SEPTEMBER 1993

The Institute of Petroleum

PETROLEUM REVIEW

North Sea

Shallow gas hazards — a HSE perspective

Well engineering in the 1990s

Conference report

From the South East Asia Australia Offshore Conference

Distribution

The role of coastal shipping around the United Kingdom

सत्यमेव जयते

GOVERNMENT OF INDIA

NOTICE INVITING OFFERS

FOR

EXPLORATION FOR OIL & NATURAL GAS

SIXTH ROUND OF BIDDING (1993)

As part of the continuous round-the-year bidding scheme for exploration acreages, the Government of India announces the Sixth Round of Bidding for exploration in India. Companies are invited to bid for the exploration blocks on offer. 23 blocks from those offered in the Fifth Round of Bidding are being offered again in the Sixth Round. In addition, 23 other blocks are on offer, making a total of 46 blocks on offer, with 17 of them being offshore and 29 onshore. Companies may bid for one or more blocks, singly or in association with other companies.

CONTRACT FEATURES

Production - sharing contracts would be entered into by the Government of India and Oil and Natural Gas Commission or Oil India Limited with successful companies, with a number of attractive features, the more prominent of which are as follows:-

- ★ The possibility of a seismic option in the first phase of the exploration period
- ★ No minimum expenditure commitment during the exploration period
- ★ No signature or production bonus
- ★ No royalty payment
- ★ Progressive fiscal regime with sharing of profit oil/profit gas being tied to the post-tax profitability of the venture for the companies
- ★ No ring fencing of blocks for corporate tax purposes
- ★ Provisions for encouraging the production and marketing of gas
- ★ Purchase of company's share of oil at international market price.
- ★ Provision for assignment.
- ★ Provision for international arbitration

BID ITEMS

Companies would be required to bid for:-

- ★ Profit oil and profit gas shares expected by the contractor at various levels of rate of return or multiples of investment recovered.
- ★ Percentage of annual production expected to be allocated towards cost recovery.
- ★ Total length of exploration period, number of phases in exploration period and minimum work commitment in each of the phases.

INFORMATION AVAILABILITY

A brochure giving details of the blocks offered, their geographical location on a map of India and the contract terms will be made available free of cost to companies.

To enable companies to assess the geological prospects of the blocks on offer, information dockets and data packages are available on sale. Separate information dockets on each basin are available, containing information on regional and local geology and the current status of exploratory activities in the blocks in each basin. The data packages contain seismic sections, gravity and magnetic anomaly maps, wireline logs and structure contour maps etc. and have been prepared for most of the blocks.

Companies interested in inspection and purchase of information dockets and data packages and in obtaining further details regarding the offer may contact :

Mr. R.N. Desai
Head, EXCOM Group
Oil and Natural Gas Commission
7th Floor, Bank of Baroda Building
Parliament Street
New Delhi-110 001, INDIA
Telephones : 3317205, 3715291
Telex : 031-65184, 031-66262
Facsimile : 3316413

Bids should be submitted in sealed envelopes superscribed **"Confidential" "Sixth Round of Bids (1993)"** not later than **3.00 PM** on **31st December, 1993,** to :

Director General of Hydrocarbons
Ministry of Petroleum & Natural Gas
2nd Floor, Shastri Bhavan
Dr. Rajendra Prasad Marg
New Delhi 110 001, INDIA

CHIRANJN

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Contents

Cover photo – New visual communication system. Photograph by British Gas

. . . news in brief

20 July
A new LPG plant is to be built at Fuzhou, the capital of Fujian in China, in a joint venture agreement between BP, Hong Leong and China's Fuzhou Gas Corporation.

National Power has pulled out of a joint venture agreement to construct and operate two gas-fired power stations in Malaysia.

21 July
British Coal announced losses for last year of £588m and predicted coal sales of less than eight million tonnes over the next two years.

26 July
Production has begun from the first of the Wytch Farm extended reach wells. The well extends to a distance of 3.8 km horizontally, into the offshore section of the Sherwood reservoir lying under Poole Bay.

27 July
Untapped trade with Colombia could be worth as much as $8bn, Trade Minister Richard Needham announced during a three-day official visit to London by President Gaviria.

28 July
China Ocean Shipping Co (Cosco) has been fined $1m by Washington State for an oil spill in July 1991. The spill was the result of a collision between a Cosco ship, carrying more than 450,000 gallons of bunker and diesel fuel, and a stern trawling fish factory.

29 July
Global Marine claims it has broken a UK rig safety record on its Glomar Labrador 1 jack-up, by chalking up five accident-free years.

The worker who claims he suffered psychiatric injury after witnessing the Piper Alpha disaster from a rescue vessel is not entitled to claim damages, the Court of Appeal has ruled.

1 August
An £8,000 tax-free ceiling on relocation assistance for all UK company personnel has been introduced by the Inland Revenue.

A new sea/air service operating directly into the interior of the CIS is to be run by Lykes, one of the USA's largest shipping companies, together with Kent International Airport and AirRep UK.

3 August
The Orwell gas field, 104 kms east of the Norfolk coast, produced its first gas eight weeks ahead of schedule.

New health and safety regulations governing the provision of information on and packaging of dangerous chemicals were laid before Parliament. They come into force on 1 September.

4 August
Mr Philippe Jaffre was confirmed as the new chairman of Elf Aquitaine, clearing the decks for privatisation.

First gas from BP's Bruce field reached the Total-operated terminal at St Fergus eight weeks early.

6 August
Eurecat SA has expanded into Japan and the Far East by forming Nippon Eurecat Co Ltd. The new firm will be located in the Shikoku region of Japan and construction of a plant for the regeneration and presulfiding of catalysts has begun already.

The one pipeline still carrying natural gas to Armenia was blown up in neighbouring Georgia, bringing the total of reported attacks to six.

China has opened its new $30m oil transhipment centre. Situated in Zhoushan, it is capable of handling tankers carrying more than 230,000 tonnes and has three storage tanks capable of handling 100,000 cu m.

8 August
A Romanian court has blocked the 51 percent sale of state shipping company, Petromin, to the Greek firm, Forum Maritime.

9 August
OPEC's oil output for July was more than 1m bpd over quota, according to the *Middle East Economic Survey*. A large part of the additional supply came from Kuwait, who refused to join the third-quarter quota accord in June.

Pakistan's only national flag oil tanker, *Johar*, ran aground off Karachi port with a crude oil load of 68,701 tonnes. It took almost 24 hours to refloat the vessel, which temporarily closed down shipping activities at the oil piers.

Dragon Oil has joined forces with a Philippine consortium to undertake a major Far East drilling programme. Its interests in Korea and Thailand have been farmed out and a stake acquired in a Philippine licence.

10 August
OPEC's compliance committee agreed at a meeting in Vienna to maintain the 23.6m barrel a day ceiling beyond the third quarter.

Amoco Netherlands Petroleum Company has announced the successful installation of the processing platform deck for the P15/P18 gas fields development in its new Dutch North Sea project.

Aran Energy Corporation has completed the first phase of upgrading the South Pass 37 field in the US Gulf of Mexico with a further horizontal gas production well.

A contract for detailed engineering of two oil platforms and some 20 kms of pipeline in the South China Sea has been awarded to Kvaerner Engineering.

11 August
A national management centre to support the needs of the offshore industry is to be established at the Robert Gordon University in Aberdeen.

The Venezuelan Cristobal Colon gas development is to go ahead after the country's Congress approved an agreement giving state oil company PDVSA a 30 percent share, Shell another 30 percent, Exxon 29 percent and Mitsubishi 8 percent.

Natural gas deliveries to Azerbaijan have been suspended by Turkmenistan after it failed to pay gas transportation fees.

The 39,848 dwt *Chevron Oregon* has left the Point Arguello oil field off Santa Barbara, California, with a cargo of crude oil. She is the first tanker to sail after more than a decade of protest by environmentalists.

Taiwan's state-owned Chinese Petroleum Corporation (CPC) has invited 20 private Taiwanese companies to back a multi-billion dollar petrochemical complex on the island.

12 August
Stolt Comex Seaway has been awarded a £9m subsea contract by Total Oil Marine for tie-in work on the Dunbar, Ellon and Alwyn North fields in the UK North Sea.

13 August
Elf Enterprise Caledonia has announced plans to drill an exploration well five miles offshore in Poole Bay.

The United States, Britain and France issued an ultimatum to Libya threatening oil sanctions unless two men suspected of the 1988 Lockerbie bombing are handed over for trial to the French authorities.

15 August
Venezuela has approved two projects to exploit the heavy crude oil from its Orinoco tar belt. The joint ventures will involve state oil company, Maraven, together with Total and Marubeni of Japan.

Iraq has accused Saudi Arabia and Kuwait of breaking OPEC production quotas in its ruling Baath party newspaper, *Thawra*.

16 August
The head of British Petroleum's Vietnam operations, Mr Mike Yeldham, has firmly denied widespread rumours that the firm has discovered an offshore gasfield containing between two and three tcf.

Japan's largest oil distributor and refiner, Nippon Oil, has announced it plans to spend a total of ¥20bn ($195.3m) on overseas exploration during the next two years.

DATES FOR YOUR DIARY...

Monday 13 September 1993
5.00 p.m. for 5.30 p.m.

'The Russian Oil and Gas Industry – whose opportunity?'

An insider's viewpoint

By Professor Valeri Shapiro, Director General Infoservice, Moscow

The status and outlook of both sectors primarily from an oilfield construction point of view.

Organised by Energy Economics Group.

IP Contact: Pauline Ashby.

Tuesday 21 September 1993
5.00 p.m. for 5.30 p.m.

The Work of the International Petroleum Industry Environmental Conservation Association

By John S Lemlin, Executive Secretary

Organised by Environment Discussion Group.

IP Contact: John Phipps.

Wednesday 22 September 1993
5.15 p.m. for 5.45 p.m.

Action Learning

Integrating Individual Development and Business Improvement

By Chris Brooks

How Action Learning was developed, and used in Shell Chemicals UK Ltd and directly contributed to the bottom line

Organised by Personnel, Education & Training Discussion Group.

IP Contact: Bob Edmondson.

Wednesday 6 October 1993
6.00 p.m

Copyright and the Energy Information Practitioner

Organised by Information for Energy Group (IFEG)

IP Contact: Catherine Cosgrove

FUTURE MEETINGS

Date	*Title*	*Group*	*Contact*
18 October	Promoting the engineer as the professional of the next century	Energy Economics Group	Pauline Ashby
21 October	Gas market liberalisation *By Dr Ian Thompson*	Energy Economics Group	Pauline Ashby
27 October	Treatment of oil-spills	Environment Discussion Group	John Phipps
16 November	UK government environment policy	Environment Discussion Group	John Phipps
22 November	European automotive fuels *By Roger Hutcheson*	Energy Economics Group	Pauline Ashby

All meetings are held at the Institute of Petroleum. Please tell the IP contact if you plan to attend any of these free meetings. Tel: (071) 636 1004. Fax: (071) 255 1472.

UK blocks PRT reform loophole

The UK government is to introduce legislation in the next Finance Bill which will block a £300 million loophole in the Petroleum Revenue Tax (PRT) reforms.

The Treasury has also implied that if companies push their claims under the loophole to the point of litigation, relief currently available for 'demonstrably abortive expenditure' on oil exploration may have to be withdrawn.

The announcement came after a number of companies lodged claims for relief under Section Five of the Oil Taxation Act 1975 following the PRT changes.

Section Five provides relief against PRT paid by producing fields for 'abortive' exploration work carried out between 1960 and 1983.

The claimants argue that some of their old expenditure is now eligible for relief under the clause because new producer fields which would have subsidised the work will no longer do so because they won't pay PRT and therefore are not eligible for exploration relief.

The Treasury is concerned that this technicality could escalate the cost of claims under Section Five from the usual £1-£15 million to as much as £300 million in 1994/95.

'To avoid uncertainty and the possibility of substantial sums of tax being lost to the Exchequer during potentially lengthy litigation', Treasury Minister Stephen Dorrell announced, 'the government will be introducing legislation in the next Finance Bill. This will put beyond doubt that the old Section Five relief will indeed continue to be due, but only for truly abortive expenditure.'

The proposed legislation will be retrospective to July 27 this year.

Saudi buys into Rotterdam refinery

Saudi Arabia has enhanced its supply position in northwest Europe by buying a one-third stake in a Rotterdam refinery from Texaco.

Aramco Overseas Company, a wholly-owned subsidiary of the Saudi Arabian Oil Company, has acquired a 34.35 percent share of the Texaco/Esso Refinery from Texaco Raffinaderij Pernis (TRP). This leaves Texaco with a reduced 22.78 percent stake. Esso Nederland remains unchanged with a 42.85 percent share.

The move will not only provide Saudi with a better European supply position but will enhance its access to crude oil storage. Until now, it has had to make do with rented storage capacity. The terminal receives, stores and pumps crude oil for the Esso refineries in Rotterdam and Antwerp and has a storage capacity of 2.7 million cubic metres. Texaco is the current operator of the facility.

For Texaco's part, the decision to sell was to 'bring its storage facilities into line with operating requirements'.

In 1989, Texaco formed the Netherlands Refining Company with BP. This joint venture agreement linked two refinery sites at Pernis and Europoort, giving Texaco additional storage and throughput facilities, and lessening the importance of the Rotterdam location.

A new independent operator is to be formed to run the terminal, to which all employees will be transferred.

The existing collective labour agreement, which runs till 31 May next year, will be maintained.

Ocean Odyssey firms fined a record £275,000

Arco British has received the highest fine ever imposed on an oil company under the Health and Safety at Work Act 1974 for its part in the 1988 Ocean Odyssey rig disaster.

The firm, which operated the rig, pleaded guilty to two charges under the Act at the High Court in Aberdeen. Also in the dock was Odeco, owner of the rig, who was fined £25,000 after pleading guilty to two similar charges, as well as one under the Mineral Workings Act.

Radio operator Timothy Williams, 25, was killed on the rig when it was rocked by a series of explosions on 22 September 1988.

He had already been evacuated into the relative safety of a lifeboat when he was ordered back to the radio room by Offshore Installations Manager (OIM) Mr Radu Ionescu in order to establish contact with the shore.

The court heard how Mr Williams was chosen over the other radio operator on board because it was felt his youth would give him a better chance of surviving if forced to jump into the sea. The other 66 crew survived, most escaping by lifeboat. William's body was recovered in a pilot room two days later – it had been his first trip offshore.

The heaviest criticism was meted out to senior Arco personnel who 'persisted in a deliberate course of conduct contrary to accepted drilling practice'. Advocate Depute Alistair Campbell told the court that in the days leading up to the incident the exploration well had become increasingly unstable, with several influxes of gas and the loss of drilling mud into the rock formation.

Three to four hours before the first explosion take place, Odeco's drilling supervisor, Mr Bruce Wiseman, decided to shut down the well but his action was dismissed by Arco's drilling supervisor, Mr John Browne, who said: 'Let's get on with the job - you are scared of a little bit of gas'.

Judge Lord Cowie heard how Arco drillers had ignored increasingly clear signs that the well was out of control. Half an hour before the explosion, gas was screaming from the derrick 'like a jet engine' and drilling mud was spilling back over the rig 'like a tidal wave'.

'It was astonishing', said Mr Campbell, 'that Arco personnel did not shut down the well at that time'.

Criticisms of Odeco centred around a failure to have an appropriate management system in place, leading to a lack of communication between the OIM and other crew members.

Mr Michael Jones, for Arco, said this was a unique and isolated incident on a frontier well from which the safety lessons had been fully learnt. Mr John Mitchell, for Odeco, said the firm had taken steps to ensure such an incident was never repeated.

Prior to this case, the highest safety fine ever to be imposed on a North Sea oil company was £101,000 against Atlantic Drilling. This was subsequently almost halved on appeal.

The Ocean Odyssey trial set a further precedent by being the first case against a North Sea oil company ever to go before the High Court.

Powergen gets Orimulsion go-ahead

The decision to allow PowerGen to burn Orimulsion at two of its power stations has provoked strong reaction from both environmentalists and National Power.

Powergen has been burning the fuel for more than two years on a trial basis but has now been granted permission by Her Majesty's Inspectorate of Pollution (HMIP) to continue for another five before having to fit clean-up equipment.

The company has until April next year to produce plans to control emissions, and until April 1998 to put them into practice.

The two power stations concerned are Richborough, on the Kent coast, and Ince B in Merseyside.

While environmentalists claim Orimulsion is the world's dirtiest fuel and should never be burnt without pollution controls, National Power wants to know why it received a different response to its own request to use the fuel at Pembroke.

A spokesman for National Power said it withdrew its application after HMIP stipulated that clean-up equipment would have to be fitted before any Orimulsion could be burnt.

Asked why the treatment had been different, he told *Petroleum Review*: 'Powergen was burning it before – we've never burnt it. They'd set a precedent.'

A spokeswoman for HMIP said every authorisation had to be treated differently, according to the age of the plant, the surrounding environment, etc.

Orimulsion is a 70-30 percent bitumen in water emulsion produced from the world's largest natural bitumen deposits in the Orinoco belt of Venezuela. It has a sulphur content of about 2.7 percent wt.

One study, carried out for South Pembrokeshire Council by Dr Robert Pigmore of Gibb Environment Science, indicates that Orimulsion waste particles are finer than other fuels. However, the Inspectorate rejects claims that Orimulsion is a dirty fuel.

'It compares very favourably with other heavy fuels, said a spokeswoman. 'It emits more sulphur dioxide but 20 percent less carbon dioxide, less dust and less vanadium.

'During the trial period with Powergen, we looked at emission levels, at the equipment needed and at how other countries were curtailing sulphur dioxide – we haven't been sitting idle.'

National Power remains keen to use orimulsion, which undercuts both coal and heavy fuel oil. A spokesman said they were looking at ways in which this could still be achieved.

OPEC warns of further price fall

In a confidential report, OPEC's Quota Compliance Subcommittee has warned that oil prices will continue to drop if member countries persist in over-production.

The report, quoted in the *Middle East Economic Survey*, said that if action to remedy the situation is delayed 'the best part of 1994 will also be lost for the organisation'.

The subcommittee accused members of 'persistent over-production' since March this year. Official crude oil production for July exceeded the current ceiling of 23,582 million barrels a day (b/d) by 924,800 b/d. However, according to the report, the true figure for total crude output may have been 24.8 million b/d or more.

Iran, in particular, is believed to have under-quoted both its production and supply figures for July. Secondary sources suggest it exceeded its quota by 354,000 b/d.

Peru changes laws to attract investors

Three laws , designed to make Peru's oil reserves as attractive to investors as those of Colombia or Argentina, have been passed by the country's Congress.

Exports will now be free of tax, foreign oil companies will be able to dispose of oil they extract in any way they wish and restrictions preventing exploration within 30 miles of the country's borders will be lifted.

A new state body, Perupetro, has also been set up to promote investment in oil exploration and development and to negotiate contracts with investors, a duty previously carried out by state-owned Petroperu.

The new body will also take over the administration of taxes and royalties.

A three-tier, 10,000-tonne oil platform deck finally set sail for the Shell Nelson field on 6 August after a 24-hour bad weather delay.

It was lifted into position two days later, having journeyed 220 miles from Teesside to Block 22/11 in the UK sector of the North Sea.

The deck, the size of a football pitch and with a power generation capability of 30mw, was constructed by Trafalgar House Offshore Fabricators, part of the Engineering Division of Trafalgar House.

The 8,900-tonne jacket was towed out in March. It had been constructed over a period of almost two years at another of the Trafalgar House yards.

Strong support for Gas Interconnector

Over 20 firms have expressed an interest in proposals for a Gas Interconnector linking Britain with the Continent, allowing the project to move now towards the preliminary engineering phase.

Interest shown so far already surpasses the 15 billion cubic metres a year initial design capacity of the line. Several more firms are still considering taking capacity, according to Mr John Wood-Collins, who manages a study group set up to look at the feasibility of the project.

Even taking into account 'double-counting', it now seems possible that the high level of support could lead to a downrating of proposed tariffs. A revised level should be indicated before the end of this month.

The £290 million plan is for a 36 inch subsea pipeline, together with compression facilities in the United Kingdom, which would link the British and Belgian national gas transmission systems. Construction would be from Bacton in Norfolk to Zeebrugge.

The project is being sponsored by a group of seven companies: British Gas, BP, Conoco, Elf, Statoil and Norsk Hydro, together with Distrigaz of Belgium.

John Walmsley leaves Enterprise

Enterprise Oil is to lose Finance Director John Walmsley at the end of the year. Mr Walmsley (46), one of the founding members of the 10-year-old firm, has decided to pursue 'alternative career opportunities'. He will be replaced by Mr Andrew Shilston as Group Finance Director. Mr John van der Welle, at present Corporate Finance Manager, will succeed Mr Shilston as Group Treasurer.

Mr Graham Hearne, Chairman and Chief Executive at Enterprise, said: 'We are extremely sorry to lose John from the Board. He leaves us with our deep appreciation for all he has done. However, we understand that, having served Enterprise for almost a decade, he wishes to have the freedom to seek business opportunities and new challenges elsewhere.'

Union protest over derecognition at Shell Haven

Shell UK has confirmed it has had private discussions with other oil companies over union derecognition, but strongly denied that the firms had been acting 'in collusion'.

The announcement came as the unions launched a national consumer boycott of Shell and its products, in protest over derecognition plans at the Shell Haven refinery. From 13 September, leaflets will be handed out at every Shell filling station asking customers to buy elsewhere.

Mr Fred Higgs, oil industry secretary for the Transport and General Workers' Union (TGWU), alleged at the launch that oil industry representatives meeting in a hotel in Stratford last March had 'colluded' over derecognition.

Shell insists the allegation is 'completely without foundation'. The meeting, it said, was 'one of a series of informal get-togethers, which provide a legitimate opportunity for discussion and exchange of information on conditions of employment'. The company did confirm, however, that union derecognition was one of the items on the agenda.

Shell said it 'regretted the call for a boycott, which is not helpful at the current time and which will only exacerbate the already fragile situation at Shell Haven'.

The company also stressed it has no general policy of derecognition. 'We continue to operate union agreements at many of our locations...where these prove effective. At Shell Haven, however, the simple fact is that the situation is so precarious that without a radical restructuring of all working arrangements on the site, we would have no option but to consider more drastic action.'

Mr Higgs claimed there are moves right across the oil industry to withdraw recognition, abolish collective bargaining rights and 'create a union-free zone'.

BP Energy's new heat and power contracts

BP Energy Ltd has won contracts for three new Combined Heat and Power (CHP) projects, with a total value of £80 million.

The contract with Nestlé Rowntree in York was signed in July. BP Energy will supply new boiler plant to provide a substantial proportion of the electricity and all the steam requirements for the famous confectionery plant.

This is the largest contract won by BP Energy so far. The capital value of the CHP plant is £8 million and the operations and maintenance contract is expected to total £45 million over 10 years. Planning permission has been obtained from York City Council, which insisted on specific noise reduction measures in the interests of local residents. A BP spokesman claimed it would be 'the quietest CHP plant in the United Kingdom'.

The new plant will comprise two 4.5 MWe gas turbines, waste heat recovery boilers and back-up package boilers. It will come into operation in January 1995.

The second recent contract is with English China Clays International (ECCI) and is a repeat order following the success of an earlier BP Energy CHP plant at Par Harbour in Cornwall. The new plant at Rocks, also in Cornwall, will be based on a 3.7 MWe gas turbine. The exhaust gas from the new turbine will be used in the process which dries the china clay.

When the new plant is complete in the middle of next year, ECCI will be drying over half of its china clay production with CHP-generated heat.

The third new CHP plant is for Chartham Papers in Kent (recently acquired by Bowater).

A 30-year old boiler house is being renovated and a new boiler installed, with a 4.5 MWe gas turbine and a heat recovery boiler. This £4 million plant, to be ready next Spring, will make the paper mill self-sufficient in electricity and steam. BP Energy will operate and maintain the plant, purchase fuel and guarantee steam and electricity supplies.

On all these three CHP schemes BP will design and build the plant as well as operate and maintain it on a 10-year basis.

The new boiler house at Chartham

The Institute of Petroleum

Practical Implementation of EC Gasoline Vapour Emission Control Directives

Thursday 25 November 1993

To be held at
The Cavendish Conference Centre, London

This one-day conference will focus on the requirements of the forthcoming EC Stage 1 and Stage 2 Directives. It will deal with the different options available to achieve compliance with these directives and the technical aspects of implementing them. The conference is being organised by the IP Vapour Recovery Committee and speakers will be experts from within the oil industry who have practical experience in their subjects. The conference is aimed at personnel both within the oil industry involved in the planning and practical implementation of control measures and authorities involved in the interpretation of legislation and checking compliance.

An Exhibition by Manufacturers will be run in parallel with the conference at The Institute of Petroleum on Wednesday 24 November from 16.00 to after lunch on Thursday 25 November 1993.

Presentations will be based on operational experience and will include:

1. A comparison of the options for control of emissions from above-ground storage tanks.
2. Road tanker vapour collection system design.
3. Vapour collection systems at road loading terminals – the options available.
4. Systems available to permit vapour collection for rail and marine loading.
5. Safety issues including ignition propagation within vapour piping systems.
6. Options for the design of Stage 1b installations.
7. The Stage 2 systems available and experience of their use in Europe and the United States.

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. Tel: 071 636 1004. Telex: 264380. Fax: 071 255 1472.*

The Institute of Petroleum

Developments in Microbial Control in Metal Working Fluids

Thursday 14 October 1993

To be held at The Institute of Petroleum

It is not difficult to kill or control microbes in MWF; previous IP symposia have addressed chemical (biocide) methods and physical methods (pasteurisation, filtration etc). The traditional objective has been the prevention or delay of spoilage with the spin-off of less MWF product used and less spoiled fluid discharged to waste. Recent initiatives have added new dimensions to this simple concept, namely that microbes may be a health hazard in MWF even when malfunction is not significant and also that toxic chemicals (particularly biocides) in MWF and sludges could be a health or environmental issue when discharged to waste. The overall antimicrobial strategy for MWF must recognise the necessity of a 'cradle to grave' approach which satisfies all health and environmental concerns and regulations.

Speakers from UK and Scandinavia will present papers covering these various topics; MWF users should integrate this knowledge into an acceptable MWF management policy.

A panel discussion at the end of the meeting will give an opportunity for delegates to put their concerns and ideas forward for comment and debate.

Topics to be presented at this conference will include:

- End user problems
- Formulation trends in metal working fluids
- Potential health hazards in metal working fluids
- Inhalation hazards of microbially contaminated metal working fluids
- Regulatory issues
- Advances in physical methods of decontaminating metal working fluids
- Disposal of metal working fluids pressures on the aquatic environment

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. Tel: 071 636 1004. Telex: 264380. Fax: 071 255 1472.*

MMC recommends break-up of British Gas

By Carol Reader

The Monopolies and Mergers Commission has recommended an end to the supply monopoly enjoyed by British Gas in the United Kingdom. It has also advocated that the trading activities of BG should be separated from the transportation sector of its business. While the MMC has not sprung any real surprises, the proposals have aroused comment, particularly on the suggested timetable for the changes. These are literally recommendations to the government – which may or may not be adopted as policy. If implemented to the letter, they involve an unprecedented break-up and a radical transformation of gas supply and transport.

The main MMC recommendations are:

- The divestment of BG's trading activities by 31 March 1997.
- The operation of the transportation sector totally independently, with all gas suppliers including BG treated exactly the same. The MMC recommends the complete separation of the two businesses while under common ownership.
- The rate of return used in setting transportation charges should be 6.5-7.5 percent on new investment (and 4-4.5 percent on existing assets.
- The tariff formula should be adjusted from RPI minus 5 to RPI minus 4 to take account of the recent reduction in the monopoly threshold from 25,000 therms to 2,500 therms.

One earlier radical suggestion by Sir James McKinnon, Director of Gas Supply at Ofgas, has been ignored – there is no mention of dividing BG up into 12 regional supply groupings, along the lines of the electricity industry.

More competition

The MMC inquiry has resulted in two initial reports, published last month. More detailed reports will follow within weeks. The first report will be presented to President of the Board of Trade Michael Heseltine, when he returns from sick leave. The second report is addressed to Sir James McKinnon, retiring Director General of Gas Supply.

Last year he asked the MMC to investigate whether the operation by BG of its pipeline system and other transportation facilities were against the public interest. It was also asked, under the terms of the Fair Trading Act, to investigate the supply of gas to tariff and non-tariff customers and the conveyance and storage of gas by public gas suppliers. Later Ofgas also referred to the MMC the fixing of tariffs.

Firstly, the MMC recommends the splitting off of BG's trading activities by 31 March 1997. At the same time other suppliers would be enabled to supply gas to users consuming upwards of 1,500 therms a year (instead of the current level of 2,500 therms a year). Here we are talking of domestic consumers and small industrial users, the tariff market. If adopted, this would allow independent suppliers access to an extra 400,000 homes and 100,000 small businesses. It is further recommended that the abolition of the entire monopoly of supply to the tariff market should be considered three to five years later, so that by 2002 householders would be able to choose their supplier. This would take place provided that safety and security aspects were deemed to be satisfactory. The physical practicalities derived from a number of different suppliers did not come within the scope of the MMC investigation.

This timetable is considered slow by those companies with available gas supplies which are snapping at the heels of BG and waiting to be unleashed. These 30 companies are not content with the industrial market to which they already have access but are looking for an entry into the sizeable domestic market. Since all but 10 percent of households use less than 1,500 therms, this sector of the market would not be opened up until the turn of the century at the earliest. These companies along with Ofgas had been hoping for an earlier end to the BG monopoly – 1998 had been quoted, corresponding with the agreed date when the electricity industry will become fully competitive.

Views on the likely effect on gas prices for domestic consumers vary. BG believes that the reduction in the tariff threshold from 2,500 therms to

1,500 therms and any removal of the monopoly will affect gas prices as between different sizes of consumer and between different parts of the country. However, some commentators' fears about the effects of the proposed changes on households in remote areas are unwarranted since for the most part piped gas has never reached them.

These claims were subsequently disputed by independent suppliers, who pointed out that where they were already supplying high volume domestic consumers, savings were between 10 and 12 percent.

Transport business

The MMC reports acknowledges the problems arising from BG's dual role as both a seller of gas and owner of the transportation system which its competitors have no option but to use. Because BG owns virtually the whole gas pipeline network, 'a natural monopoly' in MMC terms, BG's competitors are almost completely dependent on the BG pipeline and storage facilities and vulnerable to the prices charged and to other terms and conditions set by BG.

The MMC therefore believes that 'neutrality' in this sector is essential – 'Competition cannot be fully effective or self-sustained unless long-term arrangements can be put in place to secure the effective neutrality of the transportation system in such a way that this is in the interests of those who run it and that such neutrality can be readily perceived by shippers.'

The report also states, 'Competition in the supply of gas requires that transportation and storage facilities should be available on non-discriminatory terms.'

On the subject of gas storage, the MMC accepts that independent storage facilities are both feasible and acceptable in future years.

Reactions

Cedric Brown, BG Chief Executive, commented, 'The recommendations contained in the reports should enable the company to plan ahead with greater certainty.'

He added, 'The limited financial relief proposed by the reports will not greatly alleviate the financial pressure being suffered by both the gas supply business and the company as a whole. We shall therefore undertake a stringent review of our entire investment programme, both UK and international'.

Subsequent comment from British Gas indicated that the company would henceforth direct its efforts to expanding its business abroad, while some analysts even mentioned possible diversification into the business of other UK utilities. In recent years since privatisation, BG has already started to move overseas and now has operations in 45 countries, from exploration in Tunisia, Egypt, Vietnam and Yemen, to electricity generation in Northern Ireland, gas distribution in Argentina and the development of the Karachaganak oil and gas field in Kazakhstan.

Meanwhile, the independent gas suppliers are likely to press their views on the government. Some such as Alliance Gas and Utilicorp are suggesting that the proposed timetable is too slow and that all domestic consumers should have the benefit of competition as soon as possible.

In addition more and more companies are preparing themselves for the opening of the gas market. The most recent announcement is the formation of Vector Gas Ltd, a joint venture between Hydro-Electric and Marathon, which aims to sell gas to commercial and industrial and, when allowed, to domestic consumers. The company plans to start deliveries in October. This move follows the example of other electricity companies – for instance, Scottish Power's tie-up with Utilicorp.

In any event it would appear that British Gas should consider making changes to its current television advertisement with the slogan – *'Don't you just like being in control'.* ■

Iranian gas to come to the aid of Armenia

By Colin Barraclough

Iran looks set to construct a gas pipeline connecting its domestic network with energy-starved Armenia. Negotiations are still underway but officials estimate that start-up could be reached within three years. The project has one great advantage over other Central Asian and Trans-Caucasian pipeline proposals: simplicity.

One hundred kilometres of pipeline would be needed to reach the Armenian border, and a further score inside Armenia to connect to the domestic Armenian network. Initial flow would reach two billion cubic metres (bcm) per year but the contract is expected to allow for the inclusion of compressors at a later stage which could increase the pipeline's capacity.

'We are in a position to connect Armenia through the Iranian northwest network, which already reaches to Tabriz and other parts of [Iranian province] East Azerbaijan,'said Reza Rostami Sani, Director for International Affairs at the National Iranian Gas Company (NIGC). 'The feasibility study is finished and the project looks efficient.'

Armenian diplomats say funding questions are still under discussion with the European Bank for Reconstruction and Development and the World Bank but they believed a mixture of loans from international institutions and private funding could cover the investment costs. 'It is up to Armenia to look for the financing,' says Mr Sani. 'If they invest in the contruction project, part of the gas supply will repay their investment. The rest should be paid for in cash.' The construction and start-up costs are expected to be $60-70 million and construction time about a year. The comparatively low cost results from the expected use of Iranian contractors.

Armenia, independent since 1991, is already connected to the Iranian supply through Azerbaijan and Georgia; it consumed Iranian gas until the 1979 Islamic revolution in Iran. But the government in Yerevan is keen to find a new source for imported energy. A bloody dispute over the status of Nagorno-Karabakh, the Armenian-populated enclave within Azerbaijan's territory, has drawn out for five years and both republics have suffered economic hardship.

Baku still imposes an embargo on Armenia. With an unfriendly Turkey to the south and a lawless Georgia to the north, Armenia has looked to its only other neighbour, Iran.

At present, Armenia buys some gas from Russia and Turkmenistan but it can only get two to four million cubic metres (mcm) per day, 20 percent of its demand. One-third of Armenia's factories stand idle; there is no gas available for homes. As a member of the Commonwealth of Independent States, Armenia qualifies for discount rates and can pay through a mixture of cash and barter trade but its supply depends on the old Soviet infrastructure, through Kazakhstan, Russia and Georgia, and the route is fraught with difficulties.

Georgia is involved in a currency dispute with Turkmenistan and Russia over credits owed for earlier energy deliveries. Turkmenistan has threatened to stop supplying Georgia with gas which in turn would stop Armenia's supply. The immediate threat has been averted but a long-term danger remains.

Furthermore, the pipelines through Georgia are often the target of sabotage in the lawless Georgian countryside. Armenia accuses ethnic Azeris living in Georgia of blowing up the lines as an act of war over Nagorno-Karabakh. The lines are usually repaired within days but the attacks disrupt Armenia's supply and lend an urgency to finding an alternative route.

Iran, on the other hand, is very keen to rekindle its gas exports. Before the 1979 revolution, Iran exported 10 bcm per year, mainly to the USSR. With natural gas reserves estimated at 20 trillion cubic metres, the Rafsanjani government has committed itself in its first Five Year Plan to developing its gas export potential and the NIGC has recently resumed some exports to Azerbaijan.

Politically, Iran should have no objection to supplying both states involved in the Karabakh conflict. Tehran tried to mediate in the conflict but a ceasefire signed in February 1992 was broken almost immediately. However, its plans might be interrupted by its huge Azeri minority. One-third of all Iranian citizens are Turkish-speaking ethnic Azerbaijanis who live in Iran's northern provinces.

'Iran, on the other hand, is very keen to rekindle its gas exports'

They share a language with those Azeris living in former Soviet Azerbaijan; they share a literature; and they share a culture.

Talk of a unification of the two Azerbaijans is still highly speculative but Iranian government officials are defensive on the subject. In the meantime, Tehran has divided its Azeri-populated provinces into three to quash any thoughts of political unity.

Many Iranian Azeris believe that Tehran has favoured Armenia over Karabakh in order to keep Azerbaijan weak and hence minimise the threat of unification. Tabriz residents say they tried to demonstrate against Iranian backing of Armenia but were prevented from doing so by the government. Instead, they protested by boycotting June's presidential elections and ignoring two trips to the city by President Rafsanjani. Iranian Azeris may well be tempted to follow the Georgian example and attack any pipeline running to Armenia, although Iran's strict control over its population would seem to hamper any terrorist threat to the line.

At the same time, Iran is also looking at a transit pipeline from Turkmenistan; Tehran has finished a pre-feasibility study and is entering the feasability study phase. That projected pipeline would pass through 1,300 kilometres of Iranian territory and 1,600 kilometres in Turkey, possibly to the western Turkish border with Bulgaria and on to western Europe.

At the moment, the Armenia project is closer to fruition. 'The Turkmenistan project is further away simply because of its size,' says Mr Sani, 'and because Turkmenistan will have to wait for markets to develop. The Armenians already have a market.' ■

Well engineering in the 1990s

by M.G. Schaafsma, Well Engineering Manager,
Shell UK Exploration and Production.

Shell U.K. Exploration and Production, operator in the U.K. sector of the North Sea for Shell and Esso, has adopted a corporate strategy in line with the Drilling in the Nineties concept proposed by Shell Internationale Petroleum Maatschappij B.V. (SIPM) for all Shell operating companies. Within Shell Expro, the Drilling in the Nineties concept has been broadened to incorporate the drilling, well services and equipment supply areas with the resultant name change to Well Engineering in the Nineties.

This strategy has now been implemented and has substantially changed the *modus operandi* between operator and contractor with a strong emphasis on long term partnership relations with lead contractors.

This paper summarises the strategy that has been developed and the implications of implementing this strategy; the implications to both a major operator and numerous contractor suppliers; the results to date; and the course of future partnership relations.

Background

Shell Expro are currently operating 13 Northern North Sea platform rigs and 10 mobile drilling rigs.

It is expected that some £480 million will be spent during 1993 on the drilling, completion, testing, stimulation and workover of exploration, appraisal and development wells. This represents approximately 30 percent per annum of all Shell Expro's capital and operating expenditures.

Well engineering mission

The Well Engineering organisation mission is to provide high quality wells for exploration, appraisal and development of Shell Expro's hydrocarbon reserves. The wells that must reach their objective in a safe, environmentally conscious and optimum economical manner and continue to serve their purpose with minimum intervention.

The WIN 90's strategy required to meet this mission has the following key objectives:

To minimise the technical costs per barrel of oil equivalent (BOE) from existing fields and to allow the development of marginal fields

by a greater effectiveness, efficiency and profitability,

by the Operator concentrating on core business,

and developing Operator/Contractor co-operation,

and achieving continuous quality improvement.

Implementation Overview

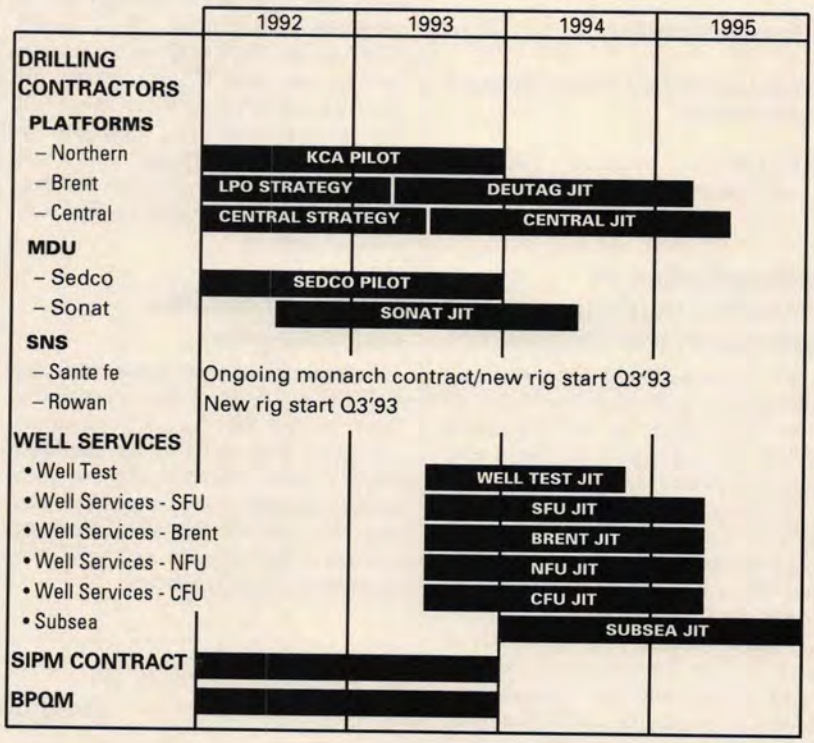
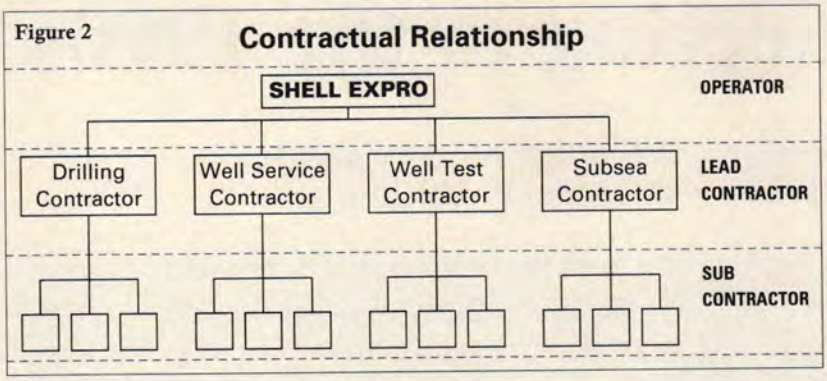


Figure 1

Win 90's Implementation Strategy and Plan

There are several on-going initiatives to implement WIN 90's (**Figure 1**) and to define its structure and administer these changes. These are:-

Figure 2



- Rationalisation of contractor portfolio and selection of lead contractors.
- Contract relationship overview.
- Lead contractor requirements.
- Joint implementation teams (JITs).
- Integrated services.
- Incentive contracts.
- Lead contractor and sub-contractor assessments.
- Business process quality management.

Rationalisation of contractor portfolio and selection of lead contractors

Shell Expro Well Engineering managed a contracts portfolio of some £300 million in 1991 consisting of 108 contractors/suppliers and some 280 contracts.

The sheer size and complexity of this portfolio made it difficult to manage and provide the goods and services required by each of Shell Expro's Well Engineering departments.

A selection was therefore made of Lead Drilling Contractors (LDC) and Lead Well Services Contractors (LWSC) to provide all of the Well Engineering services in each of Shell Expro's Northern, Brent, Central and Southern Field Units and Exploration/Appraisal Well Engineering Operations. These lead contractors will in future manage and co-ordinate an integrated service including sub-contractors.

All lead contractors must demonstrate that they can provide goods and services at market rates. In addition, with incentive type deals, contractors can earn a higher return on their investment by demonstrable improvements in productivity and performance.

By end 1994, the £300 million portfolio will have been rationalised to some 25 contractors/suppliers covering 40 contracts. A selected number of sub-contractors will still be employed, but through lead contractors.

Contractual relationship - overview

WIN 90's requires the management of non-core business by Lead Contractors. The drilling contractor will be the Lead Contractor for all drilling services. Within the Well Service areas initially, there will be three different types of Lead Contractors, for E/A well testing, Well Services and Subsea Services areas (**Figure 2**).

Lead contractors – requirements

It is expected that in some cases the drilling contractor may eventually become the sole Lead Contractor absorbing responsibility for the Well Service areas. For areas where Well Servicing operations dominate the activity one of the Well Service contractors could become the dominant Lead Contractor

The Lead Contractor will be expected to provide and manage an integrated package of services, to undertake risk sharing in contracts and to achieve the required safety, quality, commercial and performance standards in providing a cost efficient service (**Figure 3**).

Key to monitoring the performance of Lead Contractor is the need to establish agreed performance indicators and to develop the technique of benchmarking performance throughout the industry.

It is preferred that the chosen Lead Contractor develops internal management skills to manage the WIN 90's workscope rather than buying into the skills of a management consultant. Broadening of existing contractor management skills is seen as the key to establishing the long term commitment to providing an integrated managed service.

Although there are several major corporate service companies that can offer a wide range of required services from within, this is not considered the only or even ideal solution. Lead service contractors will be expected to be flexible and be willing to contract from outside their organisation to provide the optimum package. Experience to date shows that it is often the smaller more independent organisations that can be more flexible to the demands of WIN 90's.

Establishing a non-adversarial relationship between Shell Expro and the Lead Contractors is considered critical to ensure a successful long term relationship and deliver the required performance improvements and total cost reductions. Merely transferring work from Shell to the contractors is not the objective. It is proposed that a partnership type relationship is established with Lead Contractors. This will ensure a long

Lead Contractors

REQUIREMENTS

- Provide/manage an integrated package of services
- Incentive contracts
- Continually improve safety/quality/cost efficiency/technical standards

ISSUES

- Selection of Lead Contractors
- New customer/supplier relationships – Partnership
- Negotiation rather than tender
- 60 days notice

Figure 3

term preferred customer/supplier relationship with both parties willing to change and share risks. This is a significant cultural change for both organisations and will not be achieved easily or quickly.

It is expected that a similar type of relationship should also be developed between the Lead Contractor and its subcontractors. Further, Lead Drilling and Well Services Contractors who are working within a Field Unit are expected to form a close alliance in their working relationship.

Joint Implementation Teams (JITs)

Shell/Contractor Teams have been set up and are used at every level to direct implementation and establish an improved working relationship. Management Steering Groups are used to define the overall strategy and create the correct climate for change in their respective organisations. At a working level, Joint Implementation Teams (JITs) are used to develop and schedule the detailed implementation plans.

The JITs have implemented integrated service packages, incentive contracts, rationalisation of offshore crews, multi-skilling of personnel, quality improvement projects etc. The broadening of the Lead Con-tractor's role and responsibility will, where appropriate, result in a significant incentive and/or turn-key work with the emphasis on contractor performance and the ability to deliver a quality product.

Integrated Services

Traditionally, Operators have contracted in on an *ad hoc* basis a plethora of 'specialist sub-contractors' to support both Drilling and Well Service contractors. Considerable synergy exists to integrate these to produce a smaller number of contracts managed by the Lead Contractors.

For the LDC, these sub-contracts include drilling jars; drilling rental tools; moveables; drill bits; fishing/milling services; centrifuges, liner hanger and tie-back services; directional drilling; casing running; cementing and pumping services; provision of bulk cements and additives; survey services; gas detection; drilling fluid engineering; and provision of drilling fluid additives and bulk chemicals etc.

Similarly, for LWSC, these subcontracted services include provision of all completion equipment; wire-line services; coiled tubing services; through tubing/snubbing services; stimulation-frac services; downhole gauges; TCP – perforating services etc.

Lead Contractors are expected to take a major role in the detailed well planning and programming and the management of these subcontractors thus enabling them to optimise operations and reduce costs.

Incentive Contracts

The WIN 90's Lead Contractor in managing an integrated contract will be expected to work within balanced risk-sharing incentive contracts. The focus of the incentive in simple terms can be performance in delivering a quality product. Quality of the product is often difficult to define and in many cases impossible to measure. The Business Process Quality Management (BPQM) technique has been used where appropriate to define the process, identify performance measurements and define applicable incentives.

Incentive contracts were initially introduced in Shell Expro in the form of discretionary bonus to the drilling contractors in the MDU. This is a basic incentive based on beating an agreed target curve. It originally did not include a penalty mechanism as the contractor had no control over the key drilling services (**Figure 4**).

Sub-contracted services are now included and risk sharing is achieved via a bonus-capping mechanism and is applied to both the rig and service dayrates.

A further time related incentive has been used on platforms for workover and drilling activities. It is flexible enough to allow for the frequent interruptions in operations typical of a platform operation. This has allowed the drilling contractor to increase his involvement and management role with a resultant rig time saving.

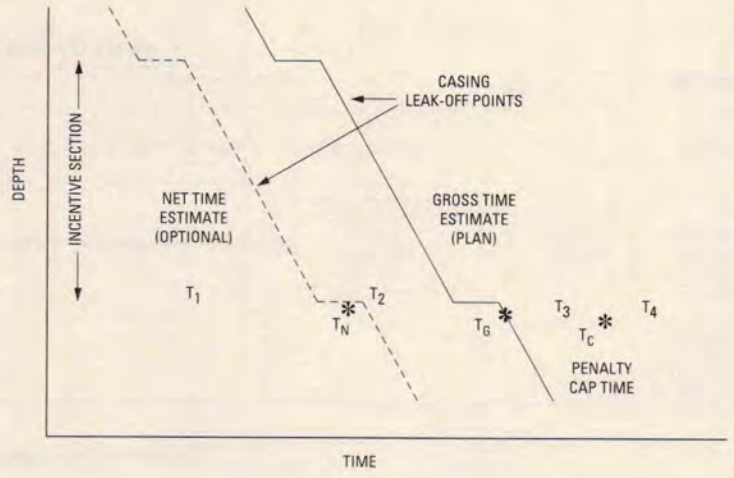
In principle the incentive should be simple, easily understood by all involved and practical to implement to ensure success.

Lead Contractor and Subcontractor Assessments

The Lead Contractors will be required to choose only contractors currently approved by Shell Expro using in-house safety, QA/QC, technical and commercial appraisals. It is the intention that as the contractor management skills broaden that they should also take on the assessments of their subcontractors.

The workscope of the existing six monthly Performance Reviews of

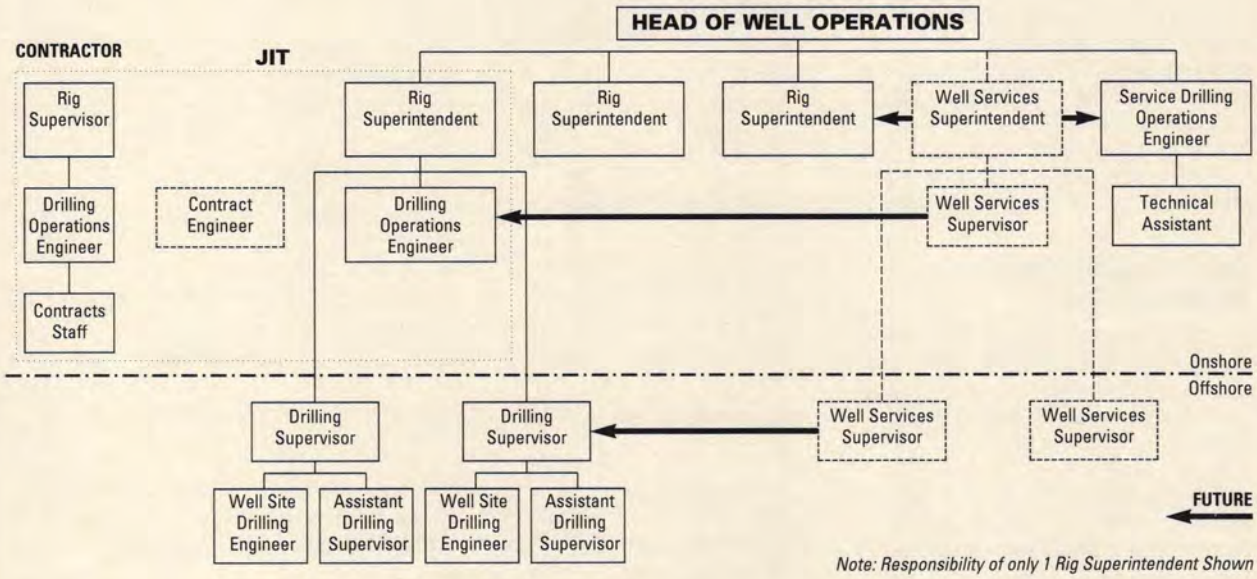
Incentive Contract Bonus/Penalty Mechanism



T1, T2, T3, T4 are actually achieved duration possibilities
T1 Bonus = [(TG -TN) (0.5) + (TN - T1) (0.75)] x day rate
T2 Bonus = (TG -T2) (0.5) x day rate
T3 Bonus = (T3 -TG) (0.5) x day rate
T4 Bonus = (TC -TG) (0.5) x day rate

Figure 4

Model Well Operations Structure Shell Expro



Note: Responsibility of only 1 Rig Superintendent Shown

Figure 5

Lead Contractors will be expanded to include feedback on performance of subcontractors.

Business process quality management

WIN 90's requires Shell Expro to hand over to the Lead Contractor significant parts of the Drilling and Well Services Business process, currently managed in-house. The Juran Business Process Quality Management (BPQM) technique is being used to define the existing process and sub-processes and identify which elements should be handed over to the Lead Contractors. This technique defines the process and required process improvements through an intense data gathering/interviewing exercise. BPQM should also identify performance indicators which can be used as the basis of both defining the standards within the process and contract incentives. The BPQM technique will also use benchmarking against other operators and outside this industry as a technique to initially rank and finally achieve the required performance standards.

Organising and staffing

Shell Expro's commissioned fields are maturing and well operations activities are moving from development drilling to infield – infill drilling; sidetracks; recompletions; workovers; and general well services etc. This necessitates a different operator organisation and staff development requiring a multi-discipline engineer.

The development of the JIT type teams is seen as the first step towards establishing the future Shell/Lead Contractor operational organisation. The initial step was to locate the Shell Rig Superintendents/Drilling Operations Engineers in the Lead Contractor's offices. JIT teams will then be established with the Rig Superintendent, Drilling Operations Engineer and Contracts Engineer as Shell members. It is expected that the Lead Contractor would match this membership within his organisation.

The JITs should be seen as initially guiding WIN 90's implementation but then developing into the new permanent Shell/Lead Contractor organisation. The Lead Contractor will eventually take an increasing role in well programming and managing the entire drilling process. The JITs are establishing the organisation to allow this handover of responsibility (**Figure 5**).

Once implementation has been completed there will be a requirement to establish a joint management structure for Shell and the Lead Contractor for WIN 90's activities.

Conclusion

The WIN 90's initiative is a fundamentally different way in which operators and contractors have traditionally worked. It recognises that a much closer working relationship requires to be built between them, based on mutual trust and built on the strengths of both parties.

Lead Contractors will have a considerably larger role and responsibility in the planning, programming, scheduling and execution of work. With this comes the requirement for performance and productivity with the emphasis to reduce the cost per barrel and well costs. Industry wide benchmarking is required to demonstrate meaningful improvements.

WIN 90's means paying contractors a market rate for goods and services. In addition, with incentive type deals, contractors can earn a higher return on their investment by demonstrable improvements in productivity and performance.

Shell Expro, with the size and scale of its operations, can offer contractors a long term stable contract environment and relationship within which benefits can be mutually shared. A WIN-WIN situation for both operator and contractor. ■

This paper was presented at a recent IP conference 'Current Developments in North Sea Drilling Operations'.

Shallow gas hazard - the HSE perspective

By Brian Moore and Terry Hamilton, Petroleum Engineering Team, Offshore Safety Division, Health and Safety Executive.

World-wide shallow gas incidents account for approximately 33 percent of all blowouts and of these just over half result in either major damage to, or complete loss of, the drilling unit. Certain areas of the world are more prone to shallow gas than others. The UK sector is probably of medium to low risk. There have been a number of shallow gas incidents in the UK and Norwegian sector of the North Sea since drilling commenced in 1964. During this time there have been no fatalities in the UK sector although there have been some serious injuries.

This relatively good record in the UK sector suggests that the combination of industry practice and geological conditions create a relatively low risk of an accident. This record, coupled with the fact that the North Sea is now a very mature oil province, begs the question, why is the Health and Safety Executive still interested in the shallow gas risk?

Changes in operating practice, experience from operations and developments in technology are factors which sustain Offshore Safety Division (OSD) interest in shallow gas risks.

Examples of Change

Rig deployment

Jack-up drilling units have until a few years ago been limited to the Southern North Sea which is considered to be a low risk area for shallow gas. However the introduction into the market of deepwater jackups has resulted in them drilling in up to 310 ft of water, in areas which are considered to be higher risk. Conversely, commercial incentives have resulted in semi-submersibles being used in shallower water in the Southern North Sea. Although the shallow gas risk in this part of the UK Continental Shelf is considered to be low they could be more vulnerable to some types of shallow gas blowout.

Well design

In an effort to keep drilling costs down and in some cases make it feasible to drill deep high pressure/high temperature wells, surface casing strings are being pushed deeper and deeper. A recent example was a 26" hole drilled riserless to 4200ft.

These changes to drilling practices, which are going on all the time, result in a constantly changing risk which is not always accompanied by a corresponding reassessment of the methods used to control the risk.

Experience

Incident investigation

The hazards arising out of a shallow gas blowout are:

- Explosion
- Fire
- Toxic gases
- Structural failure
- Broaching leading to threats to rig stability

Broaching is considered by many in the industry to be low risk but direct evidence from an incident in the North Sea shows that it cannot be ignored. The investigation of this incident by OSD showed that transient flow conditions in the early stages of a high productivity blowout, produce well bore pressures and gas volumes significantly in excess of subsequent steady state flow conditions. These transient conditions can cause fracture at the conductor shoe and cratering of the seabed, which obviously has serious implications for bottom founded vessels.

API Recommended Practices for Diverter Systems Equipment and Operations (RP64) First Edition, July 1, 1991, specifically excludes transient well response. In work at Louisiana State University on 'Estimation of Pressure Peaks Occurring When Diverting', (SPE 1959), D. L. Santos and A.T. Bourgoyne stated that:

'The peak pressure at the casing seat is typically of short duration. Thus if fracturing does occur it is unlikely that fracture propagation would move very far from the well bore before the pressure subsides to the equilibrium value. As long as the equilibrium borehole pressure is less than the fracture pressure there is a high probability that the fracture will not propagate to the surface. Thus it is recommended that the design load at the casing seat is based on equilibrium flowing conditions.'

Shallow gas blowout transient conditions, and the possibility that they could result in broaching and cratering of the seabed, must be taken into account. This adds emphasis to the need to exploit new technology to identify high risk shallow gas areas.

Developments in Technology

Incidents in the North Sea have brought about significant changes in some operators' approach to the handling of shallow gas hazards. Excellent work has been done, and is continuing, on improving the accuracy of shallow gas

prediction techniques.

Drilling procedures have been implemented which aim to minimise the possibility of losing control, and operational techniques have been adopted which aim to reduce the risk to personnel and damage to the rig should control be lost.

The identification of shallow gas before drilling into it remains at the top of the list of challenges for hazard avoidance.

In late 1987, ongoing concern within the industry about the lack of standards for carrying out site surveys for mobile drilling units, led to members of the United Kingdom Offshore Operators Association (UKOOA) requesting the development of technical notes for the geophysical and hydrographic aspects of mobile drilling rig site surveys in the UKCS. These technical notes were issued in December 1990 and they provide excellent advice on the specifications of shallow gas surveys, QA/QC and data processing.

Actual encounters with shallow gas have provided both a strong incentive and an opportunity to compare the original analysis of shallow gas site survey data with post event survey analysis.

This has resulted in some significant advances in detection and assessment technology, namely:

- Optimally designed 2D seismic surveys
- Dedicated site survey interpretation teams
- Use of 3D exploration seismic data
- Seismic attribute analysis

Optimally designed 2D seismic surveys

It is essential that all aspects of the survey are tailored to provide the desired vertical and lateral resolution across the interval being investigated. This includes: seismic source, hydrophone streamer, positioning system, acquisition parameters, survey pattern and data processing technique. A realistic objective at 1000 metres is to be able to resolve accumulations of at least 5 metre thickness and 200 metre diameter areal extent.

Quality control of data acquisition and on site processing has traditionally been under the control of the site survey contractor but some operators have found that processing has been far from optimal and in some cases has resulted in primary data being lost. Consequently, some operators are now witnessing site surveys and limiting on-site processing, preferring instead to process the data in-house.

Dedicated site survey interpretation teams

Instead of accepting the interpretation of the site survey contractor, a number of operators have set up dedicated multi-disciplinary shallow gas survey teams, consisting of a geophysicist, geologist and drilling engineer. These teams are responsible for selecting sites and planning casing programmes which minimise the risk from shallow gas. In addition to the high resolution 2D survey data which they interpret in-house, they are also able to access 3D seismic and geological and offset drilling data, which helps in getting a better understanding of the geological regime in which they are working.

Use of 3D exploration seismic data

The use of workstations with their enhanced functionality has effectively expanded the limits of existing exploration on data sets. Several operators and contractors have independently investigated the use of 3D seismic for shallow gas investigation. Pre-site survey, the 3D data can be used to ensure that resources are targeted effectively by defining areas of likely hazard. Post-site survey, 3D interpretation can provide better lateral resolution than with 2D alone, and greatly assist in developing an understanding of the shallow geological regime and possibly the origin and extent of shallow gas accumulations.

Statoil have used 3D seismic to great effect to establish that shallow gas accumulations in the Haltenbank area are associated with ancient iceberg plough marks.

Seismic attribute analysis

A further benefit of the use of workstations is the investigation of seismic attributes such as increased reflection amplitudes, phase reversal, high frequency loss and low velocities, all of which can be indicative of shallow gas accumulations. The ability to detect variations in these attributes can be enhanced by attribute analysis and display. Caution is however required because variations in these attributes can also be caused by lithological changes and seismic interpretation.

Another technique being increasingly used is the analysis of amplitude versus offset (AVO) effects. These have been shown to assist in discriminating between seismic events caused by shallow gas accumulations and those caused by lithology.

OSD recognises that the adoption of new practices and techniques will not guarantee that all shallow gas accumulations will be identified. Limitations in resolution and data interpretation will always leave some residual risk. However, it does believe that they can reduce the risk of unexpectedly drilling into shallow gas, and one of OSD's aims is to encourage their wider adoption in the industry.

Securing safety

When well planning, and operating techniques and procedures have failed to prevent a shallow gas blowout, it is essential that other plans and procedures are in place to minimise the risk of death or serious injury to personnel. Riserless drilling or diversion may be used to reduce the risk of gas ignition on the installation.

Both of these methods have different risks associated with them and careful analysis is required in all cases to determine which is the lowest risk solution for each circumstance.

Semi-submersible riserless drilling

Drilling without a riser connecting the rig to the wellhead has gained widespread acceptance in the North Sea as the primary means of protecting personnel from the hazards of a shallow gas blowout when drilling from a semi-submersible. Direct evidence from an incident in the UK sector has shown this technique to be effective. However, the practice introduces changes to risk which must be recognised and accounted for.

The probability of losing control of a shallow gas accumulation if it is encountered is actually increased by the adoption of riserless drilling. This is due to the reduced hydrostatic head available without a riser.

In the incident mentioned previously the rig encountered a very high productivity gas accumulation and quickly found itself in the middle of a gas plume. It was able to winch off location over a period of 25 minutes without causing an explosion. A 28 knot wind blowing at the time probably helped to prevent the formation of explosive mixtures of gas on the rig. What combination of water depth, current, wind velocity and gas flowrate is required to avoid

the formation of an explosive mixture would be extremely difficult to calculate. Most operators are sufficiently concerned about engulfment and subsequent explosion that they specify a minimum water depth for riserless drilling. One major operator in the North Sea considers 150 metres the minimum and the OSD has done some work which suggests that 100 metres may be acceptable. However, whatever depth is selected it is essential that operators and rig owners plan their response to possible engulfment so that gas is not ingested into power systems and that ignition sources are minimised during any winch-off operations. They should also consider whether there are any weather conditions under which they would not be prepared to drill riserless through a potentially hazardous shallow zone.

Diversion

The use of a riser and diverter maintains an overbalance even when using seawater as a drilling fluid and thus reduces the risk of loss of control. On the other hand, when primary well control is lost, gas is conveyed onto the rig before being diverted overboard. This introduces different risks.

Diversion was covered very comprehensively in a recent paper titled, 'The Shallow Gas Threat - A Difficult Challenge to Cope With', by Mr. Grepinet, Total S.A., and as such it is not intended to elaborate further on the subject in this paper.

Safety Case

Cullen Report

In his report on the Piper Alpha disaster Lord Cullen made 106 recommendations of which the most significant and probably the one which would have the greatest impact on the Industry was the first. This recommended that:

'The operator should be required by regulation to submit to the regulatory body a Safety Case in respect of each of its installations.'

Recommendation 2 (ii) stated that the Safety Case should show:

'That potential major hazards of the installations and the risks to personnel thereon have been identified and appropriate controls provided.'

The 'Offshore Installations (Safety Case) Regulations 1992', require operators of fixed installations and owners of mobile drilling units to submit safety cases prior to carrying out operations on the UKCS. Regulation 8 (1d) requires that;

'An operator or owner who prepares a Safety Case pursuant to these regulations shall include in the Safety Case sufficient particulars to demonstrate that; "risks have been evaluated and measures have been or will be taken, to reduce the risks to persons affected, to a level as low as reasonably practicable."'

The Offshore Safety Division of the Health and Safety Executive must in accordance with the new legislation satisfy itself that the Safety Case shows that the duty holder has complied with the law (regulations) and that risks have been reduced to a level as low as is reasonably practicable.

Hazards, consequences And risks

One part of OSD's review of shallow gas hazards is to try and establish benchmarks for current engineering and operational practices to assess what is reasonably practicable.

To achieve the objective everyone will need to be clear as to what is meant by 'risk', 'hazard' and 'as low as reasonably practicable'.

Risk has been defined as the product of frequency and consequence:

Risk = Probability x Consequence

This is neither mathematically meaningful nor does it clearly convey the concept of risk. An alternative and more easily understood definition is, 'the likelihood of a specified undesired event occurring within a specified period or circumstance.'

The undesired consequence that concerns the duty holder and OSD is death or serious injuries resulting from a shallow gas blowout. The probability of being killed or seriously injured in a shallow gas blowout depends on the probability that shallow gas is present, that control

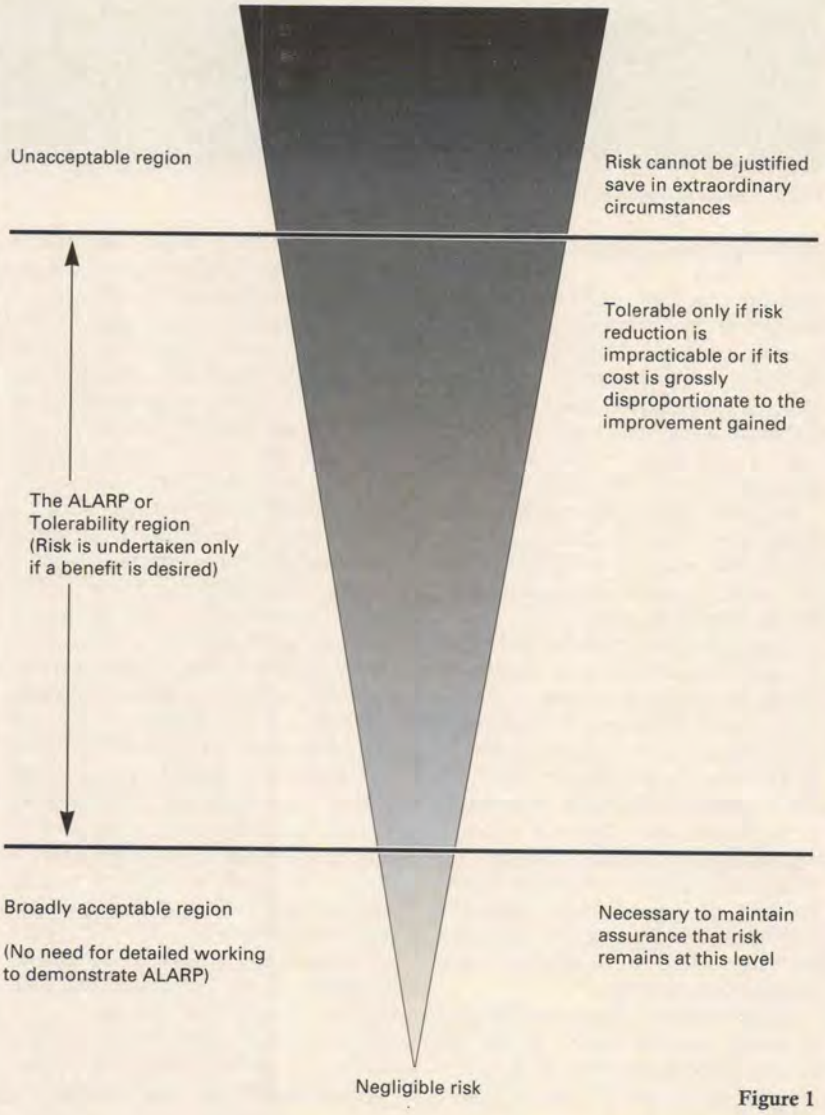


Figure 1

This photo illustrates the risk of shallow gas in the North Sea.

will be lost, that mitigation measures fail, that life threatening consequences (fire, explosion, seabed failure) result and that emergency procedures are ineffective. These probabilities are dependent on a host of factors which can combine in different ways. How then can the lowest risk combination which is reasonably practicable be found?

An early legal interpretation of the concept of 'as low as reasonably practicable' was given in 1949 in the case of Edward v. National Coal Board. Then it was stated that:

'reasonably practicable implied that a computation must be made in which the quantum of risks is placed in one scale and the sacrifice, whether in money, time or trouble, involved in the measures necessary to avert the risk is placed in the other; and that, if it be shown that there is a gross disproportion between them, the risk being insignificant in relation to the sacrifice, the person upon whom the duty is laid discharges the burden of proving that compliance was reasonably practicable.'

More recently a diagram (**Figure 1**) has been used to demonstrate the concept. Above a certain level, risk is regarded as intolerable and cannot be justified in any ordinary circumstances. Below such levels an activity is allowed to take place provided that the associated risks have been made as low as reasonably practicable (ALARP). In pursuing any further safety improvements to demonstrate ALARP, account must be taken of cost. It is in principle possible to apply formal cost-benefit techniques to assist in making judgements if this kind. In weighing the costs of extra safety measures the principle of reasonable practicability applies in such a way that the higher or more unacceptable a risk is, the more proportionately employers are expected to spend to reduce it. Where the risks are less significant, the less proportionately it is worth spending to reduce them. Thus at the point just below the limit of tolerability employers would be expected to spend substantial amounts even if there is was only a small reduction, because the risk is still very high, whereas at the lower end of the zone it may not be worth spending anything at all. Below this ALARP region the levels of risk are so insignificant that they need not claim attention. The lower limit of the 'broadly acceptable' region in fig. 1 is set by the point at which the risk becomes truly negligible in comparison with other risks the individual or society runs.

Unless the risk level from shallow gas can be shown to lie in the broadly acceptable region, it is probably in the ALARP region. Historical evidence suggests that the risk is not at the intolerable level on most of the UKCS. Thus operators and owners will have to demonstrate that their strategy for handling shallow gas meets the ALARP criteria.

To demonstrate this in their Safety Cases it will be necessary to determine what impact current shallow gas surveying techniques, drilling techniques and operating procedures have on the probabilities of encountering shallow gas, of losing control of the gas, of a hazard occurring and of that hazard resulting in the death or serious injury to personnel.

Safety Case legislation

The 'Offshore Installations (Safety Case) Regulations 1992' came into force on the 31 May, 1993. These are 'Goal Setting' regulations rather than 'Prescriptive' and impose duties on operators, rig owners and the HSE.

In their installation Safety Cases, operators and rig owners must include information on all of the major hazards they expect to encounter in their operations and the means by which the risks to personnel arising out of the hazards are going to be reduced to as low as reasonably practicable.

The inherent difficulties of assessing the overall risk to personnel from shallow gas should not be underestimated.

The UKOOA Drilling Practices Committee has identified 15 topics which should be considered in developing or reviewing shallow gas procedures. Operators of fixed installations will have the benefit of having almost complete control over the planning and execution of shallow gas prediction, control and mitigation measures. They should therefore have little difficulty in supporting their current choice of safety measures.

Mobile Drilling Units (MODU) owners do not however have the same level of control. They rely on operators to carry out a site survey and are not normally able to influence its quality and therefore the level of risk associated with it. It is also likely that key aspects of risks in drilling programmes depend on information available only to the operator. Under the new legislation the MODU owner must demonstrate that his shallow gas strategy is as low risk as possible. Clearly this is going to be difficult for MODU owners if they do not know the wells they are going to drill and the shallow gas site survey procedures that are going to be used at the time they submit their vessel-specific Safety Case.

When the present licence consent safety regime ends in 1995, operators will submit a 'Well Notification' for each well that they drill. These are not subject to acceptance, but for wells drilled by a MODU they should demonstrate that shallow gas risks at the site have been addressed.

True partnership between operator and MODU owner will be required to ensure that both are fulfilling their responsibility to reduce risk to ALARP levels, and to demonstrate this in the well notification.

Conclusion

The threat from shallow gas accidents to people is unpredictable. The risks from the hazard vary from site to site. Advances in technology, lessons from experience and differences in opinion about the best combination of safety measures lead to changes in operating practices.

Modern prediction techniques can reduce the risk of encountering shallow gas, but due to their cost they must be applied sensibly to areas of highest risk or uncertainty. Drilling and operational techniques are available to reduce the chances of blowouts and mitigate their consequences. The balance of risks and advantages of different responses to the threat requires careful matching of these techniques to the installation, well and environment.

The pattern of business relationships in the industry is also undergoing a radical change as operators seek to concentrate on core activities and build risk sharing partnerships with MODU owners and other contractors and manufacturers.

The UK safety regime demands within these new partnerships performance targets to measure their success in controlling risks to ALARP levels or better. The testing nature of this challenge, in the face of the uncertainties of shallow gas and alternative ways to deal with the hazard during well operations, is clear from this paper. Lord Cullen, however pointed the way forward with Safety Cases. These will provide new ways to communicate about risks, precautions and plans for improvement to help reduce the risks which have to be shared between partners and by employees. ■

This paper was presented at a recent IP conference, 'Current Developments in North Sea Drilling Operations.'

1. The Tolerability of Risk from Nuclear Power Stations. HMSO publications.
2. Technical Notes for the Conduct of Mobile Drilling Rig Site Surveys (Geophysical and Hydrographic). UKOOA
3. Shallow Gas on Haltenbank (Summary of study by the Shallow Gas group). Statoil
4. Site Survey Hazard Analysis - A comparison of the Limitations of 2D High Resolution and 3D Exploration Datasets. G. Thirkettle (Senior Geophysicist RACAL Survey, Gt. Yarmouth)
5. The Shallow Gas Threat - A Difficult Challenge to Cope With. Mr Grepinet Total S.A.
6. Estimation of Pressure Peaks Occurring when Diverting Shallow Gas. D.L. Santos and A.T. Bourgoyne Jr., Louisiana State University. SPE 1959
7. Recommended Practices for Diverter Systems Equipment and Operations. API Recommended Practice (RP64), First Edition, July 1, 1991.
8. A Review of Shallow Gas Practices in the Light of Recent Experience. E.B.Turner, Petroleum Consultant - HSE.

Conference Report

'Asia Pacific – the most dynamic region in the world'

By William Scholes

Nearly 200 delegates attended the South East Asia Australia Offshore Conference last month. The first ministerial address was given by Warren Snowdon MP, Parliamentary Secretary to the Minister for Employment.

Mr Snowdon said that the Asia-Pacific region was without doubt the most dynamic region in the world today and presented many opportunities for the Australian petroleum industry. Over the next 10 years GNP for the region was projected to continue growing at about double that of the OECD.

The energy sector had shown rapid growth – around 5 percent per annum. Continued growth and demand at or about this rate would see energy consumption increase by around 50 percent by the end of the century. Australia was a major energy exporter, with total energy exports valued at $A11 billion in 1991-92 and growing steadily.

Petroleum exports were worth $A4 billion, giving a positive balance of trade in petroleum of over $A1 billion per annum. 'We established an excellent track record as a reliable and efficient producer of LNG, with exports from the $A12 billion North West Shelf Project forecast to grow to 7 million tonnes per annum by 1995', said Mr Snowdon.

The government had carried out significant reforms on the Australian economy, including the floating of the Australian dollar, the entry of foreign banks, progressive reduction in tariff levels and a reduction in company tax rates from 49 to 33 percent and the introduction of a 10 percent capital investment allowance for new capital investment.

These reforms had been instrumental in creating a climate which was encouraging investment in the oil and gas industry. For instance, Esso-BHP partners plan to spend $A600 million in the Bass Strait developing the 86 million barrel West Tuna oilfield and $A1-2 billion on developing oilfields off Western Australia.

Reforms of relevance to the petroleum industry included deregulation of the industry, leaving it free to sell petroleum products anywhere in the world and the introduction of profits related Petroleum Resource Rent Tax to offshore areas, and the liberalisation of foreign investment rules.

Offshore releases

The government strategy involved:

- The regular release of offshore exploration areas
- The collection of data and its dissemination to explorers
- The improvement of company awareness of Australia's attractive title acquisition and taxation arrangements.

'Each year we endeavour to make available a broad selection of mature, under-explored and frontier areas for exploration under either the cash or work programme bidding system', Mr Snowdon said. 'The work programme is the most commonly used system for releasing offshore acreage. Companies bid a work programme with the permit offered to the company proposing the best assessment of the petroleum potential of the area.

'Since the strategy was announced, a total of 34 new exploration permits have been awarded. Of those awarded under the work programme system, programmes estimated to cost over $A820 million over a six year period have been proposed. In addition, the drilling of the first of 23 wells in Area A of the Zone of Cooperation of the Timor Gap commenced in December 1992 and it is likely that two or three rigs will be operating in Area A over the next two years.'

Timor Gap prospects

The veil of secrecy thrown around the first wells to be drilled in Timor Gap permits between northern Australia and Indonesia, whether by accident or design, has added to the romance and awe of a region which was off limits for 20 years.

Conference delegates heard that up to 45 wells would be drilled and more than 52,000 km of seismic data obtained over the next five years in the search for new oil and gas reserves.

By the end of 1995, 23 wells and 39,000 km of seismic data is scheduled to be shot. Marathon Petroleum has already drilled three wells, with frequent oil shows providing the incentive for further drilling. Eight wells are planned, with Australian companies, Woodside Petroleum and BHP Petroleum, taking a leading role. BHP Petroleum's Group Manager, Strategic Planning, Mr Andy C Clifford, told delegates that the Timor Gap region was highly attractive to BHP with the possibility of discovering oilfields of a similar nature to the

Jabiru, Challis and Skua discoveries already producing in the Timor Sea.

Discussion on exploration potential in the Timor Gap rarely takes place without mention of the Kelp prospect located near the centre of the new permits. Originally identified by Woodside Petroleum during the early 1970s, the feature has never been drilled. The early seismic surveys showed that the structure is large. Together with the oil discoveries at Jabiru, Challis and Skua, this has woven a mythology around Kelp and its potential. This Kelp 'mystery' has kept alive the interest of explorers, investors and politicians.

Mr Clifford said that extensive work to interpret the results of previous exploration indicated that structures such as the Kelp area were prospective. BHP is searching for Kelp look-alikes in the Timor Gap area.

To speed up exploration in the Indonesian section of the Timor Gap, the Indonesian government plans to ease its fiscal regime for offshore exploration and production. It has also launched a campaign to encourage more Australian investment. Indonesian Minister for Investment, Sanyoto Sastrowardoyo, singled out Australia because of its growing interest in neighbours such as Indonesia.

Natural Gas Strategy

The Natural Gas Strategy, introduced by the Australian government in 1991, has already had a major impact on the gas industry and provoked the States and Territories into examining governmental impediments to free and fair trade in gas.

The Federal Government has set the example and removed volume approvals for LNG exports; implemented a reform package for the operator of the Moomba-Sydney gas pipeline; established the Gas Industry Advisory Group, including producers, transporters, distributors and major consumers, enabling the industry to provide views on industry development issues to governments; and announced the development of a national regulatory framework for interstate trade in natural gas.

In early June the Council of Australian Governments considered a report from ANZMEC on the removal of impediments to free and fair interstate trade in natural gas.

LNG shortfall

An estimated shortfall of up to 32 million tonnes a year of LNG in the Asian region by the year 2005 is behind a proposal for a new 2 million tonnes a year LNG facility near Darwin. This is being promoted by Japanese trading house, Sumitomo Corp. Construction costs could total $A3 billion.

Further gas reserves must be proved before the project could become a commercial reality. Santos Ltd plans to drill two appraisal wells on the Tern and Petrel gas discoveries in the Bonaparte Basin, west of Darwin. The $A50 million exploration programme is designed to boost existing proven reserves from the current level of one trillion cubic feet (tcf) up to 4 tcf, considered the minimum required to support an LNG project.

Santos and Sumitomo head a four company consortium which is trying to attract venture capital for the project from Japan.The participation of a major Japanese gas utility is considered essential to the future success of any Darwin-based LNG project by providing long-term gas contracts to underpin the project.

According to Sumitomo forecasts, LNG demand in the Asian region will reach 83.7 million tonnes a year by the year 2005, which, on current estimates, would leave a 32 million tonne a year shortfall, including 21 million tonnes in Japan. Though six major LNG projects are planned elsewhere, some observers consider that each contains certain risk elements which might jeopardise their progress.

Papua New Guinea update

The conference heard that the development of the South-East Gobe oil discovery in Papua New Guinea's Southern Highlands was now likely, following the PNG government's decision to grant a new exploration licence over the area. The grant removed the need for the Chevron Niugini-led joint venture to relinquish half the PPL 101 permit.

PPL 101 contains the Juha and P'Nyang gas and condensate discoveries. The adjoining PPL 100 contains most of the exciting South-East Gobe discovery and the South-East Mananda oil find.

PNG Resources Minister, Masket Langalio, said that Chevron and its partners had sought to restructure the two exploration licences containing the Kutubu oilfield which expired the previous month.

The new licence covering PPL 101 will run for another five years, with a further one year extension possible under the Petroleum Act.

In the case of PPL 100, the government has granted a new licence which covers all 39 blocks in the permit, giving the joint venture another 11 years' security of tenure to continue its exploration programme.

The PNG member for Mendi, Michael Nali, told delegates that although half the permit must be relinquished after five years, he hoped the Gobe and Mananda discoveries would be declared 'locations' under the act or have production licences granted over them by 1999 – meaning the partners would not have to relinquish any of the new permit.

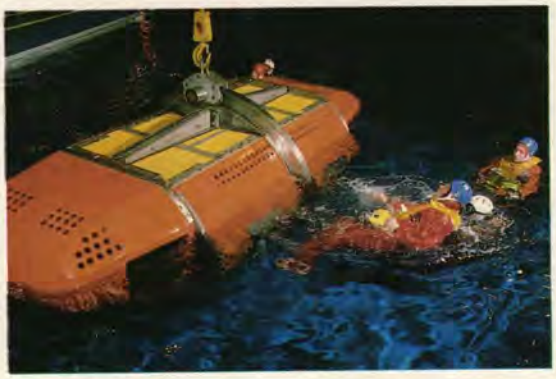
The Kutubu oil project operated by Chevron in PPL 100 is producing oil at the rate of 140,000 barrels a day and has already exported 1.8 million barrels, valued at US$385 million. During the life of the project (until 2014), Kutubu is estimated to generate US$2.3 billion for PNG government coffers, out of a total gross income of US$5.27 billion. ■

Survival training – based on fact or fiction?

Against a background argument that the demands of training are too high, especially for 'the ageing offshore population', the justification for survival training is often questioned. That the offshore population is ageing is a view that is frequently expressed but usually unsupported by data. The RGIT Survival Centre has, however, responded to the anecdotal suggestion that survival training may cause undue stress to the ageing workforce by funding a study to determine the facts scientifically.

This work admittedly is being carried out within a training establishment but the facts should be investigated and no other source of funding is presently forthcoming. In response to such worries on the dangers and the imminent alterations to guidelines, the opportunity is taken here to outline the facts surrounding survival training. Three aspects of the training process will be discussed – the outcome when the training has been applied in an actual emergency situation, the current standards and their implications for training establishments.

Survival training has been quoted as being of 'decisive moment in the escape and survival' of helicopter crash victims. The advantages of training in case of helicopter ditching and capsize have been demonstrated in a study by Bohemier et al. They found that the rate for naive subjects successfully egressing from the inverted Modular Egress Training Simulator increased at least three-fold, following seven repeated capsize trials. Seven repetitions, it should be noted, are considerably more than the two capsizes which trainees, new to offshore survival training, have the opportunity to experience (and only at certain training establishments). Evidence of 'real life' benefits of training are illustrated in a study by the Naval Safety Centre of helicopter crashes between 1969 and 1975. Of the 400 or more people involved, fewer than 8 percent of those who had received training in underwater escape died in such crashes, compared with more than 20 percent who received no such training.



Survival training

During survival training, areas of theoretical knowledge are covered which are alien to many but vital to us all. Surviving open sea conditions may well depend on considerable luck but the chances of rescue are significantly increased if the survivor is able to make correct decisions from an informed base. They must be made aware of the dangers of 'cold shock', which can cause heart failure on short exposures to very cold water, and reflex hyperventilation which can cause drowning. It is not common knowledge that increased activity in cold water can hasten exhaustion and hypothermia. Facts such as these must be taught so that informed choices can be made.

The standards outlining what training should provide are set out by the Offshore Petroleum Industry Training Organisation (OPITO) and are based on training guidelines that are published by the United Kingdom Offshore Operations Association (UKOOA). (See *Petroleum Review*, March 1993). Various criteria are used for setting the training level, including the consideration of trainees' previous experience and capabilities. Refresher training is provided for individuals with 'experience' of survival training within the previous four years. 'Capability'' is addressed at the RGIT Survival Centre by medically screening all trainees.

Trainers themselves can play a vital role in maintaining the effectiveness of survival courses. Indeed, according to UKOOA guidelines (1991), ongoing assessment should take place including 'monitoring of the effectiveness of training and how well the content is retained by trainees'.

The RGIT Survival Centre has reacted to this responsibility in several ways. Firstly, having completed any course, individuals are asked to comment by evaluating everything from the course content to the standard of instruction; finally they are quizzed on their own knowledge of the course. The results of these forms are analysed monthly and, where necessary, acted upon. Furthermore, a much more 'in-depth' scientific investigation is being conducted by the Centre's Research Unit, over three years, on how trainees react both physiologically and psychologically to training. The results of this study should provide information on just how 'stressed' trainees actually are and whether difference in response can be measured between individuals from different age, fitness and personality groups.

An important objective of this study is to determine whether or not training enhances the individual's basic capability and whether their prejudices about training and about their ability to cope are matched by the reality. The study will highlight problem areas and show whether they are inherent or whether the effectiveness of training can be improved by changing the approach. Preliminary results suggest that trainees actually cope better than expected and that the physical realities of offshore emergencies are the factors that prove to be the most difficult – the disorientation experienced in a capsized helicopter, and smoke. Only practical experience will show trainees that they can cope with such situations.

Occasionally additions are made to training following an incident that demonstrates deficiencies. This is not the only means of change as some deliberation is currently taking place as to the content of refresher training. Voices in the debate include representatives from UKOOA, offshore trade unions and training establishments. In order to obtain the opinion of individuals currently returning for refresher training, a questionnaire is presently being circulated on trial within the Survival Centre. This could provide experts in the training field with vital factual feedback on the appropriateness of training content for the industry.

In summary, research is a vital approach for determining the facts upon which training should be based. Without the essential information on effectiveness, appropriateness and response of the trainee, useful change is not possible. ■

Rachel Harris

Advanced diving

New head-up display gives divers more independence.

A new visual communications system for subsea operations promises to dramatically increase the productivity of divers, claims British Gas.

Trials carried out at the firm's Blyth Subsea Engineering Centre have shown that the time taken to carry out offshore maintenance can be cut by as much as three-quarters.

The new system consists of a head-up display, incorporated into a modified version of a standard 17B helmet, which allows the diver to see further, self-navigate and control delicate underwater inspection tasks without the need for constant guidance from colleagues above.

Computer graphics from non-destructive testing (NDT) equipment can be relayed to the head-up display, telling the diver when a measuring probe is in the best position for detecting a fault in a steel structure. Engineering drawings can also be fed into the display, enabling the diver to plan and carry out a task without the need for bolt-by-bolt verbal instructions from topsides. Even light from a hand-held sonar torch can be relayed to the surface and then back down to the diver, enabling him to locate structural items well beyond the range of normal subsea vision.

A miniaturised video camera and miniaturised light, both of which sit on top of the helmet, also come as part of the package. Output images from the camera are transmitted to the head-up display via the surface, adding to the range of visual cues.

British Gas expects to further develop the system so that it will be able to link information about a diver's position to the precise location of elements of underwater structures. This would involve combining the helmet display with an array of acoustic transponders at fixed positions around the diver's working area to create a reliable navigational system. The result, according to British Gas, would be a 'virtual reality environment, making 100 metres of murky sea water appear like clear, well-lit water'. A suitable acoustic transponder system is due for trial in the near future.

The head-up display, which is expected to be offshore as a prototype later this year, underwent a series of trials at Blyth in simulated seabed conditions using the Royal Navy. Divers wearing the new equipment carried out some maintenance tasks in as little as 15 minutes, claims British Gas, compared to an hour for those relying on verbal instructions.

Ergonomic

Mr Brian Jones, Principal Subsea Engineer, stressed that the display is ergonomically-designed. 'We tried not to add any weight, so we reduced the camera size right down in order to introduce the monitor.' The monitor image is relayed to the eye via a look-up display, thereby avoiding infringement of the diver's normal field of vision.

One major advantage to the system is that it attaches to a standard helmet. The image is then delivered through an aperture cut in the shell which can be sealed with a blanking plug when the equipment is not required.

The industry reaction has been mixed. Diving companies are showing interest in the new system but some have questioned whether it will be adopted outside the low-visibility conditions of the Southern North Sea. ■

Susannah Cardy

The system attaches to a standard helmet.

North Sea vision

By Susannah Cardy

A 28-year-old entrepreneur believes he can cut helicopter costs in the North Sea by as much as 25 percent but can he persuade the oil industry to back his £15 million project?

The world's first offshore logistics centre, handling all personnel needs for the UK Continental Shelf (UKCS) from accommodation, catering, safety training, drug-screening and personnel tracking to a centralised 'airline' service out to platforms. This is Calum MacLean's vision for the North Sea.

Planning permission has already been granted at Dyce airport, Aberdeen, for a combined heliport and advanced logistics centre spanning 10 acres and Mr MacLean has started the ball rolling by investing nearly £500,000 in the project.

One-stop shop

What he is offering is a 'one-stop shop', which will free companies from all responsibility for personnel movement in the UKCS. What he thinks will attract them most is an estimated cut in helicopter costs of between 15 and 25 percent.

His timing is spot on. Every operator in the North Sea currently charters helicopters separately but many have expressed an interest in cutting down on redundant capacity by pooling resources.

As a result, a group of operators recently formed the Chelsea Group - short for Combined Helicopter Service Arrangements - to study the idea. 'The overall utilisation of helicopters in the North Sea is only about 66 percent', said Mr David Owen, of Amerada Hess, who has been active in forming the group. 'We felt it was a luxury to have machines on permanent standby.' Chelsea now has nine members – BP, Texaco, Amerada Hess, Amoco, Chevron, Elf, Mobil, Marathon and Kerr-McGee, while Shell, Agip and Conoco are currently involved in discussions over joining. It was an obvious organisation for MacLean and his company, Aberdeen Logistics Ltd (ABEL), to court.

ABEL's presentations to the group have revolved around the concept of a centralised 'airline' service with scheduled flights to handle the 3,000 offshore personnel movements that are made each day in the North Sea. Tickets could be priced according to availability and helicopters organised to stop at several platforms on each flight. 'We're trying to allow the operators to break free from their long-term contracts with the helicopter firms,' said Mr MacLean.

'There's a lot that can be standardised and harmonised'

Not all in the industry, however, are sure about such a service. One North Sea operator told *Petroleum Review*: 'We don't always fill our helicopters up to capacity, but then we carry freight instead. This proposal would simply be creating an extra layer between the operators and the helicopter firms.'

The scheme also threatens the flexibility that the operators currently have. One industry source said, 'Helicopter flights are actually very efficient when you take out of the calculation those flights which react specifically to an emergency situation.' And there are other problems to iron out too. ABEL has to win over, not just the operators, but the helicopter firms.

Bristow's Aberdeen manager, Tony Jones, is interested in the concept but points to the difficulties involved in harmonising each firm's individual procedures. 'Some oil companies insist that emergency hoods be up on departure and landing; others don't. Then there are differences in personnel tracking systems, safety training and administration.'

The other part of the ABEL package is a fully-integrated complex offering 300 single-bed rooms, medical and dental services, safety and induction training, catering and leisure activities, a personnel security and tracking system to meet the recommendations of the Cullen Report, together with check-in facilities, departure points and lounges for each individual operator. Operators could utilise as many or as few of the facilities as they choose.

Ambitious project

'At the moment there are four or five different areas in Aberdeen controlling the logistics process - we want to tidy everything up and put it all in one centre,' said Mr MacLean. 'There's a lot that can be standardised and harmonised, which will improve efficiency and lead to substantial savings'.

It is an ambitious project but the oil industry has to be persuaded that it needs a major capital facility on this scale. Some, who are in favour of Mr MacLean's plans for helicopters, are more wary of this side of the project. They question whether an investment of £15 million can actually save

money and point out that the complex would be competing with the lowest end of the bed and breakfast market.

Mr MacLean, however, is confident that there is a gap in the market when it comes to reasonably-priced, comfortable accommodation. 'A significant percentage of personnel just don't stay in Aberdeen at the moment - they'd rather get up at four in the morning and drive up.'

Most in the industry do now believe that some form of combined helicopter service will eventually be developed in the North Sea but ABEL could find itself in competition with the existing helicopter firms, which are said to have their own ideas in this direction.

Mr MacLean, however, believes that he has put together a sound proposal. After all, £15 million is a small investment for a project that aims to slash helicopter costs by as much as a quarter. So how sure is he that he'll get sufficient funding for his brainchild and go on to revolutionise the North Sea? 'I wouldn't have invested £500,000 if I wasn't,' comes the confident reply. ■

Plans afoot for 'airline' service to North Sea platforms.

The Institute of Petroleum

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HELP US TO RECRUIT A MEMBER

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Individual membership of the IP is growing for the fourth successive year in spite of the continuing recession and major reductions in the workforce of many sectors of the oil and gas industry.

More and more people involved in the industry – which includes the oil and gas companies, the many businesses that trade with them, and the range of organisations that need financial and economic data relating to the industry – see the Institute as a vital source of knowledge, information and business contacts. They recognise that their involvement with the Institute can help them do a better job for their company, enhance their reputation and progress their career and the popularity of our Consultant List demonstrates this point.

You, as a member of the IP, are one of those people. If you read *Petroleum Review* and our other publications, attend IP conferences and discussion groups, use our library and information service, and participate in a wide range of IP events at both national and branch level, you will be better informed on a wide variety of current scientific, technical, economic and financial topics directly relevant to the industry – upstream and downstream – onshore and offshore. This has never been more important than today.

Personal recommendation

The Institute exists to serve its members. New members mainly come to us through personal recommendation from our existing membership. Current growth in a shrinking market is encouraging. More members and new ideas enable us to enhance our services. More importantly, they increase the scope, depth and value of the knowledge and contacts that you can gain through membership of the Institute. We therefore once again seek your help in achieving our objective to expand our membership.

Recruit a member

Please help us to recruit new members who will both benefit from membership of the Institute and bring to it new strengths and skills that will enhance the value of your own membership. They could be colleagues in your own company, or other important business contacts and friends – at home or abroad.

If they join before the end of September, they will automatically receive 15 months' membership for the price of 12!

Free diary

If you propose an applicant for membership before the end of October, we will send you a gift of a leatherbound 1994 IP diary as a token of our appreciation. The diary, bound in dark blue leather with the IP crest in gold, is packed full of valuable information about the oil industry and makes an ideal seasonal gift.

Why not pass the application form opposite to a friend or colleague and propose them for membership?

THE INSTITUTE OF PETROLEUM

Building on a History of Achievement

For more than 75 years, the Institute of Petroleum (IP) has been one of Europe's principal independent bodies concerned with the advancement of knowledge in the science, technology and economics of the oil and gas industry.
Its objectives are to ensure that its members are informed about the industry in which they work and are satisfied that the standards and codes which affect their commerce and operations are based on good industry practice and science. IP Committees and Panels – professionals from the oil and service industries, supported by its qualified Secretariat – pool their technical experience on international issues of concern such as health, safety and the environment, maintaining close liaison with common interest organisations in the UK, continental Europe and worldwide.
Additionally, through its comprehensive programme of conferences, courses and seminars, the IP seeks to foster and improve the professional knowledge, skills and standing of its members. In these matters the IP has earned an international reputation as a centre for information and as a respected forum for expert discussion and analysis on a wide spectrum of energy interests.

CAN I JOIN?

If you have an active professional interest in sharing and developing your knowledge of the oil, natural gas, or energy industries, then you are eligible to apply to join the Institute of Petroleum.

You may apply for membership wherever you are based in the world and whether you are employed within the petroleum industry or in any of the many industries or services associated with it.

The Institute has over 7,000 members and the number of successful new applicants grows each year. IP members are drawn from the whole spectrum of petroleum-related sectors, including:

- ❖ Exploration and Production
- ❖ Refining and Manufacturing
- ❖ Marketing
- ❖ Storage and Distribution
- ❖ Supply and Trading
- ❖ Fuels and Lubricants
- ❖ Petrochemicals
- ❖ Information Technology
- ❖ Accountancy and Financial Services
- ❖ Engineering
- ❖ Project Management
- ❖ Planning
- ❖ Economics
- ❖ Health, Safety and Environmental Affairs
- ❖ Education and Training
- ❖ Research and Development
- ❖ Consultancy

THE BENEFITS OF MEMBERSHIP

Information

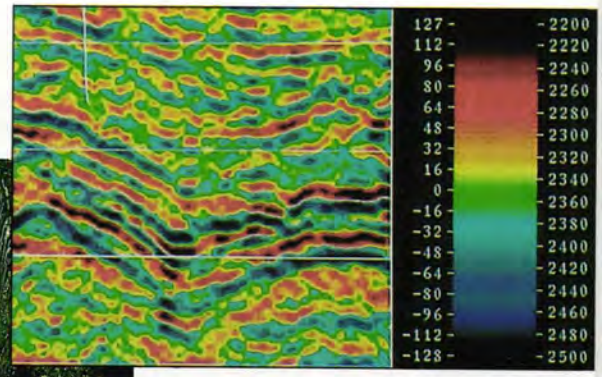
The increasing number of industry professionals seeking membership of the Institute do so because they recognise that fast and direct access to specialist advice or information when it is needed is now, more than ever, an essential requirement for staying ahead in business.

The Institute of Petroleum, as a centre of scientific, technical, economic and marketing data and expertise, has the resources to help you.

Its expert **Technical Department and Library and Information Service** answer around 15,000 enquiries each year, accessing an unrivalled range of information sources, including some 20,000 publications. The Service also accesses hundreds of external on-line databases in the USA and Europe, in addition to its own internal databases.

Petroleum Review, the Institute's respected international magazine, issued free to members, provides you with a regular and authoritative source of information to ensure that you are in a position to take advantage of important developments impacting the industry.

Attending **IP Conferences** enables you to take an in-depth look at areas of topical concern, to hear the views of prominent industry figures and to meet your opposite numbers across the industry.



The Institute's strength is derived from the diversity of skills and enthusiasm of its membership.

Pictures courtesy of BP, Enterprise Oil and Shell

PROFESSIONAL DEVELOPMENT

Upon election you can, as an individual member of the institute, use the designation **"M.Inst.Pet."** after your name. Candidates of suitable standing may, after five years' membership, apply for **Fellowship** of the Institute, with the professional status that this prestigious award would confer.

In addition, you may take advantage of any of the Institute's **Professional and Career Development Courses.** The Institute recognises the diversity and importance of the technical and management skills represented in the petroleum industry and is currently developing additional courses designed to help its members to perform their jobs more effectively and to assist them in their future careers.

BUSINESS CONTACTS

Getting involved in the activities of the IP, centred on its elegant Central London headquarters, offers members the chance to establish valuable contacts throughout the industry.

The meetings of the Institute's **Special Interest Groups** — *Energy Economics, Exploration & Production, Environment, Personnel, Education and Training, Information for Energy* — provide a forum for lively discussion and debate. Recent meetings have given members the opportunity of meeting with government ministers, EC officials, MPs, leading economists, industry Chief Executives and other experts.

You may join, free of charge, any of the Institute's active **Branches** in the UK, Ireland and overseas, which organise their own programmes of professional and social events with the aim of promoting members' interests in the region.

Attending the Institute's many **social functions,** special **Lunches** or **events** gives you the chance to meet the "Who's Who" of the oil industry and make new contacts, as well as keep up with old friends. Industry CEOs and OPEC Ministers have spoken at recent Institute Lunches and the famous **IP Annual Dinner,** the highlight of what has come to be known as "IP Week", is one of the most important social occasions on the international oil calendar.

AFFINITY BENEFITS

The Institute has negotiated, on behalf of its members, valuable personal benefits, which include preferential rates on:

- **Membership of the Royal Over-Seas League,** amounting to a **discount** of up to **£80.00** on the first year's membership. The Royal Over-Seas League has attractive Clubhouses in St James's, at the heart of London's Clubland, and in Edinburgh's Princes Street, as well as a network of reciprocal clubs around the world.
- **Motor and Household Insurance**
- **Medical Insurance**
- **Professional Indemnity Insurance**
- **Other Financial Services**

Conferences, Publications and Information are popular membership benefits.

SUMMARY OF BENEFITS

Membership of the Institute entitles you to:

- Use the designation "M.Inst.Pet" after your name and apply for Fellowship ("F.Inst.Pet.") after five years;
- Wear an Institute Members' or Fellows' tie or scarf;
- A free monthly copy of the Institute's magazine, Petroleum Review;
- Full use of all the IP's Technical, Library and Information Services, including access to computerised databases;
- Privileged access to and large discounts on the Institute's comprehensive conference programme and publications and its professional and career development courses;
- Apply for inclusion in the Institute's Register of Consultants;
- Membership of any of the Institute's Special Interest Groups or Branches;
- Attend and invite guests to the Institute's calendar of social events;
- A range of useful personal affinity benefits.

At only £40 (and only £11 if you are aged under 25), the cost of membership can easily be recouped by taking advantage of any of the discounts available to members and is tax deductible.

HOW DO I APPLY?

Simply complete the attached application form and send it, with your remittance, to:

Caroline Nutt
Membership Secretary
The Institute of Petroleum
61 New Cavendish Street
London W1M 8AR
Telephone: 071-636 1004

If you do not know an existing IP member to propose your application, we will consider a letter of reference from someone who knows you well and is in a senior position to yourself at your place of employment. We will let you know the outcome of your application within four weeks of receipt.

We consider Membership of the Institute to be excellent value. We hope that you will agree and that you will wish to take advantage of all that the Institute has to offer its members and apply today.

Nearly 400 COMPANIES have taken advantage of the benefits of membership of the Institute. If you would like to learn more, please call Caroline Nutt, who will be happy to talk to you about the benefits to your company.

The Institute of Petroleum

A Charitable Company Limited by Guarantee No. 135273 England
61 NEW CAVENDISH STREET, LONDON W1M 8AR
Tel: 071-636 1004 Telex: 264380G Fax: 071-255 1472

APPLICATION FOR ELECTION TO MEMBERSHIP

FOR OFFICIAL USE ONLY	Acknowledged:	Elected to Fellowship: Date
	Membership No:	Resigned/Lapsed: Date Owing
	Date of Joining:	Reinstated: Date Grade

Surname				Job Title (if applicable)	
First Names				Employer's Name (if applicable)	
Mr. Mrs. Miss. Ms. Dr. etc.		Decorations		Business Address	
Date of Birth		Age	Yrs.		
How were you introduced to the Institute?				UK Postcode or Country	Tel: / Fax:
				Home Address	
Have you previously been a member of the Institute? ☐ Yes ☐ No If so, please state: Grade ..... Date Joined ☐☐☐☐☐☐ Date Lapsed ☐☐☐☐☐☐				UK Postcode or Country	Tel: / Fax:
Employment Status	☐ Employed ☐ Self-Employed ☐ Retired ☐ Student ☐ Other			Preferred mailing address	☐ Home ☐ Business

ACADEMIC OR PROFESSIONAL QUALIFICATIONS & SUBJECTS (Higher First)

Qualification	College/University	Year	Subject

MEMBERSHIP OF PROFESSIONAL BODIES (e.g. Institution of Mechanical Engineers)

Professional Body	Grade of Membership	Chartered Status (e.g. C.Eng.)

TYPE OF ORGANISATION

Tick type of organisation by which you are currently, or were most recently, employed. Please tick one box only.

☐ 00	major international integrated oil co.	☐ 11	transport industry & retail services
☐ 01	other integrated oil co.	☐ 12	information technology/computing/publishing
☐ 02	independent oil co. upstream	☐ 13	traders/brokers
☐ 03	independent oil co. downstream	☐ 14	investment/finance/banking/legal
☐ 04	supply/distribution/storage	☐ 15	educational/training establishment
☐ 05	other energy industry (gas/coal etc.)	☐ 16	government/military/local authority
☐ 06	engineering contractors/manufacturers or suppliers of equipment	☐ 17	consultancy
☐ 07	shipping	☐ 18	industry association
☐ 08	E & P services	☐ 19	research establishment
☐ 09	inspection/laboratory service co.	☐ 20	geophysical/seismic company
☐ 10	chemical/additive co.	☐ 21	other (please specify) .....

JOB FUNCTION

Please tick the function(s) (2 maximum) which mostly describe(s) your current or most recent job.

☐ 00	director/general manager	☐ 10	transport/pipelines/shipping
☐ 01	planning/economics	☐ 11	refining/manufacturing
☐ 02	finance/computer services/information technology	☐ 12	marketing/sales/distribution
☐ 03	personnel/industrial relations/training	☐ 13	quality assurance/analysis/testing/measurement
☐ 04	administration/legal/public affairs	☐ 14	engineering/project management/design/construction
☐ 05	product & process research & development	☐ 15	medical/health & safety
☐ 06	exploration & geophysical	☐ 16	environment
☐ 07	E & P services	☐ 17	academic
☐ 08	drilling & production	☐ 18	other (please specify).....
☐ 09	supply & trading		.....

INTERESTS

1. Please indicate, using the code numbers above, the three subject areas which most interest you: ☐ ☐ ☐
2. Is/was your work primarily ☐ Upstream? ☐ Downstream? ☐ Both?
3. What are the particular benefits you hope to derive from membership? .....

.....

PROPOSER

I, being an individual member (member no. .....) or nominated representative of a Collective Member

(name of company: .....) and having known the candidate personally

for ..... years, propose and recommend the candidate in accordance with the Bye-Laws as a fit and proper person to belong to the Institute.

Signature: .....

Name: ..... Date: .....

APPLICANT

I, the undersigned, declare that the statements made herein are correct to the best of my knowledge and belief. I agree, if admitted to membership, to be governed by the rules and regulations of the Institute of Petroleum as they now exist and as they may hereinafter be altered. I agree that, if elected, the information provided above, and other relevant personal details, may be held on computer at the Institute of Petroleum and its branches and that my name and address may be published in the New Members' Section of Petroleum Review.

Signature of Applicant: ..... Date: .....

PAYMENT

Applications for the year commencing 1st January 1994 must be accompanied by payment, as follows:
— Applicants of 25 years of age or more £40.00
— Applicants under 25 years of age £11.00

Payment by cheque — Please make your cheque payable to the Institute of Petroleum. If you have no bank account in the UK, please pay by sterling bank draft drawn on a London Bank. Alternatively, payment may be made by credit card, as below. Please do not send cheques drawn on a bank outside the UK, as bank charges can be as high as £25.00 sterling.

Payment by Credit Card — Please complete details below, using any one of:

☐ VISA ☐ MASTERCARD ☐ ACCESS ☐ EUROCARD (please tick as appropriate)

Expiry Date m/yr ..... Credit Card Holder's Name .....

Registered Address .....

Please charge to my/our card no ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ the sum of £ .....

Credit Card Holder's Signature .....

Role of coastal shipping in the primary distribution of petroleum product in the United Kingdom

By Jonathan Packer, Consultant

The genesis of this article was an independent study into the distribution by mode of petroleum product in the UK market undertaken as input into a project on the potential for short sea, coastal and inland shipping. This 'Roads to Water ' research project was a focusing study for the Department of Transport as part of an overall commitment to support the use of more environmentally friendly forms of transport.

UK transport market

Road dominates internal goods traffic, carrying 88 percent of the total tonnes moved and 78 percent of the tonne-miles, although coastal shipping and rail take a more significant share of longer-haul traffic with nearly 10 percent of tonne-miles each. Petroleum product accounts for 5 percent of road traffic tonnes and 4 percent of tonne-miles.

Petroleum product is the largest element of coastal shipping traffic representing nearly three-quarters of true coastal shipping tonnes, excluding crude oil and ferry traffic (see **Table 1**).

Product primary distribution volumes by mode

There are 11 major refineries, and three smaller refineries, located at seven distinct refining locations around the coast of Great Britain. These refining areas can be related to the 11 economic regions of the United Kingdom. There are no statistics available for refinery output and economic region product demand. It was therefore necessary to build up the picture by the use of certain available information and by estimation.

The result of this complex analysis is summarised in **Table 4** (see page 417) which shows for each refining area the net available for UK inland distribution and the estimated primary distribution volumes by transport mode. The 'net available' is arrived at after deducting UK exports less imports and marine bunker sales. Some of the assumptions made in arriving at the volumes by mode are shown as footnotes to **Table 4**.

Distribution can be categorised as primary or secondary. Primary distribution is distribution from the refineries to the major regional distribution terminals; these terminals are fed by coastal shipping, pipeline and to a lesser extent rail. Secondary distribution is distribution, generally by road, from the regional distribution terminals direct to final customers or to local distribution points; the refinery itself also acts as a regional distribution point serving its local market by road.

Of the 57 million tonnes transported in 1990 from refinery to regional distribution terminals in primary distribution, 41 percent was carried by coastal shipping, 42.5 percent by product pipeline and 16.5 percent by rail. Road carried overall 73 million tonnes (including some LPG, bitumen and lubricants) of which an estimated 19 million tonnes was ex-refinery and import storage tanks, mainly on the Thames, and 54 million tonnes was from regional and local distribution terminals.

The oil companies operate a system of swap arrangements between themselves to limit the inter-area flows and minimise transport costs from their individual refineries, whilst still being able to market throughout the country. The swap arrangements involve both physical swaps of equivalent volume of product at different locations and/or monetary adjustments. The arrangements have resulted in less product being distributed over long distances and lower coastal shipping, pipeline and rail tonne-miles.

Pipelines now carry about 25 million tonnes of product in primary distribution. They connect together all the major refineries, except

Table 1

1991 (million tonnes)	Total tonnes	Tonnes over 300	% of total	Petroleum product
Road	1505	83	78.4	73
Rail	136	14	9.6	10
Coastal shipping	31	20	9.4	23
Inland waterways	6	0	0.1	0
Pipeline	25	0	1.5	25
Total	1704	117		

Goods transport distances in the United Kingdom are generally short – 93 percent are below 300km. 80 percent of oil product distribution by road moves under 100km and the mean distance is only 56 km. However 60 percent of oil product distributed by coastal shipping moves over 300km and 25 percent moves over 600km.

Grangemouth and Teesside, with the major markets. There are trunklines through the centre of England between Merseyside and London with links from Teesside and Milford Haven. Rings run around London, Birmingham and Manchester and spurs run to Bristol, Nottingham and East Anglia. The volume includes supply to the airports which consume over 6 million tonnes of product annually. About 10 million tonnes annually of the distribution by pipeline is within the region of origin, whilst 15 million tonnes is inter-regional distribution. There are no new major pipelines planned, although there are some modest developments underway. The crude oil pipeline from Loch Finnart on the Clyde estuary to Grangemouth on the east coast of Scotland has been converted to petroleum product and the direction reversed, thus reducing coastal shipping distances from Grangemouth to the west coast and to Northern Ireland.

Rail distributed nearly 10 million tonnes of product in 1990, of which 3 million tonnes was within the region of origin. The Humberside refineries were the major distributors by rail, shipping 4 million tonnes and London and the West Midlands were the largest rail importers bringing in 1.5 million tonnes each. The average haul is some 200km.

Road distributed a total 73 million tonnes of product, of which nearly all was within the region of origin and 26 percent represented primary distribution direct from the refineries and import storage tankage. The London and South East region alone accounted for nearly 60 percent of this primary distribution by road; of the 11 million tonnes 90 percent was from refineries and terminals on the Thames. The reason for this emphasis on road is their proximity to the major consuming area and the absence of significant and alternative distribution modes within the Greater London region. Completion of the M25 London orbital motorway has greatly facilitated road distribution of product in the South East by increasing the distance over which a road tanker can transport product in a single shift and it has eliminated distribution by water to Thames riverside terminals. Road distribution has increased in other areas such as North Wales and East Kent with the closure of small coastal tanker-fed terminals in recent years.

Regional distribution

The **South East** is a net exporter of product to other UK regions. However, Greater London is a net importer from Southampton, mainly by pipeline, from other refining areas and from abroad to Thameside tank storage. Southampton distributes by coastal shipping all round England as well as by pipeline.

Wales (Milford Haven/Pembroke) is a major net exporter of product to other regions, and also to Eire. It is responsible for one-third of the distribution in the UK by coastal shipping mainly to the Bristol Channel, the South West, Lancashire and Northern Ireland. It supplies by pipeline and rail to the Midlands.

The **North West** has a high pipeline throughput but only one-third goes outside the region. Movements in and out of the region are relatively shorthaul. Coastal shipping movements are relatively small – along the west coast of Northern England and Wales.

Scotland's primary distribution is mainly by coastal shipping of which 70 percent is to coastal terminals on the Scottish and Northern England east coast. Most of the rail movement is to Glasgow.

Teesside, like Scotland's Grangemouth, is a major net international exporter of product and its distribution by coastal shipping is along the east coast from Scotland to the Humber.

Humberside is the major user of rail and it distributes by coastal shipping mainly along the east coast from Scotland to the Thames.

Coastal shipping

The coastal tanker product distribution pattern was analysed by tanker tracking and then correlating the results with port statistics.

In general, east coast refineries ship to importing areas on the east coast; for example the Teesside and Humberside refineries ship from East Scotland to Sussex and Hampshire. Conversely, the west coast refineries ship to importing areas on the west coast and to Ireland.

The Southampton, Fawley, Milford Haven and Grangemouth refining locations account for 70 percent of coastal product shipments. Fawley and Milford Haven ship to the widest port range; Fawley ships mainly over 600km and as far as East Scotland, whilst Milford Haven ships mainly between 300 and 400km and also shorthaul to the Bristol Channel area.

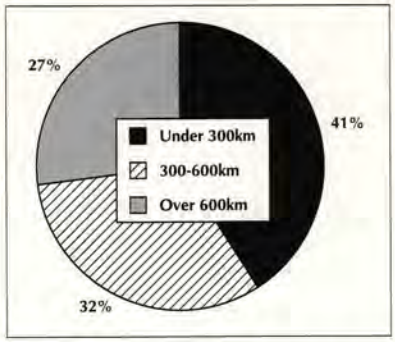


Table 2 – Coastal product shipments.

For the UK refineries as a whole the 23 million tonnes of coastal product shipments are split as in **Table 2** (above).

The largest inward shipments are to the east coast of Scotland and to the Bristol Channel/South Wales region; over 50 percent of these volumes are shipped under 300km. In contrast 50 percent of the inward shipments into the Thames region are over 600km. The coastal product 'importing' areas of mainland Britain are split by port range (see **Table 3** below).

The weighted average distance of coastal shipment is 418km (261 miles) for the United Kingdom as a whole. Scotland has some of the longest coastal supply routes, whilst the east coast has the shortest.

There is a considerable difference

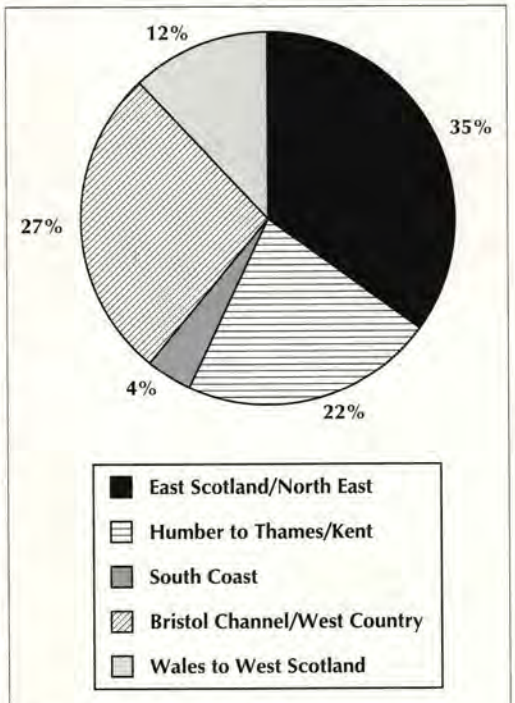


Table 3 – Inward shipments by port area.

between the trading patterns of tankers below 10,000 deadweight tonnes (dwt) and those above 10,000 dwt. Two-thirds of the coastal shipments are moved in tankers below 10,000 dwt and 50 percent of these are under 300km and only 13 percent above 600km. One-third of shipments are moved in tankers above 10,000 dwt and 53 percent of these are over 600km and only 20 percent below 300km. Generally economies of scale dictate larger tankers over longer distances but this also depends on the consignment size and draught and tank capacity constraints at the discharge terminal. There are very few two port discharges. The average distances are:

Under 10,000 dwt	350km
Over 10,000 dwt	550km
Overall	**418km**

There are now 50 coastal petroleum product terminals, of which 16 are in Scotland. Their annual throughput ranges from over 1 million tonnes down to 100,000 tonnes.

In 1992, when the tanker tracking exercise was undertaken, the mix of tankers on the UK coast was:

Smaller dedicated coastal tankers	*No.*	*'000s (dwt)*
1,000 - 2,000	28	43
2,000 - 3,500	42	118
4,000 - 10,000	10	58
Total	**80**	**219**

Larger tankers - irregular capacity	*No.*	*'000s (dwt)*
10,000 - 15,000	13	171
20,000 - 31,000	14	347

These figures exclude tankers and barges below 1,000 dwt.

Developments in distribution

It will probably be difficult to justify new pipelines on a purely economic basis, although environmentally some new local pipelines could usefully reduce road tonnes-miles. The most recent major trunk pipeline constructed is that from Humberside to Buncefield north of London. Although swap arrangements might have avoided the need for this pipeline, marketing advantages were paramount.

There will continue to be various shifts in distribution patterns such as the recent increase in supplies from the Tees to the Thames which has increased coastal shipping tonne-miles but such shifts will have little impact on road haulage volumes.

There is a dynamic balance between supplying the smaller regional markets direct by coastal shipping through local terminals and supplying them indirectly by road from more distant coastal or pipeline terminals. For the oil companies it is a question of economics, taking into account the relative costs of the different modes of transport, their terminal fixed and variable costs and their incremental pipeline costs. An oil company's distribution costs split roughly 50 percent for primary distribution and terminalling and 50 percent for secondary road distribution. The relative costs of transport per tonne-mile (in index form) are about:

Pipeline	**under20**
20-30,000 dwt tanker	**50**
2-3,000 dwt tanker	**100**
Rail	**say 120**
Road Tanker *(25 tonne artic)*	**400-500**

Coastal shipping clearly has a cost advantage over road. It is also more environmentally friendly, leading to less congestion, noise and pollution; and small coastal tankers have a fuel consumption per tonne-km of only 25-33 percent of that of road tankers.

Coastal tanker volumes showed a sharp fall of up to 20 percent in the 1980-85 period as the oil companies rationalised their distribution patterns, increased their pipeline volumes, closed coastal oil terminals and further developed their swap arrangements. Since 1986 coastal tanker volumes have been fairly steady despite a 10 percent increase in inland oil demand. This indicates a continuing but rather slower erosion in the coastal tanker share of product distribution.

The cost of road haulage has reduced in real terms over the last 10 years as roads have improved and drivers' shifts have become more flexible. Road tankers' daily productivity has risen substantially. Coastal tankers productivity has also improved, particularly as a result of faster port turnaround times. But rising terminal costs, limitations on tanker size at some of them and the high replacement cost of coastal tankers could lead to more coastal terminal closures and an increase in road haulage tonne-miles.

The author believes strongly that the oil industry should take into account the environmental factors in their assessments and not justify closure of coastal terminals on simple transportation economics grounds alone. In certain continental European countries industry is beginning to take this issue seriously, by switching to water for its raw material inputs and for some of its distribution. ■

Mr Michael Everard presented material from this summary at a recent IP Conference, 'Improving Oil Industry Cost Competitiveness through the Logistics Chain', under the title 'Is There a Future for Coastal Tankers?

Primary distribution ex-refinery (m tonnes) *

Refinery		*Net available ** *	*Ship*	*Pipeline*	*Rail*	*Road ****
South East:	Thames	16.2	1.8	3.8	0.6	10.0
	Southampton	13.2	3.8	7.6	0.8	1.0
Wales	Milford Haven	14.6	7.6	4.0	1.2	1.8
North West:	Mersey	11.5	1.4	6.7	1.3	2.1
Scotland:	Grangemouth	6.2	4.5	-	1.0	0.7
North:	Teeside	2.2	1.1	-	0.7	0.4
	Humberside	-	3.4	2.4	4.0	2.8
Total		-	**23.6**	**24.5**	**9.6**	**18.8**

Table based on the Consultant's estimates.

* *primary distribution ex-refinery and independent import tankage; excludes arrivals by coastal shipping from other UK regions.*

** *net available equals refining area refinery output less international exports and marine bunker supplies plus international imports.*

*** *primary road distribution only (includes residual error adjustments).*

Table 4 – Refining area distribution by mode – 1990.

FORTHCOMING EVENTS

September

7th-10th
Aberdeen: 'Offshore Europe 93'. Details: Offshore Europe Partnership, Rowe House, 55/59 Fife Road, Kingston upon Thames, Surrey KT1 1TA.
Tel: (081) 549 5831.
Fax: (081) 541 5657.

9th
London: 'British Annual Energy Forum 1993.' Details: The British Energy Association, 34 St. James's Street, London SW1A 1HD.
Tel: (071) 930 1211.
Fax: (071) 925 0452.

9th-15th
York: 'International Solvent Extraction Conference'. Details: Conference Secretariat, Society of Chemical Industry, 14/15 Belgrave Square, London SW1X 8PS.
Tel: (071) 235 3681.
Fax: (071) 823 1698.

15th-18th
Oxford: 'International Business Outlook'. Details: International Herald Tribune Conference Office, 63 Long Acre, London WC2E 9JH.
Tel: (071) 836 4802.
Fax: (071) 836 0717.

15th-17th
Singapore: '1993 Regional Conference on Energy Price Risk Management'. Details: Ms Saskia Dormaar, IIR Pte Ltd, #08-03 Golden Wall Centre, 89 Short Street, Singapore 0718.
Tel: 65-33835321.
Fax: 65-3364017.

16th
London: 'Kvaerner Subsea Booster Station'. Details: Gareth Edwards, Institution of Mechanical Engineers.
Tel: (071) 973 1243.

16th-17th
London: 'UK and International Oil and Gas Taxation – Optimising your Tax Efficiency to Maximise your Profits.' Details: IIR Ltd., 28th Floor, Centre Point, 103 New Oxford Street, London WC1A 1DD.
Tel: (071) 412 0141.
Fax: (071) 412 0145.

19th-29th
Divonne-les-Bains, France: '25th International Petroleum Economics Seminar'. Details: Dr Bob Gale, Petroleum Economics Limited, Piercy House, 7 Copthall Avenue, London EC2R 7BU.
Tel: (071) 638 3758.
Fax: (071) 638 3708.

20th-21st
Vienna: 'The Future of European Energy'. Details: Jackie Murphy, The Economist Conferences, 40 Duke Street, London W1A 1DW.
Tel: (071) 493 6711.
Fax: (071) 931 0228.

20th-21st
London: 'Reduce Time to Market by Implementing Simultaneous Engineering'. Details: The Customer Services Manager, IIR Ltd., Industrial Division, 28th Floor, Centre Point, 103 New Oxford Street, London WC1A 1DD.
Tel: (071) 412 0141.
Fax: (071) 412 0145.

20th-24th
Oxford: 'Natural Gas – The Commercial Challenges', a five-day Seminar/Workshop. Details: Anita Gardiner, The Alphatania Partnership, Alphatania House, 82 Rivington Street, London EC2A 3AY.
Tel: (071) 613 0087.
Fax: (071) 613 0094.

21st-22nd
Edinburgh: 'Environmental Monitoring at an Oil Terminal: The Shetland Experience'. Details: The Meetings Secretary, The Royal Society of Edinburgh, 22-24 George Street, Edinburgh EH2 2PQ.
Tel: (031) 225 6057.
Fax: (031) 220 6889.

21st-22nd
London: 'Fourth International Conference – The Jack-up Platform, Design, Construction & Operation'. Details: The Jack-up Conference Secretary, Ocean Engineering Research Centre, Department of Civil Engineering, City University, Northampton Square, London EC1V 0HB.
Tel: (071) 477 8141.
Fax: (071) 477 8570.

21st-22nd
Cardiff: 'The First International Conference on Combustion & Emissions Control'. Details: Conference Department, The Institute of Energy, 18 Devonshire Street, London W1N 2AU.
Tel: (071) 580 0008.
Fax: (071) 580 4420.

21st-23rd
Bradford: 'Hydrocyclones'. Details: Dr J Svarovska, Course Director, Fine Particle Software, 8 Carlton Drive, Bradford, West Yorkshire BD9 4DL.
Tel/Fax: (0274) 546276.

23rd
London: One day symposium, 'Environmental Law and Liability in Pollution Control'. Details: The Conference Manager, IWEM, 15 John Street, London WC1N 2EB.
Tel: (071) 831 3110.
Fax: (071 405 4967.

23rd-24th
Aberdeen: 'Practical Application of Total Quality Management in Offshore Companies'. Details: IIR Ltd., 28th Floor, Centre Point, 103 New Oxford Street, London WC1A 1DD.
Tel: (071) 412 0141.
Fax: (071) 412 0145.

27th-28th
London: 'Getting the Most Out of Unmanned and Not Normally Manned Platforms – The State of the Art'. Details: Helen Jackson, Henry Stewart Conference Studies, 2/3 Cornwall Terrace, Regent's Park, London NW1 4QP.
Tel: (071) 935 2382.
Fax: (071) 486 7083.

27th-28th
Nicosia, Cyprus: 'The 7th APS Conference – Middle East Strategy to the Year 2006: Oil, Gas, Border Issues & Energy Finance'. Details: APS Conferences, P.O. Box 3896, Nicosia, Cyprus.
Tel: (357 2) 351778.
Fax: (357 2) 350265.

27th-29th
London: 'Seatrade Tanker Industry Convention'. Details: Vanessa Stephens, The Seatrade Organisation, Seatrade House, 42 North Station Road, Colchester CO1 1RB.
Tel: (0206) 45121.
Fax: (0206) 45190.

28th-30th
Brugge, Belgium: 'Slurry Handling and Pipeline Transport Hydro Transport 12'. Details: Miss Tracey Peters, Conference Organiser, BHR Group Limited, Cranfield, Bedford MK43 0AJ.
Tel: (0234) 750422.
Fax: (0234) 750074.

28th-1st October
London: 'Third Grove Fuel Cell Symposium – The Science, Engineering and Practice of Fuel Cells'. Details: Kay Russell,

FORTHCOMING EVENTS

Conference Department, Elsevier Advanced Technology, Mayfield House, 256 Banbury Road, Oxford OX2 7DH.
Tel: (0865) 512242.
Fax: (0865) 310981.

29th
Aberdeen: Diverless Operations: Installation, Construction and Intervention'. Details: 2 Marlborough Street, Faringdon, Oxon SN7 7JP.
Tel: (0367) 242525.
Fax: (0367) 241125.

29th-30th
Aberdeen: 'Human Factors in Emergency Response Offshore' – Developments in Evacuation, Escape and Rescue. Details: Philippa Giles, Business Seminars International Ltd, Grant House, 56/60 St John Street, London EC1M 4DT.
Tel: (071) 490 3774.
FaxL (071) 490 2296.

30th
London: 'The Effects of VAT on Domestic Energy'. Details: The Conference Organiser, IFS, Freepost, WC 5466 London WC1E 7BR.
Fax: (071) 323 4780

30th-1st October
London: 'Risk Management for the Transport of Dangerous Goods – The Pan-European Challenge'. Details: Jane Worman, IBC Technical Services Ltd., Gilmoora House, 57-61 Mortimer Street, London W1N 7TD.
Tel: (071) 637 4383.
Fax: (071) 631 3214.

October

3rd-6th
Houston: 1993 SPE Annual Technical Conference and Exhibition – 'Oil and Gas Strategies in the 21st Century'. Details: SPE Meeting and Exhibits Dept., PO Box 833836, Richardson, TX 75083-3836 USA.
Tel: (214) 952 9393.
Fax: (214) 952 9435.

4th-5th
London: 'Regulation & Marketing in the UK Gas Industry'. Details: AIC Conferences, Nestor House, Playhouse Yard, London EC4V 5EX.
Tel: (071) 779 8848.
Fax: (071) 779 8663.

4th-5th
London: 'Achieving Best Practice in Leak Detection & Prevention in Underground Storage Tanks & pipes'. Details: IIR Ltd., Industrial Division, 28th Floor, Centre Point, 103 New Oxford Street, London WC1A 1DD.
Tel: (071) 412 0141.
Fax: (071) 412 0145.

7th-8th
London: 'Privatisation, Energy Utilities and the Law – the impact of UK and international law on the development of the international energy market'. Details: Katie Furminger or Christine Rickards, IBC Leagal Studies and Services Limited, Gilmoora House, 57-61 Mortimer Street, London W1N 7TD.
Tel: (071) 637 4383.
Fax: (071) 631 3214.

11th-12th
London: 'Opportunities for Trade and Investment in the Russian and CIS Gas Industry'. Details: The Conference Department, The Royal Institute of International Affairs, Chatham House, 10 St. James's Square, London SW1Y 4LE.
Tel: (071) 957 5700.
Fax: (071) 957 5710.

12th-16th
Brussels: 'THERMIE – Promotion of European Energy Technology'. Details: Commission of the European Communities, Directorate-General for Energy, THERMIE, 200 rue de la Loi. B-1049 Brussels.
Fax: 32-2-2950577.

13th-14th
Manchester: 'Engineers and Risk Issues', the Safety and Reliability Society Annual Conference. Details: The Safety and Reliability Society, Clayton House, 59 Piccadilly, Manchester M1 2AQ.
Tel: (061) 228 7824.
Fax: (061) 236 6977.

13th-15th
Leipzig: 'Flowtech '93'. Details: Mr Tony Blease, Intech Expo Ltd., PO Box 282, Watford, Herts. WD1 4EE.
Tel: (0923) 226210/245303.
Fax: (0923) 819761.

14th
London: 'Developments in Microbial Control in Metal-Working Fluids Conference'. Details: Caroline Little, The Institute of Petroleum.

14th-16th
Ho Chi Minh City, Vietnam: Vietnam's International Oil & Gas Exploration and Production Technology Trade Exhibition – 'Petro Vietnam '93'. Details: Peter Hebbourn, Reed Exhibition Companies, Oriel House, 26 The Quadrant, Richmond, Surrey, TW9 1DL.
Tel: (081) 940 3777.
Fax: (081) 332 1978.

15th
London: One-day Seminar – 'Flowmeter Selection'. Details: Short Course Administrator, Department of Fluid Engineering & Instrumentation, School of Mechanical Engineering, Cranfield Institute of Technology, Cranfield, Bedford MK43 0AL.
Tel: (0234) 754766.
Fax: (0234) 750728.

18th-19th
London: 'The Sixth Annual UKCS Oil and Gas Taxation Conference'. Details: Langham Oil Conferences Ltd., 37 Main Street, Queniborough, Leicester LE7 3DB.
Tel: (0664) 424776.
Fax: (0664) 424832.

19th
London: 'Economics of Refining Conference – What the Environment is Costing the European Refining Industry'. Details: Caroline Little, The Institute of Petroleum.

19th-21st
London: 'UK Corrosion '93 Asset Management'. Details: Jane Worman, IBC Technical Services Ltd., Gilmoora House, 57-61 Mortimer Street, London W1N 7TD.
Tel: (071) 637 4383.
Fax: (071) 631 3214.

26th-27th
London: 'After the Tunnel – The maritime and trade impact of the Cross-Channel link'. Details: Conference Division.
Tel: (071) 250 1500.
Fax: (071) 253 9907.

26th-27th
Aberdeen: 'Capitalise on Proven Strategies to Maximise Pump Performance & Reliability'. Details: IIR Ltd., Industrial Division, 28th Floor, Centre Point, 103 New Oxford Street, London WC1A 1DD.
Tel: (071) 412 0141.
Fax: (071) 412 0145.

Surge in exploration activity in Tunisia

By Naji Abi Aad, Energy Consultant

The Entreprise Tunisienne d'Activités Pétrolières (ETAP),in charge of Tunisia's hydrocarbon sector has set itself a target of awarding four to six exploration licences annually, the level deemed necessary for exploration to continue at a satisfactory pace. In 1992 alone, eight permits were assigned, increasing to 32 the total number of exploration licenses awarded since 1964.

ETAP is expecting the award of eight exploration or prospection licences to foreign companies this year. In the first quarter, negotiations with Canadian and US firms including Maxus and Atlantic Richfield Company (Arco) over four new acreages were reportedly in very advanced stages.

The 1992 agreements were concluded with Maxus Energy, Coho Resources, British Gas, Dale Operating Company/NRM Operating Company/Overseas Petroleum, Brabant Petroleum/Exploration Development, Mosbacher Energy and Wascana. They were signed under the new oil legislation of 12 June, 1990, which replaced the earlier 1987 law. The new code (Law No. 90-55) introduced new measures designed to encourage foreign companies to engage in oil and gas exploration and development in Tunisia.

Maxus Energy

In January 1992, the US Maxus Energy was awarded a second exploration licence in Tunisia for a 4,455-sq km perimeter in the West Jebel block in the north of the country. The agreement set an exploration period of four years and provided for two optional two-year extensions. In the first instance, Maxus is to carry out seismic surveys totalling 200 line km and drill one well.

Coho Resources

The Canadian company Coho Resources retains a licence for the 5,000 sq km Anaguid perimeter north of the El-Borma field since April 1992. After shooting 150 line km of seismic data which revealed a number of undrilled structures with hydrocarbon potential, Coho is planning to drill one exploration well in the acreage. Under a farm-in agreement concluded in January, Australia's Ampol Exploration (Ampolex) acquired a 33.33 percent interest in the acreage. ETAP retains the right to acquire an interest of up to 50 percent in any commercial find. A second licence was awarded to Coho in December 1992 covering the 464 sq km offshore Alyane block in the Gulf of Gabes. The agreement provided for the processing of 150-200 km of seismic data and the drilling of one well.

British Gas

British Gas acquired a new concession in Tunisia in June 1992 covering the 5,992 sq km Roumedia block offshore Sfax, which is the largest single exploration tract in Tunisia. British Gas retains three other concessions in the country covering Kerkennah Ouest, Amilcar, and Kerkennah North acreages.

DOC/Overseas/NRM

An exploration and production-sharing contract was awarded in September 1992 to a group comprising the US Dale Operating Company of Tunisia (DOC, operator, 45 percent), Overseas Petroleum & Investment Corporation of Taiwan (30 percent) and NRM Operating Company (25 percent), for the 3,972 sq km Serj block extending over the Sousse, Kairouan and Zaghouan areas. The venture is planning a geological survey, collection of seismic data and drilling of two wildcats – the first one of which is to be spudded during the first half of this year.

Brabant/Exploration Development

A 50-50 joint venture composed of Brabant Petroleum Limited of the UK (Operator) and the Exploration Development Corporation (EDC) was awarded an exploration permit in November 1992 covering the 3,932 sq km Jeffara block in the Medenine area in southern Tunisia.

The initial period of the permit is three years, during which Brabant and EDC will reprocess 2,000 km of existing seismic data, record 300 km of new seismic lines and drill one well. The permit can be extended for a further two years in return for a commitment to drill one further well. ETAP may take a stake of up to 50 percent in any discovery.

Mosbacher Energy

The US Mosbacher Energy Corp. signed in December 1992 an exploration contract with an initial period of three years for the 5,604 sq km Siliana block in the Beja/Zaghouan region. The minimum commitments of Mosbacher consist of 200 km of seismic work, 100 km of seismic reprocessing and the drilling of three wells, each to a depth of 2,000 metres.

Wascana International

In December 1992, ETAP and Canada's Wascana International Resources Inc. signed a prospection agreement for what is officially referred to as a licence with a seismic option in respect of the 4,176 sq km Telemzane acreage. Wascana considers that the acreage has very considerable oil potential and is looking for partners to join it. ■

Oil exploration licences awarded in 1992

Acreage	*Date awarded (1992)*	*Area (sq km)*	*Licensees*	*% shareholding*
West Jebel	January	4,455	Maxus Energy/ETAP	n/a
Anaguid	April	5,000	Coho Resources	66.7
			Ampol	33.3
Roumedia	June	5,992	British Gas	100
Serj	September	3,972	DOC	45
			Overseas Petroleum	30
			NRM	25
Jeffara	November	3,932	Brabant	50
			Exploration Development	50
Alyane	December	464	Coho Resources	100
Siliana	December	5,604	Mosbacher	n/a
Telemzane (*)	December	4,176	Wascana	n/a

(*) Solely a seismic permit

Award of Certificate of Appreciation

Dave Antell (right) Chairman of the Fuels and Light Distillates Sub-committee presents **Jim Earls** (left) with the IP Certificate of Appreciation.

Jim, who recently retired from Shell, joined the IP Fuels and Light Distillates Sub-committee and Aviation Fuel Test Panel, ST B-11 in 1972. He was appointed Chairman of ST B-11 in 1984, a position he held until his retirement in 1992.

He was one of the leading experts on the testing of aviation fuels. In addition to his IP work Jim sat on the Ministry of Defence Aviation Fuels Committee and the Aviation Fuels for Jointly Operated Systems Committee.

Energy Economics and Personnel Education and Training Discussion Groups

Promoting the Engineer as the Professional of the Next Century

Monday 18 October 1993, 5.30 p.m. to 7.00 p.m.

An evening meeting with the three aims of promoting engineering to schools as a rewarding profession; facilitating public discussion on the urgent need for Britain to promote applied sciences and to enhance the status of engineers; and ensuring that the oil and gas industry will continue to have access to an expanding pool of engineering talent from which to select its engineering recruits in the 21st Century.

Chaired by Mr Graham Able, Headmaster of Hampton School.

Speakers:

Professor Michael Laughton
Dean of Engineering, University of London

Professor Harold Baum
Head of the School of Life, Basic Medical and Health Sciences, King's College, London

*Please inform **Pauline Ashby** at the Institute of Petroleum **(Tel: 071-636 1004)** if you or your colleagues plan to attend.*

The Institute of Petroleum

The Myths & Realities of Vocational Qualifications and National Competence Standards

Wednesday 11 November 1993

Standards of Competence are for everyone.

- What are the benefits?
- What do they cost?
- What are the pitfalls to avoid?
- How do they affect you?

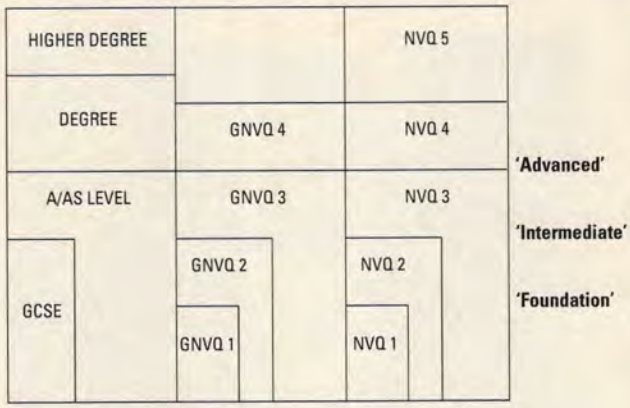
Speakers will present their views and experiences.
An open panel discussion will enable delegates to share their concerns and knowledge.

*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. Tel: 071 636 1004. Telex: 264380. Fax: 071 255 1472.*

Vocational 'A' levels

In a move to give vocational qualifications much sought after parity and esteem with 'A' levels and to sweep away some of the confusing jargon, General National Vocational Qualifications (GNVQs) at level 3 will be known in future as Vocational 'A' Levels. Vocational qualifications are not a soft option for weaker pupils; in fact, GNVQs at level 3 require a level of achievement equivalent to two 'A' levels and GNVQs at level 2 are equivalent to four GCSEs. There are three levels of GNVQs to suit a wide range of aptitudes and abilities. However, it has become clear that using numbers to denote these levels does not provide a sufficient sense of the achievement that they represent, particularly, against the well-established GCSE and 'A' level framework, so familiar to most people. The numbered levels which are shown on the accompanying chart will be replaced with a system of names where 'advanced' is for level 3, 'intermediate' for level 2 and 'foundation' for level 1.

It is intended to have in place three qualification pathways for 16 to 18 year olds. GCE 'A' levels and 'AS' exams which offer a tried and tested academic route in full-time education will continue in their present form. The new GNVQs provide a vocational route, mainly for young people in full-time education but they will be rigorous qualifications with external exams. National Vocational Qualifications (NVQs) provide a vocational route, mainly for those who have left full-time education. NVQs provide a very clear test of competence to do a particular job or range of jobs. The relevance to industry of Vocational Qualifications is demonstrated by the titles of some of the units in Vocational Qualifications for manufacturing. These include Science for Manufacturing, Mechanics for Manufacturing, Electric Principles for Manufacturing, Electronics for Manufacturing.



National qualification framework showing equivalences of qualifications.

There are indications that thousands of 16 year olds are abandoning the traditional 'A' level route in favour of the new Vocational Qualifications.

Many of the pupils who, based on their GCSE results, would be eligible and judged to be good 'A' level material decided to opt out of 'A' levels preferring the continual assessment of coursework, the breadth of study and the modular style of the new GNVQ qualifications. However, there seem to be doubts lingering about the acceptability of GNVQs as an entrance to higher education as well as the unfamiliarity of employers with these standards.

'No more black oil smoke'

A national registration scheme which aims to bring status and public recognition to the value of high standards of safety and combustion efficiency was recently launched by Lord Ezra at the Energy Efficiency Office.

Lord Ezra said that training and recognition of that training were very important to ensure that essential improvements were made to UK standards of combustion efficiency. He also said that the United Kingdom should pay more attention to using its fuel and energy efficiency expertise to assist the emerging post-communist economies in Europe.

The Energy Efficiency Office (EEO) supported the initiative of the Oil Firing Technical Association for the Petroleum Industry (OFTEC) in drawing up the scheme for Commissioning and Servicing Technicians and Plant Operating Technicians which is to complement its existing domestic training activities.

The aim of the scheme is to encourage training and to provide acknowledgement of that training by a Registration Scheme. OFTEC acknowledges that the standards of oil combustion could be improved in many areas and it is OFTEC's intention to raise the general standard of servicing up to that of the best that is being achieved.

Privatisation of the careers services

By opening up the provision of Careers Services to competitive tendering the government believes that it will ensure that the high standards achieved by the best of the existing services will become available everywhere and that the country will obtain the maximum value for the money it invests. The service is currently provided by the Local Education Authorities. Thirteen areas in England have been selected for the first tranche of bids. Further rounds will follow over the next two or three years. The selected organisations are required to ensure that young people at school or college in the 16 - 19 year age group have a clear plan of action regarding their career which has resulted from a clearly structured and impartial programme of guidance provided by the Careers Service. The selected Careers Services providers are required to reach a service level agreement with the educational establishments in their designated area and also to work with industry and other training organisations in the area. The careers guidance will continue to be provided free to all young people and the funding from the government will have an element of incentive to the provider as part of the payments will be based on their meeting their targeted action plan. The Department of Employment intends that the first contract should be in place by 1 April next year, although it is recognised there will need to be a transitional period to ensure a continuity of service to young people.

Don't ignore half the workforce

Equal opportunities for women in the oil industry is an issue of concern to many people judged by the numbers who attended the recent Personnel, Education and Training Evening Discussion Group meeting at the Institute of Petroleum. It was one of those rare occasions at the Institute of Petroleum where the women in the audience outnumbered the men. The audience of 50 heard Lois Leeming, Campaign Development Manager of Opportunity 2000, and Jill Kenny, the Plant Manager of Esso's West London Terminal, talk about their views and experiences of equal opportunities for women. Their presentations prompted many questions and extensive discussion so that Derek Forrest, Group Manager Human Resources at Texaco Ltd and Chairman for the evening, prolonged the close of the meeting.

Derek Forrest, Group Manager Human Resources, Texaco Ltd, with Lois Leeming of Opportunity 2000 and Jill Kenny of Esso.

Opportunity 2000 is the Business in the Community campaign to improve the balance of men and women in the workforce. Lois Leeming outlined some of the background to the implementation of Opportunity 2000 following work chaired by Lady Howe. Referring to studies originally commissioned from Ashbridge Management she described the business case for a balanced workforce, outlined some of the barriers to change and suggested ways to help achieve a balance in practice. A commitment to the campaign from the top of industrial organisations is seen as an absolutely essential prerequisite to the success of the programme.

Particularly as it is likely to require a behavioural change in some parts of the organisations. The Opportunity 2000 approach involves an active on-going programme of measurable improvement in each of the participating organisations. This may take place over several years. The development of challenging but achievable goals based on an assessment of each organisation's current situation and future needs; a public statement of commitment to the organisation's specific Opportunity 2000's goals and publication of progress at agreed intervals are a key part of the programme. Before implementing this programme it is absolutely essential for organisations to know where they are and many have carried out internal audits and surveys analysing their current situation and their future business organisational needs. Each action plan needs to be devised with achievable goals. Publicising its progress is a demonstration of commitment to the total activity.

The 200 organisations covering 25 percent of the oil work force who are now committed to Opportunity 2000 include five in the oil industry BP Oil, Esso, Shell UK and Texaco and, as it was reminded from the audience, British Gas. Ms Leeming stressed that they are building for quality with real depth to the commitment and it recognised that change of any kind is a long- term process. Jill Kenny emphasised equal opportunities make good business sense, bearing in mind the substantial decline in the number of young people available to enter the job market and the great waste of money spent on training new entrants if many leave soon after joining the industry. Other items include the image of the company to the public at large and customers or indeed the increasing pressure of legislation in this field. Over the last few years there have been six Acts of Parliament and two Royal Commissions. Ms Kenny pointed out that her observations were not just based on Esso's experiences and that different work-places had different needs for issues related to equal opportunities. The initial internal audit would help to assess if the measurement and collection of the relevant data could indeed be achieved from the systems currently in place. This, together with other internal seminars could be part of the programme to raise the awareness of the issue. If equal opportunities were seen to be a line responsibility and included in management job descriptions, it certainly had the effect of raising the visibility of the issue. However, speakers from the floor frequently referred to the fact that the major problems seemed to be at middle management level, even though there could well be strong commitment from the top of the company.

One of the simplest places where the measurement of progress towards equal opportunities could be seen was at the recruitment level. However it was important here to separate the different classifications and levels of staff. Attrition rate and turnover was another important indicator although it was recognised that other factors such as the recession could greatly influence this figure. A question from the floor also indicated that there were generally still very poor figures for the numbers returning after maternity leave and that the oil industry's demands for high flexibility and staff mobility were negative factors.

The audience seemed to think that the fundamental issue of cultural change still remained to be addressed by companies, whereas American companies, which had been working longer on the issue, may have a greater awareness and understanding of the question which has been transmitted from their parent companies' values. The many questions to the speakers covered a wide range of topics with no overall consistent single item except perhaps middle management prejudice. There was a general feeling that it makes good business sense to have a balanced workforce and the recent changes within the industry towards less hierarchical structures is more in tune with the manner women prefer to work.

Since the discussion meeting in June there has been further interest in Opportunity 2000 from IP collective members but no new members have joined. ■

The European automotive gasoil market

By Mathieu Zajdela and Lisa Buchholz, Enerfinance Consulting Services

Automotive gasoil is an oil product that has continued to show steady growth in Europe, while other products have shown flat or negative growth. Even when compared with gasoline, automotive gasoil has proved more dynamic: since 1985, automotive gasoil consumption has increased by 41 percent, while gasoline consumption has increased by 18 percent. Gasoil for road transport is currently 77 percent of the volume of gasoline consumption in Europe, and the continued perspectives for good growth mean that by 2000 consumption of gasoil for road transport will outstrip consumption of gasoline in Western Europe. In the EC, this overtaking will occur even earlier, around 1997, and in some countries it has already occurred.

In the following sections, the two principal end-use sectors are analysed in terms of their contribution to consumption growth. An analysis of the changing ways in which gasoil is sold to these groups follows.

Diesel passenger cars

Diesel-engined passenger cars have recovered from the slump experienced in the late 1980s to such an extent that these vehicles represent 16.7 percent of new registrations in Europe in 1992, and 11 percent of the total car fleet (up from 7.7 percent in 1986). The result is a diesel vehicle fleet of approximately 17.5 million cars. This development is not without wide variations by country: dieselisation is, for example, very strong in Austria, Belgium, and France, where fuel tax differentials result in a favourable pump price for gasoil but weak in Scandinavia and Italy where registration fees and kilometre taxes penalise diesel cars, and in Switzerland, where the price of gasoil is not advantageous.

While consumers continue to choose diesel vehicles primarily for fuel economy, the market has been helped by car manufacturers' offerings – improved performance in terms of noise and acceleration, and reduced particulate emissions (concern here caused the sharp downturn in German diesel car markets in the mid-1980s). Reduction of price differentials between gasoline and diesel engined cars is also a strategy pursued by auto manufacturers in France and the United Kingdom with notable success. Finally, increasing use of diesel vehicles in commercial fleets is an important factor behind increasing registrations of diesel cars in the United Kingdom, and the growth of commercial fleets in other countries will strengthen this trend.

Over the next few years, it is estimated that the rate of dieselisation will stabilise at the fairly high level of 16 percent of new registrations, resulting in a passenger car fleet of approximately 32 million diesel cars in Western Europe by 2005.

'Gasoil is the only major product offering real growth potential in Europe'

Consumption of automotive gasoil by passenger cars will increase by 33.1 percent between 1995 and 2005, reaching 31.7 million tonnes (mt) (from 18.5 mt in 1991), and will account for 20 percent of automotive gasoil sales, virtually the same share in total consumption that passenger vehicles have at present, albeit it at a much higher total volume.

More goods by road

Even more important for the evolution of automotive gasoil consumption is consumption by goods transport vehicles. Both the increasing volume of transport by road (road's share versus rail and waterway) and the increasing volume of total goods transported mean that automotive gasoil consumption by this user group can be expected to reach close to 135 mt by 2005, up from 77.5 mt in 1991.

Road transport has increased its share *vis à vis* inland waterway and rail, accounting for 60 percent of all tons-kilometres transported in 1988 (more recent statistics have not yet been published), up from 52 percent in 1978, with corresponding losses for waterway and rail shipment.

The growth in share is attributable to the increased need for flexibility of transport (for which road transport is much better adapted) and in part by the relative decrease in the price of transport fuels, which enhances road transport's competitivity. Neither of these factors show signs of being reversed in the short term, meaning that road's share in transport is unlikely to be reversed.

Not only has road transport increased its share in transport, but the volume of road transport itself has grown. There is a strong correlation between increased economic activity and increased road transport, at least on a European level; every 1 percent of GDP growth has generated 1.5 percent

growth in road transport. Preliminary figures for 1992 show that road transport has increased by 36 percent since 1985, and are now at 1,045 million tons-kilometres for Western Europe. Tons-kilometres transported remains fairly concentrated, as shown below, but all European countries have experienced growth.

The effect of changes in legislation regarding international haulage is felt at present only weakly. The much discussed new international regulations on cabotage remain only partially implemented. However, while international traffic will grow more rapidly than domestic transport over the next decade, it should be remembered that the most goods transport still takes place on national territory and that liberalisation of domestic markets (as in the United Kingdom) probably has greater impact. New legislative regimes (regularising dimensions/weights, or permitting cabotage) are less important to increased transport growth than the two factors mentioned above – increasing need for flexibility and GDP growth.

Thus road transport is expected to continue increasing, by approximately 3 percent per year to 2000, with stronger growth in certain countries (Germany, Portugal, Spain, and Austria).

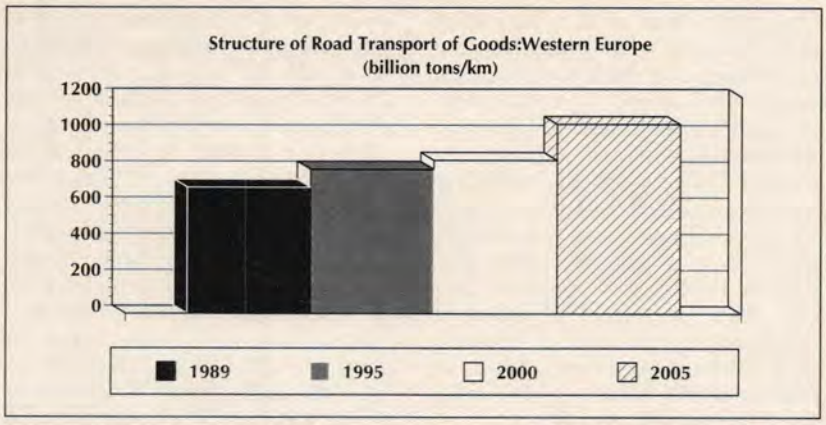
Opportunities for expansion

While international goods transport (compared with domestic transport) will remain a relatively modest portion of total tonnage of goods transport, it will be more significant if the comparison is of total tons-kilometres transported. By the end of the century we estimate that international freight traffic will account for 21-22 percent of total diesel consumption for the transport of goods.

Much of this growth will occur in particular areas, which thereby become areas of expansion opportunity for distributors. Three new traffic centres are predicted to appear:

- Berlin, which will probably become a major centre, controlling traffic to Poland and the CIS
- Prague, which will funnel traffic from southern Germany and Italy towards Poland and the CIS
- Vienna, whose role as the centrepoint between East and West will be considerably strengthened.

In addition, Cologne/Frankfurt/Stuttgart, which is by far the primary axis in Europe, and Münich will all see their roles reinforced. All these trends serve to underline the growing importance of the German road-routes. Occupation of strategic sites along these routes will become key to the successful strategy on the European/international diesel market; competition in this area is already strong and can be expected to intensify.



Distribution channels

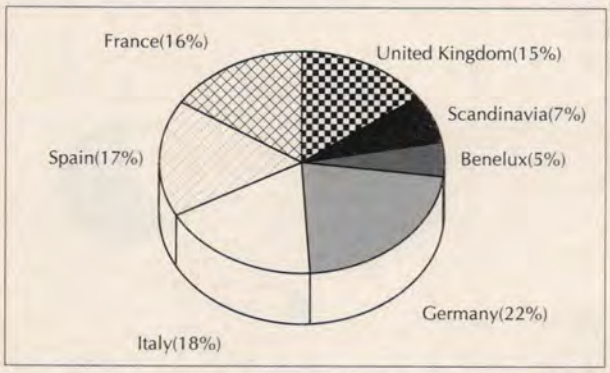
The most important discernible trend in distribution on automotive gasoil is the increasing share of diesel sold through the retail network: the increase is from 51.5 percent in 1985 to 59.8 percent in 1991. This obviously has very important ramifications for distributors. The trend bears looking at in more detail.

In 1991, close to 60 percent of all gasoil used for transport (cars + trucks) was sold through the network, a 10 percent increase over 1985 levels. This development is directly linked to the fact that trucks are provisioning more and more through retail networks. In 1985, the average truck in Western Europe met 42.8 percent of its fuelling needs through network purchasing, while in 1991, that figure had increased to 50.6 percent. Fuelling from own depots (the tradition with larger trucking companies) is a distribution method that is losing market share. This is attributable to several developments:

- The improved efficiency of the network has lowered costs and reduced the difference between retail and wholesale prices
- Simultaneously, the growing costs to transport companies of building and maintaining home-based fuelling depots make these less and less economically viable
- The proliferation of small transport companies and own-account operators, (contrary to expectations, the size of the average transport company is decreasing), for whom home-based fuelling is too expensive
- The increased number of services offered by retailers of gasoil – repair, breakdown, toll payment – which are useful to transporters and encourage retail purchasing.

The result is that in 1991, gasoil represented 30.3 percent of products sold at the average service station in Western Europe, as opposed to 24.7 percent in 1985; of this, 32 percent was sold to passenger cars, and 68 percent to transport vehicles.

At the same time, the development of new channels of marketing, and the increasing flexibility of pricing in retail outlets has blurred distinctions between channels. In certain countries the option of having oil companies construct onsite depots for larger trucking companies offers a kind of intermediate fuelling between whole-sale and retail. These systems also fidelise customers by linking the onsite fuelling system to the oil



Geographical structure of European Road Transport

company's credit card; if customers then purchase on the road from the same company, both their off and onsite fuelling will be reported in the same invoicing/information management systems.

In the United Kingdom, 'bunkering' is developing rapidly; this is a system in which a company puts a storage network at transport companies' disposal, where, for a small fee, they can draw on supplies that they themselves have purchased at wholesale prices. These networks are made up of regular service stations, bunkering-specific depots, and other sites.

Finally, oil companies' own retail networks offer flexible pricing to larger clients, and holders of their credit cards, creating a kind of bunkering system.

All of these factors make purchasing via the network increasingly likely. In fact, the share of retail is expected to increase to 66.2 percent of all automotive gasoil sales by 2000. Intensifying the above trends will be the three other important factors:

- The advent of environmental legislation concerning tank storage, which will make construction of onsite fuelling less and less attractive.
- The growth in international traffic, which typically fuels through the network.
- The marketing strategies of oil companies.

This growth will be particularly strong in countries where such provisioning is now lower. In Germany, provisioning of trucks via the network is expected to rise from 23.3 percent to 32.0 percent, and in the United Kingdom, from 25.2 percent to 33.1 percent between 1992 and 2000. The result will be a changed pattern of sales at service stations.

Strategies of oil companies

In anticipation of these trends – greater fuelling through the network by all hauliers and greater international traffic – and given their different initial situations, European oil products marketing companies have adopted widely divergent strategies.

For international sales, the presence on the market of companies like UTA, DKV and others has certainly made the situation more competitive. These companies issue their own payment cards which can be used at extensive, Pan-European networks (including Eastern Europe, CIS) made up of selected oil companies' stations chosen for the high levels of services to truckers; to this they add an impressive number of services which are useful to hauliers (toll payments, mobile repair services, ferry booking, 24 hour multilingual assistance, etc.).

Informal interviews have revealed that the density and extensivity of the network and the level of services offered are the decisive issue for haulier companies engaged in international transport. This accounts for the success of DKV and UTA. Oil companies wishing to capture growing sales of auto gasoil to transporters must take these kind of systems into account.

On the other hand, transport companies operating exclusively in domestic markets are principally concerned with price. Arrangements like bunkering are difficult for oil companies to ignore; and winning share of these sales means the marketing strategy must be price, not service, based.

Oil companies have predicated their strategies along these parameters in their efforts to capture automotive gasoil sales. Some, like Phillips with its Routemate card, have decided to offer few services but very good pricing to hauliers working in the domestic market. Others, like Total, are offering a very high level of services to domestic hauliers, while seeking to expand their network through bilateral cooperation agreements with other oil companies for mutual use of stations. Still others, like Shell, are able to offer not only their very extensive networks, but also to offer a level of services personalised to transporters/truckers that is competitive with UTA and DKV. Other companies with large European networks, such as Exxon, have not pursued the strategy of 'courting' drivers with high levels of service, on the grounds that these are of secondary importance. Finally, several oil companies have banded together to issue international payment cards (such as the PanDiesel card) which augment services and coverage through cooperation.

Conclusion

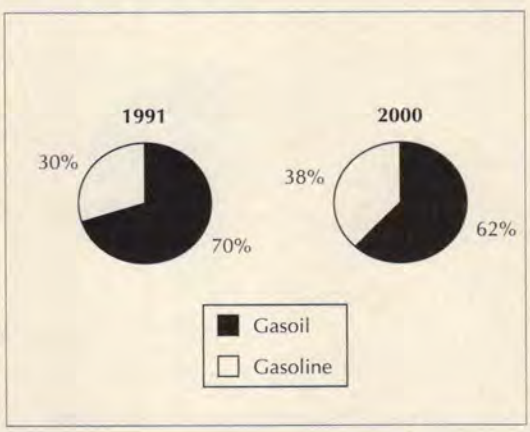
Network sales and margins will be shaped by the fact that more and more gasoil will be sold through the network at a time when the network overall in Europe will be shrinking, due to rationalisation and environmental closures. This should result in improved margins.

At the same time, pressure on prices from large transport companies unaccustomed to buying through the network will increasingly oblige oil companies to offer lower prices at retail sites, which to some extent they are already doing. This could favour further development of intermediate distribution systems between traditional wholesale and retail offerings, such as bunkering. Certain markets will be better adapted to rapid uptake of bunkering than others. Such markets are those where:

- geography permits satisfactory coverage of the country, since bunkering offers a limited number of refuelling sites (Benelux, Germany, Italy, Spain)
- the difference in retail and whole prices remains interesting enough to justify bunkering, and the margins for retail distribution remain fairly high (Benelux, Italy, and, to a lesser extent, Germany)
- the proportion of direct sales to consumers is still high (Germany, Benelux)
- environmental legislation makes own-depot storage too costly (and transporters are not already fuelling through the retail network)

Oil and other companies offering bunkering systems in the United Kingdom are now interested in European expansion.

Gasoil is the only major oil product offering real growth potential in Europe: the share that oil companies are able to win in this market will be crucial to the profitability of their distribution operations. ■



Advances in the measurement of the vapour pressure of petroleum products and crude oils

By R W Hooks, Shell Research Ltd, Thornton Research Centre, Chairman Sub-committee ST-G Analysis

Over recent years, there has been much effort devoted by national and international standardisation bodies in the search for and development of a standard method which could replace one of the oldest test methods in our industry - 'Determination of Vapour Pressure of Petroleum Products - Reid Method', known universally as RVP.

Reid vapour pressure

One of the main drawbacks of the RVP method is that it cannot be applied to the full range of the increasing number of motor gasoline compositions containing oxygenate components, in particular alcohols. The reason is that the RVP method is a 'wet' method. This means that during the test there is a risk that, when the gasoline comes into contact with the water, small amount though it is, phase separation will occur. One phase being predominantly the hydrocarbon components; the other water together with the alcohol components. Such phase separation, of motor gasoline components, will result in lower than expected vapour pressure readings.

Several attempts have been made, by the individual standardisation bodies, to modify the method to ensure that phase separation does not occur. The main modification has been to eliminate the water when preparing the apparatus for use. At the same time instrument manufacturers have been developing techniques with the aim of having an automated procedure which is applicable to all compositions of motor gasolines. It is uncertain whether the manufacturer's intention is for their instruments to cover all petroleum and petroleum products with such new instrumentation but it is known that several laboratories are using the techniques successfully for crude oil vapour pressure measurements.

In addition to these technical problems, the RVP method, as used today, still involves a large amount of manual operation, although this has been reduced to some extent with the development of the Herzog semi-automated horizontal bath technique, with its optional use of transducers.

Air saturated vapour pressure

In 1990 the Institute of Petroleum finalised the development of IP 394 'Determination of air saturated vapour pressure (ASVP)'and at the same time the ASTM developed ASTM D5191 'Vapor Pressure of Petroleum Products (Mini Method)' – formerly ES 15. Both these methods were used as the basis for developing a European vapour pressure method to replace EN 12 RVP in the EN 228 'Unleaded Petrol' specification. This new EN vapour pressure standard has been agreed by the member states and should be ratified as an EN norm in 1994. In anticipation of its acceptance, unchanged, as an EN norm, the Institute of Petroleum has adopted the English version of the final draft of the EN standard as IP 394/93.

The main features of the ASVP method are that it utilizes equipment which has either an evacuated chamber or a chamber with a piston and has flexible operating conditions i.e. a wide range of temperatures and vapour to liquid ratios can be selected. These current methods measure the ASVP at 37.8°C and at a vapour liquid ratio of 4:1.

In addition it has been shown that the ASVP method has a better precision than the RVP method.

The method places a high emphasis on calibration and verification procedures and there appears to be no limit on the composition of petroleum or petroleum products which can be tested by the method.

The ASVP methods have been developed with equipment produced by Stanhope Seta in the United Kingdom and Grabner Instruments in Austria. A third manufacturer, Herzog of Germany, has developed an instrument which is currently being evaluated to ascertain if it meets the requirements of the method.

Temperature and sample size modifications

During the development of the IP method two additional exercises were carried out. These involved eight laboratories testing eight gasoline samples. In the first the vapour pressures of the samples were measured at 50.0 °C and in the second exercise measurements were made on 50 ml samples, as compared with testing at 37.8 °C and on one litre samples, as required by the IP 394/93 method.

The two additional exercises were done in order to:

1. Meet the demands of the ADR, the European agreement concerning the international carriage of dangerous goods by road, wherein the vapour pressure is quoted at 50.0°C.
2. Check if it was possible to take, and utilize, smaller samples for the test. This has advantages of safety and savings in transportation costs when samples have to be sent to a test laboratory. In addition it has advantages for research projects when only small amounts of sample are available for test.

Statistical evaluations on the results indicated that, in both cases, there was no loss of precision compared with the standard conditions as laid down in IP 394.

Vapour pressure of crude oils

The knowledge of the vapour pressure of crude oils is especially important during ship loading and transportation and in addition the RVP is required for legal purposes.Some laboratories are already utilizing the ASVP equipment to determine the vapour pressure of crude oil; and the results obtained at the Sullom Voe laboratory, for instance, have shown that there is excellent correlation between the ASVP and RVP methods.

Future work

The IP Volatility Panel ST-B-9, which is responsible for vapour pressure methods, is currently developing the methodology and precision for an IP method to test crude oils. The panel would like to hear from anybody interested in such a method who would be willing to participate in a 'round robin' exercise to evaluate precision. Interested parties should contact the chairman of ST-B-9, RW Hooks, through the IP Technical Department. ■

IP Draft Code of Practice for On-board Truck Computers

On-board truck computer systems (OTC) are an important development for road tankers. The equipment will enhance operational safety, product security and data capture during the loading of petroleum product at the terminal gantry, its transportation to the customer and discharge at the customer's premises.

Various technologies may be used and combined for such systems in which electronic signal and logging devices interface between truck and trailer, trailer and gantry and trailer and receiving tank in order to ensure that the correct grade is transferred in the correct quantity and the transactions are properly registered.

Since exchange agreements between oil companies are now commonplace, it was recognised by IP Committees that systems installed by companies would need to be compatible with their exchange partners' equipment. Hence work was initiated in late 1990 within the IP to draft a Code of Practice, adherence to which would create the required inter-operability and provide safe operation.

A scoping study was initially carried out and led to the preparation of a Working Document, which was then widely circulated for comment to equipment suppliers and to oil companies and others engaged in the distribution of petroleum products by road.

Open forums on the subject were held in October 1991 with suppliers and in December 1991 with the oil industry and distributors to outline the principles of OTC, to discuss the Working Document, the scope of a Code of Practice, and to finalise the terms of reference for the Working Group engaged in drafting the Code.

A further draft was prepared and issued in June 1993 to potential users of the Code. This was followed by a users' forum on 18 June 1993 with the objectives of discussing the draft in detail and securing their agreement in principle to the draft and its application.

The 18 June meeting was well attended and the presentations well received, with syndicate work leading to lively debate and useful discussion.

It was agreed that the draft code would benefit both industry and suppliers by providing:

- A framework for joint operation and a standard for inter-operability between companies.
- Guidelines for the scoping and design of the OTC operating concepts.
- A detailed OTC overview for equipment suppliers to permit them to develop systems which will provide the inter-operability requirements of the users.
- An outline of safety considerations, both of the equipment and the operational methods.
- A European-based document providing a modular OTC concept suitable for future expansion.
- The avoidance of 'Christmas tree' development, equipment redundancy and single sourcing of systems.

The scope of the code primarily covers bottom loading road tankers, and bottom loading gantries for the retail operation. It covers the inter-operable communication interfaces between tractor, trailer, gantry and service station, but does not encompass off-truck communication.

The meeting highlighted and re-confirmed the need for specific vehicle design standards, in order to establish a common purpose and operation for items of equipment. Particular items in question were the API and foot valves and the location of wet-leg sensors. Industry standards are required to ensure that the fundamentals of truck design and product handling permit OTC operation.

The Institute's Electrical Committee will further clarify hose duties with respect to service station bonding and ascertain the differences between UK and European requirements for area classification of the truck cab and the requirements of ADR with respect to the double pole wiring of trailers.

The OTC Working Group will further consider the safeguards required for the disconnection and interchanging of loaded trailers between tractors, and will liaise with the Institute's Road Transport Panel on tractor/trailer 'suzy' connections.

An important part of the proceedings was to define the requirements and differences between 'inter-operable' (between different oil companies) and 'company' systems (within the same company) and to discuss data and signals for inter-operability, stressing the protection of company system data. This led to discussion on the need for a common protocol, the mechanism for its selection and the setting up of a common address schedule. Agreement/acceptance was reached regarding the protocol and standard addresses for inter-operable data.

Comments arising from the meeting and subsequent correspondence will be considered for inclusion in the draft Code. The recommended protocol and inter-operable standard addresses will be further developed and included as an Appendix of the Code. Finally, following a further review with the IP Downstream Operations and Marketing Committees, the Draft Code will be issued for ballot.

The Working Group thanked the industry representatives for attending, for endorsing the draft code and for their comments and observations which will be considered and embodied in the document. ■

J D Snook, Vice-Chairman,
Petroleum Measurement Committee

Recommendations for change in the methodology for Flash Point Testing of Residual Fuels

By Mike Sherratt, Director of Research, Stanhope-Seta.

During the past few years serious concerns have been expressed over the safety, during storage and transport, of residual fuels and other products containing volatile components, due to the flammability of the hydrocarbons which can accumulate in a tank headspace.

An article in the February 1992 issue of *Petroleum Review*, and a bulletin by the Oil Companies International Marine Forum concluded that flash points of residual fuels gave no useful indication of their tendency to release gas and hence could not predict the formation of flammable atmospheres. It was also stated that tests carried out by IP34 (Pensky-Martens) did not give consistent flash point results, while IP 303 (the rapid equilibrium Setaflash Method) gave satisfactory results in terms of precision.

The results of the above study have not changed the urgent requirement by industry for the standardisation of a suitable flash point test method for residual fuels. Indeed a method, based on Pensky-Martens, has been under development for over three years by the Flammability Panel (ST-B-4) of the Institute of Petroleum. A full interlaboratory test programme is planned once the procedures are finalised.

The problems of testing residual fuels are similar to those encountered when testing non-homogeneous fluids containing light (low flash point) fractions such as cutback bitumens and used lubricants, as volatile components can be lost during sampling, storage, test specimen preparation and the test itself. In addition, products such as paints, chemicals and solids can have similar properties.

This article reviews flash point methodology, but its aim is to justify the recommendation that the way forward for the testing of residual fuels is not via the modified Pensky-Martens test method route but one based on the existing and internationally accepted test methodology; Flash-No Flash Rapid Equilibrium Test ISO 3680, EN456, IP303, ASTM D3828.

Flash Point History

The discovery of petroleum and the increased use of distillates, in the 19th century, for lighting and heating in place of animal and vegetable oils led to a large number of accidents. These problems were addressed in 1862 by the UK Petroleum Act and the adoption, in 1870, of a flash point tester designed by Keates. This act categorised a liquid as being flammable if it had an open cup flash point below 100°F.

However, the test based on Keates' apparatus was difficult to carry out and had poor reproducibility. Sir Frederick Abel was asked to address this problem. This led to the presentation of his closed cup design on the 12 August 1876.

The Abel instrument was subsequently incorporated into the Petroleum Act and the temperature defining flammable reduced to 73°F, this being equivalent to an open cup value of 100°F.

Legislation quickly spread around the world and led to the development of many types of test instruments.

The following list shows the dates when the major surviving instruments were in a form probably recognisable today.

1876 Abel
1880 Pensky-Martens
1914 Tagliabue (Tag)
1915 Cleveland
1966 Setaflash

Designs

There are two basic categories of flash point apparatus in common use at present; open cup which aims to simulate the effects of spillage, and closed cup which corresponds to the opening of a previously closed vessel. The more controlled conditions used in closed cup tests result in better precision, a lower flash point and hence a steady move away from the recommendation of open cup testing by regulatory bodies.

Test Methodology

Non-equilibrium

The desire to measure the actual flash point of a liquid led to the development of non-equilibrium test methods, such as Abel, Pensky-Martens, Tag and Cleveland. In these instruments the liquid is heated at a steady rate of temperature increase, while the ignition source is applied at regular intervals.

The term non-equilibrium stems from the fact that the vapour is not in equilibrium with the liquid. This test methodology has the following advantages: it is well suited to automation, instrumentation is universally available and standardised for a wide range of products. However the non-equilibrium methods have the following significant disadvantages:

a) Each time the flame is dipped, some of the volatile components may escape. This can give artificially high flash points or spoil precision.

b) The vapour is not at the same temperature as the liquid and the temperature can significantly vary within the liquid and the cup. Low viscosity liquids are affected differently from liquids that have poor thermal conductivity or are highly viscous and the test methods are not well suited to solids or highly viscous materials.

The use of a vigorous stirrer, in an attempt to ensure that the temperature of the liquid is uniform, can cause a mist to form. This causes the set conditions of the test to change, resulting in erroneous results. This problem is addressed by stopping the stirrer when the ignition source is dipped. However the timing of this action is not standardised and could lead to problems.

In addition, both equilibrium and non-equilibrium tests, based on Abel or Pensky-Martens cups, use some 50 to 80 ml of sample for each test.

Test results and the above disadvantages therefore do not appear favourable for the adoption of a Pensky-Martens type test for materials, containing volatile components, such as residual fuels in particular.

Equilibrium

Test methods such as IP304 attempt to overcome some of the problems associated with non-equilibrium methods. The method allows the use of any test cup which is heated in a suitable water bath. The temperature of the water is raised at a rate which allows a maximum temperature difference of 2°C between the water and sample. The ignition source is dipped every 0.5°C after not less than 1.5 minutes.

Improved precision is achieved by this method. However it has the following disadvantages:

a) Lengthy test times. IP304 states that the total duration of the test should not exceed two hours!
b) Only 5°C to 70°C range.
c) Volatile components can still be lost during dipping of the ignition source.
d) Complex test.
e) Instrumentation not universally available.

Rapid equilibrium

The requirement to quickly carry out a flash point test on petroleum products being discharged from ships led to the idea of a Flash-No Flash tester by T Kidd who was a chemist with Esso Petroleum. A demonstration was made to the Institute of Petroleum's Volatility panel of a mini flash point tester in June 1966. Subsequently Stanhope-Seta developed the much more versatile and sophisticated Setaflash Tester which became commercially available in 1969.

This tester utilises a solid sample cup which is electrically stabilised at the required test temperature over the range -30°C to 300°C. A 2 or 4ml sample is injected into the cup, depending on whether the test temperature is below or above 100°C. After 1 or 2 minutes respectively, when the liquid and vapour have reached temperature equilibrium, a test flame is dipped into the top of the cup to test for a flash.

The tester is ideal for flash-no flash tests but exact determinations may also be made by carrying out multiple tests and changing the sample at each test.

Recent developments of the Setaflash include automation of the flash-no flash test and the development of a protocol to allow automatic flash point determinations using a pre-programmed temperature ramp.

The Rapid Equilibrium test has the following advantages:

a) Tests take only 1 or 2 minutes.
b) Only 2 or 4ml of test specimen is required.
c) Instrumentation is available in a portable form.
d) Temperature range -30°C to 300°C.
e) Liquid and vapour at temperature equilibrium gives improved precision.
f) No loss of volatile components.
g) Vigorous stirrer not required. No misting.
h) Prescribed for liquids and solids (ASTM E502).
i) No retesting required as it is an equilibrium test.
j) Small quantities of reference materials are used, hence lower cost.

Results of many national and international test programmes over a period of 25 years have shown correlation between the Setaflash and the other major flash point methods.

This test methodology, under different titles, has been adopted by regulatory bodies throughout the world.

Justification

The justification for replacing the Pensky-Martens closed cup test by the Rapid Equilibrium method can best be illustrated by the following extracts from technical papers, texts of standards and laboratory results.

a) No consistent results were obtained using a Pensky-Martens tester on the residual fuels.
b) Consistent results were obtained by IP303 (Rapid Equilibrium) on the residual fuels.
c) Pensky-Martens tests on paints/resins, with low concentra-tions of solvents, gave higher results than the Setaflash Tester. As the solvent concentration was increased the flash point deter-mined by the Pensky-Martens fell and the results came closer together. It can be inferred that the continual opening of the Pensky-Martens cup during the test caused a loss of volatile components and thus a higher flash point.
d) Tests on cutback bitumens using Setaflash in a 1°C/minute temperature ramp mode gave good repeatability. However, reproducibility appeared rather high, this was suggested to have been caused by the difficulty in controlling the temperature increase rate on the manual instrument. Two other conclusions were that the use of a disposable cup did not affect results and that weighing a viscous sample (2 grams) was a satisfactory procedure.
e) ASTM E502 states that for liquids with a viscosity greater than 150mm^2 and solid materials, use Setaflash method D3278. Heating of viscous or solid materials to assist pouring is allowed.
f) Laboratory tests at Stanhope-Seta using Setaflash instruments on three residual fuels showed the following:

It was not possible to get reliable results using Pensky-Martens; in one example a result of 160°C was obtained while Setaflash (with stirrer) gave 105°C consistently.

Increasing the rapid equilibrium time from 2 to 20 minutes resulted in a reduction of the flash point from 130°C to 112°C.

The use of a simple comb stirrer resulted in improved repeatability and a marked reduction in flash point as shown below:

Sample Number	*Stirrer*	
	No	*Yes*
	°C	
1	112	92
2	130	104
3	104.5	100

Recommendations

Because of the likelihood that Pensky-Martens tests will prove technically unsatisfactory for residual fuels and because the majority of users require a rapid Flash-No Flash test for cost and convenience reasons, the following recommendations are made:

1. A test method, based on an existing rapid equilibrium method, should be developed for the testing of materials containing volatile components. Investigations should include the use of removable/disposable foil cups to aid cleaning and a simple stirring mechanism.

   A draft method is in the course of preparation for submission to the IP Flammability Panel ST-B-4.

2. The planned full interlaboratory test programme for residual fuels, based on the Pensky-Martens test method, should be preceded by a pilot study to ascertain if the time consuming and costly full programme is justified. ■

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Institute News

New Members

Mr C C J Bell, Petrosearch Consultants, London House, 66/68, Upper Richmond Road, Putney, London. SW15 2SQ
Mr J Bray, 19 Victoria Square, Clifton, Bristol. BS8 4ES
Eur.Ing G Clarke, 5 Dinorben Avenue, Fleet, Hants. GU13 9SG
Miss L M Colman, Kuwait Petroleum (GB) Ltd, Burgan Hse., The Causeway, Staines, Middx. TW18 3PA
Mr L D Davis, The Castle, Hazel End, Bishops Stortford, Herts. CM23 1HB
Mr R I Denham, 4 Mayfair Close, Jersey Farm, St. Albans, Herts. AL4 9TN
Mr P J Dingle, Esso Exploration & Production Ltd, Esso Hse., 96 Victoria Street, London. SW1E 5JW
Mr M S Doran, ICI Katalco., P O Box 1, Billingham, Cleveland. TS23 1LB
Mr K F Doyle, Thomas Howell Kiewit (TASS), Lloyds Court, 1 Goodmans Yard, London. E7 8AT
Mr S L Dunn, 42 Balmoral Road, Hitchin, Herts, SG5 1XG
Mr I D Fraser-Ward, 9 Court 32, Howe Road, Gosport, Hants. PO13 8EE,
Mr M French, 16 Canterbury Avenue, Cranham, Upminster, Essex. RM14 3LD
Mr P Harrison, 27 Gisburn Road, London. N8 7BS
Mr J R Horne, Crosstrees, Woodham Park Way, Woodham, Weybridge, Surrey. KT15 3SG
Mr J S Johnstone, Willowbank, 9A Broomfield Road, Herne Bay, Kent. CT6 7AY
Mr T Kamiyama, JGC Corporation (UK) Ltd, 2nd Floor, 35 Dover Street, London. W1X 4AN
Mr R Kay, Conoco Ltd., Conoco Centre, Warwick Technology Park, Gallows Hill, Warwick, CV34 6DA
Mr M Khajindar, Saudi Petroleum, Berkeley Square Hse., Berkeley Sq, London. W1X 5LE
Mr M S Kwok, K9 No. 111, Mt Butler Road, Hong Kong
Mr P Longerstaey, 262 Finchley Road, London. NW3 7AA
Mr R Mackison, 474 Reigate Road, Epsom, Surrey. KT18 5XA
Mr G S Matthews, 60 Gallowhill Road, Carmunnock, Glasgow. G76 9DQ
Mr I S McAllister, London & Edinburgh Insurance Group, Room 202, ILU Building, 49 Leadenhall Street, London. EC3A 2BE
Mr D M McVeigh, The Forge, Hatchgate Farm, Cold Ash, Newbury, Berks. RG16 9NY
Mr P G Morgan, Lithgow Associates, Corrosion Centre, 87A Pennine Way, Farnborough, Hants. GU14 9JA
Mr R Musselbrook, 80 Whitehaven Close, Bromley, Kent. BR2 0YN
Mr D F Nash, Mitsubishi Oil (UK) plc, Third Floor, 30 Colman Street, London. EC2R 5AE
Mr C J Patience, The Automobile Assn, Eng Research, Lister Point, Sherrington Way, Basingstoke, Hants. RG22 4DQ
Mr J P H Pope, MeesPierson N.V., London Branch, Princes House, 95 Gresham St, London. EC2V 7NA
Ms E Pothitou, Energy Environment Ltd, 49 Hay's Mews, Mayfair, London. W1X 7RT
Mr V B Richardson, JGC Corporation (UK) Ltd, 35 Dover Street, London. W1X 4AN
Mr S J Riszko, Drake House, 4 Teal Close, Leicester Forest East, Leicester. LE3 3NR
Ms L H Simon, John Brown E & C, 20 Eastbourne Terrace, London. W2 6LE
Dr D Simpson, Analysis For Industry, Factories 2/3, Bosworth House, Thorpe-Le-Soken, Essex. CO16 0EA
Mr P B M Simpson, Andersen Consulting, 2 Arundel Street, London. WC2R 3LT
Mr S Smedley, SGS Redwood Ltd, Middleplatt Road, Immingham, S Humberside. DN40 1AH
Mr C C A Stott, 106 High Street Kensington, London. W8 5DH
Mr J Telford, Lindsey Morden International Ltd, Matheson Hse, 142 Minories, London. EC3N 1QL
Mr C Thornton, Flat 9, 35A Torrington Street, Grimsby, South Humberside, DN32 9QH
Mrs K P Trickey, Andersen Consulting, 2 Arundel Street, London, WC2R 3LT
Ms S J Wallace, 26 Besford House, Pritchards Road, Bethnal Green, London. E2 9BJ
Mr R P White, Texaco Ltd, 1 Westferry Circus, Canary Wharf, London. E14 4HA
Miss C M Whitlam, Lindsey Oil Refinery, Killingholme, Grimsby, South Humberside. DN40 3LW
Ms E Williamson, Transport & General Workers Union, Transport House, Smith Square, London. SW1P 3JB
Miss L Wormald, Blackwell Publishers, 108 Cowley Road, Oxford. OX4 1JF
Mr R F Wyatt, 4 The Oval, Frampton-on-Severn, Gloucester. GL2 7HQ
Mr J H Zuberi, Gulf Oil Middle East Ltd, P O Box 5401, Dubai, United Arab Emirates

Students

Mr A Akhtar, 108A Ashley Gardens, Thirleby Road, London. W1P 1HJ
Mr R Haftbaradaran, Imperial College, Royal School of Mines, MRE, Prince Consort Road, London. SW7 2BP
Mr M C Wood, Roselea, 6 Carrhead Road, Howbrook, Sheffield. S30 7HG

Student Prize Winner

Mr R P Salter, 67 Lavington Grange, Parnwell, Peterborough. PE1 5NZ

Around the Branches

ABERDEEN

Secretary: Mr George Wood, Mentor Project Engineering, Blackness Avenue, Altens, Aberdeen AB1 4LH.
12 October: 'Future of Helicopters (HUMS), Martin Kay.
9 November: 'Offshore Safety Regimes in Norway & Canada', Mr E C Brown.
26 November: Annual Dinner.
14 December: 'Policing the North Sea', Dr Ian Oliver, Chief Constable.
1994
11 January: 1993 Offshore Technology Award Winner.
8 February: Annual General Meeting.
8 March 'Bruce Field Development', Andy Dawson, BP.
12 April: To be advised.
10 May: To be advised.

EDINBURGH AND SE SCOTLAND

Secretary: Dr R J Hutchison, Polyethylene Group Offices, BP Chemicals Ltd., PO Box 21, Bo'ness Road, Grangemouth, Stirlingshire. FK3 9XH. Tel: (0324) 493339
14 October: 'The Scottish Computer Industry', Mr J Perry, DEC. BP Oil Refinery, Grangemouth.
To be fixed (October): Young Students visit to BP Chemicals and BP Oil, Grangemouth.
23 November: Annual Student Lecture 'The Future of Oil Exploration', Mr C Gibson-Smith, BP Exploration. Heriot-Watt University.
9 December: 'Advances in Pipeline Design', Mr G T Harker, BP Engineering. Heriot-Watt University.
1994
13 January: 'AGM and Video presentation'. BP Oil Refinery, Grangemouth.
10 February: 'The Piper Bravo Project', Mr K Dillon, ELF Enterprise Caledonian. Fourth River Purification Board, Riccarton
To be Fixed (late Spring): Annual Spouses Event

ESSEX

Secretary: A L Carlson Esq., 471 Kents Hill Road North, Thundersley, Benfleet, Essex. SS7 4AD. Tel: (0268) 794615
13 October: 'Essex County Fire and Rescue Service, and the Petro- Chemical Industry', by K M Hardingham of Essex Fire and Rescue Service.
10 November: Ladies Evening. 'Chocolate', by Mrs C French of Thorntons Chocolates PLC.

Institute News

1994
12 January: 'The Removal of Sub-Surface Pollution', by G Licence of Miller Environmental Limited,
9 February: 'On-line Engineering' by C Smith of Furmanite Engineering Limited.
9 March: 'A "Duty of Care" in Respect of Waste Management', by H G Pullen of Cleanaway Limited.
18 March: 'Annual Dinner/Dance at The DeHavilland Suite, Airport Moathouse Hotel, Southend-on-Sea.

HUMBER
Secretary: G Stratford Esq., L.E.S. Engineering Ltd., Armstrong Street, West Marsh Industrial Estate, Grimsby, South Humberside DN31 1XD. Tel: (0472) 353516.
7 October: 'Furmanite Services to Industry'. Speaker: Mr Alan Petrie, Sales Manager, Furmanite Engineering Limited.
29 October: Annual Dinner and Dance. Beachcomber Club Humberston.
25 November: International Safety Rating System. Det Norske Veritas Speaker to be confirmed.
1994
20 January: 'Tanker Quality and Shipping Inspection'. Speaker: Captain G Vanden Bergh.
17 February: 'Computer Aided Design' (preceded by the AGM). Robert James Associates. Speaker to be confirmed.
4 March: Annual Dinner. Beachcomber Club Humberston.
17 March: 'Oil Industry Rationalisation'. Speaker to be confirmed.
14 April: Ladies Night. Beachcomber Club Humberston.
11 May: 'The MaK Engine'. Speaker: Mr P D Coates of Krupp MaK (London) Limited. Joint Lecture with The Grimsby Insitute of Engineers and Shipbuilders. Venue: Winter Gardens, Cleethorpes.

IRISH
Secretary: P D Gorman Esq., Aran Energy plc., Clanwilliam Court, Lower Mount Street, Dublin 2, Ireland. Tel: (010 353 1) 760696
16 September: Social Evening. National Gallery, Dublin.
21 September: Golf. Little Island, Cork.
6 October: Evening Meeting, IEI.
11 November: IP annual dinner.
25 November: Evening Meeting, IEI.

LONDON
Secretary: Mrs Edith Walker, Conoco Limited, Conoco Centre, Warwick Technology Park, Gallows Hill, Warwicks. CV34 6DA. Tel: (0926) 404257
23 September: 'Oil Spill Response Planning', C Richards & C Morris, Texaco.
20 October: 'Managing London Underground Safety', D Brown, London Underground.
9 November: 'The Changing Requirements of the Petroleum Engineer', Ed Blair, President, Hamilton Oil Co Ltd.
1994
18 January: 'Virtual Reality – Its Potential for Business Application', M Thornton & A Tait, Dimension International.
15 February: 'Petrol or Diesel – Which is better for air quality?', P Gadd, Shell International.
15-17 March: 'Biofuels – An Energy and Economic Analysis', Dr M P Gover,Strategic Studies Dept, ETSU, Harwell.
26 April: 'Stage 2 VOC Control', speaker from Esso Petroleum. (The branch AGM will precede this meeting).
18 May: 'The Independent Petrol Retailer's Viewpoint', C K B Petter, Director, Petrol Retailers Association.
9 June: Annual Visit – Stanstead Airport.

MALTA
Secretary: Mr M Degiorgio, MEDSERV, Manoel Island, Malta. Tel: 356 335408/9.
15 October: 'The E.C. Representative – How it Functions'.
9-11 November: 'Clean Seas 93'.
17 December: Christmas Function.
1994
25-27 January: 'MOEX 94'.
25 February: Talk/Lecture.
25 March: Talk/Lecture.
30 April: Annual Dinner.
27 May: Talk/Lecture.
30 July: Annual Barbeque.

MIDLANDS
Secretary: T Dicken Esq., Rocol Ltd., Rocol House, Swillington, Leeds. LS26 8BS. Tel: (0532) 866511
15 September: 'Affects of Pollution on Marine Life'.
22 September: 'Environmentally Friendly Storage Tanks' by Mr Tim Cope of Joseph Ash.
13 October: 'The Structure and Aims of the Institute of Petroleum', by Mr Ian Ward – Director General of the Institute of Petroleum.
17 November: 'Manufacture of Lubricating Greases', Mr John Cliffe of Ironsides.
1994
12 January: 'A Presentation by Gulf Oil Ltd at Gulf Oil (GB) Limited.
16 February: AGM and tour of Bank's Brewery.
16 March: Joint Meeting with the British Lubricants Federation. 'Environmentally acceptable hydraulic fluids', by Ken Walton of Ethyl Corporation.
20 April: 'Petrol Retailing Through the Next Decade', David Rae – The Retail Manager of Q8 Petroleum UK.

NORTH-EAST
Secretary: J M Sparke Esq., Phillips Petroleum Co. UK Ltd., Seal Sands, Middlesbrough, Cleveland. TS2 1UH. Tel: (0642) 546411
28 September: 'Overview of BS7750 – Environmental Management Systems', by Mr C Sheldon – Manager Environmental Initiatives of BSI.
15 October: Social Dinner.
9 November: 'On the River Tees', speaker from the National Rivers Authority.
1994
25 January: 'Solving on-line problems in Process Plant', speaker from Furmanite Limited.
8 February: Annual General Meeting.
22 March: Abandonment of Offshore Oil and Gas Fields', Mr A McEwan, Sub-sea Operation Manager, Stena Offshore Limited.
22 April: Annual Dinner-Dance.
May: 'Port of the Tyne', presentation by Port of Tyne Authority.

NORTHERN
Secretary: Dr P Miles, 13a Carrwood Avenue, Bramhall, Stockport, Cheshire. SK7 2PX. Tel: (061) 439 3183
7 October: Golf Day, Dunham Forest.
12 October: 'Under Pressure Maintenance in the Oil Industry', by A Petrie – Furmanite.
17 November: 'Biodegradable Oils' by J Baggott – Shell Centre, Shell UK Ltd.
26 November: Annual Dinner Dance.
1994
18 January: 'New Engines & Lubricant Requirements', by J Hillier – consultant.
15 February: AGM followed by talk on 'Rape Seed Oil', by Dr P Miles – consultant.
15 March: Joint Meeting with Stanlow Branch. 'Water Based Additives', R Stubbs – Polartech, Bury, Lancs.
11 April: 'Hot Pot Supper'.
June (Date to be Confirmed): Ladies Evening.

SHETLAND
Secretary: P N Guy Esq., BP Exploration, Sullom Voe Terminal, Mossbank, Shetland. ZE2 9TU. Tel: (0806) 243437
14 September: 'Marine Archaeology', Andy Carter, Shetland Sub Aqua Club.
12 October: 'British International Helicopters – Responding to Challenge', Capt A Veale, Base Manager Shetland.
5 November: Annual Dinner.
1994
15 February: AGM

SOUTH WALES
Secretary: I J Thomas Esq., BP Oil Llandarcy Refinery Ltd., Britannic House, Llandarcy, Neath, West Glamorgan. SA10 6HJ. Tel: (0792) 322269

Institute News

23 September: 'Going for Green – BS7750', Mr D J Harries, Texaco. Texaco Refinery, Pembroke.
21 October: 'New Bitumen Developments', speaker from BP Bitumen. BP Oil Llandarcy Refinery Limited.
16 November: 'Tanker Safety in UK Waters', Captain J Phillips – P & O Tankships. Gulf Oil Refinery, Milford.
1994
18 January: Visit to HTV Studios, Cardiff.
25 February: AGM and 'Trading Standards', Mr G Coles – TSO Dyfed.
17 March: 'Combined Heat and Power Systems', speaker from Powergen plc. Elf Refinery Limited.
25/27 March: Visit to Dinorwig Power Station.
26 April: 'Local Justice', Mrs Julie Ratti – Barrister. BP Oil Llandarcy Refinery Limited.

SOUTHERN
Secretary: P Emery Esq., Esso Petroleum Co. Ltd., Fawley Refinery, Fawley, Southampton. SO4 1TX. Tel: (0703) 896021.
11 September: The Sunset Cruise.
23 September: Day Visit to Heathrow.
September/October: Treasure Hunt around the New Forest.
10 November: Talk on 'Lubes into the 1990's'. Speaker from Esso Research Centre at Abingdon.
December: Wine Tasting Evening.

STANLOW
Secretary: A Jagannathan Esq., Shell UK Ltd., Stanlow Refinery, P O Box 3, Ellesmere Port, South Wirral L65 4HB. Tel: (051) 355 3600.
30 September: Ladies Evening – 'Chester Ghost Tour'.
6 October: 'The Alba Project in the North Sea'. By Dr. Alan Higgins.
10 November: 'Total Quality Management'. By Mr W MacKay.
3 December: Annual Dinner Dance.
1994
19 January: Stanlow Branch AGM. Followed by 'The British Coal Liquefaction Process'. Shell Thornton Research Centre, Thornton.
23 February: 'The Mersey Basin Campaign'.
15 March: 'Water Based Components'. By Mr R Stubbs – PolarTech Ltd.
13 April: 'BS 7750'.

WEST OF SCOTLAND
Secretary: W H Beaton Esq., Bill Beaton Corporation, 63 Carlton Place, Glasgow G5 9TW. Tel: (041) 420 1322.
23 September: Annual Golf tournament.
1994
10 March: Petroleum Dinner.

YORKSHIRE
Secretary: I Bennet Esq., Millers Oils Ltd., Hillside Oil Works, Brighouse, West Yorkshire. HD6 3DP. Tel: (0484) 713201
12 October: 'Oil Industry Training Opportunities', guest speaker Mr J Dobson.
9 November: 'Current Lubrication Trends', guest speaker Mr T Rogers, Ethyl Eurotech.
December : Ladies Evening
1994
11 January: Committee meeting at Millers Oils.
8 February: AGM/Hot Pot Supper + Guest speaker.
8 March: 'Wind Farming', guest speaker Angela Willis, Yorkshire Water.
18 March: Dinner Dance.
15 June: Golf Tournament.

Obituary

Michael John Rimmer died suddenly on 26 June, at the age of 59. He was educated at St. Joseph's Academy, Blackheath and London University where he received his BSc with Special Honours in Physics. He joined Iraq Petroleum Company as a Petroleum Engineer and over the next eight years became responsible for the operation of several drilling rigs and laboratories.

After three years with C.I.W. in Houston, he started his long association with Vetco in 1967. Originally in R&D he designed Humble's Subsea Production System (SPS) the forerunner of Shell's UMC. Moving to the commercial side as General Manager, he set up Vetco in London, Great Yarmouth and later in Aberdeen.

He became Comex UK's Managing Director in 1977 and later Marketing Manager for Subsea Offshore before returning to Vetco in 1981, initially as Sales Director with engineering and marketing responsibilities. He worked on everything for offshore drilling from compensators down to wellheads.

In 1988 he became Goodfellow Associates' General Manager in Aberdeen and project managed the development of subsea production and process boosting station, GASP. He also joined the Institute of Petroleum.

Two years later he moved to National Oilwell as Chief Engineer. He was currently serving on an IP committee working on 'The Study and Analysis of Routine Drilling and Drill Stem Testing Operations'.

UK Deliveries into Consumption (tonnes)

Products	*† June 1992*	** June 1993*	*† Jan-June 1992*	**Jan-June 1993*	*% change*
Naphtha/LDF	214,037.0	321,110.0	1,648,517.0	1,560,890.0	-5
ATF – Kerosine	607,419.0	635,490.0	3,187,250.0	3,262,963.0	2
Petrol	2,022,164.0	1,967,979.0	11,821,850.0	11,403,633.0	-4
of which unleaded	945,054.0	1,031,825.0	5,367,157.0	5,856,195.0	9
of which Super unleaded	119,842.0	121,511.0	672.137.0	702,573.0	5
Premium unleaded	825,212.0	910,314.0	4,695,020.0	5,153,622.0	10
Burning Oil	96,659.0	117,581.0	1,253,854.0	1,291,508.0	3
Derv Fuel	931,756.0	992,253.0	5,413,943.0	5,720,036.0	6
Gas/Diesel Oil	545,470.0	546,892.0	3,966,139.0	3,888,802.0	-2
Fuel Oil	783,517.0	831,735.0	5,691,599.0	5,253,197.0	-8
Lubricating Oil	70,596.0	67,795.0	384,310.0	382,466.0	0
Other Products	584,794.0	586,612.0	3,412,014.0	3,533,484.0	4
Total above	**5,856,412.0**	**6,067,447.0**	**36,779,476.0**	**36,296,979.0**	**-1**
Refinery Consumption	492,386.0	549,712.0	2,975,833.0	3,125,658.0	5
Total all products	**6,348,798.0**	**6,617,159.0**	**39,755,309.0**	**39,422,637.0**	**-1**

*† Revised with adjustments *Preliminary*

. . . technical report

Exploration and Production

The contract with the British Standards Institution (BSI) for the Institute of Petroleum to provide Secretariat Services to the PSE/17 committee and its subcommittees is being finalised. The IP is already becoming involved with input into upstream standards and was represented at a CEN meeting in Brussels and on the E & P Forum Committee on Standardisation.

The IP is now represented on the Cost Reduction Initiative New Era (CRINE) workgroup. A conference is being organised in December to present the overall conclusions and actions to implement cost reductions.

The first draft report by W.S.Atkins on the study of the routine case on subsea equipment operating envelopes is nearing completion. It is planned to organise a workshop in Aberdeen to gain industry feedback. A 1993 research proposal for the second phase of this study covering the non-routine case has been developed and is currently being circulated for comment.

The final report by Trident Consultants on 'The Development of Design Guidelines for Protection against Over-Pressures in High Pressure Heat Exchangers' has been received. A summary and position paper will now be prepared for distribution. The second phase of this project is unlikely to be recommended for the time being.

A conference 'Current Developments in North Sea Drilling Operations' was held on the 8 June in the Cavendish Centre. The papers presented were of a very high standard (see pages 399-407).

Refining and Marketing

Three new technical guidance documents have been published:

- Recommendations for Safe Use of Radio Telephone Installations in Cabs of Petroleum Carrying Vehicles, Incorporating IP Specification Doc-1.92.1
- The Inspection and Testing of Aircraft Hydrant Pit Valves
- Guidance Notes on Refinery and Distribution Terminals Work Permit Systems

The Conveyance Panel has completed the revision of the Safe Loading Pass Scheme, which will be published shortly.

The 1987 Bottom Loading and Vapour Recovery Code has been extensively revised and will be published shortly as the Bottom Loading, Vapour Collection and Overfill Prevention Code.

Aviation Committee is sponsoring a representative on the CEN Aircraft Refueller working group.

Witnessed testing of aviation filtration equipment has taken place in the United States.

The Service Station Panel is preparing a performance specification for flexible fuel delivery pipework.

A further draft of the Code of Practice dealing with On-Board Truck Computers was issued and was followed by a users' forum on 18 June (see page 428). Further development of the Code and the implications of its adoption by the industry will be discussed at the Downstream Operations Committee.

The draft Code of Practice for Product Uplifts from Service Stations and Customer Premises has been issued for comment.

Petroleum Measurement

OIML has relaunched the draft Recommendation,'Measuring Systems for Liquids Other Than Water'. This document is strongly opposed by the oil industry since it could result in ISO metering standards for petroleum being superseded in Europe by the mandatory adoption of the OIML standard. The draft was halted at a CEN meeting in Lisbon in June but a further version has been issued by Germany. The Chairman of the Petroleum Measurement Committee has written to the Secretariat of ISO/TC 28 protesting about its explicit application to the bulk custody transfer of petroleum. NWML is holding a special meeting on the document early in October to consider the UK stance.

PMM Part XIV: Statistics for Static and Dynamic Measurement is expected to be published in the next few weeks.

User Guidelines for Standard Temperature Accounting will be published in the next few weeks.

Test Method Standardization

A proposal from IP management that all new IP test methods and all IP test methods that are called up in specifications will be written in conformance with BS 0 : Part 3, with the addition that the 'comma' will be used as the decimal marker, has been agreed by the Test Method Standardization Committee.

Negotiations continue with BSI regarding publishing of a compilation of UK specifications by the IP. Agreement has already been reached with CEC regarding their specifications.

Microbiology

The arrangements for the conference on 14 October 'Developments in Microbial Control in Metal Working Fluids' have been finalised.

A programme for evaluating some five test methods for possible adoption as IP standards has commenced.

Environment

A successful conference on 'Petroleum-based Land Contamination' was held in May. This resulted in wide publicity for the IP code of practice on this subject.

A sub-committee to look into the possibilities of the IP producing a set of guidelines for the use of halogenated hydrocarbons used in the downstream oil industry has been set up.

The project to find a replacement for Freon 113 as the solvent for the 'Oil in water' test has been completed. A suitable replacement has been identified and a full report will shortly be available.

Health

The Code of Practice for Occupational Hygiene Audit has been published.

The Occupational Health Code of Practice is expected to be published in early September.

The research project sponsoring a review of epidemiological literature on the Human Health Effects of Benzene has been completed by Dr D Coggan, Epidemiology Consultant to the Medical Research Council.

General

The Institute has circulated a draft response to the DTI Consultation process on future resourcing for BSI. Responses will be incorporated into the final submission requested for the end of September.

The 1993/94 Consultants List has been published with about 500 members providing 60 categories of expertise. Demand for this service continues to develop.

John Hayes, Technical Director

Marathon orders evacuation system

Selantic Evacuation Systems, designer and manufacturer of innovative chute-based evacuation systems for marine and offshore applications, has received a large order from Marathon Oil UK.

Two fully containerised systems consisting of the patented Selantic Evacuation Chute and four 25-man liferafts will be installed on each of Marathon's existing Brae A and Brae B platforms, as well as on the East Brae platform, which has recently been installed in the North Sea.

The installations on Brae A and Brae B will be the first retrofits seen in the UK sector of the North Sea, as operators seek to comply with the new Safety Case regime,.following Lord Cullen's recommendations to improve evacuation, escape and rescue provisions.

Marathon Oil Brae Operations Safety, Health and Environmental Manager, Bob Kyle, said: 'The decision to install the system was taken as a result of our evacuation, escape and rescue analysis, which showed the need for a more reliable secondary escape system to the sea.'

A total of 64 systems have been sold to North Sea operators and many more are fitted to the new generation of state of the art platforms.

One of these new platforms is Total's Dunbar project, which is an installation which will not normally be manned. It was felt that the quick response and high reliability, coupled with reduced long-term maintenance costs, made one of Selantic's smaller systems, with two 25-man liferafts, the best choice for the platform.

Selantic evacuation chute

Full-scale training on using the system is now available at Dundee, at the RGIT Survival Centre.

Changes in engine oils

Duckhams has introduced a five-brand portfolio of new and updated lubricants into its engine oil range.

'Motorists may now need to take more care in selecting the right grade of engine oil', says Mr Charles Hogbin, Chief Executive of Duckhams, 'but they will have the advantage of being able to choose the one that provides the best protection available for their car, their driving habits and their budget'.

As flagship for the new line–up, the firm has launched a state of the art full–synthetic engine lubricant, named QS, to provide exceptional protection for race–bred and performance sports cars. The others in the quintet are QXR - a high–performance semi-synthetic; Hypergrade Plus - a new generation API 'SH' mineral oil; Hypergrade; and Duckhams Diesel, a special formulation for diesel cars.

Each lubricant has its own container colour and informative neck collars have been added for 4– and 5–litre packs.

Duckhams' new generation engine oil range

Solving fading thermals

Growing fears in the oil industry about fading images on thermal plots have led Xerox Engineering Systems to develop a patented new plotting technology known as Advanced Silicon Imaging (ASI) for its new 8770 range of high speed plotters. This provides laser-like quality prints on paper and film at a lower cost per plot than thermal devices and ink-jet and at more than double the speed.

ASI eliminates flare through its new circuitry design and control of random electrical discharge. Line dropout, usually associated with long single-nib lines in machine direction, is also reduced substantially because consistent charging of the media is maintained. Multiplexing is not necessary with ASI circuitry.

The 8770 series of plotters begins at £15,400, comes with a three year guarantee and a full service maintenance agreement.

Pipe flange

A new type of pipe connector has been introduced in the North Sea. Operational safety has been radically improved as a result, claims the Norwegian firm, Steel-products Offshore (SPO), which invested USD 3.57m and five to six years research and development in the project.

The new compact flange design has eliminated fatigue fracture which can occur in traditional flanges as a result of variable stresses, the bolts normally being the weakest points.

The design also provides double protection against leakage. Torsion applies highly-localised pressure to the inner surface of the flange and seals the production pipe. A flexible HX packing works independently of the bolt torsion. According to Det Norske Veritas, which has given its technical approval to the product, calculations and full-scale lab tests indicate that the flange will tolerate the greatest forces that can be exerted by the actual dimensions of the pipe.

The flange is also small and lightweight and its dimensions are such that it is stronger than the pipe under all stress conditions. Experience with its use in land-based processing plants, says the company, indicates that it will remain lead-free after several years of operation, even under extreme production conditions.

Testing for auto oils

Shell Research has extended its quality assurance procedures for testing lubricant samples using a new turbidity measuring instrument from Mettler Toledo.

Development work carried out at the company's Thornton Research Centre in Cheshire includes the examination of haze found in compounds used in the production of automotive oils.

The amount of haze present can influence the end product's performance and is a key consideration in routine sample analysis. Until recently, tests relied largely on the use of a haze meter but have now been improved by the installation of a FSC402 turbidity sensor. This enables more precise measurements to be obtained using a specially-designed probe with an infra-red fibre optic beam.

Apart from providing exact scrutiny of samples in laboratory conditions, the device can also be installed directly into a production line, opening up exciting new possibilities to monitor plant operations in situ.

Suitable for a wide range of processes at extremes of temperature and pressure, the instrument is available with a choice of probes to suit different plant requirements, including heat-resistant stainless steel, Hastelloy - (TM) C and polypropylene.

Shell research technician using new turbidity measuring instrument

New pipeline coating process

The Balmoral Group has announced a new single-pass manufacturing process for multi-layer pipeline coating polyurethane systems.

The new process, named Controlled Rotational Casting, involves the pouring of multiple streams of reacting polyurethanes directly onto a transversing, rotating pipe.

Rigid polyurethane foam systems with densities of 50-600kg can be produced, covering the whole duty requirement from ultra-high insulation value coatings for oil and gas landlines and process chemical lines, through to deep water subsea flowline installations.

The outer barrier PU elastomer coating can be substituted by special impact-resistant materials for service in areas prone to extreme mechanical damage.

System integrity is further enhanced by each pipe joint installation section being totally encapsulated, minimising the extent of any waterlogging in the event of local damage.

The casting has also been developed to apply microsphere-filled PU elastomers for subsea flow line insulation, in a process designed to eliminate the major quality variability inherent in previous moulding technology.

Portable multi-gas detector

Casella London Ltd has announced the launch in the United Kingdom of a new portable multi-gas detection instrument, the MX21.

This utilises the latest innovation of 'smart' sensors to give an instrument that offers not only a significant advance in gas detection capabilities, claims the company, but also a big step to reduction in cost of ownership.

The advantage of utilising smart sensors is in the ease of sensor replacement. They can be changed easily on site without the need for calibration.

All information regarding calibration, measuring range, type of gas etc is held within the smart sensor block which simply fits to the instrument via a push fit connector. The sensor block requires calibration every six months, but only the sensor block not the instrument needs to be returned to the calibration facility.

The instrument is capable of monitoring from one to four different gases simultaneously.

Clean-up kits

The USA Oil Pollution Act 1990 (OPA '90) requires all tanker vessels carrying oil in US waters to have on board the appropriate equipment to contain and remove on-deck spills.

Ro-Clean International, in conjunction with several of the major tanker fleet owners, has developed the OPA '90 Deck Spill Kit, to help customers comply with the new Act.

Equipment contained within the easy access storage container includes: non-sparking scoops, shovels and buckets, oil absorbents, protective crew clothing, deck cleaning chemicals, non-sparking portable pump and hoses, and containers for recovered waste storage.

Shell Tankers UK has chosen the kits for its fleet.

OPAgg- '90 deck spill kit

Multiphase pipeline analysis

Scandpower AS of Norway and Scientific Software-Intercomp of the United States have announced the release of the first fully graphical two-phased model used to perform multiphase analysis in pipeline systems. The new product is called Interact-Olga and it is a training and planning software for the pipeline industry, supplying a wide range of functions for simulation of pipeline operations. It has the ability to allow users to graphically build schematics.

Handling hazardous materials

A range of hose couplings, launched in North America ten years ago, is to be introduced to the UK market through an exclusive distributor agreement between the manufacturer, Hiltap Fittings, and ARCO, a leading supplier of hose and fittings.

Flanged and traditional coupling methods can be unreliable. They rely on gaskets or rubber washers to create a seal. Repeated use and constant high temperature can compress or harden them, rendering their sealing characteristics ineffective, allowing either leakage, loss of product or a potentially catastrophic situation to develop.

The design and precision-machined surfaces of the couplings dispenses with washers and gaskets and provides exceptional sealing characteristics regardless of application, says the supplier.

Sealing dynamics are enhanced by the coupling being energised by temperature and/or pressure. Connection and sealing is quick with only light hand torque required to give a safe, leak-proof, reliable and trouble-free joint.

The couplings are manufactured from a range of materials, including stainless steel, carbon steel, gunmetal, and aluminium alloys, and, dependent on type, in sizes from 1/4 inch to six inches.

The temperature range is minus 252 degrees centigrade to plus 500 degrees centigrade and the couplings are designed and pressure-tested to ANSI B31.3.

Hiltap couplings

Heat exchange refit with stainless steel

Super duplex stainless steel SAF 2507 tubing, produced by Sandvik Steel, has been used to replace carbon steel tubing in a heat exchanger refit contract undertaken by Motherwell Bridge Thermal Ltd for BP Oil Grangemouth Refinery Ltd.

Valued in excess of £1/4 million, the project involved two different types of 'pump around' exchanger and was the first major use by BP of the tubing. The steel has since been specified for other heat exchanger refit and new build programmes. Working conditions in the two different types of exchanger had led to a problem with under deposit pitting corrosion.

A redesign of the heat exchangers had been under review by BP for some time and the availability of this tubing provided the opportunity for a much longer working life. Despite the higher initial cost of super duplex stainless steel, the life cycle cost approach made it a viable alternative to carbon steel, says the firm.

The tubing combines the best properties of both the ferritic and austenitic steels. It has very high mechanical strength, excellent resistance to corrosion and good weldability.

Shell 'classic' containers

Shell International Petroleum Company is launching 'Classic', a coherent new range designed by PI Design Consultants, to meet the company's objective of global harmonisation of packaging.

The structural pack design caters for Shell's mainstream light engine oils, as well as its heavy engine grades, and was developed to complement and work in synergy with its premium pack range.

From a technical standpoint, the design is cost-effective. The three sizes in the range – one, four and five litres – will run without modifications on the same filling lines as other Shell international bottles. This move will further advance production and distribution efficiencies across the world, says the company.

To create the concept, PI used the latest computer simulation techniques to demonstrate how the bottle pours while rotating the design to display it from various angles. The pack was developed to pilot tooling and prototyping through PI's CAD process, to test the design prior to production.

Service station pipeline system

With some licensing authorities already insisting that galvanised steel pipework will no longer be allowed for forecourt installations, unless it is double-contained and cathodically protected, it is useful to be aware of acceptable alternatives, such as the UPP Pipework System, supplied by Petrotechnik Ltd.

Developed in Sweden and introduced into the United Kingdom in 1991, the system is already in service in over 150 sites. Made from polyethylene, the suctions or pressure lines have a built-in barrier liner formulated for today's more aggressive oxygenated fuels. The system covers the complete requirements on the forecourt from suctions or pressure lines, to off-set fills, vents and vapour recovery.

Suction lines can be either flexible, with compression couplings at tank and pump only, or in straight runs with 45 and 90 degree elbows, similar to steel pipework in which case thermo-welded sockets are used for all connections. These welded joints are acceptable to authorities as continuous pipe and are able to be buried. UPP is light but extremely durable and gives a very fast installation time.

Contacts

Selantic (UK)	*0224 638926*
Xerox Engineering Systems	*0635 517200*
Steelproducts Offshore	*+47 32 81 16 30*
Mettler Toledo	*0533 357070*
Balmoral Group	*0224 874052*
Casella London	*0234 841441*
Ro-Clean International	*0732 352125*
Scientific Software-Intercomp	*713 953 9272*
Arco	*0482 27678*
Sandvik Steel	*021 550 4700*
Petrotechnik	*0449 722822*

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Ms Diane Cook, above, has been appointed a tax partner in Ernst & Young. She has extensive experience of upstream taxes both in the United Kingdom and overseas, working within joint ventures and advising on the economic impact of taxation in project analysis. Before joining Ernst & Young in 1991, she was Head of Tax for BP Nutrition in Antwerp.

Ernst & Young have also announced three senior appointments to their practice in the Commonwealth of Independent States. **Messrs John Braden** and **Dean Ridenour** become Deputy Managing Partners, while **Mr George Rees**, Managing Partner extends his secondment until 1995. **Mr Ben Miller**, an oil and gas production sharing contract specialist, is newly appointed as Managing Partner of Kazakhstan, resident in Almaty.

Mr Neil Patterson has been made a Director of Aberdeen Service Co (North Sea) Ltd., while **Mr Colin Manderson** has been appointed Managing Director.

Mr Ian Macfarlane, right, has joined Briggs Shipping as Managing Director. He is a shipbroker, specialising in chartering and sale and purchase of offshore support and research vessels.

M Jean Ping, Minister of Mines, Energy and Hydraulic Resources, Gabon, has been elected President of OPEC.

Mr David Harrison has been appointed Business Development Manager, Oil and Gas, for Kennedy & Donkin Systems Control Ltd. He was previously Sales Manager with Costain Oil, Gas and Process Ltd.

Mr Anthony Levy, Principal Partner in Ideas into Action and a member of the IP Council, has been elected as a non-executive director of Greenway Holdings plc (formerly Kingston Oil & Gas plc).

Mr Mike Pursell has joined Quest Consulting Ltd as Corrosion Engineering Consultant. The company provides specialist services principally to the oil industry, with particular involvement in the certification and inspection of offshore structures and pipelines He joins Quest from BP Exploration.

Mr Tony Sanders has been appointed Director of Lloyd's Register's Industrial Division. **Mr Clive Bainbridge** has succeeded him as Director of Lloyd's Register's Offshore Division.

Mr Paul Sheldon has been appointed to the Oil and Gas Division of CMG. He was previously with Price Waterhouse.

Mr John Firth, above, of Ingersoll-Rand has been elected the President of PNEUROP, the European technical body representing manufacturers of compressors, vacuum pumps and pneumatic tools. He will hold the position for two years.

Mr Allan M Pinne, below, has been appointed Fuels Marketing Director, Mobil Oil Co Ltd. He has been with Mobil for over 20 years and has extensive marketing experience in both the United States and Europe. He succeeds **Mr Mike Churn**, who has been appointed Regional Operations Co-ordinator for Mobil's Marketing and Refining Division in Fairfax, Virginia.

Philip R Moncrief has been made Vice President, Environmental Services for Bechtel Corp. in Houston.

Mr Bill Schrom has been named as Chief Financial Officer and Senior Vice-President of Western Geophysical, a division of Western Atlas. He continues to be based in Houston. He joined Western Geophysical in 1981 and has served in various financial positions including foreign assignments in Colombia and the United Kingdom.

Miss Georgina Slaven has been appointed a Research Fellow at the Business School Offshore Management Research Group, the Robert Gordon University. She is manager of a research project, funded by the Offshore Safety Division of the HSE, which is examining the application of information technology to safety training.

Ms Amanda J Powell has been made Public Relations Manager for John Brown Engineers & Constructors.

Mr Chris Poulton, below, has been appointed Managing Director of Cardcast Ltd which provides plastic card fraud detection systems. He was formerly Managing Director of 3C, part of the Swedish multinational Kinnevik.