PETROLEUM REVIEW

IP THE INSTITUTE OF PETROLEUM

September 1997

North Sea Survey
Production set to keep on rising

European retailing
Meeting the hypermarket threat

Hong Kong
China to take over oil entrepôt role?

UK Gas
Tackling the 'take-or-pay' problem

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EDITORIAL

Editor: Chris Skrebowski
Deputy Editor: Kim Jackson
Production Editor: Emma Parsons

The Institute of Petroleum
61 New Cavendish Street, London W1M 8AR, UK
Tel: +44 (0)171 467 7118/9
Fax: +44 (0)171 637 0086
E-mail: lis@petroleum.co.uk

http://www.petroleum.co.uk/petroleum/

ADVERTISING

Alison James
Anne Marie Fox
Classified: Elaine Smith

Landmark Publishing Services, 8 New Row, London WC2 4LH, UK
Tel: ***+44 (0)171 240 4700***
Fax: ***+44 (0)171 240 4771***

PUBLISHERS

IP THE INSTITUTE OF PETROLEUM

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Director General: Ian Ward

61 New Cavendish Street
London W1M 8AR, UK

SUBSCRIPTIONS

Subscription Enquiries: Anne Poynter
Tel: +44 (0)171 467 7124

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ABBREVIATIONS

The following are used throughout *Petroleum Review*:

mn	= million (10^6)	kW	= kilowatts (10^3)
bn	= billion (10^9)	MW	= megawatts (10^6)
tn	= trillion (10^{12})	GW	= gigawatts (10^9)
cf	= cubic feet	kWh	= kilowatt hour
cm	= cubic metres	km	= kilometre
boe	= barrels of oil equivalent	sq km	= square kilometres
		b/d	= barrels/day
t/y	= tonnes/year	t/d	= tonnes/day

No single letter abbreviations are used. Abbreviations go together eg. 100mn cf/y = 100 million cubic feet per year.

Front Cover: Erskine rig used by kind permission of Texaco

CONTENTS

NEWS

SPECIAL FEATURE

FEATURES

REGULARS

NEWS Upstream

Indian summer for North Sea producers

The main theme of this month's issue is the North Sea and specifically the new fields coming onstream (p406). The North Sea continues to be one of the most remarkable hydrocarbon provinces in the world in terms of the range of structures and traps and in the number of geological ages that are productive.

Even more remarkable is that, despite the largest structures having (almost certainly) been found, output continues to rise. The achievement reflects great credit on all those who work in this most demanding of areas and on all those who are working to extend and refine the technology which has permitted the ever increasing flows.

At the end of last year in a definitive report *Global Offshore Oil Production to 2000*, the International Energy Agency (IEA) concluded that there will be no decline in non-Opec oil production before 2000. This is largely, but not wholly, due to the changes and improvements to upstream oil technology that have occurred over the last decade.

These changes have made it economic to exploit smaller accumulations, very thin horizons, technically difficult reservoirs (such as the high-temperature/high-pressure Erskine field, see p430) and to progressively increase recovery rates.

The IEA expects non-Opec production to increase by 6.3mn b/d with 5.2mn b/d or 83% coming from new offshore output. Over 4.8mn b/d of the incremental offshore oil production comes from 10 countries (see table).

The pre-eminent position of the North Sea is clear. It is expected to contribute over 30% of global incremental offshore oil production in the period to 2000 and be a major source of additional production for several years thereafter.

Largest offshore production gains from 1995 to 2000 (thousand b/d)

Country	1995	2000	Change
US	1,397	2,390	995
Norway	2,911	3,707	796
UK	2,699	3,485	786
Brazil	524	1,302	778
Mexico	1,947	2,402	454
Angola	646	890	244
China	176	387	211
Australia	497	696	199
Azerbaijan	153	345	192
Congo	189	367	179

Source: IEA Global Offshore Oil Production to 2000

In terms of the number of new offshore field developments the North Sea accounts for more than the rest of the world put together.

However, there are many other topics of interest in this month's issue ranging from the threat posed by hypermarkets to conventional forecourts to the opening up of Indian E&P and gloomy prospects for Hong Kong's oil suppliers, along with a detailed look at the UK 'take-or-pay' gas contracts and a number of technical articles and all the month's industry news.

We have continued to make changes to *Petroleum Review*. To avoid constant repetition of units we have produced a list of standard abbreviations which will be used throughout the magazine. Every publication appears to use a different set of shortenings, so there is no standard to resort to. We have, therefore, attempted to select ones that are clear and consistent, avoiding the potential confusion of single-letter abbreviations.

Chris Skrebowski

Work begins on major Caspian Sea oilfield project

Azerbaijan International Operating Company (AIOC) has issued Brown & Root a letter of intent for a contract to provide engineering design and procurement services for Phase 1 of the full field development of the Guneshli Chirag Azeri (GCA) offshore fields in the Caspian Sea.

Under the terms of the contract, Brown & Root will undertake conceptual studies, front-end engineering and the detailed engineering design and procurement of facilities capable of producing 300,000 b/d from the GCA fields. The development is likely to centre on a single processing platform plus two drilling and wellhead platforms for up to 80 wells.

Also included in the design and procurement contract are: infield pipelines, main oil and gas pipelines to the Sangachal onshore terminal approximately 200 km away, expansion of the onshore terminal and upgrading of the main export pipelines from Azerbaijan to the ports of Novorossiysk on the Black Sea and Supsa in Georgia.

In Brief

BP has issued summons for some £1.4mn *against the environmental group Greenpeace and four named campaigners – Deputy Executive Director of Greenpeace Chris Rose, together with Sarah Burton, Liz Pratt and Jon Castle – over the ongoing campaign to prevent oil and gas exploration and development on the Atlantic Frontier, west of Shetland. A 'schedule of arrestment' was issued in an Edinburgh Court of Sessions on 18 August 1997. BP is among 21 oil companies opposing Greenpeace in the High Court over the environmental body's claim that there is a lack of protection for the environment in the Atlantic Frontier region. A hearing on leave for a Judicial Review sought by Greenpeace is due in the London High Court on 23/24 September 1997.*

Conoco Energy Nigeria has announced *first oil production from the Ukpokiti field located offshore the western Niger delta. Peak production of 20,000 b/d is expected to be reached by the end of July 1997 following completion of well tie-ins and the commissioning of a water injection system.*

Ranger Oil has announced that it has *been granted approval from the Angolan Ministry of Petroleum and Sonangol UEE (the state oil company) to develop as operator, with 100% interest, the Kiame oil field in Block 4 offshore Angola. The field has reserves of approximately 8mn barrels.*

Elf Aquitaine has signed an agreement *to sell its subsidiary Elf Hydrocarbures Tunisie (EHT) to Arco. EHT holds interests in different fields in Tunisia with its share of production amounting to 9,200 boe/d in 1996, coming principally from its Ashtart offshore field. EHT holds a 50% interest in the field along with the Tunisian national oil company ETAP. Ashtart is operated by Société de Recherches et d'Exploitation des Pétroles en Tunisie.*

Mobil Oil is to build a multi-billion *dollar floating offshore liquefied natural gas plant over the Gorgon gas field on the North-West Shelf. The 6mn t/y floating LNG plant, introduces a major new element into the negotiations between Gorgon partners and the North-West Shelf joint venture.*

Arco Ireland Offshore, Anadarkco *Ireland and BG Exploration and Production have formed a joint working alliance to evaluate the hydrocarbon potential of offshore Ireland. Work has already commenced on evaluating the blocks on offer in the recently*

NEWS Upstream

BP announces record interim profits ...

Announcing its second quarter results for 1997 on 5 August, British Petroleum reported a 21% rise in replacement cost profits to $2.43bn against the first half of 1996. Turnover rose from $33.7bn to $37.2bn in the same period.

Although capital expenditure was reported to have increased by 13% to $2.5bn a strong cashflow had resulted in net debt falling by $1.3bn to $6.1bn.

Chief Executive John Browne attributed the company's good performance to increased product sales and higher levels of output. He also stated that BP was well on track to achieving its $300mn profit improvement target from 'self help' – which includes volume improvements and cost reductions.

BP's exploration and production division recorded a 15% rise in operating profits to $2.6bn. Refining and marketing, meanwhile, reported a 57% increase in operating profits to $500mn. Cost savings from the company's European refining and marketing joint venture with Mobil contributed to this increase and BP expects two-thirds of the originally forecast $500mn in annual efficiency gains resulting from the venture to be realized by the end of 1997.

Chemical volumes grew by 13% following strong demand and continuing economic growth. However, according to Browne operating profits remained flat due to foreign exchange effects, principally a strong stirling and weak deutschmark.

BP also announced that it plans to launch a share buyback programme in a bid to ensure that its investors benefit directly from this year's record profits.

Shareholders will be asked at the next annual meeting in April 1998 to sanction the scheme. The company declined to comment on how extensive the buyback programme would be.

In a more immediate bid to curb the high growth rate in the number of shares currently in issue BP plans to buy some $500mn worth of shares in the open market for its employee share scheme instead of issuing new shares.

Shortly after BP's second quarter results had been announced, Lord Simon, Minister for Competitiveness in Europe and former BP Chairman, announced that he plans to sell his shares in the company.

He stated that he was now able to dispose of the shares – worth in excess of £2mn and currently held in an offshore corporate trust – as he no longer possessed inside information as the company figures were now in the public domain.

A number of questions concerning Lord Simon's shareholding had been asked by the opposition to the Labour government in the week leading up to the release of BP's interim figures.

John Redwood, the Tories' spokesman for trade and industry, had argued that Lord Simon's shares led to a 'conflict of interest'. It has been reported that Lord Simon plans to donate to charity any gain arising from the appreciation in the value of his shares.

... while Shell disappoints shareholders

The Royal Dutch/Shell Group announced a disappointing set of interim results last month, sharply contrasting the performance recorded by BP.

The company reported results for the quarter, measured by earnings on an estimated current cost of supplies (CCS) basis (excluding special items) of £1,140mn, down 4% on the second quarter of 1996.

Reported net income for the second quarter 1997 was £1,070mn compared with £1,183mn for the same period the previous year.

The drop in profits was attributed to the relative strength of sterling against the dollar and European currencies, inventory holding losses of £110mn (compared with losses of £5mn in 1996) and weak chemicals margins.

Crude oil production for the first half year was reported to be up 1% at 2.3mn b/d while natural gas sales fell 5% to 8.4bn cf/d. However, higher production levels are expected from the UK for oil, and from the deepwater Gulf of Mexico for oil and gas in the second half of 1997, the company stated. Capital expenditure and exploration expense in the first half of 1997 was 38% of the full year's plan of £8.2bn.

Second quarter refining and marketing earnings were up 17% on a CCS basis to £563mn, although reported earnings were lower because of inventory holding losses, stated the company.

Earnings in the chemicals division, excluding special items, were 1% lower at $182mn than recorded the same period last year.

In Brief

announced Frontier Licensing Round in the South Porcupine Basin.

***Gulfstream Resources Canada has been** awarded oil exploration and production rights in Hofar region number 30 in the north of the Sultanate of Oman. Under the terms of the agreement, Gulfstream is committed to spending at least $20mn over the next six years on exploration programmes, including the drilling of three exploration wells.*

***It has been reported that Calgary-based** Tornado Resources has signed an oil and gas exploration deal with Kenya, the first in the country in the past 10 years. The company has committed to an initial three-year exploration period and is to invest at least $7mn on a seismic programme and the drilling of two exploration wells.*

***Canadian oil company Talisman has** acquired Texaco's interests in Quadrant 13 located to the west of Talisman's Ross field in the Moray Firth. The company is also acquiring two partial blocks in Quadrant 20 which is adjacent to the Buchan field which Talisman purchased from BP last year. In return, Texaco is to take over Talisman's 10% stake in Block 15/28a.*

***Clyde Expro has signed a farmout** agreement with independent oil and gas company MSS Petroleum. Under the deal, Clyde will earn 70% of MSS' interest in the exploration, development and production sharing agreement between MSS and Petrom, the state-owned Romanian oil company, covering Block VI (Moinesti) in the Eastern Carpathian oil and gas producing region of Romania.*

***The Alfa Group, one of Russia's largest** financial-industrial conglomerates, is reported to have acquired 40% of Tyumen Oil in a government privatization in August.*

***Lasmo has announced a new hydro-**carbon discovery in Block 404 in the Ghadames Basin in Algeria. Its HBNSE-1 exploration well tested at a rate of 17,092 b/d and 37.5mn cf/d. The well is located within 10 km of the production facilities currently under construction for the HBNS field which is due onstream in 1998.*

***Norsk Hydro and Halliburton Energy** Services have completed what is said to be the world's first subsea multilateral with re-entry access. The H-3 well was completed from the Polar Pioneer semi-submersible in Norsk Hydro's Troll field. According to Halliburton, multilateral*

NEWS Upstream

Five-year plan for UK oil and gas exploration

Outline plans for future oil and gas exploration opportunities around the UK in a five-year programme of offshore licensing rounds held under new environmental regulations were released by the UK Department of Trade and Industry last month.

The planned programme can be summarized as follows:

- **The next offshore round, the 18th, will open in 1997 and cover mature areas in the north, central and southern North Sea and the Morecambe and Liverpool Bay areas of the Irish Sea. Licence awards are expected to be made around Easter 1998.**
- **The 18th round will be followed by rounds which offer acreage each year in a mixture of mature and semi-mature rounds.**
- **A frontier round will be announced in the autumn of 2000. It will be timed to allow the re-offer of acreage relinquished earlier that year in accordance with the terms of licences awarded in previous frontier rounds.**
- **A round covering the 'white zone' is planned once agreement has been reached with the Faeroes on the exact limits of the maritime boundary in the region.**
- **A suspended-well initiative is also planned to review significant discoveries which remain undeveloped or undertested six years after discovery. These include a number of suspended wellheads which obstruct the seabed to the inconvenience, and danger, of other sea users. Officials will work with licensees to encourage companies to reconsider plans for fallow discoveries.**
- **Looking onshore, a review will be made of the potential exploitation of mine gas which is a contributor to the greenhouse effect. This would have planning implications for former mining areas, since developments would mean re-introducing some activity at closed pitheads. The current landward licensing regime was designed to regulate exploration for conventional oil and gas targets and does not address some aspects of mine gas exploitation.**

Monument and Mobil agree asset swap

Monument Oil and Gas has agreed a swap of its Argentine interests with a number of the North Sea assets of Mobil.

Under the terms of the agreement, Monument will dispose of its Bermudan subsidiary Monument Exploracion – which holds all of Monument's assets in Argentina, including its 19.9% interest in the producing Sierra Chata gas field in Block CNQ10 and its 30% stake in exploration Block CNQ7 – to Mobil.

In return, Monument will receive the following Mobil producing and exploration properties in the UK sector of the North Sea: 19.5% of the Hudson field and Blocks 210/24a and b; 100% of Block 21/28a and 32.5% of Block 21/27a and b, all three of which lie in the Fyne area; 40% of exploration Block 16/18; and 20% in each of Blocks 13/16a and 13/21a in the West Captain area.

Monument estimates the swap – which is expected to complete by the end of 1997 – will result in it exchanging 16.8mn boe of booked gas reserves in Argentina for 7.5mn barrels of higher margin oil reserves in Hudson in the UK. On completion, the net assets disposed of attributable to Sierra Chata are estimated to be some £19mn with Hudson valued at approximately £24mn.

Standby vessel standards

New guidelines aimed at improving safety standards of offshore rescue and recovery are to be introduced for standby vessels operating in UK waters.

Issued by the Standby Ship Operator's Association (SSOA), the UK Offshore Operators Association (UKOOA), the International Association of Drilling Contractors (North Sea Chapter) (IADC) and the British Rig Owners Association (BROA), the 'Guidelines for the Survey of Vessels Standing By Offshore Installations' and 'Guidelines for the Operation of Vessels Standing By Offshore Installations' will come into effect on 1 November 1997.

The guidelines set out 'good practice' concerning the design, survey and operation of vessels which may form part of the rescue and recovery arrangements for offshore installations.

Developed to address Lord Cullen's recommendation that the oil and gas industry should specify the standards which are used to comply with goal-setting regulations, the new guidelines will replace the existing UK Department of Transport/Health and Safety Executive Instructions for the guidance of surveyors in 'Assessment of the Suitability of Standby Vessels Attending Offshore Installations' commonly referred to as the 'Green Code'.

In Brief

re-entry has the potential to reduce by one-half the costs associated with subsea developments by reducing the systems required to access the reservoir.

***Chevron and the State Oil Company of** the Azerbaijan Republic (SOCAR) have signed an agreement to explore Azerbaijan's Absheron offshore block in the southern Caspian Sea. Chevron will hold a 30% stake in the block and will act as operator. Exploratory drilling is expected to begin in late 1999, following a 3D seismic programme that will augment data collected in earlier surveys.*

***Indonesian state-run oil company** Pertamina has announced that it will invest $1.3bn in the development of the Coastal Plain Pakanbaru (CPP) block on Sumatra Island. It will take over responsibility for the field development from PT Caltex Pacific Indonesia in 2001 when Caltex' 30-year contract for the block expires. Pertamina plans to continue to develop the block with an enhanced oil recovery programme.*

***Pluspetrol Energy of Argentina has** announced that it plans to invest some $50mn in 1997 on energy exploration and production in Block 8 and the Lancones block in northern Peru. The company also plans to invest a further $45mn in 1998 – details of how the money is to be spent have not been disclosed.*

***It has been reported that MJC** Petroleum, a consortium in which Mobil Oil is the largest partner, has abandoned the Thanh Long (Blue Dragon) oilfield located some 280 km southeast of the Mekong Delta in Vietnam after three years of exploration yielded no commercial discoveries.*

***Exxon Exploration and Production** Azerbaijan has signed an agreement with the State Oil Company of the Azerbaijan Republic (Socar) defining the exploration, development and production sharing terms for the Nakhchivan prospect in the Azerbaijan sector of the Caspian Sea.*

***Icon Oil in Australia is offering some** 60mn shares in a bid to raise $12mn to fund a 21-well programme over the next two years in the Surat-Bowen and Cooper-Eromanga Basins in Queensland.*

***BG, together with partners Agip and** Deminex, reports that two exploration wells drilled off the northern coast of Trinidad have discovered natural gas. The estimated size of the discoveries, which extend the boundaries of the proven Hibiscus field, has not been disclosed.*

NEWS Downstream

Sea Empress report recommendations

The Marine Accident Investigation Branch (MAIB) report into the investigation of the grounding of the *Sea Empress* tanker off Milford Haven, South Wales, on 15 February 1996 was published in July 1997.

The report pointed to a number of failings that contributed to the grounding and the subsequent problems encountered in salvaging the vessel. These included the pilot's 'inadequate training and experience in the pilotage of large tankers', a lack of knowledge of the tidal flows at the harbour entrance and inadequate local emergency systems at what is one of the UK's busiest oil terminals.

The report made 24 new recommendations. Eleven of the recommendations were directed to Milford Haven Port Authority and primarily concerned the improvement of training and managment of pilotage services in the port. A single recommendation on pilotage passage plans was made to the vessel manager Acomarit (UK). A further 12 recommendations were put to the Department of Environment, Transport and the Regions/Marine Safety Agency and the UK Coastguard Agency, including three proposed amendments to the International Maritime Organisation (IMO) regulations governing oil tankers above 5,000 dwt. The amendments called for (i) such vessels to carry predetermined shipboard oil pollution emergency plans and to have access to shoreside computerized damage stability and residual structural strength calculation programmes, (ii) a double bottom to be fitted over the vessel's pump room and, perhaps, the engine room, and (iii) Marpol regulations covering bottom raking damage of such vessels should be made more stringent.

All the issues covered by the report are expected to be covered by a wide-ranging review – ordered by the government – to be carried out by Lord Donaldson who conducted the investigation into the sinking of the *Braer* tanker off the Shetlands in 1993.

BP seals shop deals in Japan and Portugal

BP has concluded two deals – one in Japan, the other in Portugal – to develop the retail side of its service station business.

In Japan, the company has joined forces with Iseya Kosan to build and operate a network of service stations adjacent to a number of new Beisia shopping arcades and DIY stores which Iseya Kosan is currently planning.

Under the agreement, BP Japan will initially build five pilot sites in the Gunma prefecture – which is approximately 100 km from central Tokyo – by the end of the first quarter of 1998.

The first proposed site will be at Beisia Super Mall Isesaki, Miyako, and will open at the end of 1997.

If the pilot sites prove successful, the scheme will be extended to other Beisia stores over the next six to seven years to create a network of over 100 filling stations.

In Portugal, BP Portuguese and Modelo Continente SGPS, Portugal's leading grocery retailer owned by Sonae, have formed a 50:50 joint venture to develop a network of convenience stores alongside BP's service stations across the country.

A number of pilot sites will be used to trial the new concept. If successful, a further 100 stores will be rolled out through company operations or franchising agreements.

Tracking fuel/lube oil markets in Central Europe

London-based market research consultancy Total Research is launching 'OilTrack East', a series of syndicated studies looking at the market for fuel and lubricants in Poland, the Czech Republic and Hungary and the market for lubricants in European Russia.

Seven surveys are to be undertaken, involving interviews with some 1,000 motorists in each country. The surveys will provide information on each oil company's perceived strengths and weaknesses compared with the competition, brand loyalty and brand marketing, motorists' practices as users of cars, motorists' behaviour and requirements as users of fuel/lubricants, their attitudes to price and quality issues, and market segments and market targeting.

The surveys will be conducted at periodic intervals so that subscribers can track market developments and their own performance over time. Those studies currently underway are expected to complete in September 1997.

Further details – Tel: +44 (0)181 995 3801 Fax: +44 (0)181 995 3496.

In Brief

Partners in Australia's North West Shelf *natural gas project have signed an A$1bn contract for the supply of up to 80 terrajoules of gas per day to Western Australian gas company AlintaGas from 2005 until 2020. AlintaGas is already required to take, or pay for, some 95 terrajoules per day until 2005 under the terms of an existing contract with the North West Shelf project partners.*

Shell International Gas and Bechtel *Enterprises announced that they have signed an agreement with a view to negotiating the possible acquisition of a 50% equity interest in International Generating Company (Intergen) by an affiliate of Shell International Gas. Intergen is a leading global power and related asset development company, which is 100% owned by Bechtel Enterprises. It develops, finances, owns and operates electric power plants as well as their related fuel, transportation, and transmission facilities.*

Exxon Corporation is selling its UK *liquefied petroleum gas business to Royal Dutch/Shell for an undisclosed sum. Shell Gas will immediately take over the day-to-day running of Essogas' cylinder and domestic bulk LPG business.*

The West Australian Government has *called for registrations of interest for the sale of the natural gas pipeline from Dampier to Bunbury. According to State Energy Minister Colin Barnett, the 1,530-km pipeline and associated assets have a current book value of more than $1bn and the sale has the potential to realize the highest price for a state-owned asset in West Australia.*

It has been reported that the Sabah *Electricity Board is to be privatized by 1 January 1998. Tenaga Nasional has been chosen by the state government of Sabah to lead the privatization programme and to head the consortium that will take over the privatized company.*

Iran's eighth oil refinery, located near *the Gulf port of Bandar Abbas, has been officially inaugurated by Iranian President Akbar Hashemi Rafsanjani. The $2bn plant is expected to produce 46,100 b/d of gasoline, 36,200 b/d of kerosene, 69,500 b/d of gasoil, 66,500 b/d of heavy fuel oil, 7,100 b/d of LPG, 5,000 b/d of tar and 124 t/d of sulfur.*

The US Government has announced *that it will not oppose the construction of a proposed $1bn gas pipeline linking Turkmenistan on the eastern coast of the Caspian Sea to Europe via northern Iran and Turkey. US officials are*

NEWS Downstream

PESC offers PINTO plan to UK government

The Petroleum Employer's Skills Council (PESC) has submitted a proposal to the UK Department for Education and Employment (DfEE) asking that it be recognized as the National Training Organisation (NTO) for the Downstream Petroleum Industry.

The development of NTOs is part of the UK Government's commitment to build upon the existing network in order to bring about a more strategic approach to labour market and training issues.

Under the plan put to the DfEE, PESC would change its name to PINTO (Petroleum Industry National Training Organisation) and become a stand-alone company limited by guarantee. The DfEE is expected to make its decision by the end of October 1997. If successful, PINTO will be registered by the end of the year and is expected to be fully functional by September 1998.

PESC recently became one of 25 new industry sectors to win a share of £250,000 of government funds to set education and training targets aimed at raising the skill and qualification levels in industry. PESC has been granted £5,000 to set up a feasibility study of a training scheme for the petroleum industry which, if accepted by the government, will help more staff in the industry reach level 2 and 3 National/Scottish Vocational Qualifications and companies achieve Investors in People accreditation.

ADNOC expansion

The Abu Dhabi National Oil Company (ADNOC) has awarded two turnkey projects worth several hundred million dollars to Snamprogetti, the international engineering contractor and technology company of ENI.

The first contract is for the Ruwais refinery expansion project and covers the construction of two parallel trains for the distillation of condensate from the onshore gas development and Asab gas development projects. The second is for the Asab gas development project and covers the construction of process units capable of handling some 856mn cf/d of natural gas to recover about 95,000 b/d of condensate by separation and stabilization.

The scope of the work also includes storage facilities, utilities, transportation of the liquids to the Ruwais refinery via a 190-km pipeline and a system for reinjection of the treated gas at Asab.

Kårstø plant plans for the new Millennium

The main Nkr737mn contract for the planned expansion of Statoil's Kårstø gas treatment plant in southwest Norway has been awarded to M W Kellogg of the UK. Work is expected to complete in autumn 2000.

A total of Nkr7bn is to be invested in new facilities at Kårstø over the next three years. This work will include the construction of a treatment plant for rich gas from Statoil's Åsgard development, an ethane recovery plant and a number of storage and jetty installations.

There are also plans to build a receiving station for the pipeline from Åsgard, an export facility for the Europipe II gas trunkline to Germany and a plant for importing gas from the Draupner riser platforms in the Norwegian North Sea.

Taking action on pilotage regulations

As part of the review of the Pilotage Act 1987 – announced in July 1997 at the same time as the MAIB (Marine Accident Investigation Branch) report on the *Sea Empress* grounding was published – the UK Department of Trade and Industry has issued a consultation paper and questionnaire to all harbour authorities with responsibility for pilotage.

The Department's Ports Division is leading and servicing the review which will look at the way functions conferred by the Pilotage Act 1987 are discharged by competent harbour authorities with particular reference to the recommendations made in the MAIB report on the *Sea Empress*.

The Marine Safety Agency, the British Ports Authority (BPA), the UK Major Ports Group (UKMPG), the UK Independent Ports Authority (UKIPA), the UK Harbour Masters' Association, the Chamber of Shipping, the Nautical Institute, the National Union of Maritme, Aviation and Shipping Transport Officers (NUMAST), the Transport and General Workers' Union (T&GWU) and the UK Pilots Association will also be involved in the review process.

The Ports Division plans to visit a range of ports in the course of the review.

In Brief

reported to have said that the pipeline does not technically violate the 1996 Iran-Libya Sanctions Act which bars US and foreign investments of more than $40mn in the development of Iran's energy sector as the law does not cover pipelines carrying another country's oil or gas across Iran.

***It has been reported that Turkmenistan** and Pakistan have signed a deal with US company Unocal and Delta Oil of Saudi Arabia covering the construction of a $2bn gas pipeline between the two countries. The 1,464-km pipeline will carry some 1bn cf/d from the Daulatabad gas field in southeast Turkmenistan, via Afghanistan, to the city of Multan in southern Pakistan. It is due to become operational in 2001.*

***Gasum Oy's new 50-km Imatra-**Lappeenranta pipeline opened at the start of August, a month earlier than planned. The pipeline will increase the transport of natural gas from Russia to Finland by 700mn cm to 4bn cm/y.*

***Suncor Energy of Canada plans to** invest some $2.2bn in bringing oil sands production at its Fort McMurray facility to 210,000 b/d by the year 2000 as part of its Project Millennium programme. The company has already invested $600mn in the site in a bid to increase production to 105,000 b/d by 1999.*

***It has been reported that British Gas is** seeking permission from New Delhi's Foreign Investment Promotion Board to build a $400mn liquefied natural gas import terminal in Pipavav in Gujarat, India. The 2.5mn tonnes capacity plant would be operational by 2001.*

***Foster Wheeler and UOP of the US have** signed a technology alliance with Venezuela's state-owned company Intevep to market a new extra heavy crude process. The Aquaconversion technology is reported to be a catalytic conversion type of process with effects similar to visbreaking.*

***American International Petroleum has** purchased a 70% interest in Kazakh company MED Shipping Usturt Petroleum.*

***It has been reported that Reliance** Petroleum of India has been granted a $300mn loan from a group of international banks that will help finance the construction of a $2.4bn refinery project in the country.*

***UK Trade and Industry Secretary** Margaret Beckett has called for the £3.65bn bid by PacifiCorp of the US for*

NEWS Downstream

Modest impact of UK budget fuel duty increases

July figures in the PHH AllStar monthly fuel report published by Swindon-based PHH Vehicle Management Services indicate that despite the four pence rise in duty on a litre of fuel following the UK's July Budget, average forecourt prices nationwide have only risen around two pence per litre.

According to PHH, this is due to a combination of factors. 'Firstly, some forecourts have been running out existing stocks which were topped up prior to the Budget. Secondly, although ex-refinery fuel prices increased steadily throughout the month of July, the recent strong pound has also meant the price of raw materials has fallen in real terms. Thirdly, continuing competition amongst petrol retailers has led to the absorption of a part of the duty increases in some areas of particularly fierce competition.'

However, the company expects fuel prices to rise again over the August holiday period, taking pump prices up by the UK Chancellor's original four pence and possibly more due to increased demand and rises in the price of crude oil.

The figures for July also showed that while fuel prices are very competitive locally, there is a massive price variance across the country (see table).

Data for the monthly PHH AllStar fuel reports is drawn from 750,000 transactions made each week, worth over £20mn, by 650,000 drivers using AllStar and PHH-operated fuel cards.

	Pence per litre
Diesel	
Lowest: Glasgow	59.04
Highest: Dover	66.00
National average	62.28
Unleaded petrol	
Lowest: Glasgow	58.96
Highest: Aberystwyth	64.99
National Average	61.90
Four-star petrol	
Lowest: Sheffield	64.81
Highest: Northampton	70.52
National Average	67.20

UK-based energy company Energy Group to be referred to the Monopolies and Mergers Commission (MMC) despite advice to the contrary from the Office of Fair Trading and UK electricity regulator Offer. She is reported to be concerned over the UK authorities' ability to regulate the takeover. The decision puts on hold any bidding among UK utilities until the commission reports its findings.

***British Gas Trading (BGT) has made its** first step into the UK electricity supply business with the start of a one-year contract for the supply of an undisclosed amount of electricity to sister company Hydrocarbon Resources Ltd (HRL).*

***It has been reported that state-owned** Indian Oil Corporation and Petroliam Nasional of Malaysia have signed a memorandum of understanding covering the import, storage and sale of bulk and packaged LPG in Malaysia.*

***Shell, Texaco and Marathon have joined** forces to build a network of pipelines to land crude oil from deepwater projects in the Gulf of Mexico. The Odyssey system will have a capacity of 300,000 b/d and is due onstream at the end of 1998/early 1999.*

***It has been reported that Nigeria plans** to begin a repair programme at its refineries in a bid to help alleviate fuel shortages in the country. Work will begin on the Kaduna plant in the north, followed by the Port Harcourt and Warri refineries. The Nigerian Finance Ministry is said to have released some $145.8mn for state-run Nigerian National Petroleum for priority projects, including refinery rehabilitation programmes.*

***It has been reported that Russia is** considering the construction of an oil pipeline running through the Dagestan region in order to avoid transitting the adjacent Republic of Chechnya with which it has been unable to agree an oil transport deal. The new pipeline section would form part of the main pipeline linking Baku and the Black Sea oil export port of Novorossiysk.*

***Kuwait is to sign a deal with Tunisia for** the construction of an oil pipeline linking the Sidi Kilani oilfield – which lies some 190 km south of Tunis – with La Skhira port in the North African state. State-owned Kuwait Foreign Petroleum Exploration holds a 45% stake in the field, the remaining 55% interest held by Enterprise Tunisienne d'Activites Petrolieres.*

***UK logistics company Hays has secured a** five-year, £100mn, supply contract from BP which is reorganizing the way it supplies some 1,000 of its forecourt shops across the UK. The new deal cuts out a number of direct suppliers and is expected to save BP around £15mn per year.*

In Brief

***It has been reported that Dea** Mineraloel plans to close up to 150 of its 1,700-strong network of service stations in Germany by the year 2000. While the company plans to renovate or build new sites in western Germany it has decided to significantly reduce its expansion plans for the east of the country.*

***The UK Department of Trade and** Industry has given consent to the Saltend Cogeneration Company for the construction of a new £300mn combined cycle gas turbine power station at BP Chemicals' Salt End works near Hull. The facility will have a capacity of 1,200 MW.*

***TransCanada Pipelines has announced** plans to construct a US$950mn pipeline running through Saskatchewan and Manitoba. The TransVoyager Transmission Line will carry some 2bn cf/d of gas from western Canada to the proposed 1,280-km Viking Voyager pipeline that will carry some 1.2bn cf/d to markets in Minnesota, Wisconsin and the north Illinois/Chicago area. Linking the two pipelines will be the proposed Vector pipeline which will transport some 1bn cf/d of gas from Chicago to southern Ontario. The new pipelines will replace the originally planned Nexus pipeline expansion proposal which was deemed too expensive at a cost of C$2.6bn. The new west to east gas transport link is due to open by the end of 1999.*

***It has been reported that Romania is to** shut its Petrotel, Darmanesti and Vega oil refineries as part of a restructuring of the country's inefficient refining sector.*

***Texaco and Atlantic Aviation have** opened an aviation fuelling facility at Arturo Michelena Airport in Venezuela.*

China hosts 15th World Petroleum Congress

On 12 October, the world's oil industry will descend on Beijing, China, for what is the last World Petroleum Congress (WPC) of the 20th century. The main theme this year is *Technology and Globalisation: Leading the Petroleum Industry into the 21st Century.*

The opening address given by the President of the People's Republic of China, Jiang Zemin will take place in the Great Hall of the People, Tiananmen Square and will be attended by approximately 5,000 top industry personnel. The Forbidden City will also provide a star attraction during the week, providing the backdrop for China Night organized for 15 October. This will take place in an area of the City not normally opened to the public. The Congress, which concludes on 16 October, is followed by a week of business and cultural fare. This includes a range of visits and tours of refineries and production facilities all over China, taking in the tourist routes as well as industry sites.

This year has seen a greater upsurge than usual in WPC membership although increases are expected around the time of a Congress. New member countries include Korea, Angola, Papua New Guinea and Kazakhstan. Expected in time for the Congress will be South Africa, Philippines, Ukraine, Tanzania, Vietnam, Peoples Republic of Yugoslavia and Libya.

Delegates attending consist of top management personnel, engineers and research staff. Others include industry consultants, journalists and government representatives.

What they can expect is the cream of the industry presenting subjects that have been through a careful scrutinizing procedure before acceptance by the WPC. Each Congress represents the culmination of a three-year process to establish the main topics for consideration. A Chairman of the Scientific Programme Committee is elected. This year it is President of Exxon Research and Engineering worldwide, Clarence M Eidt Jnr. His predecessor Dirk van der Meer, former Head of KSLA Shell Laboratories, Amsterdam, has taken up the reins of President of the WPC. The task of the Chairman is to develop a scientific programme with the aid of a highly qualified committee. They in turn appropriate the 'best' person in the field to head up particular lines of enquiry into various parts of the industry. Their next task is to define key topics facing the industry which are then allocated to 21 Forums and 10 Review and Forecast Panels. Four or five speakers are then selected to address the topics and to commission papers. The individuals consist of highly respected personnel drawn from major companies around the world, producing a collective effort between the company and their staff. In contrast to the Forums which provide a general overview, the Review and Forecast Panel consists of 10 key and well-known experts presenting in-depth reviews of progress in specific areas of the industry over the last three years. They have a special mandate to assess where the industry is now and which way it is likely to turn.

The Poster Room is also an established feature of the World Petroleum Congress, with approximately 200 on show this year. Each poster contains technological information, the appearance of which has been subjected to the same rigorous selection process as the Forums. Presenters appear for two to three hours at a time giving one-to-one seminars to delegates.

The Plenary speakers will be covering a range of subjects including *Oil and Natural Gas in China* given by Dr Wang Tao, former President of China National Petroleum Corporation, Vice-President of WPC-15 and Chair of the China Organising Committee; *The Restructured Petroleum Industry of Russia*, by A E Putilov, former President of Rosneft; and *Global Energy Prospects* by R Priddle, Executive Director of the International Energy Agency. The Japanese automobile industry is represented with a speech entitled *Coming Advances in Transportation Technology* by Tsutomu Kagawa, Managing Director of Japan Automobile Manufacturers Association. Dr Rilwanu Lukman, successor to Dr Subroto as Secretary General of Opec, and former Energy Minister of Nigeria, will be speaking on *The Oil Exporting Countries*. The Chairs of Exxon, Chevron and Elf will be speaking on *The Pacific Rim; Long-term Prospects for Petroleum;* and *Technology – A Global Strategic Asset*, respectively.

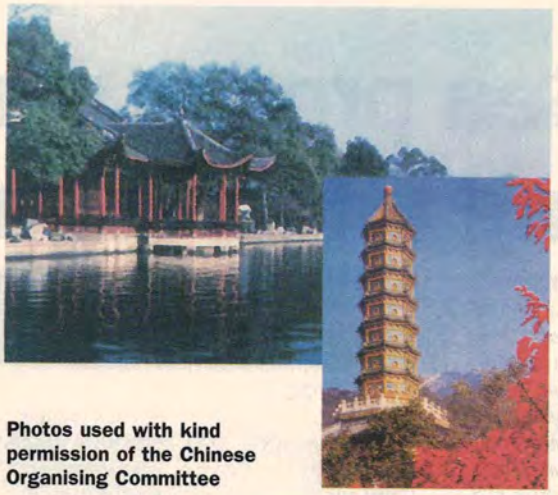
Other presentations include a Ministerial Panel chaired by Dirk van de Meer, the final line-up and format as yet to be confirmed. The Panel consists of a group of petroleum ministers who will discuss the issues in the petroleum industry and present accounts of the industry in their own countries. The International Petroleum and Petrochemical Exhibition will take place in the Exhibition Halls, China International Exhibition Centre running concurrently with the Congress and each National Committee will have its own stand in the China World Trade Centre.

The principal aim of the Congress is to provide an academic forum for discussion and exchange of ideas amongst the world's top petroleum engineers. The 15th Congress looks at what is coming in the longer-term, the impact of new technology on manufacturing and the market and what is new in every part of the industry. Paul Tempest, Director General of the WPC, explains that one of the objectives of the Congress is 'to profile information

as summarized by the Chairs into an overview of everything happening in the oil and gas industry', noting that what is produced is an 'extremely valuable piece of work, and judgement of what is important'. One of the original aims of the first Congress in 1933 was to reach agreement on product standards and industry definitions of a barrel of oil in the ground, proven, probable, possible. A new set of these definitions will be announced in Beijing. Summaries of all the papers and discussions are bound into Proceedings volumes which are available within three months.

The 16th Congress will be held in Calgary, Canada, in the year 2000. Bids have already been received from Brazil, Egypt, France, Turkey, Indonesia and Iran for the 2003 Congress. For more information on WPC-15, visit the web site at www.world-petroleum.org or call the WPC Secretariat on +44 (0)171 467 7137 which gives further details. The web site can be accessed through the Institute of Petroleum web site at www.petroleum.co.uk/petroleum/ providing a comprehensive overview of the petroleum industry.

Emma Parsons



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North Sea production potential still being underestimated

The production potential of the North Sea has consistently been underestimated and it seems that, even now, the process is continuing. A combination of reasonably firm oil and gas prices, rapidly improving technology and a benign political and taxation environment gives companies a strong incentive to maximize their investment in, and their production from, the area.

The North Sea offers an unusually large range of trapping mechanisms and a significant number of productive geological horizons. This resource wealth combined with skilled local workforces, sophisticated engineering capabilities and an adjacent market for all the likely output make the North Sea one of the most attractive development areas on earth. Add in political stability, established law and regulation and you have an almost perfect offshore province – apart from the weather.

The International Energy Agency (IEA), in its report *Global Offshore Oil Prospects to 2000*, anticipates that the North Sea and Atlantic margin will account for 30% of the world's incremental offshore oil production in the period up to 2000. As the agency expects over 80% of incremental oil production to come from offshore, it is anticipating that the North Sea will provide a quarter of the world's incremental production over the rest of this century.

An additional 150,000 b/d

The table of new field developments represents the situation at the end of 1996 when the IEA published its report. Since that date some field programmes have been advanced and some have slipped. This is to be expected. What is perhaps more unexpected is that there have been a number of revisions to peak production rates and these are predominantly upward revisions. Notable examples (changes to peak production rates in '000 b/d) are: Andrew (+17); Armada (+8); Balder (+2); Banff (+37); Captain (+10); Curlew (+4); Foinaven (+5); Galley (+9); Gannet E (+4); Gannet F (+4); Harding (+28); Keith (+5 to 10); Kingfisher (+14); MacCulloch (+20 to 30); Nevis (+5); Pelican (+5); Schiehallion (+25, the Loyal satellite); Sedgwick/West Brae (+5); Teal/Guillemot (+20); offset by only Katrine (-6) and Magnus South (-5).

In addition there are field developments sanctioned in the last year:

Production profile to 2000 for North Sea fields started up after 1996 ('000 b/d)

Field	Production System	1996	1997	1998	1999	2000
UK SECTOR						
Andrew	Forties system	22	51	53	50	45
Angus (restart)	Offshore loaded		5	5	3	1
Arkwright	Forties system	1	9	7	7	6
Armada	Forties system		1	18	16	14
Banff	Offshore loaded	10	5	6	23	25
Brae West	Forties system		3	14	9	5
Britannia	Forties system			52	75	70
Buckland	Beryl area		12	15	13	11
Captain	Offshore loaded	3	56	53	50	48
Clair	West of Shetland	3			9	45
Columba B	Ninian system	3	8	7	4	2
Curlew	Offshore loaded		9	41	40	38
Cyrus	Forties system	4	10	7	6	7
Dauntless	Offshore loaded		14	18	17	12
Douglas	Liverpool Bay	16	31	37	34	30
Durward	Offshore loaded		22	41	33	24
Egret	ETAP fields				11	10
Elgin	HP/HT gas cond					45
Enoch	Forties system				5	12
Erskine	Forties system		2	30	27	24
Fergus	Offshore loaded	5	12	8	5	3
Foinaven	West of Shetland		57	76	80	75
Franklin	HP/HT gas cond					4
Galley	Flotta system			26	29	27
Gannet E	Fulmar area		2	4	4	5
Gannet F	Fulmar area		5	13	8	6
Grant	Ninian system				2	3
Gremlin	Beryl area		5	17	16	15
Guillemot A	Teal area	4	23	20	18	15
Guillemot West	Teal area			3	14	15
Harding	Offshore loaded	31	52	52	46	39
Heron	ETAP fields				33	35
Jacqui	J-Block			4	8	7
Janice	Fulmar area		15	17	15	13
Joanne	J-Block		23	28	26	22
Josephine	J-Block		1	18	15	13
Judy	J-Block		21	23	21	18
Julia	J-Block			3	2	1
Katrine	Beryl area		12	14	13	11
Keith	Forties system		10	13	10	8
Kingfisher	Forties system			16	23	22
Kyle	Offshore loaded			16	33	31
Lennox	Liverpool Bay	3	29	25	23	19
MacCulloch	Flotta system	1	29	30	27	25
Machar	ETAP fields			10	28	28
Magnus NW	Ninian system			1	9	10
Magnus South	Ninian system	5	15	13	10	9
Mallard	Teal area					15
Mariner	Offshore loaded		2		50	65
Marnock-Skua	ETAP fields			13	23	23
Medan	Offshore loaded				9	17
Monan	ETAP fields			5	23	25
Mungo	ETAP fields			6	31	33
Nevis	Beryl area	3	12	20	18	16
Pelican	Brent system	31	31	27	24	21

Perth	Flotta system				11	15
Pierce	Offshore loaded	3			10	18
Piper South	Flotta system			6	11	10
Puffin	HP/HT gas cond					11
Ross/Ettrick	Offshore loaded		2	10	38	36
Schiehallion	West of Shetland			39	105	110
Sedgwick	Forties system		1	11	9	6
Shearwater	HP/HT gas cond				32	42
Solan	West of Shetland					17
South Teal	Teal area	1	5	6	7	6
Tay	Beryl area		4	3	2	1
Teal	Teal area	3	15	11	9	8
Telford	Forties system		20	22	18	15
Thelma	Forties system	4	26	27	27	25
Wendy	Ninian system			2	14	24
Total UK sector		**134**	**616**	**1,009**	**1,371**	**1,467**
NORWEGIAN SECTOR						
Åsgard	Haltenbanken area			19	80	90
Balder	Central area		49	81	80	78
Dagny (Enoch, UK)	Central area			0.3	5	5
East Troll	Oseberg-Troll area	7	30	33	28	25
Fram	Oseberg-Troll area				4	25
Gullfaks South	Gullfaks area			37	40	50
Gullveig	Gullfaks area			1	8	8
Gungne (My)	Central area	0.3	4	3	2	1
H-Central	Statfjord area		5	5		15
Hermod	Central area				19	75
Huldra	Oseberg-Troll area					15
Jotun (Eli/Tau)	Central area			13	78	80
Loke	Central area	0.3	1	2	2	1
Midgard	Haltenbanken area			8	32	33
Mjolner	Southern area				4	9
Njord	Haltenbanken area		9	69	66	65
Norne	Haltenbanken area		62	153	155	145
Oseberg East	Oseberg-Troll area			10	65	70
Oseberg South	Oseberg-Troll area				14	50
Rimfaks	Gullfaks area			34	49	50
Skirne/Bygge	Central area					1
Sleipner West	Central area	8	64	44	35	29
Smorbukk South	Haltenbanken area			13	63	63
Southeast Tor	Southern area		1	8	7	6
Tordis East	Gullfaks area		8	18	17	15
Trym	Southern area					5
Tyrihans North	Haltenbanken area					5
Tyrihans South	Haltenbanken area					10
Varg (Fenris)	Central area			25	33	33
Vigdis	Statfjord		60	83	80	75
Visund	Gullfaks area			44	76	85
West Troll cond	Oseberg-Troll area				19	150
Yme	Southern area	22	40	29	22	14
Yme Beta East	Southern area	3	7	7	6	4
Total Norway		**40.6**	**340**	**739.3**	**1,089**	**1,385**
DANISH SECTOR						
Adda	Tyra area				2	2
Elly	Tyra area				3	3
Gert	Tyra area				2	4
Harald	Tyra area		9	28	24	21
Igor	Dan area				0.5	2
Lulita	Tyra area		3	12	12	12
Roar	Tyra area	5	8	7	6	5
Sirri	Tyra area			3	15	25
South Arne	Tyra area			3	10	17
Svend	Tyra area	13	23	30	25	17
Total Denmark		**18**	**43**	**83**	**99.5**	**108**
DUTCH SECTOR						
F2-65				10	20	25
Total Netherlands				**10**	**20**	**25**
NORTH SEA TOTAL		**192.6**	**999**	**1,841.3**	**2,579.5**	**2,985**

Source: IEA Global Offshore Oil Prospects to 2000

Brimmond (2), Bladon (9) and Iona (4.4).

The message from the North Sea is very positive: overall decline is even further away and fields are once again proving more productive than expected.

However, it is somewhat surprising that official Norwegian Government publications are still predicting that Norwegian oil output is likely to decline after 2001. As Norwegian reserves are rather larger than those of the UK, and as it is a province that is much less intensively explored than the UK sector (a total of 859 wildcat and appraisal wells compared with the UK's 2,750) this seems a highly pessimistic interpretation and one that, hopefully, will be proved wrong.

The latest North Sea fields are smaller and technically more demanding, and many will have only limited field lives when compared with the early giants. Despite this and the unrelenting decline in output from the early North Sea fields, total output is still climbing.

Having brought onstream around 25 fields in 1996 the industry will add another 25 this year, up to 32 more in 1998, 19 in 1999 and 10 in 2000. In terms of the number of new offshore field developments, the North Sea accounts for more than the rest of the world put together.

In terms of technology the North Sea has been a highly productive forcing ground. Notable achievements are the application and development of 3D seismic, horizontal drilling, high-angle deviated drilling and multilateral completions.

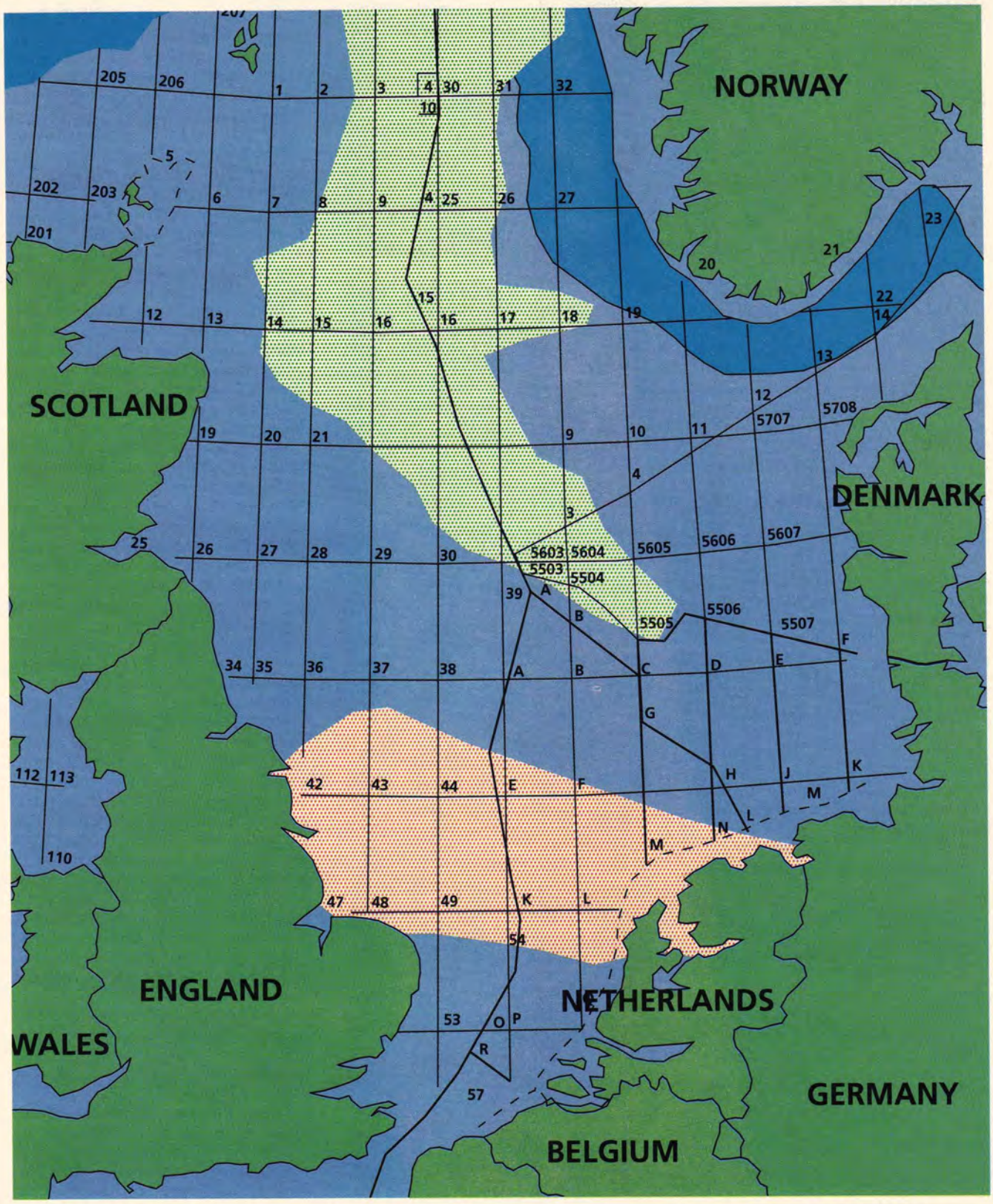
Petroconsultants' *World Petroleum Trends (WPT) 1997* records that in 1996 some 118,400 sq km of 3D seismic was shot worldwide with the two main North Sea producers – the UK and Norway – accounting for 44,000 sq km or 37% of the global total. Similarly, the North Sea accounts for the largest amount of horizontal drilling outside the US, most of the world's high-angle deviated wells and a high proportion of the complex completions. The skills and technology learned and perfected in the North Sea are actually expanding the amount of oil that can be economically recovered.

A less tangible but equally important feature is the way that production complexes have evolved, allowing even quite small accumulations to be economically developed.

One of the reasons there have been fewer North Sea field abandonments than once seemed likely is that companies have been prepared to offer processing and transport capacity to other companies in order to delay abandonment (and its associated costs) by maximizing the utilization of field facilities.

The following pages contain details of the main oil and gas fields coming onstream in 1997.

North Sea licence blocks



Red shading shows the main gas producing areas. Green shading shows the main oil producing areas. Sub blocks within the main latitude/longitude blocks are as follows: UK 30 (5 across, 6 down); Norway 12 (3 across, 4 down); Denmark 32 (4 across, 8 down); Netherlands 18 (3 across, 6 down). All number left to right across main blocks and from top to bottom.

UK SECTOR

ARMADA blocks **16/29a,c 22/4a, 22/5a,b**

Operator: **BG** **(45.27%)**

Discovered: **1980** S/U: **October 1997**

Reserves: Condensate: **50mn b**
NGLs: **20mn b**
Gas **1.2tn cf**

Peak prod: Condensate: **26,000 b/d**
Gas: **450mn cf/d**

Production system: **Platform**

Licensees: **Amoco (18.20%), Fina (12.53%), Phillips (11.45%), Yorkshire Energy (6.97%), Agip (5.58%)**

Development: Extended reach drilling allows Armada's three reservoirs to be accessed from one platform. The platform has 21 slots – eight wells are planned in the first phase with a further seven expected in about five years time, leaving six slots for future satellites. Gas and condensate will be separated on the platform with gas piped to the Everest riser platform and on to Teesside via the CATS (Central Area Transmission System) pipeline network. Condensate will be piped to the riser platform and on to the Forties pipeline system to Cruden Bay and then to Grangemouth, Scotland, for processing. BG aims to be the lowest cost producer in the North Sea with an opex target of under $3/boe. Five of the co-venturers are to sell gas to BG at an average rate of 225mn cf/d and to National Power at 100mn cf/d over a five-year period. The sixth partner, Yorkshire Energy, will have a gas entitlement of up to 30mn cf/d which will be marketed directly to gas consumers.

Investment: **Phase 1 – £420mn**
All phases – £530mn

BLADON block **16/21d**

Operator: **Arco** **(100%)**

Discovered: **1996** S/U: **August 1997**

Reserves: Oil: **4.5mn b**

Peak prod: **9,000 b/d**

Peak prod/y: **1998**

Production system: **Subsea wellhead tied back to floater**

Development: Bladon's subsea well-head is tied back to the *Petrojarl 1* floating production vessel located some 5 km to the south and which is currently developing the Blenheim oilfield.

BUCKLAND block **9/18a**

Operator: **Conoco** **(39.83%)**

Discovered: **1978** S/U: **2H1997**

Reserves: Oil: **40mn b**
Gas: **Tested at 4.4mn cf/d**

Licensees: **Repsol (33.3%), Mobil (26.83%)**

Development: Conoco is looking to sell its interest in the field. Any development plan will be decided upon by the new operator, although a subsea option seems most likely.

Investment: **£65mn**

Armada's 6,000-tonne jacket leaving Ardesier yard in Scotland. It was installed in March 1997.

CAPTAIN block **13/22a**

Operator: **Texaco** **(85%)**

Discovered: **1977** S/U: **March 1997**

Reserves: Oil: **>300mn b**
Gas: **>53bn cf**

Peak prod: Oil: **63,000 b/d**
Gas: **6.6mn cf/d** (for power generation only)

Peak prod/y: Oil: **1997**

Production system: **Dedicated floater, wellhead protection platform and subsea satellite production manifold**

Licensees: **Korea Petroleum Development Corporation (15%)**

Development: Captain is to be developed in two parts, A and B. Area A is already producing 19–21° API crude from seven wells to the *Captain* FPSO which has a storage capacity of 550,000 barrels (equivalent to some nine days' storage at current levels of production). The vessel will be upgraded to handle outputs of up to 100,000 b/d once area B comes onstream at the turn of the century. Area A, which is at a water depth of 104 metres, is being developed using extensive horizontal drilling with sections up to 1,828 metres. In a North Sea first, water injection technology is being used with polymer flooding in a bid to improve the efficiency of water injection and increase recovery of the heavy crude oil. Some 230,000 b/d of water is being injected. First oil was produced from seven wells in Area A where a total of 22 wells are planned – 16 producers, five water injectors and one water source well. Area B will be developed by either a subsea manifold or wellhead protection platform tied back to the FPSO. A decision is expected by the end of 1997/early 1998. In time, there could also be Area C and D developments. These would also be tied in as satellites to the FPSO. Field life is estimated at 25 years.

Investment: **£500mn** (part A development)

CURLEW block **29/7**

Operator: **Shell** **(50%)**

Discovered: **1990** S/U: **October 1997**

Reserves: Oil: **70mn b**
Gas: **240bn cf**

Peak prod: Oil: **45,000 b/d**
Gas: **100mn cf/d**

Peak prod/y: **1998**

Production system: **Dedicated leased floater and subsea manifold**

Licensees: **Esso (50%)**

Development: Curlew comprises two reservoirs and is being developed by a 560,000 barrel capacity FPSO leased from Maersk Company Ltd UK. Oil will be exported by shuttle tanker while gas will be exported via Shell/Esso's Fulmar gas pipeline to St Fergus in Scotland. Field life is estimated at seven years.

Investment: **£300mn**

DURWARD block **21/11**

DAUNTLESS block **21/16**

Operator: **Amerada Hess (28%)**

Discovered: **1993** S/U: **August 1997**

Reserves: Oil: **80mn b (Durward)**
10mn b (Dauntless)

Peak prod: Oil: **38–41,000 b/d (Durward)**
18,000 b/d (Dauntless)

Peak prod/y: **1998**

Production system: **Dedicated leased floater and subsea manifold**

Licensees: **Santa Fe (23.5%), DSM Energy (20%), British-Borneo (18.5%), Seafield Resources (10%)**

Development: The two fields are to be developed in parallel by the *Glass Dowr* FPSO which is owned and operated by Bluewater (UK). The fields achieved start-up just 16 months after the UK Department of Trade and Industry (DTI) approved the field development plan for Durward and 12 months after approval for Dauntless.

ERSKINE block **23/26a,b**
Operator: **Texaco** **(50%)**
Discovered: **1981** S/U: **mid-Sept 1997**
Reserves: Condensate: **>75mn b**
Gas: **>830bn cf**
Peak prod: Condensate: **29,600 b/d**
Gas: **120mn cf/d**
Peak prod/y: **Late 1998**
Production system: **NNM platform**
Licensees: **BP (50%)**
Development: This high-pressure/high-temperature field is being developed by a not normally manned platform controlled from the nearby Lomond facilities. Initial production will be from three wells with a further three wells expected onstream in October 1998. Gas will be exported via the CATS pipeline and condensate transported to Cruden Bay via BP's Forties pipeline. *(See also article page 430.)*
Investment: **£290mn**

FOINAVEN block **204/24a,19**
Operator: **BP** (block **204/24a: 80%**
block **204/19: 50%**)
Discovered: **1992** S/U: **2H1997**
Reserves: Oil: **250–500mn b**
Peak prod: **85,000 b/d**
Peak prod/y: **1998**
Production system: **Dedicated floater and two subsea manifold systems**
Licensees: **block 204/24a – Shell (20%); block 204/19 – Shell (50%)**
Development: Foinaven will be the first field to be developed in the deep waters (400 to 600 metres) of the Atlantic Frontier, to the west of the Shetlands. The partners opted for a fast-track, parallel engineering programme in which the time taken for the three key phases of field development – appraisal, pre-project work (including engineering design) and construction – were shortened and then carried out in parallel in a bid to reduce costs. Traditionally, the three phases run sequentially. The development plan consists of two drilling centres each based upon a subsea manifold and well cluster arrangement producing into the dedicated FPSO *Petrojarl Foinaven* with a storage capacity of some 300,000 barrels. Oil will be exported by shuttle tanker every three days during peak production. Horizontal well drilling has reduced the number of wells required from 28 to 14. The FPSO is capable of processing over 100,000 b/d and injecting 165,000 b/d of water into the reservoir. Gas lift and re-injection will be available from first oil. Some 200mn barrels of oil are expected to be recovered in Phase 1 of the development plan. Field life is estimated at 12 to 15 years.

A number of technical problems with the seabed manifold and leaks in five of the field's 11 subsea Christmas trees have delayed the project by more than a year.
Investment: **£550mn**

GANNET E and F block **21/30**
Operator: **Shell** **(50%)**
S/U: **2H1997**
Reserves: Oil: **23mn b (Gannet E)**
19mn b (Gannet F)
Peak prod: **8,000 b/d (Gannet E)**
12,000 b/d (Gannet F)
Production system: **Subsea tie-back to Gannet platform**
Licensees: **Esso (50%)**
Development: Each of the two satellite fields will be developed by a single production well tied back by a common subsea pipeline system to the Gannet Alpha platform located in 95 metres water depth some 14 km away. An electrical submersible pump is to be remotely deployed in Gannet E which contains a relatively thick and heavy crude oil. Such a pumping system represents a 'technological milestone' in the North Sea according to Shell; while it has used such pumps before, it is the first time that such a system has been installed and controlled so far away from the mother platform. If successful, the company believes the technology could have 'major implications for the development of many small fields which, because of the characteristics of the oil or the particular geology, are difficult to produce and are substantial distances from existing infrastructure'.
Gannet F contains a much lighter crude more typical of central North Sea reservoirs and does not require a downhole pumping system. Oil from Gannet E and F, will be exported, together with oil from the main Gannet field, via the Fulmar platform by a new pipeline linking Fulmar to the Phillips-operated Norpipe export pipeline which lands at Teesside in northeast England. Field life is estimated at nine and 16 years for Gannet E and F, respectively.
Investment: **£90mn** (Gannet E and F)

IONA block **15/17**
Operator: **Elf** **(24.33%)**
Discovered: **1982** S/U: **January 1997**
Reserves: Oil: **5.6mn b**
Gas: **4.6bn cf**
Peak prod: Oil: **4,400 b/d**
Gas: **4mn cf/d**
Peak prod/y: **1997**
Production system: **Deviated well from Saltire platform**
Licensees: **Enterprise (12.67%), Texaco (23.5%), Lasmo (20%), Union Texas (20%)**
Development: An appraisal well has been drilled and following an EWT the results are disappointing and are being evaluated. Iona production will be exported from Saltire to the Piper Bravo platform from where oil will be transported to Flotta in the Orkneys and gas to St Fergus via the Frigg line.
Investment: **£7.2mn**

KATRINE block **9/13a**
Operator: **Mobil** **(50%)**
Discovered: **1977** S/U: **July 1997**
Reserves: **To be determined following extended well testing**
Peak prod: Oil: **8,000 b/d**
Gas: **4mn cf/d**
Production system: **Extended reach well from Nevis subsea template**
Licensees: **Enterprise (22.778%), Amerada Hess (22.222%), OMV (5%)**
Development: The Katrine field lies in 105 metres of water and will produce through an extended reach well from the Nevis subsea template, tied back to the Beryl Alpha platform. Oil will be processed on the platform before being tanker loaded offshore using the single point mooring system linked to Beryl A. Gas will be exported to the Mobil-operated Scottish Area Gas Evacuation (SAGE) plant at St Fergus. The UK DTI has given consent to a six-month extended well test to enable Mobil to evaluate options for further development of the field which has an estimated economic life of eight years.
Investment: **£40mn**

KINGFISHER block **16/8a,c**
Operator: **Shell** **(48.9%)**
Discovered: **1984** S/U: **October 1997**
Reserves: Oil/condensate: **56mn b**
Gas: **368bn cf**
Peak prod: Oil/condensate: **37,000 b/d**
Gas: **160mn cf/d**
Production system: **Subsea tie-back to Brae B platform**
Licensees: **Esso (48.50%), Marathon (0.9%), Nippon (0.4%), Premier (0.4%), Saga (0.45%), Transworld (0.49%)**
Development: Kingfisher comprises three separate reservoirs and will be developed using six subsea production wells tied back to the Marathon-operated Brae B platform. The project involves the seabed deployment of a high integrity pressure production system (HIPPS) that will protect the production pipelines from the high pressures that will be present in some of Kingfisher's wells during the first two or three years of production. According to Shell, installation of such a system 'allows the wall thickness of the production pipelines to be reduced without compromising the safety of the system'. While such systems have been used on platforms before, they have never been used in a subsea application before, says the company. Oil and condensate will be exported through the Brae-Forties pipeline to Cruden Bay and Kinneil in Scotland. The gas is being acquired by the Brae group and will be re-injected into the Brae reservoirs for pressure maintenance, until such time as a gas sales contract is agreed. The field has an estimated life of nine years.
Investment: **£220mn**

MACCULLOCH block **15/24b**
Operator: **Conoco** **(60%)**
Discovered: **1990** S/U: **August 1997**
Reserves: Oil: **58mn b**
Gas: **15bn cf**
Peak prod: Oil: **50–60,000 b/d**
Production system: **Subsea production wells individually tied back to dedicated leased floater**
Licensees: **Lasmo (40%)**
Development: This small marginal field has been brought onstream by three production wells tied back to the *North Sea Producer* FPSO which is owned and operated by North Sea Production Company, a joint venture between Maersk and Odebrecht-SLP. The initial production services contract runs for two years on a per barrel tariff arrangement based on production. Crude oil is piped to the Flotta terminal in the Orkney Islands via the Elf-operated Piper B platform some 30 km to the northwest. Associated gas is also exported to Piper B for transmission by the Frigg pipeline to St Fergus. The FPSO has a 560,000-barrel oil storage capacity and offshore loading for use in the event of the pipeline systems being unavailable. A further two production wells and three water injection wells may be drilled later in 1997. Field life is estimated at five years.

MALLARD block **21/19**
Operator: **Shell** **(38.12%)**
Discovered: **1990** S/U: **October 1997**
Reserves: Oil: **25mn b**
Gas: **17bn cf**
Peak prod: Oil: **16,000 b/d**
Gas: **11mn cf/d**
Production system: **Subsea tie-back to Kittiwake platform**
Licensees: **Esso (38.12%), Total (23.76%)**
Development: Mallard is one of the first of a new generation of high-pressure/high-temperature fields to be developed by Shell in the North Sea. It will be developed by two subsea wells tied back to the Shell/Esso-owned Kittiwake platform located some 15 km to the northwest. The pipeline system for the field includes cooling equipment at the subsea wellhead to reduce the pipeline operating temperature to conventional limits. Oil and gas will be processed in a new module on Kittiwake. Oil will be exported from the platform via the exposed location single buoy mooring system and the Esso *Fife* and *Norissia* tankers while gas will be exported via a pipeline connection to St Fergus.
Investment: **£100mn**

MORDRED block **48/12a,c**
Operator: **Mobil** **(91.67%)**
Discovered: **1989** S/U: **2H1997**
Reserves: Gas: **30bn cf**
Peak prod: **15mn cf/d**
Peak prod/y: **1998**
Production system: **Extended reach well from Galahad platform**
Licensees: **Chieftain (5.33%), Premier (3%)**
Development: Mordred gas is to be produced via an extended reach well tied back to the Mobil-operated Galahad platform. From there it will pass through the 16-km Galahad pipeline to the tie-in point on the Lancelot pipeline and on to the Phillips-operated terminal at Bacton in Norfolk. Field life is estimated at nine years. The gas is to be sold to Mobil Gas Marketing (MGM).
Investment: **£17mn**

SEDGWICK/WEST BRAE block **16/6a,7a**
Operator: **Sedgwick – Enterprise (40%)**
West Brae – Marathon (38%)
Discovered: Sedgwick – **1975**
West Brae –**1985**
S/U: **4Q1997**
Reserves: Oil: **40mn b**
Peak prod: **30,000 b/d**
Peak prod/y: **1997**
Production system: **Tie-back from subsea manifold to Brae A platform**
Licensees: **Sedgwick – BP (20%), Talisman Energy (20%), Texaco (20%); West Brae – BP (20%), Talisman Energy (14%), Kerr-McGee (8%), BG (7.7%), LL&E (6.3%), Sands Oil & Gas (4%), British-Borneo (2%)**
Development: Sedgwick, located in 108 metres of water, and West Brae, will be jointly developed by a single production well on Sedgwick tied back 2.3 km to a subsea manifold housing four West Brae development wells. Comingled flow will be piped to the Brae A platform for processing and onward transport through the Brae and Forties pipeline systems. Under the terms of the joint development agreement, production from the two fields will be allocated 67.5% to the Brae Group and 32.5% to the Sedgwick Group. The bulk of the drilling programme is being carried out by the semi-submersible drilling rig *Transocean Explorer*, although initial work began in April 1997 using the *Kan Tan IV*.
In addition to the Sedgwick well, three West Brae producers and a water injector are planned.
Investment: **£100mn**

MacCulloch FPSO – *North Sea Producer*

NORWEGIAN SECTOR

BALDER block **25/11, 25/10**
Operator: **Esso Norge** **(100%)**
Discovered: **1967** S/U: **1997/98**
Reserves: Oil: **170mn b**
Gas: **800mn cf**
Peak prod: Oil: **83,000 b/d**
Peak prod/y: Oil: **1999–2000**
Production system: **Subsea tie-back to dedicated floater**
Development: Balder lies in 125 metres of water. It will be developed by 15 subsea wells – 10 producers, three water injectors, one gas injector and one water source well – grouped at four field locations. The total number of wells may be extended to 26. The FPSO will be

connected to six of 11 separate structures on the field. The vessel has a storage capacity of 380,000 barrels that will be offloaded via shuttle tankers. Balder has an estimated field life of 15 years, although this may be extended if more oil is identified in the remaining five structures. Associated gas will be re-injected initially.
Investment: **NKr5bn**

NJORD block **6407/7,10**
Operator: **Norsk Hydro (22.5%)**
Discovered: **1986** S/U: **October 1997**
Reserves: Oil: **37.5mn cm**
Gas: **14bn cm**
Peak prod: Oil: **70,000 b/d**
Gas: **To be re-injected**
Production system: **Subsea tie-back to semi-submersible platform**
Licensees: **Statoil (50%), Mobil Development Norway (20%), Petro-Canada (7.5%)**
Development: Njord lies in 330 metres water depth. It is being developed with 15 subsea wells tied back to a floating, steel-hulled production, drilling and quarters platform. Oil will be shipped from an anchored storage vessel while gas will be initially re-injected into the reservoir.
Investment: **NKr6bn**

NORNE block **6608/10**
Operator: **Statoil (70%)**
Discovered: **1991** S/U: **July 1997**
Reserves: Oil: **455mn b**
Gas: **15.6bn cm**
Peak prod: **155,000 b/d**
Peak prod/y: **1998**
Production system: **Subsea tie-back to dedicated floater**
Licensees: **Norsk Hydro (9%), Saga Petroleum (9%), Enterprise Norge (6%), Norsk Agip (6%)**
Development: Norne lies at 380 metres water depth some 80 km north of the Heidrun field. The field has an estimated life of 15 years and is being developed by 14 subsea wells – seven producers, five water injectors and two gas injectors – tied back to a dedicated floater with a storage capacity of 115,150 cm. It is expected to produce some 10mn cm of oil in 1998.
Investment: **Nkr8bn**

VIGDIS block **34/7**
Operator: **Saga Petroleum (7.7%)**
Discovered: **1986** S/U: **January 1997**
Reserves: Oil: **33.9mn cm**
Gas: **2.4bn cm**
Peak prod/y: **1998**
Production system: **Subsea tie-back to Snorre platform**
Licensees: **Statoil (55.4%), Esso Norge (10.5%), Idemitsu Petroleum Norge**

Balder floating production unit

(9.6%), Norsk Hydro (8.4%), Elf Petroleum Norge (5.6%), Deminex Norge (2.8%)
Development: The field is being developed with subsea installations tied back to the Snorre platform which is also operated by Saga Petroleum. Once processed, the oil is transferred via a dedicated pipeline to the Statoil-operated Gullfaks A platform for storage and loading into tankers. The field came onstream in January 1997, some five months ahead of schedule. Production was temporarily interrupted in July/August due to problems in the gas compressor system.
Investment: **NKr5.3bn**

DUTCH SECTOR

P2-NE/P2-SE/P6-South block **P2a, P6**
Operator: **Clyde Petroleum Exploratie (100%)**
Discovered: **PS-NE – 1982, P2-SE – 1985, P6-South – 1990**
S/U: **mid-1997**
Reserves: Gas: **112bn cf**
Production system: **NNM platforms**
Development: These three satellite fields will be developed simultaneously using a new generation of low-cost, unmanned, fully re-usable jack-up production platforms tied back to the P6-A processing facilities where the gas will be tested prior to export. The development plan comprises one vertical and one horizontal production well on the P2-NE field with gas exported by a 10.7-km pipeline to P2-SE. The new pipeline will also provide the opportunity for further satellite developments in an area currently devoid of infrastructure. Two new horizontal production wells are planned for P2-SE. Gas from both fields will be combined and exported to the P6-A processing facilities, from where it will be transported via the P6 export pipeline to L10-A and subsequently into the Noordgastransport pipeline to landfall at Uithuizen. Both P2a unmanned platforms will be controlled from the manned P6-A platform. The development plan for the P6-South gas field comprises re-entry and dual recompletion of two reservoirs in the P6-8 discovery well with produced gas exported by a 6.6-km pipeline to the unmanned P6-B satellite platform. Gas from P6-South will be comingled with main field production from P6-B and transported to the manned P6-A facilities for processing. The subsequent export route will be the same as for P6 and P2a production.
Investment: **Dfl40mn.**

DANISH SECTOR

HARALD
Operator: **Maersk (100%)**
Discovered: **1980** S/U: **1997**
Reserves: Oil: **44mn b**
Peak prod: **28,000 b/d**
Peak prod/y: **1998**
Production system: Further details were not available at the time of going to press.

LULITA
Operator: **Maersk (100%)**
Discovered: **1992** S/U: **1997**
Reserves: Oil: **25mn b**
Peak prod: **12,000 b/d**
Peak prod/y: **1998**
Production system: Further details were not available at the time of going to press.

Extended Well Testing as an appraisal technique for marginal field development

Extended Well Testing allows critical data for optimization of field development plans to be gathered and reduces uncertainties about reservoir performance prior to commitment to field development. The storage and sale of the produced crude helps to reduce the cost of acquisition of appraisal data. *T J Leeson*, Marketing Manager, Floating Production Systems, The Expro Group, reviews recent developments in the UKCS.

A significant number of EWTs have been undertaken in the North Sea, and a good track record established; however, the technique is only likely to grow in popularity when costs can be reduced through radical advances such as use of a rigless arrangement.

As discoveries in the North Sea become smaller, in terms of reserves, and field development targets became more marginal, accurate evaluation of the commercial risks of production becomes progressively more important.

One particular technique that has been successfully employed over recent years has been Extended Well Testing (EWT). First used in the North Sea by Occidental to appraise the Birch field in 1988, it has not been as widely utilized as might have been first thought, due in part to the larger expenditures traditionally required to reach target depth (TD) compared to a conventional drill stem test (DST) (see **Table 1**). In addition, the rising rig rates and difficulties in obtaining suitable vessels/rigs have reduced the opportunities for choosing this technique. However, it has been used by a number of operators to minimize appraisal costs and to progress with field developments; for example BP – Foinaven and Schiehallion, Texaco – Captain, Norsk Hydro – Hermod, and most recently in the UK sector, Ranger, with the Pierce field, to be operated by Enterprise.

EWT Objectives

The principal objectives of an Extended Well Test are to:

- confirm the extent of reservoir connectivity around the producing well;
- confirm long-term well productivity;
- identify production chemistry and fluid processing issues and optimize the solutions for future management; and
- reduce the overall cost of appraisal programmes.

Critically, the long EWT duration results in a very large 'radius of investigation' of the pressure transient set up in the reservoir. The increased radius of investigation has a number of effects on the results of pressure transient analyses:

- The calculated kH results in a horizontal permeability averaged over a large portion ('bulk') of the reservoir, compared to short duration tests.
- The effect of non-permeable boundaries deeper in the reservoir can be seen. However, other data sources such as 3-D seismic should be investigated for corroboration.
- The effect of constant pressure boundaries (gas-cap or aquifer) can be evaluated.

The significant production volume provides information on depletion and in-place volumes, and the drive mechanisms present in the reservoir.

In parallel, the flow period permits handling trials to examine the problems associated with wax and asphaltene deposition. Experimental programmes undertaken to examine management methods including chemical injection can be used to optimize the design of future facilities, with significant potential benefits for life-of-field costs. The extended flow period can also be designed to provide data on water and/or free gas breakthrough providing valuable data for field economics and process design.

Year	Operator	Field	Test (Days)
1988	Occidental	Birch	270
1993	BP	Mungo	50
	Texaco	Captain	90
1994	BP	Foinaven	45
	BP	Macher	270
	Bow Valley	Sedgwick	30
1995	BP	Schiehallion	60
	Conoco	Banff	60
1996	BP	Clair	60
	Ranger Oil	Pierce	104

Table 1: History of Extended Well Testing in UKCS

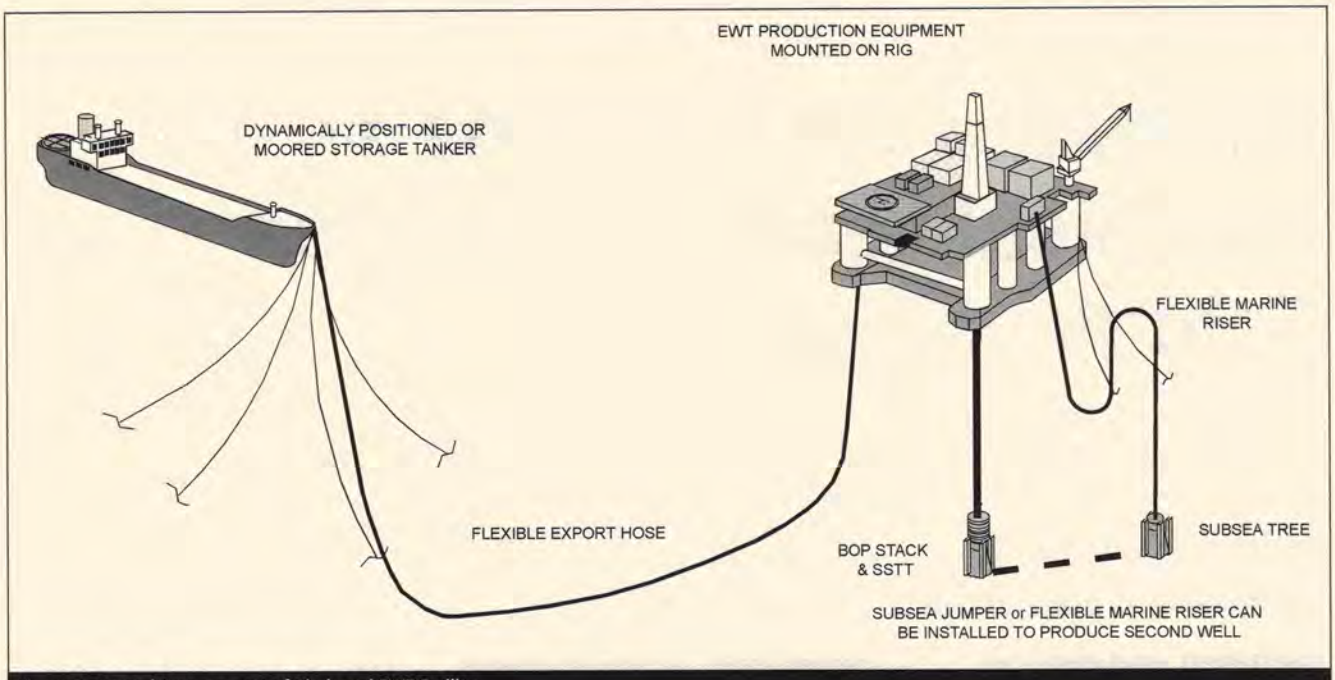


Figure 1: General Arrangement of Rig-based EWT Facility

An EWT in the North Sea utilizes the drilling rig as a temporary production installation, and transfers the produced crude to a tanker (see **Figure 1**). Tests can be undertaken with almost any type of rig, but the following assumes a semi-submersible.

Completions

Fluids from a single well can be produced via a temporary completion, Subsea Test Tree (SSTT) and a BOP stack and riser, to the drill floor, in a similar manner to a traditional DST. Alternatively the well can be completed with a tubing hanger and a production string through the use of a SSTT providing dual-bore access. The completion can then be retrieved or utilized as a suspension string depending on the results of the test programme. In addition, it offers the option of larger bore completions, increased flowrates and a higher revenue stream. This reduces the cost of re-entry and recompletion should the well be included in future development plans. It has become the preferred route for completing development wells, for a number of operators in the North Sea, including BP and Amerada Hess, and is applicable to EWTs.

Subsea tie-back

A well can also be completed with a subsea Xmas tree and tied back to the rig via a flexible riser. Although this increases the expenditure on hardware it offers the opportunity to test a second well simultaneously. Additionally a fast-track drilling programme can be accommodated by employing simultaneous drilling (through the marine riser), and production (SIMOPS). Both these options are planned for the next EWT that Expro is currently involved in.

The number of producing wells can be increased by tying multiple wells back in parallel, or by employing subsea chokes and 'daisy-chaining' wells with jumper flowlines between hubs mounted on production guidebases (PGBs). The single riser is then connected to the end of the chain. Hardware costs are minimized and flowrate data for each well can be acquired with downhole flowmeters. The facility now resembles an option which can be used later as an early production system (EPS) or Phase 1 Development facility.

Production facility

The produced fluids are separated, and the crude conditioned to tanker specifications, in a purpose built production facility mounted on the rig. The separation train is usually designed for higher flowrates (currently up to 30,000 b/d) than for a DST, and customized to the test objectives.

Sophisticated control, alarm and shutdown systems are required to manage the hazards and increased risks associated with the extended flow period. In addition, much of the flow routes are hard-piped to reduce the number of potential leakpaths.

Two-stage separation is utilized to reduce the vapour pressure of the produced crude to permit it to be transferred, via export pumps and a low pressure flowline, to the awaiting tanker. This reduces the hydrocarbon emissions, typically by more than 85%, and allows the cost of operations to be offset through sale of the crude. In 1996, Ranger Oil was able to cover its £17mn test budget with the sale of crude from the Pierce test.

Produced gas is routed to the rig burner booms, and any produced water is usually treated to reduce the oil content to an acceptable level (40 ppm or lower) rather than recombining it with the produced oil and routing to the storage vessel.

Storage tanker

The storage tanker is normally positioned in a downstream direction in the prevailing weather. A flexible flowline is deployed from the rig, usually initially to the seabed, although floating or submerged arrangements can be used in deepwater, and returned to the surface at the point of connection with the tanker. The additional costs of a dynamically positioned (DP) tanker are likely to more than offset any savings made by dispensing with the mooring system required for a conventional tanker.

Rigless alternative

Relocation of the process facilities to the deck of the storage tanker offers large potential savings in rig hire (see **Figure 2**). However, this is reduced by the need for additional hardware and the costs of modifying the tanker. Temporary, modular process facilities, located on the deck, will minimize the

modifications required to the vessel.

To minimize costs, if production from two or more wells is planned, the wells are daisy-chained to a single flowline/riser. The cost of subsea chokes and the jumper flowlines and hub connectors will be considerably less than multiple risers. Individual production data can be collected from each well by downhole flowmeters with the data transmitted to surface via electrical connections within the control umbilical(s). Rig intervention is still required to complete the wells, install Xmas trees, and to kick-off and suspend the wells.

Such a concept has not yet been deployed in the North Sea. However, by assembling a programme of consecutive tests, involving one or more operators, it should be possible to demonstrate the cost-reduction potential. It may soon be economic to use floating production vessels for long-duration well tests.

Project schedules

The simplest schedule for testing is to carry out the flow period immediately after completion of the drilling programme. This minimizes the total cost of the operation.

To design and procure a new-build process facility can take up to six months. This can be reduced to three months or less, by utilizing existing equipment, with minor modifications as necessary. A similar timescale is required to permit a suitable tanker to be chartered and the necessary modifications to accommodate a bow mooring and/or flowline connection. Conversion of the tanker to a temporary production vessel is likely to take significantly longer.

Finally, there are likely to be a number of submissions required to the regulatory authorities. It is possible to eliminate any impact on the schedule by commencing preparation early at minimal cost. Delaying commitment to the temporary production arrangement until after initial tests increases total expenditure as additional rigtime is required to suspend and then subsequently re-enter the well. This can be minimized by suspending the well with a production string in place and employing wireline retrievable plugs in tailpipe and tubing hanger. A delay of three to four months from completion of the drilling programme to re-entry and production testing appears a realistic target.

There are, however, a number of submissions required to the regulatory authorities, but any impact these would have on this schedule can be eliminated by commencing their preparation prior to completion of the drilling programme, of minimal commitment cost after 'realistic target'.

In the right circumstances Extended Well Testing can provide the bridge between conventional appraisal testing and commitment to full field development. Although not applicable to all reservoir types, it provides a cost-effective route to prospect evaluation and reduction in critical uncertainties in future field performance.

Marginal increases in field development costs, by including an EWT, are likely to be more than offset by the reduction in cost of development facilities, as the range of likely production profiles is reduced. Economic uncertainties in the development of marginal fields can be reduced significantly, permitting the commitment to development to be made without potentially costly delays or further appraisal wells. The financial commitments required prior to confirmation of the well logs and initial inflow performance can be minimized by delaying the extended production period until three to six months after the initial drilling programme.

Challenges

The challenge is to provide a method for economically developing small, and marginal, fields. In order to make Extended Well Testing more effective and more attractive there are a number of areas for improvement. Cost reduction is always an issue, and use of, or modification of, existing equipment can help in this respect. However, the greatest gains will come from more radical approaches such as use of the rigless solution, or extended flow from multiple wells.

The future for oil and gas production in the North Sea appears bright. However, in order to maintain production levels and profitability it will be necessary to find ways of bringing smaller, and more marginal, fields onstream while reducing development costs. Extended Well Testing provides one route for both obtaining the data required to reduce the uncertainties within, and thus the costs of facilities design; and reducing the uncertainties of reserves and productivity. In the right circumstances it provides the key to unlocking untapped reserves and reducing costs of field development.

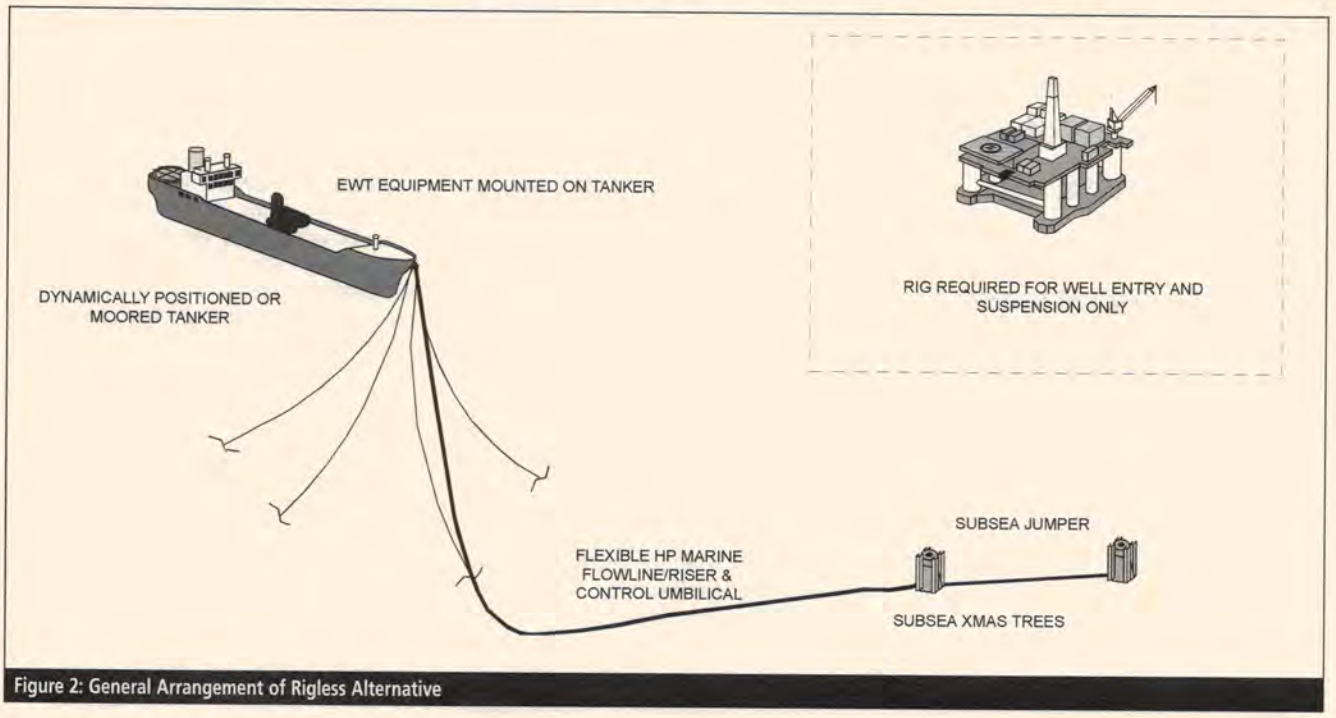


Figure 2: General Arrangement of Rigless Alternative

Anytime, anywhere as India encourages E&P

Despite the threat of political instability that hangs over the recently appointed administration in India, one thing is for certain: the recent measures to liberalize the Exploration and Production (E&P) sector will not be reversed. For if there is one issue that unites all of India's bickering political parties, it is the need to reduce the country's crippling dependence on foreign imports of crude, oil products and gas, reports *Deepak Mehta*.

India's Ministry of Petroleum and Natural Gas estimates that the country currently imports 50% of its oil and gas needs, a figure expected to rise to 65% within five years as consumption soars in an economy growing at 7% per annum.

So critical is the situation that India can no longer afford to pay its oil bill, a fact recognized across its ideologically diverse political spectrum. It has an energy account deficit of $9bn/y, and its state-owned oil companies, both upstream and downstream, can no longer pay off their debts, causing friction with foreign partners.

Coupled with this, domestic production is plummeting, particularly from the Bombay High group of fields. Output from these fields, which make up the country's most prolific oil-producing region, fell to 10mn tonnes in 1996 from 13.5mn tonnes in 1995. Total production across the country is likely to be just 30mn tonnes, down from 34mn last year. In contrast, demand for petroleum products is expected to reach 80mn tonnes, a rise of 6mn tonnes from last year.

Against this depressing back-drop, the government has been forced to act. On 18 March, the reformist Petroleum Minister T R Baalu, announced the long-awaited New Exploration Licensing Policy (NELP), in a speech to parliament.

He explained that: 'The policy aims at a significant increase in the domestic production of crude oil and natural gas. India is one of the least explored regions in the world. We need vast amounts of capital to augment the exploration effort.'

In a single unprecendented move, Baalu announced the opening up of the whole of India's previously reserved E&P sector. In future, the government would allow 100% private participation – domestic and foreign – in the business of oil and gas exploration.

Key to the government's new policy was a willingness to allow access to all of India's 26 sedimentary basins for exploration. To date, just six of the sedimentary basins have been exploited, and these only partially.

In a wide-ranging speech, Baalu announced three fundamental policy changes aimed directly at wooing foreign 'upstream' companies to India. He said the allotment of exploration blocks would in future be carried out within the parameters of an 'Open Acreage System'. This means that companies can apply for exploration blocks at any time without first having to wait for the appropriate bidding round. Baalu said oil companies could now pick the acreage they found most appealing, and make an immediate application for a licence to explore.

India's Directorate General of Hydrocarbons – the executive arm of the Ministry of Petroleum – has since announced that it will be offering for tender some 31 shallow-water blocks for exploration and production licensing by the end of August 1997.

Baalu also signalled the ending of the E&P sector monopoly enjoyed by India's two major state-owned oil companies, Oil and Natural Gas Corporation of India (ONGC), and Oil India Ltd (OIL). He indicated there will no longer be any compulsory state participation in E&P through ONGC and OIL, and that private companies would no longer be compelled to enter into strategic alliances with ONGC. Previously a minimum 30% equity stake by OIL or ONGC in a private joint venture had been mandatory for the granting of an exploration licence. This has effectively been abolished, and private companies can now have free rein. The minister also announced an exemption from the payment of petroleum exploration licence fees and area rentals.

Baalu confirmed a number of other areas which he said had received government approval. These include:

- forcing ONGC and OIL to compete with the private sector for exploration licences instead of receiving them on a nomination basis;
- paying ONGC and OIL international rates for oil and gas discovered in

blocks awarded under the new policy – but not from existing wells;

- royalty payments of 12.5% for onshore areas and 10% for offshore areas;
- setting up a new Hydrocarbon Development Fund to fund exploration activities such as the acquisition of geological data on unexplored basins. The fund will receive half the royalty payments from offshore areas;
- encouraging deep-water exploration, over 400 metres, by halving the royalty for the first seven years after commercial production begins;
- a proposal to abolish payments for blocks offered under the new policy;
- a proposal to relax tax payments for blocks awarded under the new policy; and
- major tax breaks – including a seven-year tax holiday from the date of commercial production – for companies prepared to conduct E&P operations in areas of terrorist activity such as the northeast states of Tripura, Nagaland, and Assam.

Reaction to the new policy announcement has been mixed. Bob Morgan of British Petroleum Exploration Operating Company, which has a joint venture with ONGC in Vietnam, said there was 'muted enthusiasm' at the Indian reforms within BP. 'We've always had problems when we deal with state-owned oil companies,' he said. 'They have a different ethos to us. The problem with working in a market dominated by the likes of ONGC and OIL is that they keep all the good acreage to themselves and leave the unexploited or low potential acreage to the outsiders. India is no different and it'll take time for the operating environment there to change.'

Confirmation of this view comes from Enterprise Oil, a recent entrant to India in its tie-up with the downstream state-owned refining giant Indian Oil Corporation (IOC). An Enterprise/IOC consortium had been awarded acreage in the Bombay High area previously owned by ONGC. It is reported that ONGC is now actively trying to get the acreage back.

Enterprise's alliance with IOC is among the first to follow new government guidelines allowing India's downstream companies to operate upstream and vice versa. 'This is a good arrangement', said an Enterprise source. 'They want to learn from somebody who is technically competent in upstream E&P. The advantage for us is that they have downstream capability.'

Privately, foreign operators complain most about bureaucratic delay and red tape in the award of exploration licences. This criticism came out into the open recently when B C Hung, Managing Director, Cairn Energy Asia, sharply criticized Indian government red tape in the award of exploration acreage. Hung told the Indian Oil and Gas Conference in Delhi (April 1997) that Cairn had to obtain 36 separate government licences before it could start operating the Ravva field in the Krishna Godavari basin. He said Cairn's frustration with Indian bureaucracy was compounded when the state government of Andhra Pradesh arbitrarily forced the Ravva consortium to pay a tariff for all the oil it loaded through a local port.

Luckily for Hung, the NELP has been designed to resolve some of his criticisms. In particular, it plans to introduce what has become known as a 'Single Window Clearing Facility' for licences. The new policy will also make it mandatory for each ministry involved in the issuing of an exploration licence – defence, home affairs, law, environment, and finance – to designate a civil servant whose specific job will be to help the oil and gas companies get the necessary clearance.

If the main purpose of the NELP was to renew interest in India by foreign companies, it appears to have succeeded. Amec, the technical services and oil rig designing company, already has a four-year joint venture with Engineers India, but is keen to expand its presence in India by seeking out new opportunities to implement its innovative 'Alliance Contract'. Max Hobbs of Amec says he is encouraged by the recent development in India, but insists that problems still remain to be resolved: 'Finding work in India is not a problem', he said, 'Getting paid is. For much of what we plan to do in India we'll be asking for money up front. It's very important to get off on the right foot when dealing there. India needs companies like us and if we get it wrong the only casualty will be India itself.'

Despite the hurdles, however, western oil companies continue to follow the example set by a group of companies including Enron, Shell, Hardy Exploration & Production (previously called Hardy Oil & Gas), Premier Oil and Cairn Energy (Cairn, a Scottish company, has bought out the Australian Command Petroleum's Indian operations) all of whom are already actively involved in India's complex operating environment.

Enron has a joint venture with the Indian private operator Reliance Petroleum, and on 31 March announced production of gas from its South Tapti field on the Bombay High. Shell operates acreage in the desert state of Rajasthan and says it will bid for more acreage when appropriate. Premier has a joint venture with India's Essar Oil to operate sites on the Ratna and R series of fields on the Bombay High, though this is currently the subject of a government investigation following criticism of the award by India's Comptroller and Auditor General. Command Petroleum/Cairn Energy has shown keen interest in joining ONGC in developing the recent gas find off the Andaman Islands.

Hardy – operator of the PY-3 block in the Krishna Godavari basin off Madras – has been quietly consolidating its presence in India. In April this year Hardy acquired a 15.5% stake in India's only privately owned oil company devoted solely to E&P, Hindustan Oil Exploration (HOEC). Hardy has just recently acquired more acreage in Cauvery offshore and the Gulf of Cambay, all of which it plans to operate jointly with HOEC and another Indian operator, Tata Petrodyne.

As India's oil and gas sector is further deregulated, this type of equity tie-up is likely to become the norm, not the exception as it is now.

The writer is editor of *Upstream India*, a bi-monthly news report on the latest E&P developments in India.

India: Gas Production and Consumption
(million tonnes of oil equivalent)

	Production	Consumption
1987	7.0	5.7
1988	8.0	6.6
1989	9.6	9.6
1990	11.1	11.2
1991	12.8	12.7
1992	14.3	14.3
1993	14.5	14.7
1994	15.6	15.7
1995	16.9	17.7
1996	18.4	19.5

Source: BP Statistical Review

India: Oil Production and Consumption
(million tonnes)

	Production	Consumption
1987	30.9	47.0
1988	32.7	51.5
1989	35.0	55.8
1990	34.8	57.9
1991	33.1	58.9
1992	30.2	62.1
1993	29.0	62.7
1994	33.2	67.4
1995	37.2	73.0
1996	35.0	78.7

Source: BP Statistical Review

Companies to hold back the hypermarket threat?

The move by hypermarkets and similar stores into motor fuels retailing is a major challenge for oil companies with significant marketing assets, whether or not their key markets are already affected, according to *Andrew Bradley*, Senior Consultant, Supply and Marketing for consultants Wood Mackenzie. In the company's recent special report – *The Hypermarket Threat: Hungry for More?* – he assesses the potential impact of the hypermarkets outside of the UK and France, and the question of how oil companies should respond.

It is reasonable to believe that a primary motive for hypermarket groups in developing a motor fuels business is to reinforce their low price image and thereby attract customers into their stores. While this holds true in all European countries where hypermarkets have developed fuels retailing activities, to date it is only in France and the UK that they have become a major force. So what is it about these two countries that has encouraged hypermarket fuels retailing development to the extent that such groups now account for close to 50% of the market in France and more than 20% in the UK?

Growth of 'out-of-town' retailing centres: encouraged by liberal planning regulations, large 'centres commerciales', incorporating hypermarkets and associated car parks on which petrol stations have been established, have been a feature of the French grocery/retail sector since the late 1960s. The UK has experienced a rapid growth in similar out-of-town shopping centres/hypermarkets following the liberal planning regime of the 1980s.

Fuel supply availability: in France, the hypermarkets have been able to take advantage of regional gasoline and diesel supply/demand imbalances to obtain low-cost supplies. France was actually an overall net importer of gasoline during the 1980s but with major refining centres in the north and south, there were significant regional product imbalances which enabled the hypermarkets to play the refiners off against each other on an 'if we don't supply, someone else will' basis. In the UK, a major net gasoline exporter, securing product presented no entry barrier at all.

Working capital benefit: this is particularly true in France, where large cooperative chains such as Leclerc and Intermarche are widely regarded as under-capitalized. These companies get up to one month's grace to pay duty once product leaves bonded storage and in many cases product is delivered to service stations direct from bonded storage. The hypermarkets also enjoy a significant cash flow advantage in the UK by only becoming liable for duty once they lift the product out of storage rather than as it leaves the refinery gate.

Hypermarket penetration across Europe can be summarized in the chart in **Figure 1**. The message is clear – as hypermarkets acquire market share, gross margins crumble.

So what does the future hold for other national markets currently sitting in the high gross margin, low penetration quadrant of the chart?

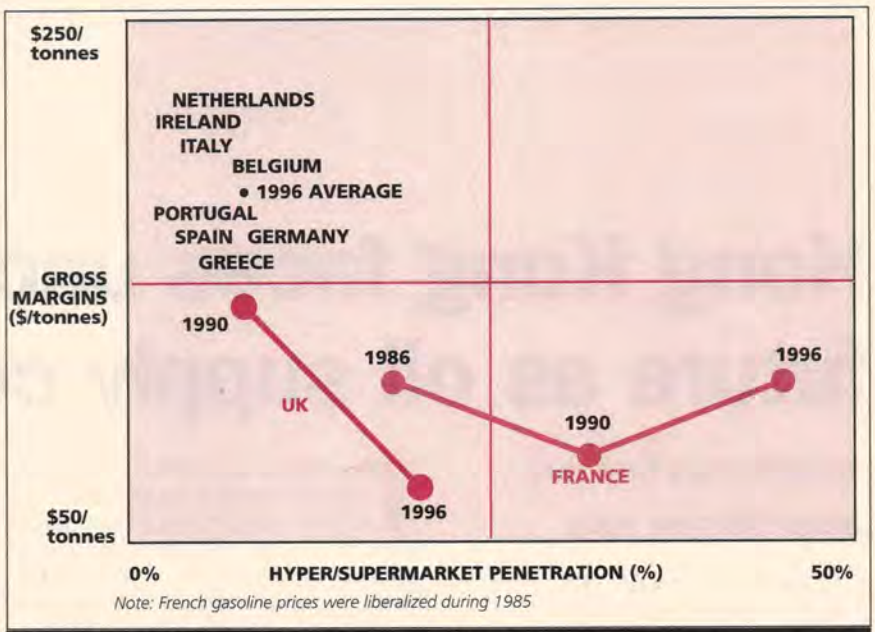
In most northern European countries other than France and the UK there has not been such a strong move towards general hypermarket retailing, especially of the out-of-town variety. This has mainly been the result of tighter planning regulations, especially concerning land use and transport policy. This has particularly been the case in Germany and the Netherlands, where strict environmental requirements have also increased the cost of doing business. In the eastern part of Germany, several hypermarket chains initially expanded quite rapidly but with the market approaching saturation, further growth seems likely to be limited. In Belgium, the hypermarket chains have actually retrenched from motor fuel retailing since the early 1980s, when they held about 15% of the market. Many of the major players sold out to the oil companies following a period of fierce competition and low returns, effectively neutralizing their threat. Will a period of significant network consolidation driven by environmental requirements give the hypermarket chains an opportunity to rebuild their market share?

Hypermarket development?

Spain, Portugal and Ireland have four important characteristics in common that make them ripe for hypermarket development: good economic prospects, growing car ownership, improving road infrastructure and (relatively) cheap real estate. In Spain, small pockets of hypermarket activity are appearing especially around the Catalan region, although it remains on a small scale at present. The situation in Portugal promises to develop in a similar fashion and the French hypermarkets, looking to expand outside their saturated home market, are likely to play a growing role in both of these countries. In neither Spain nor Portugal is product supply expected to present a

fundamental obstacle to the hypermarket retailers. In Ireland, hypermarket growth could be sparked by the UK chains moving into this market around Dublin, the area in which 20% of the country's population reside. Planning regulations will present an obstacle to the construction of large, out-of-town centres however, and product supply could be problematic given the country's dependence upon imports.

In Italy, the dominance of Agip/IP – both through its retail market share and its control of the country's logistical infrastructure – continues to represent a significant entry barrier to hypermarkets, which in any case are restricted from selling motor fuels by Italian trading laws. However, neither of these factors should be considered inviolable: EU Single Market requirements may eventually lead to both a significant market restructuring and open the way for hypermarket chains to start retailing motor fuels.



Note: French gasoline prices were liberalized during 1985

Figure 1: Summary of Hypermarket Penetration across Europe

Countering with 'quality'

The traditional response of most major oil companies to the hypermarket threat (or, indeed, other discounters such as unmanned site operators in Scandinavia) has been to emphasize their 'quality' image: consolidate the retail network on the strongest locations, introduce 'premium' fuels and develop the non-fuel offer. Such a strategy reduces the business exposure to fuel margins but is it realistic to assume that a brand can establish a pump price premium, ie add value through the brand?

Esso in the UK has obviously decided that it is not. The strong locational strengths of its network and its quality brand image were not sufficient to prevent a gradual erosion of its market share to the hypermarkets. By introducing its 'Price Watch' campaign, Esso has effectively moved in line with the hypermarkets' philosophy: customers see gasoline as a commodity which they buy on price.

Consumer behaviour differs in each market and 'quality'-based strategies will have more success in some countries than others. But in a situation where the market leaders follow a premium price strategy, this will always give the hypermarkets the potential to build a low price position in the market. And once these high-profile retailers become established, could the market subsequently become more price sensitive? This would ultimately boost the hypermarket share further and lead to a downward spiral in the oil companies' market share as the number of consumers buying on quality or convenience diminishes. It remains to be seen what effect the hypermarkets may have upon consumer behaviour in countries such as Spain, Portugal and Italy.

The impact of the hypermarkets on fuel margins is likely to be greatly exacerbated when there is a high degree of inter-hypermarket rivalry because gasoline is such an attractive product for them to use as a weapon in a broader price war. In markets not yet seriously affected by the hypermarkets, future margin development could to a large extent be determined by the number of competing chains trying to establish gasoline as a part of their customer offer: if there are several, they are likely to set pump prices at a lower level than would otherwise be the case.

Conflict or cooperation?

If it really is unsustainable to counter the hypermarkets through a 'quality' strategy, how should oil companies respond? In particular, should these responses be characterized by conflict or cooperation?

Inherent retail cost structures mean that oil companies will almost never profitably beat the hypers on price. A pre-emptive 'low fuel price' strategy therefore makes most sense before the hypermarkets have established a significant market presence. This is, of course, easier said than done – who wants to sacrifice margin today to protect next year's margin? However, if by this means the hypermarkets lose or are prevented from establishing a low price advantage and are forced into substantial losses on fuels trading, they may quickly lose their appetite for what will always remain a non-core activity for them, as actually happened in Belgium during the 1980s.

An alternative, lower risk, more cooperative approach could be to enter into joint venture retailing agreements with the hypermarket groups, so protecting both market margins and the oil company's volume. Recent such initiatives include Repsol/El Corte in Spain, BP/Safeway in the UK and Shell/Ahold in the Netherlands. This type of approach recognizes the respective strengths of both oil companies and hypermarkets, exploiting them to maximize mutual advantage.

A much more radical move, especially in markets so far unaffected by significant hypermarket competition, would be for oil companies to divest from fuels retailing completely while margins and business valuations are still good. A few years after the hypermarkets have entered a market, their impact is likely to become more acute, leading to a situation of more sellers than buyers and hence much lower realizable values for filling station networks.

We believe that the hypermarkets do pose a real threat in certain markets outside France and the UK and, as experience has shown, the threat can materialize more rapidly than forecast. Will the industry be able to learn these lessons, recognize the potential threat early and develop appropriate pro-active strategies to protect long-term volumes and profitability?

About the author

Andrew Bradley gained his industrial experience with BP Oil International, first in London where he assisted in the development of BP's European retail strategy, and then for Deutsche BP in Hamburg, where he was a member of the team implementing the national retail strategy.

This article expresses Wood Mackenzie's views on both the history and the future of the hypermarket 'threat'. The author welcomes responses and opinions. His contact number is: Tel: +44 (0)131 243 4509 Fax +44 (0)131 243 4482.

Hong Kong faces uncertain future as oil supply centre

Hong Kong's first day under Chinese rule, 1 July 1997, was not exactly auspicious. A celebratory parade organized by the Chinese was washed out by torrential rain, and the grand finale of a firework display, described as 'a bold statement... embodying confidence in the future of Hong Kong' fizzled out when one of the firework barges caught fire. The omens are not necessarily good for the territory's oil industry either, according to *Paul McDonald*, Managing Director, Pearl Oil Ltd.

The Chinese authorities show every sign of wanting to increase their role in Hong Kong's free market economy, and the oil industry is unlikely to escape their attentions. Hong Kong's Tsing Yi oil terminal currently operates as an important supplier of refined products to parts of southern mainland China, as well as supplying the local market. While its local supply function is fairly uncontroversial as far as the Chinese government is concerned, Hong Kong's role as an entrepôt serving neighbouring provinces like Canton is likely to come under increasing, and probably unfriendly, scrutiny.

Tsing Yi is the main terminal for Hong Kong's domestic market of approximately 200,000 b/d, which is supplied primarily by Mobil, Caltex, Shell, Esso and the mainland-owned China Resources (CRC). In addition to this, Tsing Yi exports some 150,000 b/d to China, mainly to the neighbouring province of Canton. It is these exports that are exciting the attention of the Chinese government.

The precise volume of Hong Kong's exports to China is not known, since not all cargoes make it into the records of the Chinese customs authorities. China's system of high oil tariffs provides an incentive to smuggle products that some traders have been unable to resist. Products bought from bonded storage in Hong Kong can be delivered to mainland buyers at a cost considerably below the local state-controlled price. Some diesel cargoes were landed in southern China during the summer for a price of 1,350 yuan/t ($21.71/b), compared with the official, ex-refinery price of 2,190 yuan ($35.22/b). The result has been that the main state refiner, Sinopec, has been left with unsold stocks, while being forced to sell other products at a loss. The central government, meanwhile, has been deprived of excise revenues.

All of this has led to pressure in some government circles for the product trade of Hong Kong to be brought under more centralized control. Under the terms of the Joint Declaration, signed by the British and Chinese governments in 1984, governing the arrangements in the colony after 30 June 1997, China is not supposed to interfere with Hong Kong's economic and commercial system during the 50 years following the handover. There are, however, provisions for China to intervene in any circumstances when national security is said to be threatened. The somewhat belated Chinese concern over smuggling may be an attempt by the central authorities to establish the existence of such a threat. Whether the imposition of Chinese controls on Hong Kong's oil trade will eliminate smuggling is another matter altogether.

The terminal operators are unable to control what happens to oil products once they have left Tsing Yi. Oil bought with legitimate documents can fairly easily be diverted to some of the several hundred small terminals spread across southern China. It is almost certain, in any case, that some of the oil is landed with the connivance of local officials. Furthermore, the provincial authorities are often slow to investigate charges of fraud. Customs duties go to the central government rather than the provinces, which often claim to have more pressing cases to pursue.

Smuggling may not be the only reason for China to seek an increased role in Hong Kong's oil industry. The local market is an attraction in its own right, and has already drawn in one mainland company: CRC. China Resources is a diversified industrial and trading enterprise owned by the Chinese Ministry of Foreign Trade and Economic Co-operation (MOFTEC). The company now has a terminal on Tsing Yi and sells oil products in Hong Kong. The territory's retail market is traditionally associated with good margins and may attract more participants from the mainland.

The normal route for Chinese companies into the Hong Kong market has been to purchase a stake in an existing local participant, usually at a discount to the actual value of the shareholding. The local partner normally takes the

view that such arrangements are necessary in order to allow it to go on doing business successfully in China. Given that Hong Kong's downstream sector is mainly made up of subsidiaries of large foreign companies, this particular method may not be so appropriate in the case of the oil industry. Mainland firms may instead try to establish new operations from scratch, probably in conjunction with an amenable local property company.

A few Hong Kong property firms have already expressed interest in opening retail sites in China, for which they, in turn, would require a mainland partner. Such arrangements would require the cooperation of the state refiner, Sinopec, which would almost certainly be the sole source of products supplied to any retail operation. The property companies, for their part, could provide capital for new service stations both in China and Hong Kong – which has some of the costliest land in the world – thus changing the normal pattern of foreign involvement in the retail sector in both places. This has been traditionally the preserve of oil companies rather than non specialists, such as property firms.

Property values may ultimately have a role in determining what happens to Tsing Yi. The island's location on the edge of Victoria Harbour and on the way to Hong Kong's new airport at Chek Lap Kok makes it a highly desirable piece of waterfront real estate. Early in the next century, it could be worth more as commercial and residential land than as a series of tank farms. There are already several nearby Chinese ports ready to accommodate any oil terminals presently located in Hong Kong. The Chinese authorities, too, might be happy to see these places develop at the expense of the former British colony. There is a strong feeling amongst some mainland officials that China should increase the number of oil terminals in areas with rapidly growing oil demand, like the Pearl River Delta, rather than relying on the use of a small number of entrepôts, such as Hong Kong. Trans-shipment is seen as inefficient and expensive. The building of new ports, however, is somewhat constrained by the lack of natural, deep water harbours along the southern Chinese coast. This fact, in the end, may grant TsingYi at least a temporary extension of life.

Investment opportunities

Hong Kong's energy connection with China is by no means confined to its role as a supplier of refined products. It also acts as an important centre for raising finance for Chinese industry and offers investment opportunities to mainland firms in energy sectors outside the oil distribution sector.

Hong Kong's financial markets are used by an increasing number of Chinese state enterprises to gain access to private capital. Among those with energy activities to have raised money in Hong Kong are CRC, China Ocean Shipping (Group) Company (COSCO), which is involved in trading and bunkering, plus industrial conglomerates China Everbright Group, China Travel Services and China International Trust and Investment Corporation (CITIC). Hong Kong's role as a supplier of energy finance looks set to continue: at least in the short term. One of the state upstream companies, China National Offshore Oil Corporation (CNOOC) is considering the listing of a subsidiary on the Hong Kong Stock Exchange (HKSE) to raise funds to help it expand away from its domestic production base into such areas as foreign production and refining.

Diversifying into energy

Large state companies that do list on the HKSE are known locally as 'red chips'. There are around 56 of them and they constitute about 9% of the stock markets capitalization. The normal flotation procedure involves the setting up of a Hong Kong company and then the injection of valuable mainland business assets on financially advantageous terms. This process enables mainland firms to diversify from a narrow industrial base into several new business areas, including oil and energy. China's two international stock markets at Shanghai and Shenzhen, just across the border from Hong Kong in Canton, are not big enough to attract the funds that flow into Hong Kong, which is Asia's second largest financial centre after Tokyo.

Among the red chips seeking a greater involvement in energy are China Everbright, which has a general interest in raw materials; China Travel Services, which is investing in petrochemicals; COSCO, which wants to move into petrol retailing; and CITIC and COSCO, which are both involved in terminalling and trading. CITIC has also expressed interest in refining and power generation. Earlier this year, it bought 20% of Hong Kong's largest utility, China Light and Power for $2.1bn.

Not everyone in China thinks this use of Hong Kong to raise finance for energy is a good idea. There is a growing feeling in government circles that China should concentrate its efforts on securing oil and gas reserves abroad in order to ensure China's future access to sufficient sources of energy to enable its economic growth to continue. China has been a net importer of oil since 1993, since when its dependence on foreign oil has risen to 750,000 b/d: equivalent to 21% of national consumption. The Chinese Communist Party (CCP) generally regards this as a source of economic weakness. Oil is seen as a strategic industry and security of supply is viewed primarily as tied up with physical access. Hence the main state upstream company, China National Petroleum Corporation (CNPC) has recently signed a number of deals involving exploration and production of both oil and gas in Russia, Iraq, Kazakhstan and Venezuela. Among them are several proposed pipeline schemes to bring hydrocarbons from various parts of the former Soviet Union to China.

State assets sold cheaply

Many CCP officials believe that these sort of deals, involving direct access to oil and gas, should have first call on investment funds. Raising money in Hong Kong to allow state enterprises to diversify into petrol retailing and other downstream businesses is seen by them as being rather less directly in the national interest. There is also concern that too many state assets are being sold off cheaply in an attempt to make red chip firms attractive to foreigners. Some officials want the practice of injecting assets at bargain prices into firms listed in Hong Kong to stop. Others say that China needs to reduce its reliance on the territory's capital markets and build up international financial centres on the mainland, where there are many that regard Hong Kong as something of a separate entity, despite its recent handover to China. Shanghai, in particular, wants to take over the role of the country's main international financial market from Hong Kong.

Hong Kong thus faces a series of challenges from the mainland to its role in China's energy economy. The territory's oil industry is likely to see its role as a supplier to the mainland decline as new ports and terminals are built in southern China. Its role as an energy finance centre is also in doubt in the longer term as mainland interests promote Shanghai as a rival. Such developments are nevertheless likely to take several years, during which Hong Kong will continue to play an important role both as a supply source and financial centre. Its relative lack of political clout in central government, however, could be a serious handicap in the longer term in a country as centrally directed as China still is. Hong Kong's expansion in recent years as an international oil centre looks as if it is about to falter.

The investigation of the transitional seizure with an Amsler test

The following paper, by András Zalai, Chem Eng, Lubrication Eng, Scientific Association of Mechanical Engineers, Hungary, is to be presented at the First World Tribology Congress, 8–12 September 1997. The Congress is to be held at the Westminster Central Hall and the Institute of Mechanical Engineers London headquarters.

The objective of the investigation is to study the tribological system in seizure or near-seizure conditions. The conditions of wear and the attachment of wear particles has been studied on test specimens, also the changes in the peak-to-valley dimensions (R_t roughness) and the micro-hardness of the sliding surfaces.

Introduction

According to the literature,[1,2] it is the softer of the two materials in sliding contact which has the greatest effect on the wear and seizure.

During partly elastohydrodynamic and boundary lubricating conditions the controlling factors of the friction are: the load, the roughness profile (R_p) and the relative velocity between the sliding surfaces. Also described in the literature[3] is the relation between seizure behaviour and operating conditions. It is stated that, prior to actual seizure, the wear rate is in the following relative proportions, and dependent upon the orientation with respect to the wear scar:

$$W_t > W_l > W_o$$

Where:
W= wear rate prior to seizure
W_o = angular wear scar
W_t= transverse wear scar
W_l= longitudinal wear scar

The sequence for the wear coefficient (f) before seizure is the reverse of the above, ie:

$$f_t < f_l < f_o$$

For the test-specimens, with similar roughness profiles, the seizure load (P) changes as follows:

$$P_t > P_o > P_l$$

The nature of the contact between rough surfaces has, according to Ref 4 three possibilities:

1. Plastic-peak contact
In this case the wear rates and friction are high. Material is either broken off from the peak asperities or they are permanently deformed.

2. Elastic peak contact
In this case the wear rates and friction are low since the peaks deform then reform.

3. The total surface contact is under elastic strain condition
This can only occur with a theoretically smooth surface. Wear rates and friction rates can reach very high values, depending upon the presence and effectiveness of boundary lubricants.

The above three types of contact condition are now considered together with material and surface parameters. High values of surface hardness decrease the probability of the plastic peak contact condition. In order to avoid the total contact surface condition, it is necessary to increase the modulus of elasticity of the material. It is practical to adjust the surface to one of medium high roughness.

The hardness is one of the factors influencing wear behaviour.[4] The numerical value of the hardness is dependent upon the structural state of the material. It is generally considered that the softer of the two materials in sliding contact is the main determinant of the frictional relationship between the two.

Material transfer between the two surfaces and subsequent attachment influences the hardness, when the linear wear equation's wear factor 'K' can change by an order of magnitude. Material transfer occurs in the direction of the material having the higher cohesive attraction. There is a close link between the effects of such adhesion and other mechanical characteristics such as hardness, plasticity and tensile strength. At higher loads, a layer of plastic deformation is present at the sliding surface.

At low to medium loads, the wear mechanism changes from plastic defor-

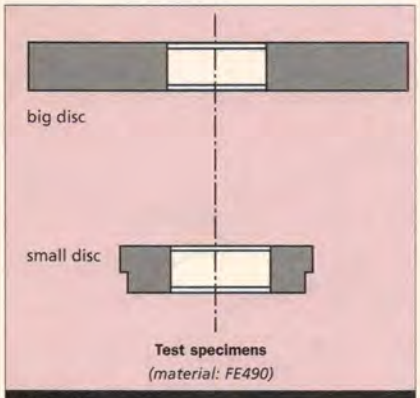


Figure 1

Quality characteristics	Measured Values
Kinematic viscosity at 40°C, mm²/s	14.96
Kinematic viscosity at 100°C, mm²/s	3.45
Viscosity index	108
Pour point, °C	-18
Anilin point, °C	98.5
Aromatic content, % (IR)	4.2

Table 1: Characteristics of White Oil

mation to oxidative wear with increase in sliding velocity. Localized changes in the hardness of the material are caused by the formation of, for example, martensite, grain refinement and oxidation processes.

Test methods

Wear and Seizure investigation

The study of the relationship between test severity and wear, material transfer and seizure was carried out using an Amsler A 135 test rig. The test specimens were made from low strength steel and are shown diagrammatically in **Figure 1**.

The tests were performed using white mineral oil as a lubricant. The characteristics of the lubricant are shown in **Table 1**. Due to its low viscosity and severe refining, white oil is not generally suitable as a lubricant for this particular process. This may be demonstrated by comparing the results (**Table 2**) of the lubricating performance of the white oil with the performances of more suitable lubricants.[5]

Under similar conditions of contact surface and load, a base oil for an engine oil, which had a viscosity four times as great as that of white oil, and containing natural oxidation inhibitors, extended the time to seizure by a factor of 29. When using a hypoid gear oil, of even higher viscosity and containing extreme pressure additives, the time was extended by a factor of 36 compared with the white oil.

The reason for using relatively poor test materials and lubricants in this test was to reach the seizure point in a reasonably short time.

The Amsler tests were performed using loads from 500 to 1,500 N, and for periods from 0.5 to 1.33 hours, with a constant sliding velocity of 0.7646 m/sec. The loading on the test specimens was accurately achieved by using a certified spring calibrated over the range 0 to 2,000 N. The lubricant is transferred by chain to the shaft of the large disc, and then is transferred to the sliding surfaces. The weight of the discs were measured using a balance with a range of 0 to 200 grammes and an accuracy of 0.001 grammes.

Measurement of the peak-to-valley dimensions (R_t) of the sliding surfaces

For this determination a Perthometer S6 P was used. The peak-to-valley (R_t) readings were achieved by measurements over a base length of 0.8 mm, the measurement length being 5.6 mm for the large disc and 4 mm for the small disc. To obtain these measurements a '6 profile' and 'PROG 0.2' were used. The values of R_t obtained ranged from 4.7 to 82 microns.

Measuring the microhardness of the sliding surfaces

The measuring instrument used had a Mahnemann type objectives lens with a magnifying power of 32. In the centre of this lens was located a Vickers hardness pyramid, with a 136° peak angle. The indentation diagonals were measured by a micrometer drum of 100 calibration. Knowing the indentation diagonals (d) and the loading forces (F), the microhardness is calculated as follows:

$$HV_{micro} = \frac{1.854 \times F}{d^2}$$

where F= load (N)
d = indentation diagonal

A 100 pound load was used for these tests.

The microhardness was measured over the surface of the discs, in areas of seizure and also in seizure-free areas in 3 × 3 places; for each disc some 20 measurements were made.

Lubeoil	White oil	Base oil For engine oil	Hyphoid oil
Amsler test load, N	1,500	2,000	2,000
time at seizure hour	0.8	23	29
Lubeoil characteristics: natural inhibitor content	No	Yes	Yes
EP additive content	No	No	Yes
Viscosity at 100°C, mm²/s	3.5	13	17

Table 2: Seizure Time Using Different Lubeoils

Test No	8	6	2	1	3	5
Test conditions:						
load (N)	500	900	1,000	1,500	1,400	1,500
time (h)	1	0.5	0.66	0.5	0.95	1.1
Test severity:						
load x time	500	450	660	750	1,330	1,650
Test results:						
weight changes (mg)						
big disc	+1.9	+82.6	+38.0	+24.6	+33.1	-38.0
small disc	-65.3	-115.6	-88.8	-82.2	-73.0	-174
Seized surface:						
small disc, %	0	35	55	55	70	100
big disc, %	0	25	30	40	55	100

+ weight gain, – weight loss

Table 3: Conditions and Results of Amsler Test

Results of the measurements

The tests were halted when it was possible to observe by eye the areas of seizure on the surfaces of the large and the small discs. One exception was Test 8, which was stopped before the seizure area became visible. It was noticed that for tests with relatively

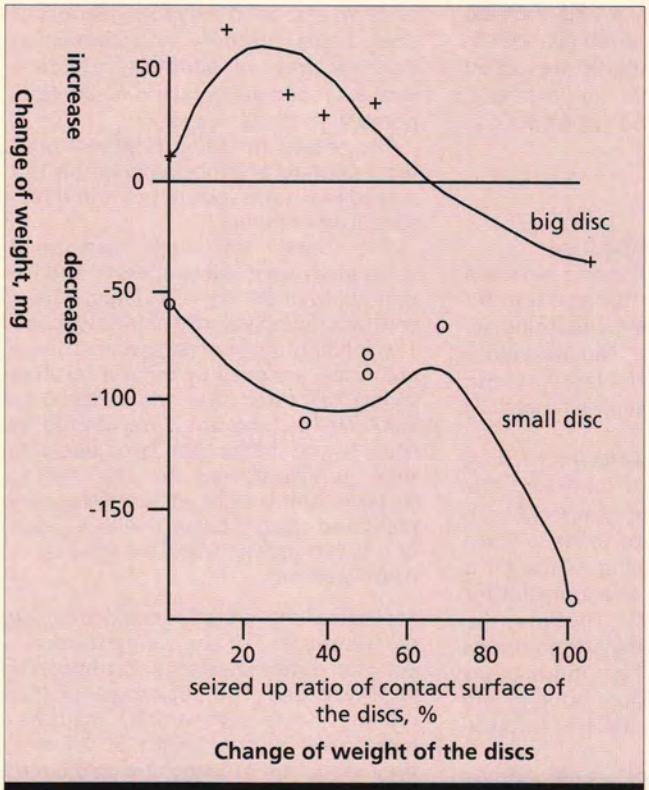


Figure 2

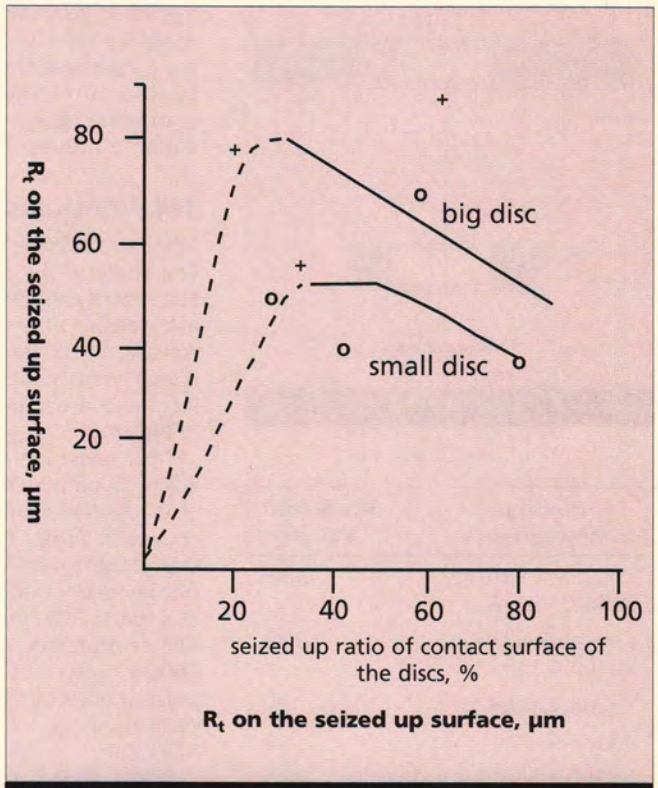


Figure 3

small seizure ratios, the areas of seizure and of non-seizure developed circularly. The characteristics and results of the tests are recorded in **Table 3**. The tests were evaluated by measuring the weight changes of the discs and the relative proportions of the seized to non-seized areas of the contacting surfaces of the disc. The weight changes and the percentage value of the seized surfaces are represented in **Figure 2**.

On the part of the disc surface in contact a black discoloration occurred at an early stage during the test. This is due to the formation of an iron compound, which is easier to shear than the original material.[6] On the seized part, the black layer is therefore worn away. For this

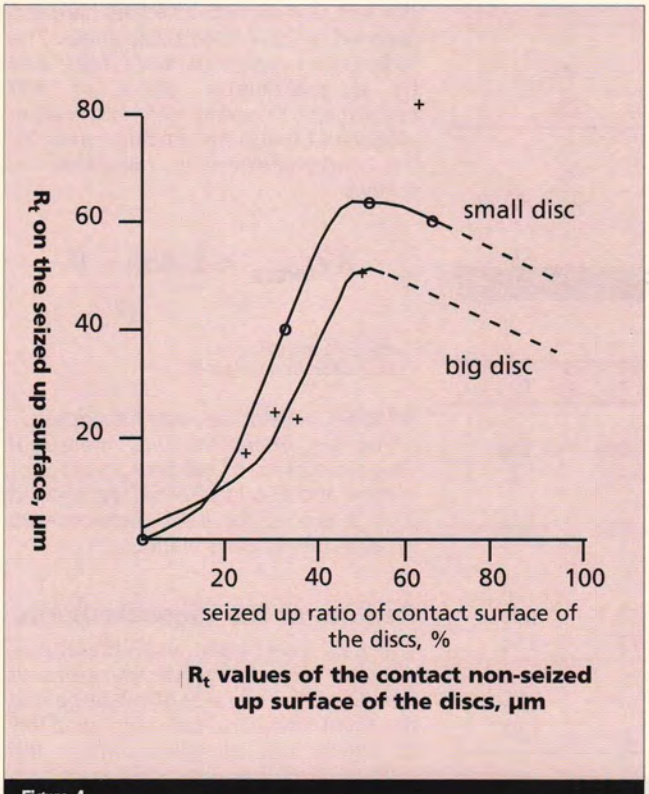


Figure 4

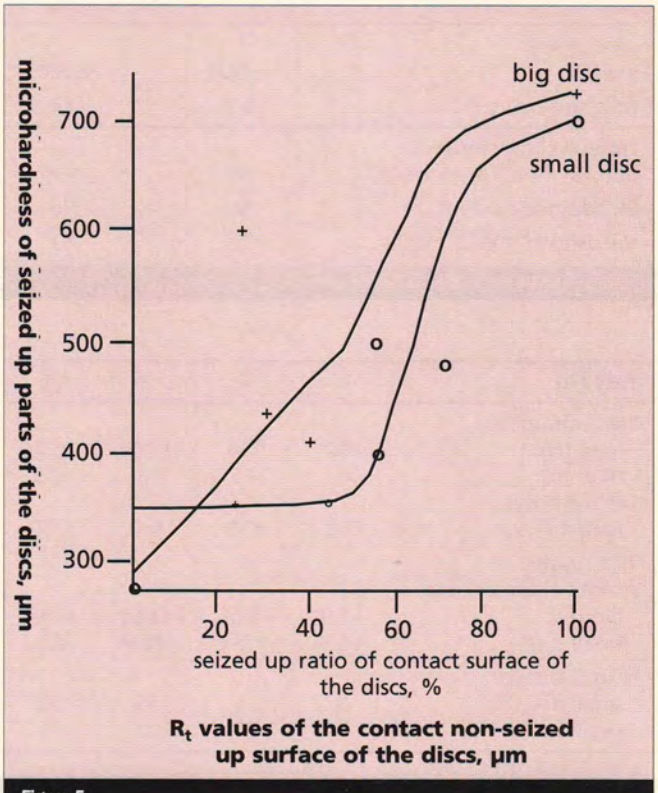


Figure 5

reason, it is easy to differentiate between the seized area, which has the normal metal colour, and the non-seized area, where the black colour remains.

Evaluation

The most important factors arising from the seizure pattern are the weight changes of the discs (**Figure 2**) and the peak-to valley (R_t) values of the sliding surfaces (**Figures 3 and 4**). The degree of hardness of the sliding surfaces affects the previous two factors, since as the harder surfaces wear each other more severely, this results in a larger weight change. The large and small discs behave differently because the stress on the small disc is more severe, due to its lower mass and more frequent contact between the sliding surfaces. **Figures 2 and 4** show the various changes which occur depending on the percentage of seized area of the sliding surfaces.

As is seen in **Figure 2** for the small disc there is always a significant weight loss at any value of the percentage of seized area up to 100%, since many wear particles are formed and detached from the surface of the small disc. In contrast, for the large disc, at values of up to 75% seized area there is in fact a weight gain, since these wear particles attach themselves to the large disc. However, from 75 to 100% of seized area there is an overall weight loss from the large disc, since, because of more severe test conditions in this situation, there is little opportunity for wear particles to attach themselves to the disc surface.

The results of the peak-to-valley (R_t) values and of the microhardness measurements are shown in **Figures 3 to 5**. On the seized surfaces of the large disc, the R_t values initially show a rapid increase, reaching a maximum at 35% of seized surface area, and then diminishing steadily to the point where 100% of surface area is seized. The pattern of results for the small disc is generally similar, although the overall values are lower, and also the maximum R_t value is not reached until 55% of the surface area is seized. For identical areas of seizure, differences of up to 30 in the R_t value are seen between the large and small discs. On the non-seized (black) areas the general pattern in the rise and fall in the values of R_t is similar, but in this case the values are higher in the case of the small disc. A possible explanation is that the seized portion of the large disc is wearing away the small disc, but this situation is reversed in the case of the non-seized areas. The very rough surfaces subsequently smooth out the peaks, and the values of R_t then diminish over the region from 55 to 100% of seized surface.

The microhardness values increase slightly when the percentages of the seized area is small, but then escalate rapidly as the percentage of the seized area increases, reaching 700 to 730 HV at 100% of seized surface area.

Sufficient wear particles were detached from the small disc to account for the weight gain in the large disc. From 0 to 35% seizure area, the weight of the small discs rapidly diminished. At the same time the R_t values of the seized portions (**Figure 3**) increased rapidly, and even more rapidly in the case of the large disc. On the unseized portions (**Figure 4**) the reverse effect occurs in that the R_t values of the small disc generally exceed those of the large disc. It is assumed that in the case of the unseized areas, the growth of R_t values up to the maximum values of 50 to 60 microns occur at the higher percentages of overall seizure areas and the R_t curve of the small disc exceeds that of the large disc for all values. This also indicates that particle detachment occurs from the small disc, resulting in increases in R_t values, but that on the non-seized portion of the large disc neither detachment nor attachment of particles is yet significant. In the case from 0 to 30% of the seized surface the microhardnesses of both discs are low (350 to 400 HV) and significant smoothing effects are not yet occurring. In the case of 75 to 100% seizure area of the large disc, weight losses were measured, since in this case particle detachment was occurring in considerable measure from both discs. However, in this region, particles did not attach to the large disc because of the severe test conditions. On both discs, increases in microhardnesses were evident, reaching maxima of 700 to 730 HV. In this region the R_t values of both discs diminished considerably, in both seized and unseized areas. At 0 to 30% seized surface area of the large disc, a large weight gain occurred. At the same time, the R_t values in the areas of seizure considerably increased, indicating that the attached wear particles resulted in an increase in R_t. The values of microhardness are relatively low but increase linearly up to 30% seizure. Attachment is therefore taking place initially on the seized surfaces and the R_t values of the non-seized surfaces are associated with the areas in which detachment has taken place.

Summary

At the lower values (0 to 35%) of seized surface area on the more highly stressed small disc, the detachment of wear particles is considerable. In the case of the large disc at seized areas of up to 66% attachment predominates since the large disc is operating under low stress conditions. The effect of the attached particles results in a significant increase in the R_t values, however the effect of particle detachment has a less significant effect upon R_t. The microhardnesses of the sliding surfaces of the discs are relatively low and unchanged in this region.

At the other extreme, that is, from 75% to 100% of seized area of the large disc, there is significant weight loss since the process of detachment predominates. Presumably, the particles are prevented from re-attaching due to the severe test conditions. In the case of both discs the microhardness values increase to levels of 700 to 730 HV. At the same time, the R_t values of both discs diminish considerably since attachment is not occurring, and there is a smoothing affect on the hard surfaces. In the transitional region i.e. from 35% to 75% of seized surface, the large disc shows a change from weight gain to weight loss. The R_t values reach a maximum, then start to diminish. In both discs, the microhardness values show an initial increase, which then becomes more pronounced, before tailing off to the final maximum value. The process of attachment of the soft wear particles increases the R_t values.

Acknowledgement

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Oiling the wheels of automotive performance

The rapid and continuing changes in automotive technology have meant that the lubricants industry has had to develop a whole range of ever more sophisticated products to ensure that new vehicles can operate close to their design capacity for longer periods of time. Specification levels have become far more stringent and the lubricants sector has had to respond. Increasingly, the industry is looking to the additives sector to provide effective technical and commercial solutions to these challenges. *Simon Napper* reports ...

Changes in the last decade and a half have been dramatic. The public is looking for lower maintenance vehicles and oil change intervals are being extended. Some 19,200 km (12,000 miles) is now commonplace for family cars and over 80,000 km (50,000 miles for trucks) compared with as little as 6,400 km (4,000 miles) in the early 1980s. In those days, too, new oil was continually being added which topped up the lubricant and replenished its efficacy. Today, lubricants must function effectively for much longer.

This is the case for transmission fluids as well where vehicle systems are increasingly designed with a 'fill for life' (FFL) lubricant, which means they have a working life of 240,000 km (150,000 miles) or more.

Lubricant stress has therefore become much more of an issue. Here, again, new additives have had to be developed to counter this problem and to ensure that lubricants can continue to function effectively under much more demanding operating conditions.

Engines themselves have become more complex with a greater number of working parts engineered to finer tolerances and a greater mix of different materials – factors which the lubricant supplier must take into account.

Latest engine designs place heavy demands on lubricants

Another factor is the operating temperature. In today's cars with their aerodynamic styling, air cooling around the engine has been sharply reduced – very few cars have appreciable radiator grilles for example. Front wheel drive and the addition of much more powered equipment in cars, such as power steering and servo assisted braking as well as options like air conditioning, all driven from the engine, have also reduced the free space under the bonnet to a minimum. As a result, engines typically run at higher temperatures.

Because the engines are required to run for much longer, lubricants must keep engines clean and efficient and this is the particular function of many of the high-performance additives found in today's products. As an environmental improvement, they are also required to absorb much of the part-burned hydrocarbons that previously might have been vented to the atmosphere through the exhaust system.

Environmental driver

Over the past few years, the internal combustion engine has been singled out for a great deal of attention and regulation on environmental performance. In fact, today's vehicles are much more environmentally sound, but David Margaroni, Technical Officer at the British Lubricants Federation, believes that the trend is certain to continue. 'Environmental issues are going to drive vehicle and lubricant design more and more as time goes on,' he says. 'Emissions regulations are continually being tightened up. Although lubricants may have less direct environmental impact than fuels, they do affect factors like fuel consumption and therefore will come within the ambit of further regulations.'

In fact, there has been a general move by all the bodies concerned with automotive development to improve environmental performance. In the case of the lubricant, this has been accompanied – or been created – by increased efficiency and economic performance. For example, the generation of waste oil has been reduced by the use of smaller sump sizes and extended drain intervals. The amount of lubricant consumed during use has been reduced by improved

sealing, which eliminates leakage, and tighter engineering design and tolerances which reduce the amount of oil being burnt in the combustion chamber. Increased fuel efficiency is another area of improved environmental performance, achieved through the use of lower viscosity lubricants.

In the early 1970s annual sales of lubricants in the UK were approximately 1.1mn tonnes. Today, with a much larger number of vehicles on the road, the figure has actually decreased to between 800,000 and 900,000 tonnes.

Regulatory focus

'Significant environmental improvements have been achieved through the cooperative efforts of the engine builders, lubricant marketers and the additives industry. Much activity has been focused on specific activities, for example fuel economy, and on technologies that maintain engine efficiency over longer periods of operation,' notes Nigel Tilling, Automotive Development Manager (Europe) at Paramins, an international manufacturer of additives for fuels and lubricants with its European base at Abingdon, UK. 'Legislation to tighten up emission performance requires that our technologies and processes for innovation move in step with these advances.

'Regulation through voluntary industry Codes of Practice now provides a level playing field for robust product performance claims on lubricant technologies. Anticipation of future emissions legislation will continue to spur new developments in our industries.'

The market players

Three major groups of players make up the vehicle lubricants market: the motor manufacturers or original equipment manufacturers (OEMs); the lubricant manufacturers; and the additives suppliers. The OEMs are continually looking for higher performance and quality assurance for their products and are consequently seeking ever greater sophistication and performance from the fuels and lubricants they use in their vehicles.

The lubricant manufacturers are seeking to provide high-quality products at an acceptable price to both OEMs and consumers. In order to do this, they are increasingly relying on additives to achieve a close match to the specifications of the OEMs. Within a given crankcase lubricant, up to 30% of the total may consist of additives and the rest will be the base oil. The additives suppliers therefore play an essential part in delivering product performance.

Sometimes, this means taking a specification from the OEMs and creating a blend of additives which, when mixed with a base oil, will meet the specified performance level. Or the additives sector may be responding to a practical problem that has arisen once production has started. About 10 years ago, 'black sludge' was causing damage to car engines, in some cases making them seize up as a result of blocked oilways. This had not been foreseen when the original lubricants for the engines concerned were being developed. Additives suppliers were able to analyse the problem and come up with a new combination of additives which dealt with the problem – and the complaints.

Additive technology is a complex science, dealing with interactions between different chemical compounds operating under harsh conditions. The end product, though, must have predictable and consistent performance.

Setting the standards

The performance requirements for European lubricants are set down in the ACEA Oil Sequences 1996. ACEA is the European Automobile Manufacturers Association. They replace the older Common Market Constructors' Committee (CCMC) sequences which were not updated after the breakup of that organization in 1990. The new standards mark a move towards more modern test engines and test cycles which are better suited to current and emerging engine designs. They are expected to cater for longer lubricant drain intervals, greater fuel economy, lower emissions and lower maintenance costs.

Although the ACEA Sequences were only introduced in 1996, an upgraded series of specifications known in the trade as ACEA II are already under preparation.

Product cycles

The OEMs are keen to develop higher lubrication specifications to support advanced engine designs. However, the impact of this is to reduce product life cycles dramatically. In the past, a relatively simple lubricant formulation might have a working life of up to 10 years. Today, a much more complicated product may only be in use for two or three years before a higher specification renders it obsolete.

With new lubricants costing up to $600,000 to test and evaluate – and that money having to be found by the lubricant and additives suppliers ahead of fuel sales – there is understandable concern that it may be difficult for these companies to recover their development costs if the specifications are driven higher at too fast a pace.

In particular, European manufacturers are keen to avoid the US experience where the ILSAC Sequences (set by US and Japanese motor manufacturers) went through a number of changes in very short succession, causing additives manufacturers to spend more and more money in an effort to keep up with the changing specifications.

While this has become a very public concern, David Margaroni does not believe this will happen here to the same extent. 'The ACEA update requirements appear to be not too dissimilar from the orginal sequences,' he notes. 'I believe the modifications necessary to meet ACEA II should be achievable by the additives and lubricants industry, although timings and return on investment are still under discussion.'

Transparency of tests

The ACEA structure is also leading to more transparency and standardization of test results through the industry. In the past, replicability of results could be a problem. That has changed with the ACEA arrangements. There is a standard test procedure and all the results have to be registered. So everyone does the tests in exactly the same way and presents the data in the same way too. This industry-wide bank of information also helps the European Coordinating Council (CEC) to improve the test procedures.

The road ahead

Developing new additives and lubricants is expensive and the industry is concerned about recouping its development costs. One way in which this has happened is through rationalization within the industry. 'Twenty years ago, there were hundreds of lubricant manufacturers in Britain,' says Rod Parker, Executive Director of the British Lubricants Federation. 'Today, there are about 60 and only about a dozen of those are international players. Yet the total amount of lubricants sold is still about 80% of the total in the 1970s, so the demand has not changed as dramatically as the supply side of the industry.'

Although there has been a process of rationalization within the OEM sector too, it is noticeable that Europe still has a number of nationally based car manufacturers. Nigel Tilling believes that the challenge of this diversity could prove to be a handicap or a benefit. 'The challenge continues to be to reach a workable consensus across Europe with so many different interests involved. However, if we can manage the situation and get it right, we will find ourselves better equipped to deal with the new challenges of globalization and the development of markets in Asia Pacific and Latin America.'

UK Deliveries into Consumption (tonnes)

Products	†Jun 1996	*Jun 1997	†Jan-Jun 1996	*Jan-Jun 1997	% Change
Naphtha/LDF	177,412	177,224	1,465,955	906,921	-38
ATF – Kerosene	719,376	756,739	3,766,256	3,939,513	5
Petrol	1,814,333	1,922,396	10,870,760	11,096,668	2
of which unleaded	1,210,903	1,371,633	7,291,927	7,822,998	7
of which Super unleaded	55,206	46,354	385,964	270,949	-30
Premium unleaded	1,155,697	1,325,279	6,905,963	7,552,049	9
Burning Oil	131,849	156,041	1,797,168	1,746,599	-3
Derv Fuel	1,165,130	1,325,515	7,000,573	7,430,374	6
Gas/Diesel Oil	513,815	529,679	3,981,157	3,757,295	-6
Fuel Oil	572,228	273,927	3,563,296	2,327,832	-35
Lubricating Oil	69,224	75,362	433,323	443,247	2
Other Products	677,512	665,191	4,319,639	4,171,211	-3
Total above	5,840,879	5,882,074	37,198,127	35,819,660	-4
Refinery Consumption	538,581	517,000	3,254,264	3,197,693	-2
Total all products	6,379,460	6,399,074	40,452,391	39,017,353	-4

† Revised with adjustments *preliminary

Aker Maritime's new platform concept

Aker Maritime of Oslo, Norway, has developed a new generation of floating platform specifically for use on smaller offshore oil and gas fields that have previously been uneconomic to develop. The Buoyform platform can be moved relatively easily from field to field as each is depleted. As it is a floater, it is capable of adapting to a wide range of water depths from 70 to 400 metres.

According to Aker Maritime, preliminary estimates indicate that the platform can be constructed in just 23 months – shortening the lead time to production – at a cost that is around Nkr500mn less than comparable solutions.

The Buoyform concept is partly based on the patented technology developed from the Spar platforms currently being built by Aker Maritime for use in the deepwaters of the Gulf of Mexico. It comprises a conical storage tank topped by a deck with living quarters and process equipment. It is claimed that the platform's cone shape together with its 83-metre diameter and 44-metre draught, results in smaller and calmer motions than experienced by a production vessel or semi-submersible platform. Typical heave response for the platform is in the region of 1.2 to 1.3 metres, less than half that of a semi-submersible, while its pitch in waves of 10 metres is of the order of two degrees compared to the six-degree pitch of a production vessel.

Unlike a production vessel, the new platform does not require an expensive turret to accommodate the mooring lines and risers. It is held in position by 12 conventional anchor lines, with the drillstring and risers running through an opening in the middle of the hull. 'Furthermore, the combination of drilling, processing and storage facilities avoids the need for investment in a separate storage system and in hiring a drilling rig,' comments Aker Maritime.

The platform design is relatively flexible with respect to deck load, and equipment can be changed out as required. It can also be configured as a pure drilling platform.

Statoil has been heavily involved in the development of the Buoyform concept which has been evaluated with respect to various of the Norwegian oil company's marginal undeveloped fields. Solutions evaluated to date have had a production capacity of 60,000 b/d and a storage capacity of 570,000 barrels. Aker Maritime states that the hull could be delivered from its Mäntyluoto yard in Finland which it acquired earlier this year. It is also looking into the possibility of dynamic positioning of the platform using thrusters.

The Buoyform platform

Texaco overcomes obstacles to bring in difficult North Sea field

When Texaco first approached Amoco with a view to exporting gas and liquids from its planned HP/HT Erskine field via the Lomond platform, it was bluntly rebuffed. Amoco said that, although there was spare space on Lomond, this had been set aside for two compressors to be installed in the future. But Texaco did not give up. *Neil Potter* takes up the story of the successful development of the first HP/HT gas field in the North Sea, with production on track for mid-September 1997...

Erskine, in 90 metres water depth in blocks 23/26a and 23/6b, with Texaco, operator, and BP as 50:50 partners, was discovered in 1981. It was not developed due to the lack of infrastructure for export, uncertainty over the size of the field and the technical concerns related to high-pressure/high-temperature (HP/HT) reservoirs.

The producing horizon of this gas and condensate field lies in Jurassic sandstone at a depth of 15,000 feet. Reservoir pressure is 14,000 psi with a bottom-hole temperature of 345°F. The well fluids contain 18 to 33 ppm of H_2S; 3.5 to 5.5% CO_2 and more than 90,000 ppm chlorides.

Recoverable reserves are put at over 330bn cf of gas and 75mn barrels of condensate.

According to Texaco it was changes in the North Sea industry, which provided the final impetus for development – particularly the original Crine initiative, deregulated gas sales and changes to the Petroleum Revenue Tax.

Texaco had studied various development scenarios: export via the Cod field, which lies 20 km to the east, in Norwegian waters just across the median line; south 40 km to Phillips' J-block facilities or as a stand-alone project. But all these options were ruled out as being too expensive.

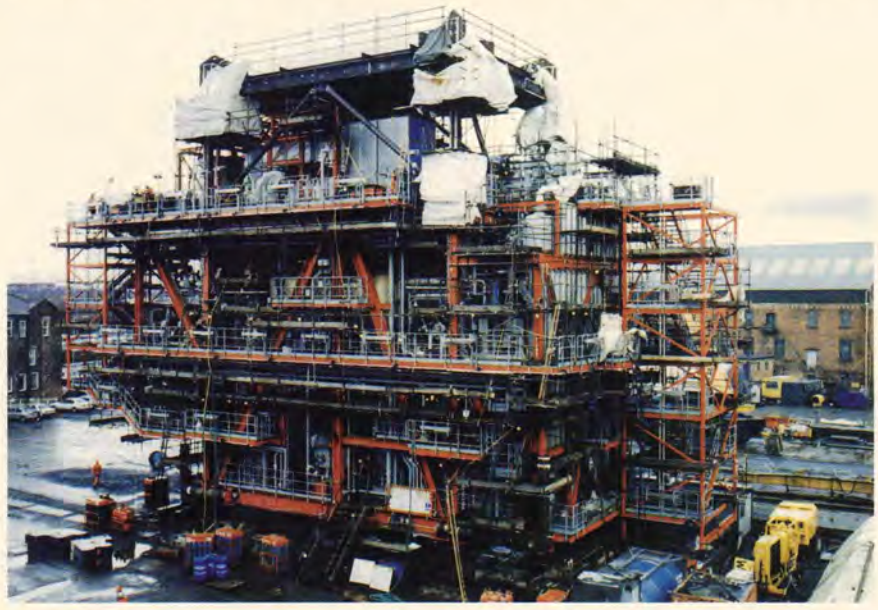
Then in 1993, Amoco developed the Everest and Lomond fields to the north and built the 395-km, 36-inch CATS pipeline system from Everest to Teesside. Texaco took a new look at Erskine and proposed installing an unmanned platform on Erskine and exporting the production to a module on Lomond for processing and export via CATS.

After the initial refusal, says Jeff Brubaaker, Principal Project Engineer on Erskine, we said to Amoco, 'You are our only hope, can't we just look into the conceptual aspect?'

Charlie Harding, Project Manager at Kvaerner H&G Offshore, which designed the process module, played a key role in persuading Amoco to agree that it was possible to reconfigure the proposed module upwards to fit into the space on Lomond and provide space on its top deck for Amoco's planned future compressor.

The £30mn development plan was approved by the government in May 1995.

Fred Gibson, Field Development Manager, claims that Erskine is some



Erskine topsides approaching completion

The jack-up *Santa Fe Monitor* which pre-drilled Erskine's wells

three years ahead of the competition in applying HP/HT technology and is setting the standard to be followed by other projects. He also says that: 'Offshore hook-up and commissioning, while very complex, is going extremely well. We are now aiming for completion and start-up in mid-September.'

The facilities consist of a normally unmanned wellhead platform, (jacket 2,720 tonnes, piles 1,090 tonnes, deck 1,510 tonnes); a 30-km, 16-inch multiphase pipeline to Lomond and a 1,330-tonne module for processing and gas compression. The Erskine platform will be controlled from Lomond, with the gas going into the CATS system and the condensate via BP's Forties System to Cruden Bay.

An Erskine topsides alliance was formed with Aker McNulty Offshore, Amoco, AOC International, Kvaerner H&G Offshore, Seaway Heavy Lifting and Texaco. The agreement established a commercial basis for sharing risk and reward among the participants. The risk and reward incentive has two components – the final cost and the completion date (commercial gas production).

But there were a number of technical and logistical challenges to overcome. Harding said that Texaco and Kvaerner H&G engineers worked together for 18 months, in both conceptual and front-end design, adding real value to the project through numerous innovations.

Gibson says that Texaco brought to the project its HP/HT expertise from the Gulf of Mexico, onshore Texas and Alabama, and elsewhere in the world.

The aim of the Erskine topside design was to minimize the exposure of personnel to HP/HT safety risks. This has been achieved by minimizing the amount of planned interventions.

The 30-km pipeline to the Lomond platform, fabricated and installed by McDermott-ETPM, is designed for operating temperatures of 145°C and is a pipe-in-a-pipe system. It has a 16-inch od inner pipe which carries the multiphase well fluids. A 24-inch carbon steel outer pipe creates a space that is filled with aluminium silicate insulating microspheres. This reduces hydrate inhibitor costs and wax deposition problems.

The process module, fabricated by Aker McNulty, had to fit into an area 9 metres by 19 metres on the host platform.

Harding says that so congested is the Lomond platform that it would have been impossible to design the module in the old-fashioned way on the drawing board. Precise CAD modelling was essential. The design of the module is a tall, thin structure – 25 metres by 10 metres and 15 metres high.

The module was installed in April by the Seaway Heavy Lifting's *Stanislav Yudin*. It was placed on the south side of the platform and skidded 25 metres across the wellbay area on drilling rig skids. It was then moved 40 metres at a right angle along skids specifically built by Aker McNulty to its location on the east side.

Iain Hutchinson, Divisional Manager of AOC International, responsible for the hook-up and commissioning, said he expects to save about 35,000 man-hours on the offshore work, due to be completed by the end of August. This, he said, at offshore hourly rates amounts to a considerable cash saving.

AOC, he said, developed a strategy based on an additional 24 beds in temporary living quarters on the main deck of the Lomond platform. More temporary living quarters for a further 40 men were installed for the final hook-up. This realized significant cost savings by negating the need for an accommodation vessel.

Significant offshore modifications had to be carried out on the Lomond platform prior to the installation of the process module, while the platform continued in production. There was a considerable amount of welding carried out on a live platform, said Hutchinson. This necessitated extra vigilance and extra fire watching.

AOC is also involved in the start-up and production trials.

The £19mn Erskine jacket, fabricated in only eight months by Lewis Offshore under sub-contract from Saipem, was installed in April 1996 by Saipem's *S7000*. The jack-up *Santa Fe Monitor* had pre-drilled and suspended three wells through the jacket by February. Total drilling costs for six wells are put at $120mn, with an estimate of 120 days to drill to 16,000 feet and each well taking another 35 days to complete.

The plan was that an additional two wells would have been drilled to the 13 $^{3}/_{8}$-inch casing point by the time of the topsides installation. When the Erskine topsides, fabricated by Aker McNulty, arrived, the drilling derrick was lifted off the jacket on to the rig. Once the deck had been installed, the derrick was swung back so that drilling could continue. It had been decided that the rig should remain on location to save drilling downtime.

The aim is to have three wells completed by 1 October 1997. The field successfully test-produced first gas from the W3 well in late July, with the second well being perforated in mid-August. The other two will be completed after the field comes onstream. Texaco plans to remodel the reservoir this year. It will then decide whether to re-enter an old exploration well, side-track it and complete as a producer, or to drill another new producer in 1998.

According to Brubaaker, the maintenance strategy on the Erskine platform, which has a temporary refuge, is to have an 18-man crew flown in from Aberdeen by helicopter, as required. Normally, he said, visits to not-normally-manned platforms are restricted to 12 people or less. But using an 18-man crew increases efficiency and exposes personnel to fewer offshore risks.

There is accommodation for 20 on board, providing for the two helicopter pilots who will remain.

First production of commercial sales gas is on schedule for October 1997. Peak production will be 120mn cf/d of gas and 29,600 b/d of condensate. Field life is put at 15 years.

Most of the gas has been sold to Scottish Hydro with the rest being split between the marketing arms of BP and Texaco.

Looking further ahead, Texaco believes that the eastern part of the reservoir, known as the Beta Terrace, could contain more reserves. But, so far no wells have yet been drilled in this part.

Tackling the take-or-pay problem

Centrica, the gas sales, trading and services company previously part of British Gas plc, has renegotiated a number of its take-or-pay contracts with North Sea gas producers since the end of 1996. The contracts – a legacy of the British Gas monopoly era – had placed an increasing financial burden on the company as it was effectively forced to pay above-market prices for gas which it did not always want to take while trying to remain competitive in a market where an ever growing number of independent gas suppliers were offering low-cost supplies. *Kim Jackson* looks at how Centrica has tackled its take-or-pay problem.

From the late 1960s, the development of the UK gas industry was supported by long-term gas supply contracts, running for up to 25 years, between British Gas – as it was known before its demerger into BG plc (responsible for the gas transportation and storage business Transco and British Gas' exploration and production, international downstream, research and technology and property activities) and Centrica – and the North Sea producers. Whole reservoirs of gas were signed up on a 'depletion basis' – ie gas would be purchased until such time as it became uneconomic for the field to continue producing.

Most of the contracts contained take-or-pay provisions under which British Gas paid annually for a minimum contracted volume of gas whether the gas was physically taken or not. Such contracts were necessary to ensure that British Gas met its monopoly supply obligations while for the producers the contracts provided a guaranteed cash-flow which underpinned investment in the UK continental shelf (UKCS). While the take-or-pay contracts were indexed against non-gas references – product price inflation (PPI) or oil prices – the prices agreed reflected the energy environment at the time.

British Gas' monopoly obligation to supply gas continued when the company was privatized in 1986. At this time, the UK Government foresaw a 25-year monopoly for British Gas to supply the bulk of UK customers.

However, in the late 1980s, following the findings of the first Monopolies and Mergers Commission (MMC) reference in 1987, steps were taken to allow easier market entry to British Gas' fledgling competitors. These included an end to British Gas' practice of buying 100% of fields on a depletion basis so as to leave some gas for its competitors in the industrial and commercial gas supply sector. British Gas was also required to give back at cost some 700mn therms of gas as part of a Gas Release Programme. As a result of these changes, the market share of the independent gas suppliers in the industrial and commercial sector increased rapidly. By June 1995 British Gas' market share in the industrial sector had fallen to 35%, well below the MMC's proposed target of 55%, and it found that it had much more gas under long-term contract than it needed.

By mid-1995, there was a national oversupply as UK gas availability was increasing faster than consumption – production increased by 87% between 1990 and 1996 compared to a 62% increase in demand in the same period. The fact that the commissioning of a number of new combined cycle gas turbine (CCGT) power stations had been delayed by technical problems coupled with a series of warmer winters exacerbated the oversupply problem and, as a result, British Gas was having to pay for its contracted gas at prices far higher than those available to its competitors.

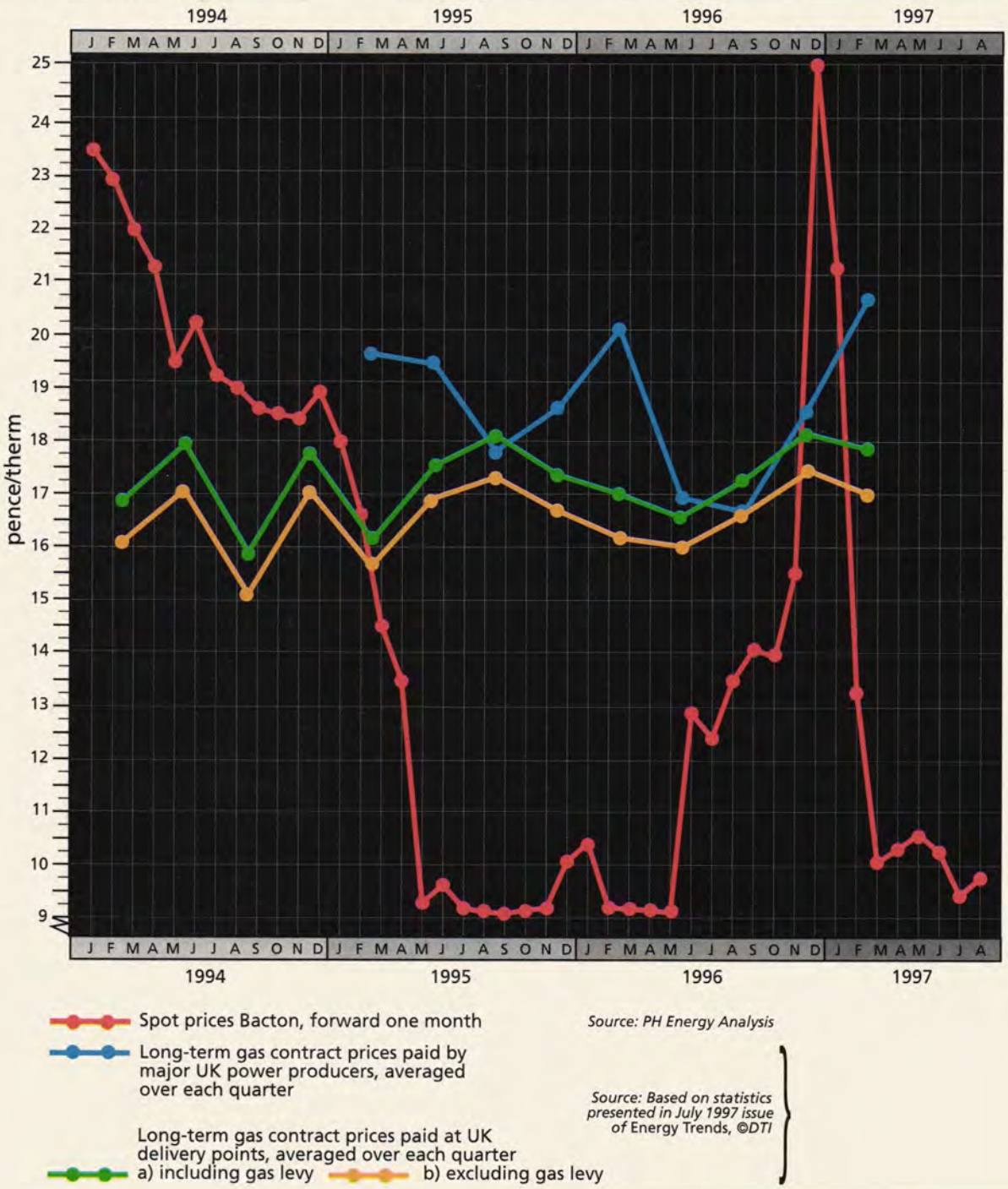
British Gas' oversupply of gas and the associated take-or-pay problem was further exacerbated by the government's decision in December 1993 to accelerate the introduction of competition into the domestic gas sector. The MMC had originally proposed that competition should be introduced gradually in this sector, completing by 2002. The Secretary of State decided to bring forward the date of full completion to 1998, starting with a pilot in 1996 (see *Petroleum Review*, May 1996). However, some 97% of British Gas' contracts had already been committed at that time.

The potential oversupply of gas, sometimes referred to as a 'gas bubble', on the UK market led to a sudden and unforeseen collapse in the spot price from 19 pence/therm at the beginning of 1995 to below 10 pence/therm at the end of the year (see **Figure 1**, red line). This compared with a weighted average cost of gas to British Gas of 19 to 19.5 pence/therm.

Take-or-pay renegotiations

In June 1995, Ofgas, the UK gas market watchdog, gave Business Gas, British Gas' industrial and commercial business, permission to suspend its pricing schedule which allowed the company to manage its market losses, and associated profit losses, more effectively. As part of this management programme, British Gas decided it needed to renegotiate its take-or-pay contracts. The demerger of British Gas at the close of 1996/beginning 1997 acted as a catalyst for such renegotiations to take place. As Nick Fulford, Assistant to the Chief Executive of Centrica explains:

Trends in UK Gas Prices since 1994



'Because the company hived off its trading activities to British Gas Trading, a subsidiary of Centrica, the contracts needed to provide a certain level of viability so that the company could trade competitively. This meant the company had to look very carefully at the price exposure and volume exposure of its take-or-pay contracts.'

The first set of take-or-pay contracts was renegotiated with British Petroleum at the end of 1996. The amended contracts – which cost the company some £293mn before tax in aggregate compensation – reduce Centrica's gas volume purchase commitments by some 2.8bn therms over the next five years and cut prices to market levels on a further 13.5bn therms over the next few years. The contracts accounted for some 10% of the gas volumes that Centrica, through its subsidiary British Gas Trading, hopes to reduce in the long term.

As can be seen from **Figure 1** it was not only in Centrica's interest to renegotiate the contracts. By the end of 1996/early 1997 the spot price had risen sharply and, although only lightly traded, were now well above long-term contract levels. The relationship between buyer and seller had now reversed from the 1995/early 1996 position to the possible benefit of producers who had cancelled volumes.

Centrica quickly followed the BP deal by reducing its long-term commitment to purchase gas volumes from Mobil through the termination of two contracts at the beginning of 1997. It also renegotiated to reduce prices to market levels on a phased basis on three other contracts during the next few years. In total, the agreements allowed Centrica

to reduce its price and volume commitment on some 10bn therms.

In consideration for the renegotiation, BG plc transferred to Mobil North Sea producing and transportation assets in and around the Beryl field. These assets comprise 5% of the Beryl field, 29.5% of Block 9/12a containing the Nevis field and 2.5% of the Scottish Area Gas Evacuation (SAGE) pipeline system. In all, the assets transferred provide Mobil with an extra 27mn boe in reserves and increase daily oil and gas production by approximately 9,000 boe. The total cost of the restructured Mobil contracts has been estimated at £341mn.

Commenting on the deal at the time, John Cousins, Chairman Mobil North Sea said: 'This is an agreement that benefits both parties as well as the UK gas industry as a whole. It gives Mobil increased oil and gas reserves and production in our core Beryl area. At the same time, it frees up gas enabling us to meet the needs of our expanding customer base.'

In July 1997, Centrica renegotiated its North Sea take-or-pay gas supply contracts with Beryl field partners Amerada Hess, OMV and Enterprise Oil. Taken together with previous contract renegotiations, the deal, which is effective from 1 October 1998, reduced Centrica's price and volume commitments on more than 30bn therms.

This latest deal provides the Beryl partnership with the opportunity to enhance oil recovery and will enable the three companies, together with Mobil, the field operator, to make more efficient use of the Beryl area infrastructure. Subsequent to the renegotiation, Amerada Hess and Enterprise Oil have entered into agreements to increase their interests in oil and gas assets in the Beryl field to 22.22% and 22.78% respectively. Amerada Hess and Enterprise have also acquired additional interest in the major transportation assets associated with the Beryl field, including the Sage pipeline system and onshore terminal.

According to Nick Fulford, Centrica is now 'significantly more comfortable on the volume side' than when it first embarked on the renegotiation process. As a result, it is likely that future renegotiations on take-or-pay contracts will focus more on price.

However, Centrica does not plan to renegotiate all its take-or-pay contracts. 'Ours is a business of hedging and risk management,' comments Fulford. 'It would not make economic sense to renegotiate all our take-or-pay contracts even if we had the opportunity to do so. There is a possibility that the spot gas prices may rise substantially again. What we need to do is introduce sufficient stability and certainty so that under most scenarios the company will not be subject to unreasonable business risks.'

A stabilizing influence

Demand for gas in the UK has risen by 62% in the past six years, largely because power generators and industrial energy users have switched to natural gas which now costs industrial users half what it did a few years ago. The biggest rise in demand, 17.3%, took place between 1995 and 1996 as the delayed CCGT power station projects came onstream. This positive trend looks set to continue as yet more industrial users install gas burning power generators and domestic usage picks up.

The UK gas market is also set to be linked into Europe once the UK-Interconnector opens in 1998. Running from Bacton in Norfolk, to Zeebrugge in Belgium, the 238-km, 40-inch diameter pipeline will connect the gas supply grid of the UK to that of continental Europe. It is being built by a consortium of nine companies: BG, Amerada Hess, BP, Conoco, Distrigaz, Elf, National Power, Gazprom and Ruhrgas. Centrica has contractual rights to some of BG's 8bn cm of the Interconnector's 20bn cm capacity. The immediate effect of creating an export route for UK gas supplies is that excess production potential no longer leads to a downward pressure on spot prices.

Nick Fulford expects that the Interconnector may well act as 'a stabilizing influence' on gas prices in the UK, and may even bring them up slightly. 'Gas traded on the European market, which is some seven to eight times that of the UK, is still broadly speaking done on a long-term basis with gas indexed against oil and, as a result, prices are typically slightly higher than in the UK.'

Although the line is not due to open until 1998, British Gas plc signed its first contract to supply gas through the Interconnector in July 1996. Under the terms of the agreement, the company will supply Wingas of Kassel, Germany (the joint venture of Wintershall and Russia's Gazprom) with over 20bn cm over 10 years.

This was followed by the signing of a contract between Thyssengas of Germany and Centrica in May 1997 under which Centrica will supply up to 2bn cm of gas over a seven-year period.

A further contract was signed in July 1997 between Centrica and the fuel purchasers for the Elsta cogeneration project in the Netherlands. Under the agreement, Centrica will supply some 1bn cm/y of gas to Inkoopcombinatie Elsta, which buys electricity and steam from the Elsta project on the Dow Benelux site at Terneuzen, for an eight-year period. The deal represented the first agreement that Centrica had signed to supply direct to a major continental European end-user, rather than a gas trading/transmission company. It also represented the first UK gas export sale to a power project in Europe.

The Frigg factor

The Frigg pipeline, which lands gas at St Fergus in northeast Scotland, may influence UK gas prices following the renegotiation of the Frigg Treaty earlier this year. There had been a stand-off between the UK and Norwegian government over the Frigg Treaty which stipulated that only gas from the Frigg field, one-third in UK North Sea waters and two-thirds in the Norwegian sector, be piped through it. However, the field is now largely depleted and thus volumes transitting the pipeline were minimal. The Norwegians wanted to use the pipeline to transport gas from their other gas fields to the UK market – only a few additional kilometres of pipeline are necessary to link fields such as Sleipner to the Frigg line – but the UK government was reluctant as it did not wish to increase the country's dependence on gas imports. The Interconnector link has helped resolve this impasse by opening the European market to the UK gas producers.

Looking to the future

Looking to the future, Nick Fulford predicts that gas marketers will rethink the balance and make-up of their gas trading portfolios over the next few years. He envisages that, typically, they might look to have roughly one-third of their portfolio made up of reasonably long-term contracts (5 to 10 years), possibly indexed against a non-gas parameter with price reopeners, one-third comprising short-term contracts of less than 12 months duration and the remainder traded on a very short-term basis capable of responding quickly to market demands.

What we haven't got yet, but need, is some way of pricing gas effectively at the market,' he adds. 'But before that can happen, we need much more liquidity in the gas market. In terms of generating this liquidity, I think the financial players will increasingly enter the market, essentially trading non-physical trades, swaps and futures.'

Another interesting point that Fulford highlights is the fact that the UK gas market is commercially driven whereas much of the European market has been driven by 'engineering needs to optimize network flow'. He envisages that once the UK has direct access to the Continental market, the European gas marketers may well have to rethink their business philosophy. This could well provide the potential for the UK to export its commercial marketing expertise as well as its gas.

REPORT Technical

Upstream

As part of the continued drive to increase industry participation in, and awareness of, the standardization work of ISO/TC 67 a further page has been added to the IP web site [http://www.petroleum.co.uk/petroleum/]. It is entitled *Oil Industry Standard (Upstream)* and includes background information on ISO/TC 67, CEN/TC 12, PSE/17 and the role of the IP. The concepts of *Review Networks* and *Lead UK Experts* are also detailed. A listing of all draft standards that are currently available for comment is being maintained on this page.

The IP has become the custodian of the CRINE Functional Specifications and Common Working Practices. An active interest in the documents is reported. The Standard Contracts have now been published and were launched in Aberdeen and London in June 1997.

The contract with the Health & Safety Laboratory at Buxton to carry out the experiment on a full scale shell and tube heat exchanger was signed in May. Fabrication work at Motherwell Bridge Thermal in Scotland is nearing completion.

Environment

The Environment Committee continued to review with UKPIA opportunities for partnership in the development of a programme of activities and research for the period 1998–2000.

The text of a *Sector Application Guide for ISO 14001 for the Marketing and Distribution of Petroleum Products* has been finalized and is scheduled for publication in the 3Q1997.

Aviation

Contracts have been signed for three 1997 research projects. The first is the continued involvement of the IP in the development of the API 1581 4th Edition and will include testing of the new filtration protocols to be used in this specification and also the IP Microfilter Specification. The second project is an investigation into the effectiveness of hydrant pipeline gradient in generating self-cleaning of systems, and the third will provide an assessment of the performance of filter monitors in aviation fuels containing Fuel System Icing Inhibitor (FSII).

A consultant has been nominated to an API work group established to carry out a review of API Bulletin 1584 *Four-inch Hydrant System Components and Arrangements*. The IP document *Aviation Hydrant Pit Systems – Recommended Arrangements* could possibly be incorporated into the revised API Bulletin.

Test Method Standardization

The text for ISO 13726 Flash Point by the Abel method for aviation kerosine and low-flash petroleum products such as white spirit has been finalized.

Three new ISO/IP tests for the determination of water by Karl Fischer are under evaluation by round robin.

Microbiology

The first stage of a research project for the development of a Biovulnerability Test for petroleum products was developed. This programme is being funded by DGMK and managed by the IP.

Refining and Marketing

PESC has adopted the proposal from the Electrical Committee for the establishment of industry specific NVQs for electricians and electrical technicians.

A joint industry Environment Agency position has been agreed on how the DoE Pollution Control Regulations proposals may be progressed.

An HSE draft document to replace the two separate guidance HS(G)50 and 52 for large and small storage installations has been reviewed and comments submitted.

The IP Secretariat has been heavily involved in revising the industry technical guidance for Service Stations HS(G)41 following the 1996 consultation. This is now ready for final review by the industry Technical Co-ordinating Body.

The Work Control Procedures with Service Stations have now been finally agreed and will be published as part of the *Contractors Work Procedures at Service Stations* guidelines.

Arrangements are being made to carry out in October 1997 trials of the test protocol to determine the maximum number of leading arms that can fill gasoline road tankers simultaneously.

A WG has identified the safety features not required by the new Carriage of Dangerous Goods Regulations, but thought necessary in petroleum operations. These will be developed into a replacement for the Road Tank Wagon Code.

An analysis of vapour concentrations in collection headers has been carried out to provide guidance on the periods of time that the concentration is within the flammable range. This information is a critical element in the risk assessment process to determine whether detonation arresters should be installed.

A first draft of the *Procedures for Duty Reclaim on Recovered Vapour at Bonded Locations* has been completed for panel review before submitting to HMC&E for agreement.

The final meeting of Electrostatic Guidelines WG was held, and document reissued for comment.

IP comments on proposed guidelines for *Additive Criteria for Multi-Product Pipelines* are being reviewed by UKPIA/IP. This document will be published in the 3/4Q1997.

The guidelines on *Access to Top of Road Tankers* has been completed and will be published in the 3Q1997.

Health

For security reasons and ease of access approximately 100,000 documents used in the Epidemiology Study are to be scanned on to CD-Rom. Contracts are currently being negotiated for this work. Following scanning the documents will be archived.

Comments have been received from HSE and Associated Octel on the guideline for the declassification of tanks which are currently in leaded service. Publication is scheduled for the 3/4Q1997.

Measurement

Petroleum Measurement Manual Part VII, Density, Sediment and Water: Continuous Density Measurement has been completed. This is currently scheduled for publication in the 3Q1997.

A Petroleum Measurement Paper – Temperature Corrections in Tank Calibration and Gauging which will be published jointly with API has been reissued for comment.

John Hayes,
Technical Director

Facing down the Millennium Bug sooner rather than later

Wayne Dresser, the petrol pump and forecourt equipment manufacturer, is actively tackling the problem of the so-called Millennium Bug in cooperation with its suppliers.

Andy Cullen, Wayne's Management Information Systems Manager, says: 'This is not a problem for the year 2000, it's a problem right now and companies cannot afford to have a head-in-the-sand attitude hoping that it will go away. It's one of the most significant challenges ever faced by industry. I'm shocked to hear of statistics that claim 90% of UK organizations are failing to face up to the problem.'

The company has set up a Year 2000 Task Force whose mission is to prepare the organization for a smooth IT transition into the next millennium.

Cullen continues: 'We've been fortunate in securing the support of senior management from the outset, without this the task would be impossible, yet I know of companies where this endorsement has been lacking.

'The Year 2000 Task Force has been made up of staff from all departments, and we have publicized its work internally to get all personnel involved. It is important to enlist the help of staff and impress on them the urgency and seriousness of the matter.

'Our first priority has been to make sure that our own products are year 2000 compliant. We supply petrol pumps and IT systems for service stations and it was imperative that our products be ready for the date change. The sites we supply would not be happy if they were unable to do business on 1 January 2000.

'However, as a responsible business we also contacted our customer base and our own suppliers alerting them to the year 2000 problem and reminding them to carry out their own checks. This in itself was revealing – many didn't even know that there was a problem.

'We've not just looked at the products that we sell; in house we have had to carry out an inventory of all the computer systems that we use (hardware, operating software, networks and applications), also security systems, telephone systems and basically anything else that can be controlled electronically. This is why internal promotion of our work is important; the assistance of staff is invaluable and makes the job so much easier. The year 2000 Task Force has been busy looking at the implications and finding solutions for our internal systems for accounts, purchasing, stock control, etc. Regular meetings are held with a note taken of actions required. We are getting over the problem in a systematic and methodical manner.'

Cullen offers some advice to others: 'There's a lot of scaremongering going on and talk of a timebomb. In part this is justified as those companies which refuse to come to grips with the problem will be crippled. However, a calm, concerted effort to assess your own situation and look for solutions will save a lot of pain later.

'Also, for relevant companies, ensuring that what you supply is itself year 2000 compliant will receive the thanks and long-term good will of your customers.

'We are not finished yet but are the best part of the way there. Certainly there is some comfort in the knowledge that for us things are moving. Alarmingly, few companies can say that.'

Summing up his words of caution, Cullen has the following 'tips for action':

- Act now – start an inventory.
- Include all departments.
- Get backing from senior management.
- Check both what you sell and what you use internally.
- Be a good neighbour – remind customers and suppliers that they have got to get their house in order too. (If they don't you might be adversely affected.)
- Plan to complete your Year 2000 project by the end of 1998 so that you are running 'live' for at least 12 months before 'the moment of truth'.
- Don't sit and wait for someone else to find a solution – you've got to find your own.

Tel: +44 (0)1875 402190
Fax: +44 (0)1875 400010

Petroleum Review is always pleased to publicize the work being done by suppliers to the oil and gas industry to overcome the so-called Millennium Bug, as lack of knowledge of the problem and solutions to it remain a considerable threat to the economic well-being of the industry.

Japanese approval first

UK company Tescom Corporation has announced that its range of pressure control equipment has been approved by the Japanese Ministry of International Trade and Industry (MITI).

According to the manufacturer, it is the first foreign company in the world to achieve such certification to the Fifth Procedural Manual of the Japanese High Pressure Gas Safety Laws.

The company will be exhibiting for the first time at Offshore Europe '97, held in Aberdeen on 9–12 September, and can be found at Stand 359 (Red Zone).

Tel: +44 (0)1236 440884
Fax: +44 (0)1236 434740

Helideck sound system makes birds fly for cover

Birds roosting on platform helidecks cause a number of problems for the offshore industry: droppings obscure helideck markings, helicopter landings have to be aborted when birds do not vacate the area, visiting crew are exposed to potential diseases which have been found in gull guano such as 'E' Colli and Salmonella, maintenance and refurbishment costs increase as the droppings have to be periodically cleaned off the helideck, and there is the potential of a bird striking incoming aircraft and causing an accident.

The Gull Scat™ offshore bird deterrent system from J B Offshore has been designed to keep the helidecks of normally unmanned installations clear of birds and open for 24-hour helicopter access.

The device creates a constantly changing, audibly hostile environment which unsettles the birds. They are unable to habituate to the sounds and roost elsewhere, states the manufacturer.

The system was tested on two platforms in 1995 in the Southern North Sea, both of which had just cleaned and refurbished their helidecks. One deck had the system fitted to it, the other acted as a control for the trial. One year later, the control deck was covered with guano to a depth of some inches while that fitted with Gull Scat remained clear.

J B Offshore will be exhibiting at Offshore Europe '97, Stand 331 (Red Zone).

Tel/Fax: +44 (0)1493 750088

NEWS Technology

New pressure seal cuts oilfield project costs

A new 'O'-ring seal designed to offer cost savings by speeding up time to commissioning by reducing the time spent on having to slowly pressure up new downhole equipment, has been unveiled by Economos UK.

The normal process of testing new oilfield hydraulically operated equipment, known as ramping, requires the pressure to be gently raised at lengthy intervals to enable the system and its seals to stabilize gradually.

A new polyurethane sealing material with good hydrolysis and wear resistance and low differential pressure sealing performance was chosen to overcome the limitations of conventional seals.

However, while the H-Ecopur material provided good dynamic sealing force and less seal deflection, it proved to be harder and more stable than traditional sealing materials and the resulting expanded contact area produced unacceptable sealing forces and friction values.

This problem was overcome by the addition of a groove in the seal to control the direction of H-Ecopur's elasticity – the new T-section design directs the material to spread out and fill the seal groove.

New 'O'-ring seal

The new seal is capable of handling dynamic application pressure ratings of 500 bar with standard extrusion gaps and 1,500 bar with minimum gaps.

Economos will be exhibiting at Offshore Europe '97, Stand 867 (Blue Zone).

Tel: +44 (0)1753 696565
Fax: +44 (0)1753 696181

Emperor cable cleat unveiled

Ellis Patents – the Malton, North Yorkshire-based manufacturer of electrical cable fixings, cable clamps and jointers' tools – has entered into a new market sector with a stainless steel trefoil cleat specifically developed for cable fixing applications in the offshore and onshore oil and gas sector.

The patented Emperor cleat is available in both single-bolt and two-bolt fixing versions. It is light and compact with a wide aperture when opened out for ease of cable fitting.

The framework is manufactured from 316 stainless steel to provide protection from corrosion while the inner liner is made from an LSF polymeric material which not only ensures minimum damage and protection if a short-circuit failure occurs but is also flame retardant and does not give off smoke and fumes in the event of a fire, claims the manufacturer.

The unit can accommodate a wide range of cables – from 24mm outside diameter (od) to 82mm od as standard but can be tailored to handle 117mm od cables for special applications.

Ellis Patents will be exhibiting at Offshore Europe '97, Stand 508 (Blue Zone).

Tel: +44 (0)1944 758395
Fax: +44 (0) 1944 758808

Pipeline protection caps offered with a flare

Kidlington, Oxfordshire-based Moss Plastic Parts has upgraded its SR1358 range of pipe protection caps. All caps in the range with diameters from 14-inch up to 64-inch now feature a flared lip designed to make fitting an easier process.

The standard material on these sizes has also been changed from low density polyethylene to highly flexible PE/EVA which not only makes the caps easy to fit and remove, but also reduces distortion when they are packed for storage and transportation. The PE/EVA material is also suited for low temperature applications down to –40°C.

Designed to protect the internal bore and bevel of metal pipes and tubes to DIN and ANSI specification, the SR 1358 range also incorporates split ribs moulded circumferentially on the inside of the cap, which act as a tolerance band to ensure a snug fit and also allow trapped air to escape making them easier to fit. Versions with an optional vent hole are also available to release internal pressure in warmer climates.

Pipeline protection caps

Moss Plastic Parts will be exhibiting at Offshore Europe '97, Stand 1105 (Blue Zone).

Tel: +44 (0)1865 841100
Fax: +44 (0)1865 370135

IP News

NEW MEMBERS

Mr E F Allen, TDG Pinnacle Storage
Mr J D Anderson, Warren Rogers Associates
Mr O K Ashiru, London
Dr H Badra, Banque Paribas
Ms M E Boulton, Forecourt Trader
Mr M C Bowen, Thomas Miller & Company Limited
Dr D J Bower, Arbroath
Mr J K Braithwaite, Ingatestone
Mr R Bruce, Telford
Mr D Butler, Arthur Andersen & Company
Mr D B Capitanchik, Aberdeen
Mr C Capsoni, ENI (UK)
Mr D W Challinor, Shrewsbury
Mr P J Cochrane, Babcock Rosyth Defence Limited
Mr D Connelly, CMP Limited
Mr S Davies, Corporate Intelligence
Mr C J Dawood, ITS-Caleb Brett
Mr D J Deacon, GWS (UK) Shopfitting Limited
Mr B Demba, Senegal
Mr D J Docherty, Milford Haven
Mr I Dunleavy, Tullow Oil plc
Mr M Foltynowicz, Poland
Mr A V Fomin, Oil & Gas JSC Slavneft
Mr P K Galvin, Anadarko
Mr M H George, Milford Haven
Mr D R Goldie, Reading & Bates (UK) Limited
Mr I Gordon, Winchester
Mr K A Green, Doncaster
Mr R J Guebert, Energy Services Limited
Mr A Hanna, Andersen Consulting
Mr P Harding, ARCIRIS Limited
Mr L G Hendry, Dango Training Services
Mr M D Heughan, Theydon Bois
Mr B Hurworth, James R Knowles Limited
Mr S L Johnson, Banque Paribas
Mr A N Juma, Malawi Government-Ministry of Energy
Mr S Kanchwala, Sharjah National Lube Oil Company Limited
Dr B Knox-Holmes, Baker Hughes Process Systems
Mr J J A LeTourneur, Five Anchors Group
Mr M J Madden, M J Madden Consultancy Services Limited
Mr C Matheson, Inverness
Mr A S Mathieson, Aberdeen
Mr G A McIntosh, Aberdeen City Council
Mr J G Mitchell, Scottish Enterprise Operations
Miss B A Mustapha, Shell Petroleum Development Company
Mr M C Nelson, Inland Revenue
Mr M Niemann, Germany
Mr G N Olafsen, Marsoft International AS
Mr N E V Perry, Croydon
Mr D Reading, Potterton
Mr D I Richardson, Peterborough
Mr R Schouten, Andersen Consulting
Mr L Smith, Banbury
Mr K K Srinivas Iyangar, Kaveri Baag Corporation
Mr C H Steyn, Sasol Oil (Pty) Limited
Mr T V N Tuft, VeeTee Consultants Limited
Ms T Vernel, Andersen Consulting
Mr C M Vinhas, Damena
Mr L Wark, Booz Allen & Hamilton
Mr J A T Woods, EMA

STUDENTS

Mr C Emele, London
Mr H Kanjer, Middlesex
Mr P Rattigan, Liverpool
Miss N L Thomas, London

NEW CORPORATES

PetroStudies HB, Sjoblads vag 17, 21370 Malmo, Sweden.
Representative: Mr E J Magnusson
PetroStudies HB is responsible for research and consulting with regard to all upstream and downstream activity of the oil and gas industry. Their client base extends across 30 countries.

Federation of Petroleum Suppliers, Ellesmere Chambers, 136 Ellesmere Centre, Walkden, Manchester M28 3ZD, UK.
Representative: Ms S Hancock
The Federation of Petroleum Suppliers is the trade association for oil distributors in the UK and Eire. It provides its members with a collective voice for the industry at national level and business and information services to assist members in optimizing the efficiency of their operations.

Kvaerner Oil & Gas Ltd, Trafalgar House, Hareness Road, Altens, Aberdeen, AB12 3RB, UK.
Representative: Mr S R Fudge
Kvaerner Oil & Gas Ltd (KOGL) is a fully integrated company that provides a complete range of services for the oil and gas industry from front end studies and engineering through fabrication to maintenance, operational support and ultimately decommissioning.

BT Global Energy, 59 Delahays Road, Hale, Altrincham, Cheshire WA15 8JH, UK.
Representative: Mr Andrew Laurie
BT Global Energy has a large team with considerable oil industry expertise located around the world. Its aim is to help oil industry customers operate more effectively, through innovative business solutions, a partnering approach and extending the reach of businesses to meet all their customers' communications and IT needs.

NEW FELLOW

Dr Mark Moody-Stuart, FInstPet
Dr Moody-Stuart became a member of Shell's Committee of Managing Directors in 1991, when he was the Co-ordinator of Exploration and Production, based in the Hague. He gained a doctorate from Cambridge University, based on research into the Devonian sediments of Spitsbergen. Dr Moody-Stuart's whole working life has been with Shell, largely working in countries outside Europe. Practical experience gained in Spain, Oman, Brunei and Australia was, in 1976, focused on the challenge of leading Shell's teams in exploring the UK North Sea. He headed up the Shell effort at a time when the first large fields in the northern North Sea were coming onstream and major new exploration plays were being developed. After this he moved into senior management, working in Africa, Europe and Asia. As Shell's most senior manager in Turkey and Malaysia, he was involved in developing Shell's businesses in those countries, working with national governments to initiate a number of major projects. At the start of the 1990's, Dr Moody-Stuart returned to Europe, to the Hague, to take up the position of Co-ordinator of all Shell's exploration and production operations outside North America. He became Chairman of the Shell Transport and Trading Company plc early this year. Dr Moody-Stuart is an active member of the Institute.

AROUND THE BRANCHES

Essex Branch
8 October: *LPG – Liquid Under Pressure*
David Hepworth, Conoco

The full branch programmes will be published in October.

MOVES People

Clive Bainbridge (top), Director of Offshore Services in Lloyd's Register, retired on 1 August 1997 after 26 years' service. He joined the company in 1971 and spent his career in Offshore Division. His responsibilities have been passed on to *Tony Sanders*, Director of Industry Division, who became Manager of Offshore Division in 1990 prior to his current appointment in 1993.

Weatherford Enterrra Compression Company has named **Ron Swank** as Senior Vice President, Sales and Operations. He will be responsible for sales and marketing for all the company's products from gas compressor frame and cylinder sets to used compression equipment and international business. He will report to **Bob Vilyus**, President and General Manager of the company.

Arco Senior Vice-President **Kenneth R Dickerson** has elected to retire at the end of 1997 after 34 years of service with the company. For the last nine years he has directed Arco's External Affairs operations. He is succeeded by **Mark L Hazelwood**, who was elected Arco Senior Vice-President by the Board of Directors in July 1997.

Eric Woolley has been appointed Financial Director of the Expro Group, where he will deal with the group's global financial management. His previous position was as Finance Director of Vibroplant.

Atlantic Power has appointed *Malcolm Gourlay* as Deputy Chairman and Non-Executive Director. He was previously at Clyde Petroleum where he spent 23 years as a founder Director, Chief Executive and then Chairman of the company before its take-over earlier this year.

Eric Grimshaw has joined Syntroleum Corporation as Vice-President and General Counsel. In this newly created position he will be responsible for all of Syntroleum's legal affairs including the company's growing gas to liquids technology licensing, as well as corporate and project finance activities.

Asx-Maple Oil NL has appointed **Bruce Atkins** as Manager, Exploration and Production, and **Barry Wells** as Manager, Finance and Accounting. They will be based at the company's head office in Sydney.

Donne W Pitman and **Tony Mackintosh** have been appointed Non-Executive Directors to the Board of Avalon Oil. Pitman, who is based in Tulsa, Oklahoma, is also a Director of Chapman Exploration Inc. Mackintosh, who is based in London, was formerly an Executive with British Petroleum.

Conoco UK Ltd has made a number of changes to its management team. *Carin Knickel* (top) succeeds *Glen Bishop* (below) as General Manager, Business Development and will be based in Aberdeen. Bishop takes up the position of General Manager, International Exploration. Both will report to *Dr George Watkins*, Chairman and Managing Director. *Phil Close* (right), currently Manager, New Ventures, has been appointed Manager, Operating Unit and will report to Bishop. *Bob Pelzer* (right) will become General Manager of Conoco's legal and security department. He succeeds *Frank Gannon* who is retiring after 27 years' service.

The new Chair of Conoco Exploration Production Europe Ltd is *Tom Knudson* who succeeds *Roger Abel*. Knudson is transferring to London from Houston, Texas where he held the position of Vice-President and General Manager for natural gas and gas products for Conoco Inc.

Repsol has appointed four new members to its Board of Directors. They are: **Gonzalo Anes, Ignacio Bayon Mariné, Juan Antonio García Díez** and **Antonio Hernández-Gil Alvarez-Cienfuegos.**

Jean-Michel Muls has taken up the post of Managing Director and Chief Executive of Fina plc. Since 1995 Muls has held the position of Managing Director, Fina Exploration Norway and Norske Fina. He has succeeded *Henrique Bandeira Vieira* who has taken up overall responsibility for the marketing of petroleum products.

Brendan Monaghan, David Hall and **Roger White** have all been appointed Principals of Golder Associates (UK), and **Bob Pine** has been appointed Associate.

Casebourne & Turner has promoted **Stephen Findlay** to the position of Partner, with full managerial and operational responsibility of its Liverpool office.

Former Health & Safety Executive Inspector *Neil Edmunds*, has been appointed Corporate Safety Manager of Atlantic Power. His responsibilities will be to maintain the highest levels of safety throughout the company's operations both at home and overseas.

EVENTS Forthcoming

September

9–12 **Aberdeen**
Offshore Europe '97
Details: SPE, 4 Mandeville Place, London W1M 5LA, UK.
Tel: +44 (0)171 487 4250
Fax: +44 (0)171 487 4229

13–15 **Romania**
3rd Black and Caspian Seas Conference on Petroleum Geology and Hydrocarbon Potential
Details: Ms Joanne Norris-Smith, Petroconsultants, Geneva, Switzerland.
Tel: +41 22 721 1745
Fax: +41 22 721 1747
E-mail ird@petroconsultants.com

14–17 **Dubai**
Pipetech '97
Details: Dubai RAI, PO Box 9225, United Arab Emirates.
Tel: +971 4 319444
Fax: +971 4 319011

15–16 **London**
Financing Oil & Gas Projects in the Middle East
Details: IBC Financial Focus, 57–61 Mortimer Street, London W1N 8JX, UK.
Tel: +44 (0)171 453 2703
Fax: +44 (0)171 323 4298

16–17 **Tbilisi, Georgia**
TransCaucasus '97
Details: ITE, 112a Shirland Road, London W9 2EQ, UK.
Tel: +44 (0)171 306 0033
Fax: +44 (0)171 306 0358

18 **London**
Legal and Commercial Issues in Pipeline and Terminal Infrastructure Agreements
Details: Langham Oil Conferences, 37 Main Street, Queniborough, Leicester LE7 3DB, UK.
Tel: +44 (0)1509 881022
Fax: +44 (0)1509 881576

18–19 **London**
Investing in Kazakhstan
Details: IBC Financial Focus, Gilmoora House, 57–61 Mortimer Street, London W1N 8JX, UK.
Tel: +44 (0)171 453 2703
Fax: +44 (0)171 323 4298

18–19 **Moscow**
Investing in Russia's Oil Refineries
Details: IBC UK Conferences Ltd, Gilmoora House, 57–61 Mortimer Street, London W1N 8JX, UK.
Tel: +44 (0)171 453 2160
Fax: +44 (0)171 631 3214

18–19 **Kuala Lumpur**
22–23 **Bali, Indonesia**
Production Sharing Contracts & International Petroleum Fiscal Systems (PSC '97)
Details: Conference Connection Administrators Pte Ltd, 15a Goldhill Centre, Thomson Road, Singapore 307606.
Tel: +65 356 0960
Fax: +65 356 0962
E-mail: cconnect@pacific.net.sg

22–23 **London**
Petroleum Trading and International Law
Details: Abacus International, 214 Inchbonnie Road, South Woodham Ferrers, Essex CM3 5WU, UK.
Tel: +44 (0)1245 328340
Fax: +44 (0)1245 323429

22–23 **London**
Implementing Dynamic Risk Management in the Oil & Gas Industry
Details: ICM Marketing Ltd, 5 Cavendish Square, London W1M 0BX, UK.
Tel: +44 (0)171 436 5735
Fax: +44 (0)171 436 5741

22–24 **Aberdeen**
Safety Culture in the Energy Industries
Details: Conference Registrar, Energy Logistics International Ltd,

IP Conferences and Exhibitions

IFEG Conference

Re-Engineering the Energy Information Service

London: 6 November 1997

- Knowledge Management
- Professional and personal competencies
- Business process re-engineering
- Intranets

and other technological developments are changing the way information services for the energy industry are organized and managed. Information professionals and their employers need to understand their impact. This Conference will translate management jargon into practical action.

International Conference

The World's Your Oyster: New Opportunities for Upstream Oil and Gas

London: 18 November 1997

The structural changes wrought in the oil and gas world during the nineties have far reaching consequences for service providers and contractors as well as oil companies. A positive view of the future by analysts coupled with a renewed appetite for investment in the sector by the banks have created significant new opportunities for upstream oil and gas. This Conference will consider these issues from the standpoint of oil companies, operators, contractors and financiers.

To obtain copies of the programmes and registration forms when published, please contact: Conference Department, The Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR Tel: +44 (0)171 467 7100 Fax: +44 (0)171 255 1472 E-mail: lis@petroleum.co.uk Internet Address: http://www.petroleum.co.uk/petroleum/

EVENTS Forthcoming

Europower House, Lower Road,
Cookham, Berkshire SL6 9EH, UK.
Tel: +44 (0)1628 525492
Fax: +44 (0)1628 521928

23 **London**
Latest Developments and Applications of Metocean Services for Operations Offshore
Details: The Institute of Marine Engineers.
Tel: +44 (0)171 488 2084

24–25 **Southampton**
Unmanned Underwater Vehicle Showcase
Details: Spearhead Exhibitions Ltd, Ocean House, 50 Kingston Road, New Malden, Surrey KT3 3LZ, UK.
Tel: +44 (0)181 949 9222
Fax: +44 (0)181 949 8186

24–25 **London**
Automotive, Aviation and Marine Fuels
Details: Abacus International, 214 Inchbonnie Road, South Woodham Ferrers, Essex CM3 5WU, UK.
Tel: +44 (0)1245 328340
Fax: +44 (0)1245 323429

29 **London**
Doing Business with Venezuela
Details: The Economist Conferences, 15 Regent Street, London SW1Y 4LR, UK.
Tel: +44 (0)171 830 1047
Fax: +44 (0)171 931 0228

29–30 **London**
European Power Summit
Details: Peter Fusaro, Global Change Associates, 20 Harwood Avenue, White Plains, NY 10603, US.
Tel: +1 914 949 6798
Fax: +1 914 948 5301

29–1 October **Hertfordshire, UK**
9th European Gas Contracts Negotiating Workshop
Details: Langham Oil Conferences, Ltd, 37 Main Street, Queniborough, Leicester LE7 3DB, UK.
Tel: +44 (0)1509 881022
Fax: +44 (0)1509 881576

30–2 October **Singapore**
ASME Asia '97 Congress & Exhibition
Details: IGTI
Tel: +1 404 847 0072
Fax: +1 404 847 0151
E-mail: moores@ASME.org1

October

1–3 **Aberdeen**
The E&P Business Game
Details: MD Consultancy (UK) Ltd, 18a Carden Place, Aberdeen AB10 1UQ, UK.
Tel: +44 (0)1224 626268
Fax: +44 (0)1224 626950
E-mail: 106334.2720@compuserve.com

World Tribology Congress
8–12 September 1997

At Westminster Central Hall and IMechE Headquarters
London

Organized by the Tribology Group of the Institution of Mechanical Engineers, the first World Tribology Congress has the full support of more than 30 associated bodies worldwide. The five-day Congress will include more than 350 oral presentations by speakers from over 50 countries. In addition, there will be an exhibition and around 600 poster contributions.

Sponsored by NSK-RHP, AEA Technology, GKN and Climax Molybdenum.

For further information, please contact:
Fiona Bangs, IMechE,1 Birdcage Walk, London SW1H 9JJ, UK
Tel: +44 (0)171 973 1249
Fax: +44 (0)171 222 9881
E-mail: wtc@imeche.org.uk

IP Conferences and Exhibitions

3rd International Conference on

Logistics – Competitiveness through Innovation
London: 27 November 1997

In reviewing the logistics of petroleum products from the refinery to the end user via bulk storage terminals, this Conference will focus on those links in the chain where value can be added, through new technology, developments in IT, outsourcing and rationalization. It will be of interest to oil company general managers, strategists and planners as well as contractors, equipment suppliers and service companies.

Conference and Exhibition on

Oil Spill Response – The National Contingency Plan
London: 10–11 March 1998

In recent years, the UK has suffered two large oil spills. One of these involved the largest shore-line clean-up in the UK since the *Torrey Canyon* incident over 30 years ago. In the light of these incidents, the National Contingency Plan has been reviewed and revised, and at the same time, there have been many new innovations to oil spill response on the international scene.

This Conference will address the key issues affecting all those involved with oil spill response in the UK and will attract representatives with a common interest in Oil Pollution Control, representing the Maritime Counties, Regions, Districts and the Port Authorities of the UK.

IP Week 1998

London: 16–19 February 1998

'IP Week' in February is the focal point in Europe when leading figures in the oil and gas industry migrate to London for an intensive round of conferences, industry and trade association events, company meetings and social functions. The Institute's programme of conferences, together with its world renowned annual dinner and lunch are the central focus for these activities.

EVENTS Forthcoming

October

1–2 **Oslo**
8th Conference on the European Downstream Industries in a Changing Environment
Details: Norwegian Petroleum Society, PO Box 1897, Vika, N-0124 Oslo, Norway.
Tel: +47 22 12 90 04
Fax: +47 22 55 46 30

1–4 **Almati, Kazakhstan**
5th Kazakhstan International Oil & Gas Exhibition
Details: ITE Oil & Gas Division.
Tel: +44 (0)171 286 9720
Fax: +44 (0)171 286 0177

2–3 **Moscow**
Financing Oil & Gas in Russia
Details: IBC UK Conferences Ltd, Gilmoora House, 57–61 Mortimer Street, London W1N 8JX, UK.
Tel: +44 (0)171 453 2703
Fax: +44 (0)171 323 4298

5–8 **Texas**
SPE 72nd Annual Technical Conference and Exhibition
Details: Registrar, Society of Petroleum Engineers, PO Box 833836, Richardson, TX 75083–3836, US.
Tel: +1 972 952 9393
Fax: +1 972 952 9328

5–8 **Amsterdam**
Adapting to a Competitive Global Utility Environment
Details: AM/FM International, 14456 East Evans Avenue, Aurora, Colorado 80014, US.
Tel: +1 303 337 0513
Fax: +1 303 337 1001
E-mail: amfmintl@aol.com

6–7 **Singapore**
Petroleum Trading and Cargo Shortages
Details: Abacus International, 214 Inchbonnie Road, South Woodham Ferrers, Essex CM3 5WU, UK.
Tel: +44 (0)1245 328340
Fax: +44 (0)1245 323429

6–8 **Nicosia**
Middle East Strategy to the Year 2010
Details: APS Europe, PO Box 2501, London W5 2LR, UK.
Fax: +44 (0)181 566 7674

7–9 **The Hague**
International Disaster and Emergency Response
Details: Andrich International Ltd, 51 Market Place, Warminster, Wiltshire BA12 9AZ, UK.
Tel: +44 (0)1985 846181
Fax: +44 (0)1985 846163

8–9 **London**
Caspian Oil & Gas Projects
Details: IBC UK Conferences Ltd, Gilmoora House, 57–61 Mortimer Street, London W1N 8JX, UK.
Tel: +44 (0)171 637 4383
Fax: +44 (0)171 631 3214

13–14 **Bahrain**
1st GCC-EU Conference on Advanced Oil and Gas Technologies
Details: GCC General Secretariat, Oil and Gas Department, PO Box 7153, Riyadh 11462, Saudi Arabia.
Tel: +966 1 488429
Fax: +966 1 4827716

14–15 **Brussels**
Change Management in R&D
Details: The Booking Department. Learning in Business Ltd, 14a Smiths Yard, Summerley Street, London SW18 4HR, UK.
Tel: +44 (0)181 944 9030
Fax: +44 (0)181 944 0434

14–16 **London**
London Tanker Event Conference
Details: Ms Jane Markussen, INTERTANKO, Oslo.
Tel: +47 22 12 26 52
Fax: +47 22 12 26 41

Diary Dates

Energy Economics Group

'Political Risk and the New Frontiers'

Tuesday 23 September, 17.00 for 17.30 until 19.00

John Bray, Principal Research Consultant, Control Risks Group

IP Contact: Jenny Sandrock

All meetings are held at the Institute of Petroleum unless otherwise stated. Please tell the IP contact if you plan to attend any of these free meetings
Tel: +44 (0)171 467 7100 Fax: +44 (0)171 255 1472

Exploration and Production Discussion Group

'Reputation is All – Can the Industry Change its Culture?'

Wednesday 17 September,

James May, Director-General, UK Offshore Operators Association

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Tuesday 14 October
a talk on natural gas
John Flemming, Warden of Wadham College, Oxford

Wednesday 19 November
a talk on under-balanced drilling
John Foy, Senior Well Engineer, Shell UK Exploration & Production

IP Contact: Jenny Sandrock

EVENTS Forthcoming

15–17 **Cape Town**
Africa Upstream '97
Details: Global Pacific & Partners Pty Ltd, 147 Hendrik Verwoerd Drive, Randburg 2194, Johannesburg, South Africa.
Tel: +27 11 781 3358
Fax: +27 11 781 3362
E-mail: global.pacific.@pixie.co.za

16 **London**
Designing for Health, Safety and the Environment
Details: Ms Barbara Williams, M W Kellogg Ltd, Greenford Road, Greenford, Middlesex UB6 0JA, UK.
Tel: +44 (0)181 872 7000
Fax: +44 (0)181 872 7272

20–21 **Dubai**
PSC '97
Details: see 18–19 September, Kuala Lumpur.

20–21 **Aberdeen**
Controlling Hydrates, Waxes and Asphaltenes
Details: The Bookings Department, IBC UK Conferences Ltd, 57–61 Mortimer Street, London W1N 8JX, UK.
Tel: +44 (0)171 453 2712
Fax: +44 (0)171 631 3214
E-mail: caroline.murgatroyd@ibcuk.co.uk

20–22 **Cape Town**
Southern & Central Africa Downstream
Details: Global Pacific & Partners Pty Ltd, 147 Hendrik Verwoerd Drive, Randburg 2194, Johannesburg, South Africa.
Tel: +27 11 781 3358
Fax: +27 11 781 3362
Email: global.pacific.@pixie.co.za

21–22 **London**
Expro Software '97
Details: Conference/Exhibition Administration, Expro Software '97. Geomedia Ltd, Europower House, Lower Road, Cookham, Berks SL6 9EH, UK.
Tel: +44 (0)1628 527771
Fax: +44 (0)1628 521928

22–23 **Aberdeen**
FPSO World Congress & Exhibition
Details: Jim Morgan, OCS Aberdeen Office
Tel: +44 (0)1224 708088
Fax: +44 (0)1224 708080

22–24 **London**
The E&P Business Game
Details: See entry for 1–3 October, Aberdeen

23–24 **Aberdeen**
Maximising Return from Maturing Assets
Details: IQPC Ltd, 1st Floor, West Wing, Chancery House, 53/64 Chancery Lane, London WC2A 1QU UK.
Tel: +44 (0)171 421 3500
Fax: +44 (0)171 831 9249

23–24 **Brussels**
5th International LFE Congress
Details: Orthim Congress, Rue au Bois 370 – BTE.2, B-1150 Brussels, Belgium.
Tel: +32 2779 9312
Fax: +32 2779 8128

24–25 **India**
PSC'97
Details: see 18–19 September, Kuala Lumpur

27–28 **Stavanger**
Marginal Oil and Gas Fields
Details: IBC UK Conferences Ltd, Gilmoora House, 57–61 Mortimer Street, London W1N 8JX, UK.
Tel: +44 (0)171 637 4383
Fax: +44 (0)171 453 2058

27–28 **Aberdeen**
Environmental Management Implementation in the Oil & Gas Industry
Details: MD Consultancy (UK) Ltd, 18a Carden Place, Aberdeen AB10 1UQ, UK.
Tel: +44 (0)1224 626268
Fax: +44 (0)1224 626950
E-mail: 106334.2720@compuserve.com

Diary Dates

Energy Economics Group

'The Fundamental Impact Competition is Having on the Gas Industry'

Monday 20 October, 12.00–14.15

Clare Spottiswoode, Director General of Gas Supply, OFGAS

This meeting includes a buffet lunch at a cost of £15. Prior registration is essential. Please write or fax for a registration form, which will be available in the week commencing 8 September.

IP Contact: Jenny Sandrock

London Branch and Exploration & Production Discussion Group

'Decommissioning and Re-Use of a Major North Sea Platform'

Wednesday 21 October, 18.00
Mr P M Spaven, Phillips Petroleum Company UK Ltd

The Maureen field facilities are soon to be decommissioned. This event examines the re-use opportunities.

Tea and biscuits will be served at 17.15. The meeting will be followed by light refreshments. Enquiries Mr J M Wood at the IP. Tel: +44 (0)171 467 7128

Post of Honorary Secretary

A vacancy has arisen for the post of Honorary Secretary to the London Branch. The Secretary is a member of the Committee which is responsible for running the Branch and organizing its activities. The duties are not onerous, amounting to a few hours per year.

If you are interested please contact Mr J M Wood on +44 (0)171 467 7128 for more details.

EVENTS Forthcoming

28 **London**
1st ACTIVE Conference
Details: Sandy Morris, ACTIVE Secretariat, c/o Mobil Court, 3 Clements Inn, London WC2A 2EB, UK.
Tel: +44 (0)171 412 4447
Fax: +44 (0)171 412 4443
E-mail: active@mc-lon.mobil.com

29–30 **Aberdeen**
Project 2000 in Oil & Gas: Auditing, Testing and Correcting Systems for the Millennium Bug
Details: IQPC Ltd, 1st Floor, West Wing, Chancery House, 53/64 Chancery Lane, London WC2A 1QU, UK.
Tel: +44 (0)171 421 3520
Fax: +44 (0)171 831 9249

30–31 **London**
Sakhalin Oil & Gas
Details: IBC UK Conferences Ltd, Gilmoora House, 57–61 Mortimer Street, London W1N 8JX, UK.
Tel: +44 (0)171 637 4383
Fax: +44 (0)171 631 3214

31–3 November **Surrey, UK**
Understanding the Fundamentals of the Oil Industry
Details: Petroleum Economist, PO Box 105, Baird House, 15–17 Cross Street, London EC1N 8UN, UK.
Tel: +44 (0)171 831 5588
Fax: +44 (0)171 831 5313

November

3–4 **Bali, Indonesia**
Surplus or Shortage: Condensate for the Asia-Pacific
Details: Conference Connection Administrators Inc, 151a Goldhill Centre, Thomson Road, Singapore 307606.
Tel: +65 356 0960
Fax: +65 356 0962
E-mail: cconnect@pacific.net.sg

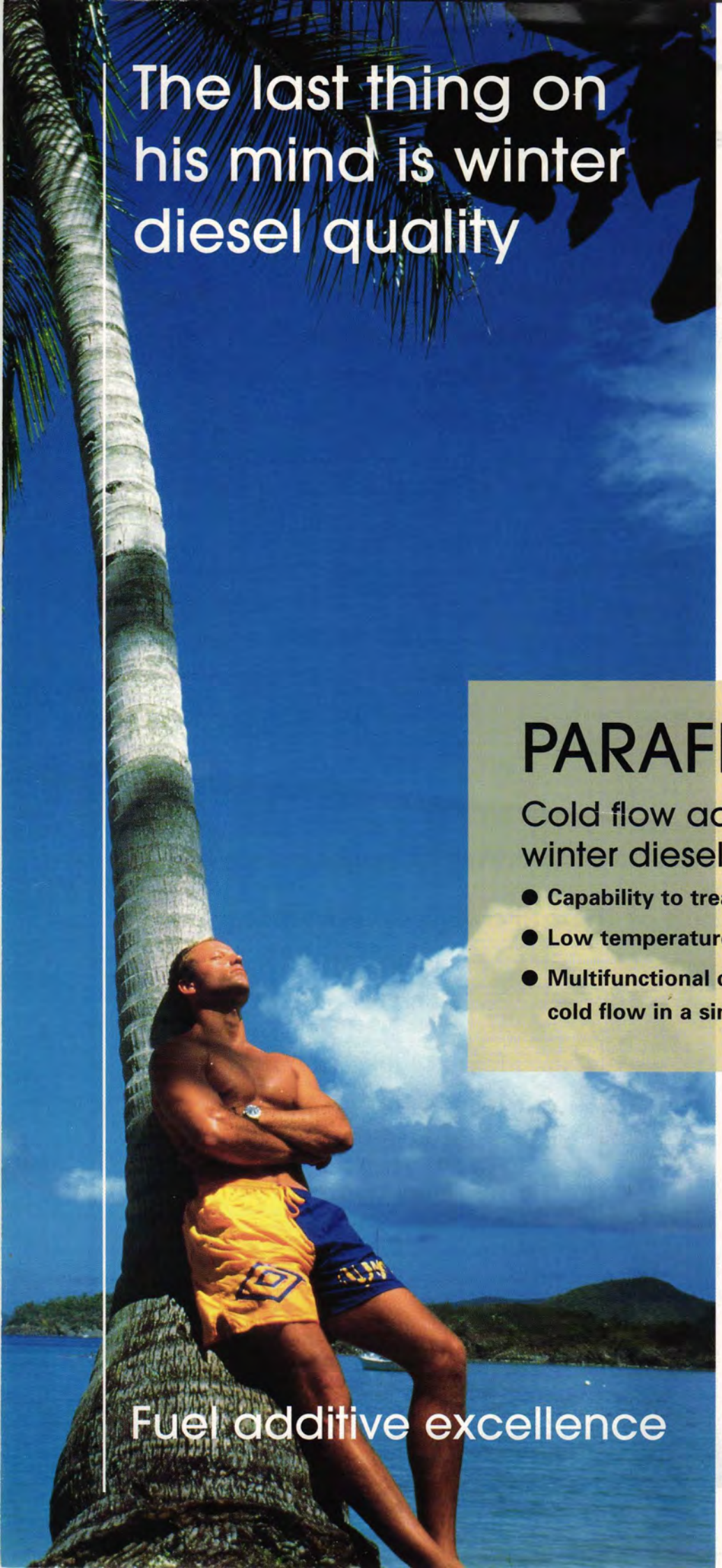
4–5 **Barcelona**
12th Annual European Autumn Gas Conference: Coping with Supply
Details: Overview Gas Conferences, 82 Rivington Street, London EC2A 3AY, UK.
Tel: +44 (0)171 613 0087
Fax: +44 (0)171 613 0094

5–7 **London**
Environmental Management Implementation in the Oil & Gas Industry
Details: See entry for 27–28 October

5–7 **London**
The Changing Economic Geography of the Gulf: Implications for Trade and Investment
Details: The Conference Unit, The Royal Institute of International Affairs, Chatham House, 10 St James' Square, London SW1Y 4LE, UK.
Tel: +44 (0)171 957 5700
Fax: +44 (0)171 321 2045

6 November
London: *IFEG Conference: Re-engineering the Energy Information Service*
Details: Pauline Ashby, The Institute of Petroleum.

10–11 **Birmingham**
17th APEA Conference and Exhibition
Details: Barbara Jacketts, APEA, PO Box 2, Hadleigh, Suffolk IP7 5SF, UK.
Tel: +44 (0)1473 828539
Fax: +44 (0)1473 828 538



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PARAMINS

EXXON CHEMICAL LIMITED
Paramins Marketing Communications
P.O. Box 255, Abingdon,
Oxfordshire OX13 6TT
Tel. 01235 545701 - Fax 01235 545715