, first on land then on a subsea well.

This opportunity was provided by

Hamilton who offered the use of a subsea well, and the platform and support facilities on Argyll. Due to the limited future of this declining field a tight schedule was needed to meet the installation weather window of 1988.

## Subsea separator

The subsea separator pilot unit (SSPU) is shown by **Figure 2**. The photograph was taken less than four months after the first metal was cut. The SSPU had a weight of 58 tonnes and was built to simulate all key process and instrumentation functions of the conceptual SSSU. The three vessels therefore comprised high and low pressure separators and a storage tank split internally into separate oil and water compartments, to simulate the three separate storage tanks of the SSSU. The design was defined by limitations which were unrelated to its technical purpose. Dimensions and weight were constrained by the need for road transport and installation through the stern 'A' frame of the BUE 'British Argyll' diving support vessel (made available to BOET by Hamilton). The gravity base was the only option for installation on the seabed. A batch pumping system for the separated oil and water was made necessary because only one export riser was available to the platform. Installation of the 5 tonne control pod, umbilical, gas riser and power cable was dictated by the equipment already installed on this congested working platform.

Autonomous control was provided by a conventional programmable logic controller, which was encapsulated in

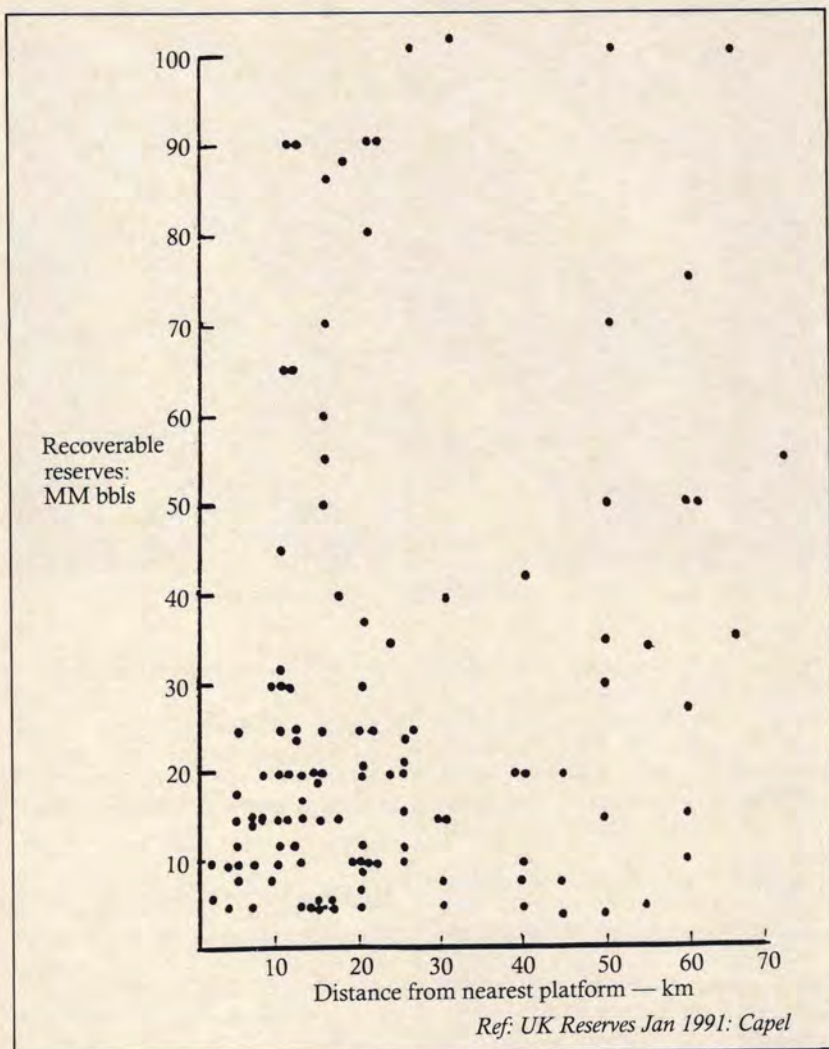


Figure 3: Potentially commercial fields in UKCS.

a dry nitrogen atmosphere within a subsea control pod. This unit controlled the continually active and normally passive functions of the system. The active functions comprised a closed loop pressure control valve, two closed loop level control valves, two oil/water changeover valves to batch feed the pump and the actual pump on/off cycle. Passive functions included the production choke, emergency shutdown (ESD) and bypass valves and the ESD interface with the platform topsides and subsea well. BOET believe the system to be the most advanced subsea control system to receive full Lloyds certification and operate successfully. The pressure control valve may have been the first closed loop modulating valve with position feedback to operate subsea.

By late 1989 after overcoming a series of time consuming installation and development problems, BOET were able to demonstrate that tanker

quality dead crude could be produced subsea by an autonomous subsea controller with no surface intervention. This performance was confirmed by analysis of oil and water samples from the SSPU production batches before they were returned to the main Argyll production separators on the platform. The analysis was one of the main trial objectives and the results expressed as BS&W, oil-in-water and Reid Vapour pressure tended to exceed design targets. The system, the first of its kind, started up, and achieved operation with little need to modify the original design, or control logic. After a successful trial period demonstrating mixed oil/water and batch separated oil/water production, verifying the performance of the control system, gas riser and other areas of enquiry and achieving refinery feedstock quality crude oil, the trial was discontinued for budgetary reasons in 1990.

## Experience build-up

In 1991 the predictions of 1984 are now coming about. Production from the major established fields is now on the decline at a rate of about 90 million barrels per year, and interest is moving to the remaining unexploited fields many of which are shown by Figure 3. Most of these may be potential candidates for subsea separation either tied back to a platform or as isolated systems with tanker export. More recent work has shown that subsea separation will not only reduce the capital cost of developing such fields, but also increase the productivity compared with conventional platform-based subsea production systems.

This increase in productivity is due to the reduction in back pressure on a subsea well, made possible by the separators and pump just downstream of it. It can benefit the Operator by providing an increase in daily production, particularly in later field life, or it can extend this life by allowing production to a lower reservoir pressure. Independent analysis has suggested benefits of the order of 17 percent in the UKCS with as much as 50 percent in deepwater areas such as Brazil and the Gulf of Mexico. These very generalised benefits will vary with depth, step out distance, the well fluid characteristics and any assisted production methods (eg gas lift) that may be used. They do, however, make subsea separation an attractive method and in some cases the only economic method of developing some of the very small and more distant fields in Figure 3.

Subsea separation has other applications which can cover the beginning and end of phases in a field development. A subsea separator unit (SSU) can provide an extended well test of a new prospect with the oil exported by tanker or infield pipeline to generate income. It can also be a method of draining the last oil from a subsea field which can no longer justify the cost of a floating production facility. In a similar application it can be used to delay the abandonment of a fixed platform. In all these cases the SSU can be recovered for reuse after meeting its purpose.

Hamilton Brothers who have made the development possible remain one of the many operators who, with BOET, are examining the use of subsea separation on the smaller or more problematic fields in their portfolio. It is fitting that the Argyll field, which was the start of the first generation of North Sea offshore production systems should also be a testing ground for the second. ■

# IP Information Service News

## IP Statistics

The department has recently published *UK Petroleum Industry Statistics — Consumption and Refinery Production 1981–1990*. This 10 year cumulation of statistics contains tables and charts showing how the consumption and production of individual products has varied over this period together with end use analyses.

It includes graphical comparisons between the consumption of motor spirit, derv, gas/diesel oil, and fuel oil. Graphics are also used to illustrate the trend in the consumption of motor spirit with the split by grade/unleaded, as well as the deliveries of motor spirit and derv to retail and commercial customers.

These and other useful tabular information are available as a 20 page booklet price £10 (£5 for members of the Institute).

For further information please contact Information Department on 071 636 1004.



## News

Congratulations to IFEG Committee Member, Arnold Myers, who recently received the IIS Jason Farradane Award for his work on the bibliographic sourcebook **Petroleum and Marine Technology Information Guide**. The award was presented to him by the Institute of Information Scientists for the bibliography and also in recognition of his contribution to information services within the international oil and gas industry.

The bibliography will be published by ASR Books in 1992.

## Selected additions to the library

Classic Petroleum Provinces.  
THE GEOLOGICAL SOCIETY.

Edited by: Brooks, J.  
Geological Society Special Publication No 50. London, Geological Society, 1990. Class Number: 325.

Dictionary of Petroleum Exploration, Drilling, & Production.  
By: Hyne, NJ.  
Tulsa, Pennwell, 1991. Class Number: 050 Ref/Directories.

EEC Treaty and Environmental Protection.  
By: Kramer, Dr L.  
Pickering, North Yorkshire, Sweet and Maxwell Ltd, 1990. Class Number: 130 769.

Energy Law.  
By: Mankabady, S.  
London, Euromoney, 1990. Class Number: 980.

Eni Long Term Outlook.  
ENTE NAZIONALE IDROCARBURI NATIONAL HYDROCARBONS AUTHORITY ENI.  
Edited by: Luzzi, L.  
Rome, Eni, 1991. Class Number: 096 136 Pamphlet.

European Conference: Safety in Refining and Petrochemical Plant. Held on Wednesday 6 March at the London Tara Hotel, Kensington, London W8.  
TECHNOLOGY FORUM.  
London, Technology Forum, 1991. Class Number: 935.

Financial Innovation and Upstream Petroleum Development.  
INTERNATIONAL RESEARCH CENTER FOR ENERGY AND ECONOMIC DEVELOPMENT ICEED.  
Edited by: Pollio, G.  
Occasional papers: Number Fourteen, Boulder, Colorado, ICEED, 1991. Class Number: 920 Pamphlet.

Gastech 90: The 14th International LNG/LPG Conference and Exhibition; held at the Ral Congress Centre, Amsterdam, December 4–7, 1990.  
GASTECH.  
Rickmansworth, Gastech, 1990. Class Number: 520.

The German Opportunity: The Implications of a Unified Germany on the Energy Industries: A Conference held at the Royal Garden Hotel, Kensington on 23 May 1990.  
ENERGY BUSINESS CENTRE ERNST & YOUNG MIDLAND MONTAGU.  
London, Energy Business Centre, 1990. Class Number: 134 Pamphlet.

Industrial Hygiene Procedures for the Safe Use of Drilling Fluids.  
UK OFFSHORE OPERATORS ASSOCIATION UKOOA.  
London, UKOOA, 1991. Class Number: 935.4 425.1 Pamphlet.

Integrity of Offshore Structures — Fourth International Symposium on Integrity of Offshore Structures, 2–3 July 1990, held at the Kelvin Conference Centre, University of Glasgow, Scotland.  
UNIVERSITY OF GLASGOW, DEPARTMENTS OF NAVAL ARCHITECTURE, OCEAN ENGINEERING & MECHANICAL ENGINEERING.  
Edited by: Faulkner D, Cowling MJ, Incecik A.

London, Elsevier, 1990. Class Number: 539 395.

Libya in the 1990s: Can Its Resources be Salvaged.  
THE ECONOMIST INTELLIGENCE UNIT.  
By: Besschorner N, Smith A.  
Special Report No 2134.  
London, Economist Intelligence Unit, 1991. Class Number: 157 Pamphlet.

Model Code of Safe Practice: Part 1: Electrical Safety Code.  
INSTITUTE OF PETROLEUM IP.  
6th edition.  
London, Institute of Petroleum, 1991. Class Number: 935.1 Pamphlet.

Natural Gas in the European Community.  
FINANCIAL TIMES.  
By: Kalim, Z.  
London, Financial Times Business Information, 1991. Class Number: 520 130 Pamphlet.

New Prospects for Methanol: Fuel or Chemical.  
FINANCIAL TIMES.  
By: Fahy, JC.  
London, Financial Times, 1990. Class Number: 815 Pamphlet.

Oil Spill Conference 1991: Prevention, Behaviour, Control, Cleanup: Proceedings of the 12th Biennial International Conference, held on 4–7 March 1991, San Diego, California.  
AMERICAN PETROLEUM INSTITUTE API ENVIRONMENTAL PROTECTION AGENCY.  
Washington, API, 1991. Class Number: 769.3.

Radio Transmitter on Road Tankers: Assessment of RF Spark Hazards.  
ERA TECHNOLOGY.  
By: Colwell, B.  
London, Era Technology, 1991. Class Number: 935.3 Pamphlet.

Safety Developments in the Offshore Oil and Gas Industry: An International Conference held on 23–24 April 1991 at Moat House International Hotel, Glasgow.  
INSTITUTION OF MECHANICAL ENGINEERS IMECHE.  
London, Institution of Mechanical Engineers, 1991. Class Number: 935 Pamphlet.

Soviet and East European Energy Databook.  
EASTERN BLOC RESEARCH LTD.  
By: Wilson, DC.  
Newton Kyme, North Yorkshire, Eastern Bloc Energy, 1991. Class Number: 131 Reference only.

## Edinburgh and South-East Scotland branch

The first Minute book of the original Scottish branch of the IP states: 'The Scottish branch was brought into being by a unanimous resolution passed at a meeting of members of the Institute of Petroleum resident in Scotland, held at the Empire Exhibition, Glasgow, on the 7th day of June 1938'. The inaugural meeting of the branch took place in Edinburgh: 150 people attended (an enviably large audience given today's meetings attendances!) to hear a lecture by the President of the IP (Lieut. Col. SJM Auld) entitled 'The New Outlook on Lubrication'.

The branch prospered in the post-war years and organised among other events, the Second International Conference on Oil Shale and Cannel Coal (held in Glasgow) in July 1950, and a joint meeting of the IP and the Association des Techniciens du Petrole (held at Gleneagles) in May 1964. The discovery of oil and gas in the North Sea in the 1960s and their commercial production in Scottish waters since 1975 led to the creation of a new branch of the Institute of Petroleum in Aberdeen in 1972, and of another in the West of Scotland in 1976. What remained of the original Scottish branch constituted itself as the Edinburgh and South-East Scotland Branch.

The original Scottish branch had drawn its membership heavily from the staff of BP Oil and BP Chemicals at Grangemouth, but in contrast the membership of the new branches in Scotland came from engineering, commercial and financial businesses with interests in North Sea oil and gas. Interests in the more financial aspects of the industry also led to the foundation of the Leith Petroleum Club in Edinburgh — despite efforts to recruit budding members to the IP, and despite Edinburgh being the venue for most of the evening meetings of

the branch. The 1980s saw a major petrochemicals development within the 'catchment' of the branch, at Mossmorran in Fife where Shell built a gas separation plant, and Exxon an ethylene cracker. Relatively few new branch members have been recruited from these sources. The reasons for this may be logistic, but in any event, the core of the active branch membership remains the BP Oil and BP Chemicals sites at Grangemouth. The branch is, of course, always delighted to welcome new active members from other parts of the petroleum industry.

### Branch activities

The make-up of the branch membership, and the heavy concentration of petroleum and petrochemicals activities in the branch catchment area ensures that the annual programme of evening meetings continues to reflect the objective of the Institute of Petroleum to be a technological rather than a learned society. The meeting topics are aimed towards the technology of oil, gas and petrochemicals. However, the financial and commercial aspects of our industry as well as environmental matters and renewable energy sources are not neglected. The branch held a symposium on 'Onstream Maintenance and In-situ Repair' in March 1983, and jointly with the IChemE a symposium on 'The North Sea in the Nineties: Economy and Technology', in March 1988.

A feature of the branch programmes for many years has been the holding of joint meetings with other kindred societies in order to keep in touch with the widest range of advances in petroleum and other industries. This practice extends the contacts of the branch members, and also helps to swell audiences at the meetings!

Currently, the branch has joint meetings with the Institution of Chemical Engineers, the Institute of Measurement and Control, and the Pipeline Industries Guild. Other links are also under consideration.

A proud achievement of the branch was the establishment, in 1983 in cooperation with the Petroleum Engineering Department of Heriot-Watt University, of the Annual Student Lecture. These lectures have been consistently well attended by final year and post-graduate students of Heriot-Watt and Edinburgh Universities, and have covered a wide range of topics designed to make students aware of the technical excellence of the work carried out within the petroleum industry. For example, in last year's lecture, Dr Neil Carmichael of Shell Expro spoke about applications of parallel computing within the industry, and brought some excellent demonstrations of the power of the technique in solving problems of seismic and geophysical data analysis.

One tradition has remained with the Edinburgh and South-East Scotland branch from the very early days — the annual 'Spouses' Evening', where there is a chance to socialise followed by a light-hearted talk of general appeal. This year's talk was given by the inimitable Jim McColl, former presenter of BBC's 'Beechgrove Garden'. He spoke on the intriguing topic of 'How Green is Malt Whisky?', and described some of the environmental initiatives being taken by the whisky industry.

All of these events keep the members of the branch committee busy. Most of them come from the staff of firms working in 'our industry'. A few are retired, but continue to serve the Institute loyally.

**RN Beer**

### ENVIRONMENT DISCUSSION GROUP

The next meeting of the Environment Discussion Group will be held at the Institute on **Tuesday, 15 October 1991** starting at 5.30pm. (Tea and biscuits will be available from 5.00pm).

**Biological recovery following oil spills around the world.**

Speaker: **Dr Jennifer M Baker**, Independent Biological Consultant.

If you would like to attend this meeting please contact **Mr AE Lodge**, Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Tel: 071-636 1004.



# THE INSTITUTE OF PETROLEUM

## A TRAINING FRAMEWORK FOR THE 90s — THE CHALLENGE OF INTEGRATION

Thursday, 24 October 1991

A one-day conference organised by the Education and Training Committee

*The following papers will be presented*

**The Concept of a Coherent Training Framework**  
**Ian Williamson**, Director, The College of Petroleum Studies

**NVQ and Personal Competence**  
**John Gregg**, Training Supervisor, Esso Petroleum Co Ltd.

**Management Charter Initiative — How far have we got?**

**Bill Simpson**, Endorsement and VQ Director, MCI

**Continuing Professional Development**  
**Chris Senior**, Senior Executive — CPD, The Engineering Council

**The GEC Professional Development Consortium — A working liaison between industry and higher education**

**Paul Watts**, Director, GEC Management College

**Integrating Distance Learning into Company Training**

**Mike Hawse**, Manager, Distance Learning Unit, British Gas plc.

**The Training Framework and Corporate Strategy — The challenge of integration**

**Doug Riach**, Training Manager, BP Exploration Operating Co Ltd.

*For further information and a copy of the registration form please contact Alan Lodge, Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR. Tel: 071 636 1004.*



## 1992 IP Diary

Orders are now being taken for the 1992 IP Diary. The leather covered diary has the IP crest (as above) reproduced at the top with the date and gives ample space for a company logo to be embossed underneath. The diary will be available in late Autumn.

The colour of the cover will be burgundy.

The diary contains 32 pages of specially printed copy, including oil industry statistics collected by the Institute of Petroleum.

The cost for a single diary is £6.50 (incl. p&p and VAT) and £7.50 overseas.

Discounts are available for bulk orders as follows:

25-49 diaries: £4.75 + VAT each  
50-999 diaries: £4.50 + VAT each  
1000+ diaries: £4.25 + VAT each

Embossing of company logos is available at extra charge.

Enquiries and orders should be made to:

Susan Ashton, Institute of Petroleum,  
61 New Cavendish Street, London W1M 8AR  
Telephone: 071 636 1004. Fax: 071 255 1472  
Telex: 264380

Please reserve for me ..... copies of the 1992 IP Diary

I enclose my cheque for £..... made payable to

**The Institute of Petroleum**

NAME .....

COMPANY .....

ADDRESS .....

TEL No .....

SIGNATURE .....

DATE .....

# Ranger contract for Galaxy

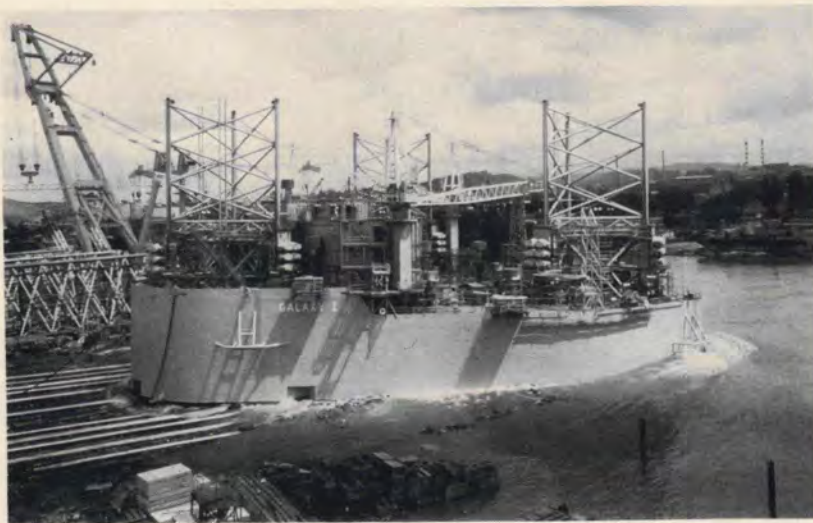
Ranger Oil has contracted to use Santa Fe Drilling Co's new Universe class jack-up rig, *Galaxy I*, beginning this autumn in the Central North Sea.

Built at a cost of approximately \$100 million, the *Galaxy I* represents the largest investment to date for a deep water jack-up rig.

The *Galaxy I*, the world's largest jack-up, will be mobilised to the North Sea and delivered to Ranger from the Far East Levingston Shipbuilding in Singapore.

Ranger will use *Galaxy I* for two wells in the North Sea, one an ultra-deep, high pressure/high temperature well. This enhanced equipment will give *Galaxy I* unparalleled drilling capacity.

*Galaxy I*, designed by Friede & Goldman of New Orleans, is capable of operating in the harsh environment of the Central North Sea in water depths of 440 feet seasonally and 360 feet on a year-round basis.



Into the water: Santa Fe Drilling Co's *Galaxy I* rig is launched into the water in January for the final stages of construction at Far East Levingston Shipbuilding facility in Singapore.



The introduction into British waters by Conoco of one of the world's most modern fleets of oil and gas standby safety ships was marked at a naming ceremony in Aberdeen during Offshore Europe.

The *Veesea Topaz*, one of nine standby vessels operated for Conoco by Vector Offshore of Aberdeen and Great Yarmouth, was named by Mrs Ann Irelan — whose husband Mr Bob Irelan is Conoco's Aberdeen-based production director.

## Greener halon substitute

Aberdeen-based firm Marioff has demonstrated that its Hi-fog water spray system is capable of very rapidly extinguishing all machinery space fires, and subsequently cooling down with very small amounts of water.

A series of tests were carried out at a fire test centre 40km outside Helsinki which clearly proved the rapid capabilities of the system.

The UK Department of Transport felt that 'Marioff Hi-fog could now be regarded as a very effective replacement for ozone depleting halon.'

Through the series of five tests, the fires were extinguished in between 6 and 12 seconds and the amount of water used for extinguishment and cooling was between 7 and 35 litres.

## Joint venture

Seaway and Schlumberger Exploration and Reservoir Services have combined their expertise to provide a fully integrated subsea intervention system for the oil and gas industry.

The joint venture agreement between the companies was signed at the Offshore Europe Exhibition in Aberdeen.

By operating from dynamically positioned vessels, the joint venture will provide a more cost-effective alternative to traditional techniques using mobile drilling rigs.

## Handy system

Dutch based company HDS Ltd introduced the first remote controlled steerable drilling system (bent-housing) at Offshore Europe.

The new tool is an important step forward in directional drilling. The tool is called 'Hands', which stands for 'Hydraulically Activated Navigational Drilling System'.

The tool enables operators to straighten while drilling the benthouse in vertical, horizontal and tangent sections and bend the tool at kick-off points. This is all done by remote control. The bending and straightening is activated in less than one minute.

The main advantages of Hands are: cost-saving, improved drilling and better hole maintenance.



Four pusher tugs have been built by OIL Offshore in the United Kingdom to an innovative twin-hulled design which increases the bollard pull, reduces the bow wave and thus improves fuel consumption. They were built by OIL specifically for operation in the inland waterways of Nigeria, supporting oil production and exploration work.

The use of a catamaran principle achieves the bollard pull associated with a single screw vessel but with the reliability and manoeuvrability of a twin screw vessel. Trial results have shown a bollard pull of 6.1 tonnes with the twin Caterpillar diesel engines producing 500 bhp. This also provides considerable fuel savings over long periods of operation.

## Gulf abandonment system

Smit International has just completed its largest platform abandonment project yet in the Gulf of Mexico. The contract called for total removal of the main deck and jacket of the Vermillion 372 platform, an eight-pile structure in 296ft water depth.

Smit uses a novel system to topple and tow the 2,800-tonne jackets, following the section-by-section removal of 1,000-tonne topsides. The jacket piles are severed with the aid of explosives. The Takheave 31

crane then rigs to the jacket bracing at points situated below the centre of gravity. The jacket is then toppled to the horizontal and lifted clear by Taklift 6. Two tugs then connect to the Takheave 31 and tow the jacket in a submerged condition to a selected disposal site.

Special areas for the controlled disposal of redundant steel jackets have been designated by the states of Louisiana and Texas.

## Geotextile

Heavy duty geotextile from leading Scottish manufacturer Don and Low has been helping an Edinburgh-based oil company prospecting in the foot of the Cantabrican mountains in Spain.

Cairn Energy needed to establish a temporary test rig on a site in Hontomin, mid way between Madrid and Bilbao but local soil conditions and a bad front of running sand beneath the surface meant a stable platform had to be created to take the rig.

Cairn civil engineers specified Lotrak 45/45 with a locally mined limestone layer on top, up to 700mm in depth in places.

## DiffStar recognition

Accurate navigation is so vital to seismic work, rig movements and cable laying that operators always use two or more positioning systems.

But DiffStar for the first time have been promoted to the status of primary navigation aid by a seismic operator, Kongsberg Navigation reports.

Offering better accuracy than many onshore or platform-based systems, covering a much wider area and also being more reliable, calibration-free, simpler to use and far more cost-effective, DiffStar could replace most other systems now in use, Kongsberg Navigation claims.

## Latch-Lok

Hydra-Lok Limited of Barrow-in-Furness, have a revolutionary new service 'Latch-Lok' aimed at speeding up the installation of subsea structures. The Latch-Lok system is a jacking device to level templates while avoiding the need for permanently installed hydraulic jacks and mudmats.

Latch-Lok uses the support piles to react to the template weight during jacking, and this gives precise position control for accurate levelling in any bottom condition.

## Satellite benets

The most detailed and complex information ever obtained about the earth's surface is now being transmitted back to earth from the European Space Agency satellite, ERS-1 — with direct benefits for the oil and gas industry.

ERS-1 will provide invaluable data for the oil and gas industry, including weather and sea-state forecasts for shipping traffic and safe drilling rig construction. The satellite's imaging radar will also be able to detect oil spills at sea, speeding the industry's ability to deal with pollution resulting from such accidents.

British-built Gy-ro rowing machines have been ordered as part of the largest fitness equipment contract ever placed by the North Sea oil and gas industry.

Amoco UK Exploration Company is to place the machines at 15 on and offshore sites. These fitness sites will open in Scotland, one in Amoco's Aberdeen office and one on each of two North Sea oil production platforms. In England, 10 gas production platforms will be supplied plus two regional offices in Great Yarmouth, Norfolk.

In Amoco's London head office gym an estimated 90 percent of the 500 workforce are believed to use the Gy-ro demonstration model.



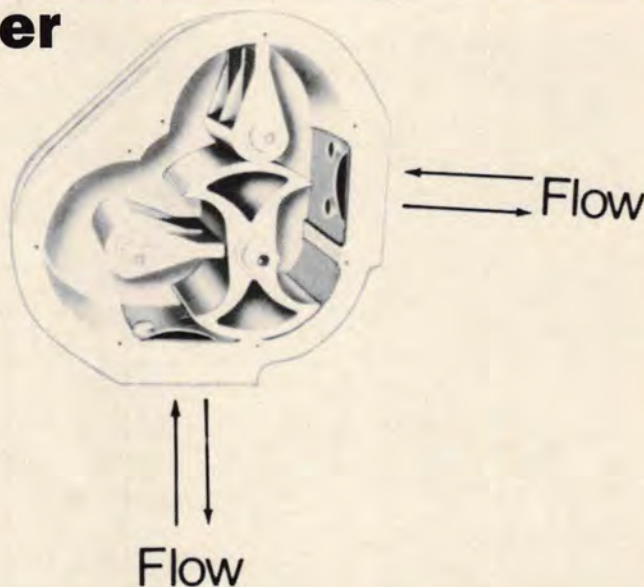
## Rotary motion sweeper

Liquid Control Corporation has launched a new metering system which uses a rotary motion design to prevent paraffin and base sediment and water build-up.

The design keeps the measuring chamber continuously swept clean and so does not trap static liquid that would otherwise allow BS & W to settle out onto working parts.

In addition, the bearings and journals are located high in the measuring chamber and there are no ball bearings to collect paraffin and sand.

The measuring chamber's three moving parts are synchronised to minimise intrusion to liquid flow and provide consistent, volumetric measurement over a range of liquids, flow rates and operating conditions.



Simulated distillation software for the HP 5921A atomic-emission detector from Hewlett-Packard Company provides petroleum analysts with boiling-point distribution as a function of element rather than compound. Analysts can obtain simultaneous carbon and sulphur boiling-point distributions during a single chromatographic run. This new AED capability complies with ASTM Method D-2887 and is used to characterise petroleum fractions. The HP 5921A is the first detector capable of detecting any element except helium in gas chromatographic effluent.

### Technology contact list

RAT (Manufacturing) Ltd	081 847 3331	John Ash Storage Tanks	021 622 4661
HDS Ltd	Holland +31 2207 44714	OIL Offshore	0483 728150
Marioff Services Ltd	0224 249030	Racal Survey Ltd	0734 782158
Seaway	0224 662300	Team Galaxy	US +212 315 8200
Schlumberger Exploration and Reservoir Services	0224 723671	Hewlett Packard	0743 784774
Data Sciences	0932 765511	Don & Low Ltd	0307 65111
Kongsberg Navigation	Norway +47 373 6080	Smit International	0304 813366
Avon Industrial Polymers	02216 3911	Conoco	0224 205315
		Hydra-Lok Ltd	0229 825080

### Green tank alarms

Joseph Ash Storage Tanks has designed special double-skinned storage tanks able to send out an alarm and prevent any leakage of hazardous liquids becoming potentially serious.

The 'Envirotank' can be used above or below ground.

Tim Cope, who heads the Birmingham-based company said: 'Leaking tanks represent a potential environmental disaster for the country.'

### Skyfix Rome station

Racal Survey has launched a high accuracy DGPS SkyFix service in the Mediterranean, using a newly commissioned Global Positioning System (GPS) reference station in Rome.

The new Rome GPS reference station not only covers the offshore industries throughout the Mediterranean but will also afford improved and additional coverage throughout the Adriatic, Aegean and Black Seas.

### Avon's record role

A specialised rubber stator manufactured by Avon Industrial Polymers has played a key part in the creation of a new world record for a horizontal well of 5,373 feet.

The elastomer stator, forming half of the power unit, is moulded and bonded to the outer steel casing. The material properties must be stable at elevated temperatures in contact with aggressive drilling fluids and the complex profile must be maintained at extremely high stress levels.



Amerada Hess have appointed **Dr Caroline Harper**, above, as Marketing Manager of the new direct gas sales operation, Amerada Hess Gas Limited. Dr Harper joins Amerada Hess from British Gas.

Nigeria's former Federal Minister for Foreign Affairs and past President of OPEC, **Alhaji Dr Rilwanu Lukman**, has been appointed to the Chairman's Advisory Panel of Foster Wheeler Limited. The Chairman's Advisory Panel is a new body, formed to render advice on global and strategic issues to the benefit of Foster Wheeler's international clientele.

Foster Wheeler have also appointed **Mr Geoffrey Rimmer** as Group Company Secretary. He succeeds **Mr Colin Agombar**.

Serck Audco Valves have appointed **Mr Peter Hesketh**, below, as Regional Oil Industry Manager for the North Sea oil industry and Scandinavia. Mr Hesketh has been a sales area manager with Serck Audco Valves for two years and has extensive experience in valve technology.



Petroleum Review October 1991

**Mr Neville Henderson**, currently Controller Gas Purchasing with British Gas, is to become the new Director of Industrial and Commercial Marketing at British Gas following the appointment of **Mr Colin Playle** as Regional Chairman, British Gas Scotland.

The International Drilling and Downhole Technology Centre has appointed **Mr Malcolm Coward** as Marketing Consultant. He comes to the Centre from Zapata International where he was responsible for marketing the company's mobile drilling units in the United Kingdom.



Digi Table (UK) Ltd has recently expanded its sales and distribution network with the appointment of **Mr Colin Ballard**, above, as UK Sales Manager. Mr Ballard was UK Sales Manager for Moore Industries for over 10 years and has substantial experience of process control instrumentation in the oil, chemical and gas industries.

Oceaneering International Services Limited have announced the following appointments. **Mr Paul Hayward** has been appointed Engineering Manager and **Mr Thor Haavie** has been appointed to provide technical support on aspects related to Mobile Offshore Production Systems.

Teledyne Exploration have announced the appointment of **Mr Guy Malden** to Vice President and Division Manager of Marine Operations. Mr Malden is responsible for all aspects of marine operations. He has 17 years of experience in acquisition and processing and most recently was employed by Halliburton Geophysical Services Inc.

Smith International Inc has announced the following management changes. **Mr Chan Daigle** has been appointed Area Manager for the United Kingdom, Ireland and Norway and **Mr Andrew Tugwell** has been appointed District Manager for Aberdeen.

Brabant Resources Plc have announced the appointment of **Mr J Harry Peacock** as Chief Geophysicist. He has wide experience of the geophysical field, both as a university lecturer and in industry, and has previously held senior positions with Britoil plc and Geco Geophysical Company.



Salvesen Well Services, an Aberdeen-based division of Salvesen (Oilfield Technology) Ltd, has appointed **Mr Tim Eley**, above, as Sales and Marketing Manager. Mr Eley has 12 years oilfield experience including work as an international Sales and Marketing Manager with Halliburton Geodata.

**Mr Richard McNairn** has joined Tramp Oil and Marine Limited, as Marketing Executive, Crude Oil and Refined Products.

The Yorkshire based oil and petrochemical pump manufacturing specialist David Brown Pumps Limited, a member of the David Brown Corporation Plc, has announced the appointment of two new directors. **Mr Derek Bailey**, formerly Sales Director, has been appointed to the new position of Contracts and Engineering Director, **Mr Malcolm Blackwell** has been appointed to the position of Commercial Director. He joins David Brown from the compressor business unit of NEI where he was Sales and Marketing Manager.



**Mr M Claren Mays**, above, has been appointed Treasurer of Conoco (UK) Limited and elected a Director of the company. Mr Mays was previously an Assistant Treasurer and Manager of Banking and Corporate Finance for E I du Pont de Nemours & Co. He replaces **Mr Heinz Starke** who has transferred to Geneva as Financial Director — USSR and Eastern Europe.

**Dr Graham Dixon** has been appointed to the new Hamilton Chair of Offshore Engineering at the Robert Gordon Institute of Technology. Established in the Institute's School of Mechanical and Offshore Engineering, the Chair is sponsored by Hamilton Brothers Oil and Gas Limited. It is the first industry sponsored Chair of Offshore Engineering in the United Kingdom.

A natural gas directorate has been formed by Shell UK Exploration and Production. The head of the new directorate is **Mr Ian Wybrew-Bond**, below, who since January 1990, has been Natural Gas Manager for Shell UK Exploration and Production, the operator on behalf of Shell and Esso in the North Sea.





## Obituary

Mr Alick Buchanan-Smith MP, a Fellow of the Institute of Petroleum, died on 29 August 1991 aged 59.

Over the period 1983-87 he was Minister of State for Energy. During this time he urged the Institute to give priority to creating standards and operating codes of practice for the offshore oil industry in the United Kingdom but which could also serve as models for use by other countries. The Institute responded to his prompting and a programme of work started which is still continuing.

As recently as last December he was a gracious host at the Institute's Staff Christmas Dinner at the House of Commons.

Alick Buchanan-Smith was a good friend of the Institute and of the oil industry — he will be sadly missed.

## Corrections

### Radio telephones in cabs — avoiding the big bang (July 1991)

Due to a printer's error there was an omission from the text of Mr Millington's article which might cause misunderstanding. The paragraph commencing on line 26 of column 3 on page 338 should have read 'Similarly, from an RF point of view, hand held cellular radio telephones operating at frequencies above 870MHz may safely be used on retail forecourts since it is not practically possible for them to be placed sufficiently close to the URA to be capable of producing a spark on the URA'.

### Minimum transferred volume necessary for accuracy when determining custody transfer volumes by tank gauging (August 1991)

There was a typographical error in Table 1, page 371. The value for C1 should read 0.1 percent rather than 1 percent and the value for C2 should read 0.05 percent rather than 0.5 percent.

## Annual Dinner

Please note that tickets for the 1992 Annual Dinner are only available to collective or individual members of the Institute.

## New Collective Members

**Brown & Root Limited**, 150 The Broadway, Wimbledon, London SW19 1RX. Tel: 081 544 5000. IP Nominated Representative: Mr Keith N Henry, Chief Executive.

Brown & Root, engineering contractors, a subsidiary of Halliburton Holdings Ltd, are engaged in the design, fabrication and installation of offshore oil and gas platforms and onshore petroleum and chemical plants. They are also involved in the civil engineering, defence and industrial sectors.

**Petroleum Argus Limited**, 83/93 Shepperton Road, London N1 3DF. Tel: 071 359 8792. IP Nominated Representative: Mr Adrian Binks, Managing Director.

Petroleum Argus Limited publishes *Weekly Petroleum Argus*, specialising in reports on the oil markets and price assessments.

## Death

We report with much regret the death of the following member:

JB Christian, Barton-on-Sea, Hampshire

**Born**  
1902

## Around the Branches

### Aberdeen

8 October: 'Ninian — The Next Decade', Alan Higgins, Chevron UK Ltd.

12 November: 'North Sea Safety', Tony Barrell, Health and Safety Executive.

22 November: Annual Dinner — Guest Speakers: Mr John Collins, Chairman of Shell UK and Mr Richard Coe-Hamilton, Chief Executive, Clydesdale Bank Plc.

### Edinburgh and South East Scotland

10 October: 'Nissan — Driving towards 2000', Mr R McIntosh, Director, Advanced Engineering, Nissan, (joint meeting with Institute of Measurement and Control).

7 November: 'Prospects for Renewable Energy in Scotland', Mr R Morris, Group Head, Energy and Environmental Technologies, Scottish Enterprise.

### Essex

16 October: 'Bitumen, Ancient and Modern', Mr TS Hoben, Technical Manager, Shell Bitumen.

13 November: Ladies Evening — 'Wines of Europe', Mr PA Gibb, Branch Manager, Peter Dominic Ltd. Followed by buffet supper.

### Humber

17 October: 'Humber Tugs Past and Present', Mr LAJ Dalrymple, Managing Director, Humber Tugs.

25 October: Dinner Dance.

### Irish

14 November: Annual Dinner

### London

23 October: 'Current/Future European Fuel Quality and Vehicle Emissions Standards', Mr J Feltham, Department of Energy.

14 November: 'Piper Alpha and the Cullen Report — The Aftermath', Dr BGS Taylor, UK Offshore Operators Association.

### Malta

19-22 November: 'Clean Seas 91 Conference' co-sponsored by IP Malta Branch.

### Midlands

16 October: 'Transportation of Hazardous Materials', Sergeant Lewis, West Midlands Police.

13 November: 'Diesel Emissions', Dianne Hall, BP International.

# Institute News

## North East

- 4 October: Branch Dinner.  
12 November: 'Gas from the North Sea to Teesside — A description and progress report on the Amoco CATS project', Mr D Nelsen, Amoco.

## Northern

- 15 October: 'Making Clear Grease', Mr J Cliff, Ironsides.  
12 November: 'Futures and the Spot Market', Mr G Watson.  
29 November: Dinner Dance, guest speakers Mr Basil Butler OBE, President of the IP and Mr T Wilkinson, Chairman of Blagden Industries plc.

## Southern

- 4 October: Visit to Fawley Refinery.  
15 October: 'Aircraft Accident Investigation', Royal Aeronautical Establishment (joint meeting with the IMechE).  
22 November: 'Defence Procurement', George Eynon, Woolwich.

## Stanlow

- 11 October: Works visit — Tour of Wrexham Lager Brewery.  
27 November: 'Fast Track Project Management', Mr H Wang, Shell UK Oil, (joint meeting with IChemE).  
29 November: Annual Dinner Dance.

## Shetland

- 14 October: 'Subsea Development'.  
1 November: Annual Dinner, Guest Speaker Dr Harold Hughes OBE, Director General, UKOOA.

## South Wales

- 24 October: 'Safety Measurement and Control', Mr G Farnell, International Loss Control Institute.  
21 November: 'Expert Systems in the Oil Processing Industry', Mr P Andow, KBC.

## West of Scotland

- 21 October: Celebrity Lecture.

## Yorkshire

- 8 October: 'Vehicles, Emissions, Fuels and Lubricants', Mr J May, Executive Engineer, Analytical and Environmental Services, Rover Group.  
12 November: 'BS5750 Quality Assurance — An Assessors Point of View', Mr I Hodgkinson, Development Manager, Lloyds Register.

## New Members

- Akintoye, FO, 13 Oyemade St Santos, Lay-out Dopemu Agege, PO Box 118, Nigeria  
Amine, RC, Robert Amine Research Associates, Watt Cottage, Catsey Lane, Bushey Heath, Herts WD2 3HY  
Baldwin, JC, Roseneath, Peat Common, Elstead, Surrey, GU8 6DX  
Bates, DJ, 3326 South Sutton Square, Stafford, Texas 77477, USA  
Berney, NP, 170 Salmon Street, Kingsbury, London NW9 8NX  
Clausen, LE, 15 Ashcroft Park, Cobham, Surrey KT11 2DN  
Draper, D, 46 Mulcaster Avenue, Grange Park, Swindon SN5 6EH  
Fisher, SW, Wroxton House, Flat 3, 6 Gillisland Road, Edinburgh EH10 5BW  
Halton, BJ, 1 Dairy Bungalow, Briantspuddle, Dorchester, Dorset DT2 7HU  
Keith, DB, Drumoak House, Drumoak, Banchory AB31 3HA  
Kossifos, A, King George No 8, Larnaca, Cyprus  
Loveridge, DJ, Maltmans House, Maltmans Lane, Gerrards Cross, Bucks SL9 8RS  
Millar, JA, 12 Shore, Arbroath DD1 1PB  
Miller, M, Whistlebrae, Braco, Dunblane, Perthshire FK15 9RA  
Minton, PA, 6 Woodholm Close, Crundale, Haverfordwest, Dyfed SA62 4DH  
Norman, RA, 2 Church Path, Wendens Ambo, Nr Saffron Walden, Essex CB11 4JZ  
Pang, Capt TCR, Blk 22, Apt 24-182, St George's Road, Singapore 1232  
Perks, DR, 44 Lambert Court, Kingswinford, West Midlands DY6 7RA  
Preller, TR, 2 Kirkham Drive, Toton, Notts NG9 6HG  
Prentice, IA, Pine Cottage, Blackhall, Banchory, Kincardineshire AB31 3PS  
Richardson, KW, 207 Rushgreen Road, Lymm, Cheshire HA13 9QY  
Ronayne, PJ, 11 Manor Close, Tongham, Farnham, Surrey GU10 1DB  
Sarraf Nahar, R, National Iranian Oil Company, International Affairs, 12th Floor Crude Exports Operation, Central Building of NIOC, Tehran, Iran  
Serrano Velasco, A, 78 Cadogen Square, London SW1X 0EA  
Steenbergen, HDC, Chevron UK Ltd, (Human Resources), 2 Portman Street, London W1H 0AN  
Telford, C, 16 Reid Street, Middle Greens, Morpeth, Northumberland NE61 1TY  
Tett, STL, 10 Maud Terrace, Gt Yarmouth, Norfolk N30 4JD  
Thomas, RM, Key Offshore Marine Ltd, 54 South Street, St Andrews, Fife KY16 9JY  
Thomson, SRP, 75 Marlborough Road, Ryde, Isle of Wight PO33 1AF  
Tomlins, M, Orchard Cottage, Cold Harbour, St Briavels, Glos GL15 6SD  
Watson, I, 10 Dulverton Way, Guisborough, Cleveland TS14 7BZ  
Whittome, D, 39 Markham Square, London SW3 4XA

## Deliveries into Consumption

UK deliveries into inland consumption of major petroleum products — Tonnes — July 1991

Products	Jul 1990†	Jul 1991*	Jan-Jul 1990†	Jan-Jul 1991*	% change
Naphtha/LDF	248,610	283,620	1,740,600	2,033,750	16.8
ATF—Kerosine	653,610	630,140	3,841,600	3,380,530	-12.0
Motor Spirit	2,112,360	2,160,460	14,198,200	13,893,090	-2.1
of which unleaded	716,260	892,900	4,540,490	5,548,850	22.2
Super unleaded	84,710	106,110	509,200	650,090	27.7
Premium unleaded	631,550	786,790	4,031,290	4,898,760	21.5
Burning Oil	131,830	114,290	1,173,570	1,367,740	16.5
Derv Fuel	917,980	924,610	6,220,420	6,177,310	-0.7
Gas/Diesel Oil	631,410	557,670	4,769,950	4,778,920	0.2
Fuel Oil	1,289,700	860,260	8,388,146	7,075,030	-15.7
Lubricating Oil	65,426	69,650	475,896	462,660	-2.8
Other Products	493,784	618,680	3,761,438	3,699,810	-1.6
<b>Total above</b>	<b>6,544,710</b>	<b>6,219,380</b>	<b>44,346,460</b>	<b>42,868,840</b>	<b>-3.3</b>
<b>Refinery Consumption</b>	<b>520,120</b>	<b>528,810</b>	<b>3,467,610</b>	<b>3,504,080</b>	<b>1.1</b>
<b>Total all products</b>	<b>7,064,830</b>	<b>6,748,190</b>	<b>47,814,070</b>	<b>46,372,920</b>	<b>-3.0</b>

†Revised \*Preliminary



CHEM SYSTEMS

### OIL INDUSTRY CONSULTANT IN ENERGY AND REFINING

Chem Systems is an international consulting group providing business planning services to the hydrocarbon process industries.

We are seeking an additional consultant in our Energy practice who can make a substantial contribution to our consulting business, particularly in the areas of refinery operations, planning or supply. Candidates must have a technical degree and five to ten years' industry experience. They must also understand the economics of the refining and marketing business. A knowledge of the refining/petrochemical interface is desirable.

Candidates are expected to have highly developed communication skills, be self motivating and work with the minimum of supervision.

The preferred age range is 28-35. This will be a demanding but very interesting position for those currently in the fast-track within their own organisation.

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Reporting to the Production Manager and responsible for liaison between Production and Projects/Construction departments of Egyptian oil company, the successful candidate will advise on specific requirements and logistical essentials for on and offshore production plant facilities from a production departments viewpoint, especially on startup (first oil/gas to plant) with an emphatic overview on field equipment requirements.

Background: preferably BSc in an Engineering discipline with a minimum of 10 years experience in front line Production Plant control room supervision. Comprehensive understanding of well services field work and sound experience in Process Engineering and associated plant.

Salary commensurate with experience. Leave schedule negotiable as single/family status. Medical and life cover. Start October '91.

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**The Institute of Petroleum**

**The Fourth Oil Loss Control Conference**

**REAL AND APPARENT LOSSES IN REFINING AND STORAGE**

**30-31 October 1991**

**A two-day conference to be held at  
The Institute of Petroleum**

Please contact:

**Caroline Little, The Institute of Petroleum Telephone: 071 636 1004.**



The Institute of Petroleum  
**Remediation of  
Industrial Sites**

22 October 1991

A one-day conference to be held at  
The Institute of Petroleum, London

The remediation of polluted industrial sites has now become a major environmental issue. Technologies for the clean-up of soil and ground water contaminated by petroleum products and chemicals includes remediation techniques that can leave sites intact. This conference will discuss the development application of these techniques and some case histories.

*The following papers will be presented:*

**UK Legislation and Developments**

Dr Judith Denner, Department of the Environment,  
Contaminated Land Branch, Local Environment  
Quality Division

**European Approaches to Contaminated Sites**

Dr G Edulgee, Environmental Resources Ltd

**Petroleum Industry View of Contaminated Sites**

Ir B Horvat, Shell Internationale Petroleum Mij BV

**Site Assessments and Analysis Strategies**

M James, Land Restoration Systems

**Soil and Groundwater Remediation Technology  
Overview**

Dr P Wood, Warren Spring Laboratory

**CASE HISTORIES**

**1 Bioremediation**

Dr P Barratt, Biotreatment Ltd

**2 Bioremediation**

A de Boer, Nederlandse Aardolie Maatschappij BV

**3 Physico-chemical methods — Venting**

J Harrison, Delft Geotechnics UK Ltd

**4 Alternative Physico-chemical methods**

Dr MA Smith, Clayton Environmental  
Consultants

*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, UK.**

**Telephone: 071-636 1004. Telex: 264380. Fax: 071-255  
1472.**



**IS THERE A FUTURE FOR  
THE INDEPENDENTS IN  
THE UK NORTH SEA?**

**Thursday 21 November 1991**

To be held at

**The Cavendish Conference Centre,  
London**

Even though the North Sea is now considered to be one of the world's more mature oil provinces, the recent 12th licensing round aroused a great deal of interest from companies still prepared to face the challenges offshore.

Among these companies the independents successfully accounted for 25 percent of the new acreage granted, showing that they were confident they could overcome the special risks that accompany exploration on the United Kingdom Continental Shelf.

This conference, organised jointly by the Institute of Petroleum and County NatWest Wood Mackenzie (CNWM), brings together a group of acknowledged experts and analysts to look at the role of independents in the North Sea and the future risks involved.

Aside from a comprehensive overview on the independent sector by CNWM, the conference's topics will cover every aspect of the business from starting up an independent company to breaking into the international market.

*For further information, and a copy of  
registration form which will be available  
shortly, 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 300 members offer 44 different categories within which we can identify other areas of expertise.

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**Finance**  
**Fuels & Fuel Technology**  
**Government & EC Relations**  
**Health and Hygiene**  
**Industrial Relations**  
**Information Technology**  
**Laboratory & Test Method Advice**  
**Legal Advice**  
**Loss Prevention**  
**Loss Prevention – Marine**  
**Lubricant Technology**  
**Maintenance & Inspection**  
**Management Organisation**  
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(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