Petroleum review

JUNE 2000

Drilling Technology
The drilling revolution

Latin America
- E&P developments in Venezuela
- Exploitation of the Roncador field

Methanol
Looking to a brighter future?

Measurement
Relationship between Cetane Index and Cetane Number

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The Institute of Petroleum's annual introductory courses have proved very successful in providing delegates with a comprehensive oil and gas industry overview.

These three-day courses are particularly valuable for:

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- Participants from within the industry who require a broader perspective of the oil and gas industry's activities and the economic factors affecting its development
- Those new to the industry, including graduate trainees, who require a concise introduction to the industry
- Companies who do not hold their own in-house induction courses on these topics

Each course is self-contained but many participants will find it advantageous to attend both, in which case, a combined registration fee is available at a reduced rate.

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London: Wednesday 14 – Friday 16 June 2000

This course provides a concise and informed introduction to operations, from the search for oil and gas to the delivery of products to different customers. Participants will gain an appreciation of the principal activities in the international upstream and downstream petroleum industry and an understanding of how these inter-relate, as well as an appreciation of the impact of external influences and the ways in which the industry is adapting to increase its competitiveness and to meet new challenges.

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This course is designed as an informed introduction to petroleum economics, concentrating on the structure of the oil industry, the geopolitics of oil and the working of the principal markets. It is presented by a team of lecturers all of whom have considerable experience of the oil and gas industry and are practised in teaching and lecturing on these subjects.

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London: Thursday 22 – Friday 23 June 2000

This course provides a comprehensive examination of accounting requirements associated with the major types of contracts entered into by oil and gas enterprises in carrying on international exploration and production activities.

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London: Monday 26 – Tuesday 27 June 2000

This training course is designed for delegates with relatively little experience in oil and gas accounting and finance. It covers basic accounting and financial reporting methods for upstream activities, focusing on UK standards. US and international accounting standards are discussed where appropriate. Emphasis is placed on recent pronouncements of the Oil Industry Accounting Committee and relevant Accounting Standards Board pronouncements.

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London: Wednesday 28 – Thursday 29 June 2000

This training course provides a basic understanding of current SEC and FASB accounting and reporting requirements for oil and gas producing companies. Emphasis is placed on recent pronouncements of the FASB and SEC.

**To take account of the individual's level of experience these courses can be attended in any combination of number of days from 1-4 days. In addition, special rates are available for those individuals wishing to attend the programmes in 4 or 6 days' combinations.*

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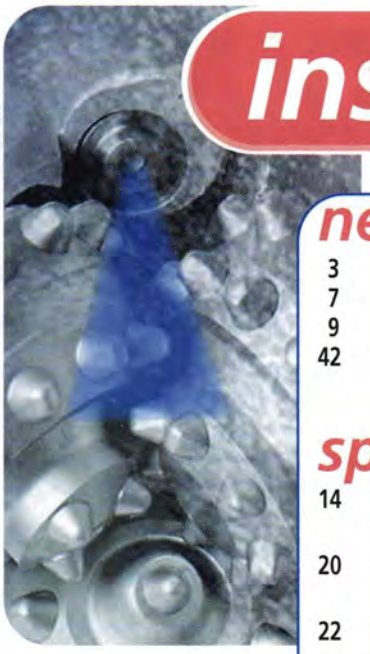
ABBREVIATIONS

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: The recently completed 4,000 tonne jacket for Texaco's Captain B project at Kvaerner's Methil yard.



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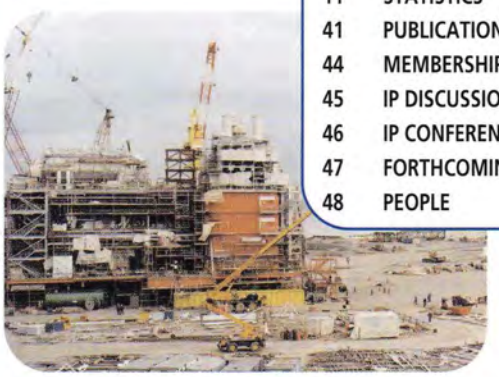

ROUNDUP From the Editor

Kashagan find – blessing or curse?

The recent reports of a massive oil find at the Kashagan East well offshore Kazakhstan in the Caspian appear a blessing for the region and a triumph for technology. Reports of an initial 30bn barrels and, if the whole 100 km-structure is productive, 90bn barrels of reserves would make the find the largest since the 1960s.

However it would also provide enough volume to fill the Baku–Ceyhan pipeline, so assiduously promoted by the US. Already the Russians are 'saying' production should flow north through Russia and the Iranians that it should flow south through Iran. The legal status of the Caspian has never been fully defined and accepted by the littoral states. The acceptance of the *de facto* partition of the Caspian into national areas has allowed E&P to proceed. But the view that it is a lake subject to joint exploitation by the littoral states has not been formally conceded by Russia or Iran. A mega-find may be enough to re-ignite the dispute. An increasingly assertive President Putin and the newly elected US President could all too easily make Kashagan's export route a 'cause'. Politics rather than economics will determine whether Kashagan is seen as a blessing or a curse in this volatile and unstable region.

One of the greatest challenges to the international oil industry is the speed with which the global supply/demand balance swings around. The great hope has always been that as markets became more open and responsive they would work better – meaning that prices would be more stable and that demand, supply and stocks would move slowly and predictably.

Alas, there is little or no evidence to support this hope. Data remains erratic and subject to large revisions. Agencies such as Opec have a slow-moving decision-making process that is at odds with its pricing objectives. Companies generally seem more relaxed, accepting the impartiality of the market's price judgement than taking the risk of making an arrangement where they could subsequently be 'proved' to be 'wrong'.

In a world that has come to regard markets as sovereign and the ideal solution, it is worth pointing out that there are high costs in this strategy that are not always recognised. For the producing country massive swings in revenues are highly destabilising and make government expenditure planning extremely difficult. The situation is no better for the oil companies. Massive revenue swings depress share prices and company valuations, totally disrupt exploration and development plans and institutionalise a boom/bust mentality.

There is one potential solution to damping down a price volatility – a price volatility that is greater than in any other major industry. The solution is to trade the bulk of oil months in advance of physical delivery.

Forward prices can only become a stabilising influence if the bulk of the trade is in the forward contracts. We know it can work. The price of the long bond (30-year US Treasury) increasingly determines short-term interest rates (except when governments interfere). The near locking of the forward curve damps the spot/immediate period price movement right down. This still relies on a market mechanism so cannot be construed as anti-competitive. However, a bold leader is needed to persuade Opec, the producers, the consumers and the oil companies that oil prices needn't be a lottery if they all agree to trade forward.

The costs of the oil price lottery are becoming very clear in the UK. The sail-away of the various parts of the Captain B project (see p38) means that the UK's major platform yards are empty or about to be empty (see p39). Under the lure of high oil prices and pressure from the government, the oil companies are moving ahead on all the small projects they had on the shelf.

However, the low prices of 1998 have taken their toll. The large Norwegian projects – Kvitebjorn, Grane and Ringhorne – seem unlikely to be fabricated before the 1Q2001. The UK's largest undeveloped field – BP Amoco's Clair, west of Shetland – now seems certain to go ahead but it will be mid-2001 before major construction can begin. The race to evaluate some of the promising discoveries is now on, but fabrications are likely to be small and some way off.

The UK Government is now working more closely and in greater collaboration with the oil companies to wring the last drops from the North Sea. Greater collaboration between governments and the oil industry is now becoming widespread across the world (there are notable exceptions). This is highly desirable but has not yet addressed the institutionalised price instability that is so destructive to investment.

Chris Skrebowski

eworld

The UK Geological Society recently launched its new website – **www.geolsoc.org.uk** 'The site will be news-led and content-rich, and will give a more accurate reflection of the broad range of the Geological Society's activities nationwide', states the society.

The Society of Petroleum Engineers, too, has unveiled a new website at **www.spe.org** The site features a 24-hour 'news ticker' that highlights global and business news, as well as stock prices related to the oil and gas industry and online versions of the *Journal of Petroleum Technology* and *Oil and Gas Executive Report*.

OS Integration – a leading UK e-business consulting organisation has sold a minority stake to global energy and communications company Enron Corporation for £6mn.

Itochu Corporation and Automated Power Exchange have unveiled plans to jointly develop what is claimed to be the first private Internet-based electric power exchange to serve the Japanese electricity trading market. The site is due to open by November 2000.

Broker Clarksons is reported to have become the most recent company to agree a strategic alliance with the online bunker trading site **OceanConnect.com** Due to begin online trading in late spring, the site will initially focus on marine fuels, branching out to other marine products at a later date.

In addition, **yet2.com**, a forum for technology exchange on the Internet, has announced a strategic alliance with Derwent, claimed to be the world's largest provider of global patent information, to integrate the Derwent World Patents Index (DWPI) with **yet2.com**'s user services. Derwent's electronic database includes more than 14mn patents and nearly 3mn diagrams and images.

J2C (**www.just2clicks.com**) – claimed to be the UK's largest quoted operator of business-to-business (B2B) vertical trading communities – has acquired Granite Rock, an international provider of geophysical services to the oil and gas industry. The merged operation is to build an independent online B2B vertical trading community which will allow the oil and gas industry to exchange technical information, access a range of asset and production data, participate in relevant affiliation schemes and buy/sell industry equipment and services. The new trading portal is expected to be fully active within the next six months.

J2C also reports that UK manufacturing companies exporting overseas

continued on p17...

NEWS Upstream

Libya leads new E&P ventures ranking

Political developments coupled with world-class prospectivity have propelled Libya from 20th position in 1998 to the No. 1 country for new exploration, development and production ventures in 2000, according to Robertson Research International's latest *New Ventures Survey*. Now in its 14th year, the survey polls oil companies involved in E&P ventures outside North America, and asks them to rate their level of interest in new ventures in 146 countries.

Responses were received from 76 companies, which accounted for an estimated 70% of total oil company worldwide upstream spending in 2000.

The top ten countries are: (1) Libya, (2) Iran, (3) UK, (4) Australia, (5) Algeria, (6) Iraq, (7) Indonesia, (8) Angola, (9) Brazil, and (10) Egypt. The Middle East continues as the most popular region, reports Robertson, with 'solid performances' from Iran (2nd), Iraq (6th), Qatar (13th) and Oman (16th). Prominent risers in the region include Abu Dhabi (+6 places), Bahrain (+12), Dubai (+14) and Israel (+18). Africa is reported to have made up 'good ground' in the regional rankings, moving from 6th to 3rd on the strength of impressive showings from the North and West African countries. The Far East and Australasia remain in second position in the regional rankings, while Latin America/Caribbean, Europe and Eurasia all dropped one place to accommodate the rise of Africa.

'The resurgence of the oil price during 1999 and early 2000 has brought with it a cautious increase in E&P spending,' reports Robertson, 'with 62% of companies indicating higher E&P budgets for this year.' However, the consultancy goes on to suggest that: 'Significant increases in upstream expenditure will probably not occur until investor confidence is restored in the energy sector.'

An average oil price of $18.94 has been used for 2000 budgeting purposes, up from $13.76 in 1999, and, not surprisingly, 64% of respondents predicted a falling oil price for 2000. Gas and deep-water ventures continue to increase in their popularity, representing the primary areas in which opportunity for significant growth exists.

Triton's Guillemot fields onstream

The Guillemot West and Guillemot North West fields, part of the North Sea Triton project, came onstream on 20 April. Bittern, also part of the Triton project, came onstream on 15 April, producing through the Amerada-Hess operated *Triton FPSO*. Once gas export is achieved, production will be ramped up to plateau at 105,000 b/d of oil.

Combined field reserves for the £550mn Triton project are put at 140mn barrels of oil and 210bn cf of gas. Amerada Hess is operator of the shared production facilities while Shell Expro is operator of the Bittern field and of the development phase of the Guillemot West/Guillemot North West fields. Operatorship of the Guillemot fields will pass to Veba Oil & Gas UK with the establishment of the production phase. Triton project partners include Esso Exploration & Production UK, Enterprise Oil Exploration and Paladin Expro.

Norwegian offshore

The Norwegian Government is understood to have awarded exploration licences to eight companies covering 34 blocks and part blocks offered under Norway's 16th licensing round.

Chevron was awarded a 40% stake in licence PL259, including the operatorship, together with a 25% interest in PL252 and 30% in PL263. Fortum Petroleum has secured a 25% stake in licence PL256, located in the prolific Haltenbanken area close to the Åsgard gas field, which is due onstream in 2H2000. Other successful applicants were Norsk Hydro and BP Amoco – granted licences and operatorships of three blocks apiece – while Statoil secured two operatorships. Agip, Chevron, TotalFinaElf, ExxonMobil and Shell were awarded one operatorship each.

BG expands Tunisian ops

BG International is to invest up to $450mn over nine years to 'substantially' expand its activities in Tunisia. Plans include development of the Hasdrubal gas condensate discovery, located 25 km south of the Miskar field, which contains recoverable sales volumes of 260bn cf of gas and 25mn barrels of condensate. An appraisal well will be drilled in 2002 to assess the additional reserves potential adjoining the field, prior to finalising a development plan.

The Miskar field, which currently supplies over 65% of Tunisia's total daily gas demand is to be expanded in several phases, beginning in 2000, over five years. The field currently supplies 168mn cf/d of gas to Tunisian gas and electricity company STEG. Further development will increase the supply to over 200mn cf/d.

In Brief

United Kingdom

***Conoco has discovered oil and gas in** block 15/29b of the Central North Sea. The Kappa discovery also extends into block 21/4a-North. An appraisal well is planned for late 2000.*

***BP Amoco has put out to tender the** front-end engineering and design contract for the West of Shetland Clair field. One or two fixed platforms are expected to be used to develop the field.*

***Enterprise Oil's Cook field in North Sea** block 21/20a has come onstream ten weeks ahead of schedule. Reserves are put at 20mn barrels of oil and 15bn cf of gas. Initial production of 10,000 b/d is forecast to double by 2001. The field is tied back to Shell's* Anasuria *FPSO.*

***Amerada Hess has announced the dis-**covery of a potentially commercial oil and gas accumulation on block 15/27 in the Outer Moray Firth area of the North Sea. The discovery, named Rochelle, is located close to the Renee and Rubie fields operated by Phillips.*

***Talisman Energy is reported to have** agreed in principle to exchange assets with BP Amoco and Amerada Hess in order to acquire a 60% interest in the undeveloped Halley oil discovery which lies adjacent to Talisman's Clyde/Orion core area in the North Sea. Halley reserves are estimated to be 8mn barrels of oil. To be developed via extended reach wells from the Shell-operated Fulmar platform, first oil is expected in 2Q2001 at a rate of 12,000 b/d.*

***Coflexip Stena Offshore has secured a** euro 60mn contract from BG International covering the installation of subsea structures, control systems, flowlines and umbilicals for the North Sea Blake field, as well as two satellite water injection wells.*

Europe

***Kvaerner Oil & Gas is understood to** have secured the contract to build a production module for Norsk Hydro's Grane field in the Norwegian sector of the North Sea. The field – which is said to be the largest undeveloped discovery on the Norwegian Continental Shelf – is due onstream in autumn 2003. Production is expected to plateau at more than 200,000 b/d of oil.*

***TransCanada Pipelines is reported to** have made a new commercial gas discovery in the Dutch sector of the North*

UK production on the up

At £44.8mn/d, the average daily value of UK oil production in March reached its highest real level since October 1990, according to the latest Royal Bank of Scotland *Oil and Gas Index*. This was 114.5% higher than in March 1999, and is attributed to the increase in the oil price along with a slight weakening of sterling against the dollar.

The price of Brent crude oil averaged $27.27, a fall of 2.5% compared with February, but April saw a substantial decline to $23.15/b – a fall of 15.1% on the month – as the market reacted to Opec's production increases.

Stephen Boyle, Head of Business Economics at The Royal Bank of Scotland said: 'Current price levels are sustainable only with continued production restraints as the marginal cost of "new" oil lies well below Opec's unofficial $22–$28/b range. In the short-term, the actions of Opec and its allies will remain the critical determinant of price movements.'

During March, oil output increased by 38,715 b/d, up just 1.5% on the month but down 2.7% on the year due to much lower output from a number of fields.

The start of spring sees the beginning of the seasonal decline in gas production, with gas output falling by 3.2% on the month. However, there was a sharp 10.2% rise on the year and average daily output in the 12 months to March 2000 was up by 12.3% compared with the 12 months to March 1999.

Combined oil and gas output fell by 0.7% in March.

Year Month	Oil production (av. b/d)	Gas production (av. mn cf/d)	Av. oil price ($/b)
Mar 1999	2,679,786	11,107	12.54
Apr	2,717,767	9,863	15.66
May	2,507,093	7,349	15.18
Jun	2,400,277	6,785	15.91
Jul	2,602,363	6,852	18.90
Aug	2,645,493	6,604	19.93
Sep	2,588,488	7,379	22.83
Oct	2,666,146	9,380	22.03
Nov	2,698,681	11,641	24.64
Dec	2,634,050	13,054	25.64
Jan 2000	2,645,841	12,900	25.63
Feb	2,567,535	12,645	27.97
Mar	2,606,250	12,238	27.27

Source: The Royal Bank of Scotland Oil and Gas Index

North Sea oil and gas production

Goloil pipe to boost Siberian production

EuroGas recently began funding a work programme to begin completion of the Goloil Project pipeline in Western Siberia. The pipeline project, which will connect the Goloil license area with the processing facility on the 7bn barrel Samotlor field, was reported as *Petroleum Review* went to press to be progressing on budget and on schedule to complete in May 2000. A gathering system, which will tie the existing wells to the main pipe-line, is slated for completion by September 2000.

The 8-inch pipeline should result in a significant increase in oil production, as wells that have been choked back due to transportation constraints will be allowed to flow freely. Current average production from the Goloil Project is 1,000 b/d. Field output is expected to rise to 3,000 b/d by the end of 2000, and by 14,500 b/d by 2004.

EuroGas is also to commence a development well drilling programme under the terms of its recently announced acquisition of Teton Petroleum Company.

In Brief

Sea. Reserves are put at between 4bn and 10bnn cm of gas. First production is slated for 2002.

***The West Navion drilling vessel is** reported to have struck oil in the North Sea with its first ever completed exploration well. The Svale discovery is located to the east of the Norne field.*

***US companies FX Energy and Indie** Apache are planning to expand activities surrounding their recent gas find in the Lublin Basin which accounts for 80% of Poland's gas reserves and 56% of its production, writes* Stella Zenkovich. *Field reserves are expected to exceed the original estimate of 30–50bn cm.*

North America

***Mariner Energy's Apia field in the Gulf** of Mexico is understood to have come onstream and is currently producing 40mn cf/d of gas.*

***The 3,850-tonne second deck module** for Texaco's Petronius compliant tower platform in Viosca Knoll block 786 in the Gulf of Mexico has been successfully installed. Standing in 1,754 ft of water and measuring over 2,001 ft tall above the seafloor, the tower is claimed to be the tallest freestanding structure in the world. Petronius is expected to produce up to 60,000 b/d of oil and 100mn cf/d of gas. It is due onstream in October 2000.*

Middle East

***Canadian Occidental Petroleum is** reported to have produced a record 111,000 b/d of oil in the 1Q2000 from the Masila block in Yemen.*

***Iran's first post-revolution onshore oil** exploration contract has been awarded to Norsk Hydro in the Anaran block, near the western border, writes* Stella Zenkovich. *Norsk Hydro is due to start work on the four and a half year contract at the end of June.*

***ExxonMobil and Qatar General** Petroleum Corporation (QGPC) have signed a development and production sharing agreement for the Enhanced Gas Utilisation (EGU) project under which 1.75bn cf of gas from Qatar's North field will be developed.*

***Elf Petroleum Qatar is reported to** have announced plans to invest*

Demand for UUVs set to grow

Sales of unmanned underwater vehicles (UUVs) are expected to climb from $100mn in 2000 to over $300mn in 2004 and total $1.2bn over the period, according to the latest report from analyst Douglas-Westwood. *The World UUV Report* predicts growth in operational revenues to be even greater, rising from $500mn to nearly $930mn.

Although over 3,000 remotely operated vehicles (ROVs) of various types have been built to date, the report concentrates on the high-price, high-earning Work-Class ROVs. There is currently a world fleet of 478 such units, for which the offshore oil and gas industry is the biggest customer.

According to the report, 2000 represents a cyclical low for the UUV manufacturing industry, caused by the earlier oil price fall. In 1999, 61 Work-Class ROVs were delivered, but in 2000 only 38 are expected. However, firm oil prices and growing deepwater activity are forecast to boost deliveries to 118 units in 2004.

Over the period, the report's base-case analysis shows the Work-Class ROV fleet growing by nearly 50%. This growing fleet will require an increasing expenditure on ancillary equipment and replacement items, with an estimated market value of $468mn over the five-year period.

The report states that the major technical challenges are to 'reduce costs of ownership and to provide cost-effective systems for operations in ever-increasing water depths'. One approach is the use of all-electric ROVs (most existing units are electro-hydraulic systems) involving the use of aerospace standard power systems and a total redesign to reduce component count and the numbers of electrical connections exposed to seawater.

Autonomous underwater vehicles (AUVs) are the 'new kids on the block.' says Douglas-Westwood. True pre-programmed robots, AUVs are increasingly capable of carrying out underwater survey and other missions without direct human control. AUVs will enter commercial service in 2000 and, if industry expectations are achieved, the report suggests that annual sales could grow to over 30 units in 2004 and AUVs account for 20% of UUV operations revenues.

UKCS showing signs of recovery

The UK Offshore Operators Association (UKOOA) reports that the first signs that confidence is returning to the UK's offshore oil and gas industry have begun to appear. A total of 22 operators active on the UK Continental Shelf – accounting for 95% of all the oil and gas produced in 1999 – were surveyed by UKOOA in mid-March on what they expected to spend on exploration and development over the next three years. They were also asked to predict what future activity was likely to be for the same period.

The responses suggest that expenditure on both exploration and development in 2000 is set to rise above 1999 levels. Development spending is expected to reach £3.5bn this year, compared with an estimated £3.2bn in 1999 and £5.1bn in 1998. Exploration budgets are also up slightly, from £0.3bn in 1999 to a predicted £0.4bn in 2000.

The survey also indicates that the number of exploration and appraisal wells drilled this year is anticipated to rise to 48, compared with 31 in 1999. However, UKOOA notes that activity was slow during the first three months of 2000, with only six E&A rigs on location. Furthermore, despite predictions of 54 wells in 2001, this is still below 1998 levels when 59 wells were drilled.

New developments over the next three years are expected to lead to orders for 25 'jackets' or offshore production platforms, about half of which would be destined for the southern sector of the North Sea, reports UKOOA. Greater demand is expected for subsea equipment, with some 68 subsea tie-back clusters projected over the same period. One new floating production development is anticipated for 2000, but none thereafter.

Australian offshore licensing round

A record number of 86 areas offshore Australia are to be released in the 2000 licensing round, 28 more than in 1999. The areas to be opened to bidding include 67 areas offshore Western Australia, six in the territory of Ashmore and Cartier Islands, five offshore Victoria, four offshore the Northern Territories, three offshore Queensland and one in the Bass Strait offshore Tasmania. Bids for 47 of the areas on offer will close on 2 November 2000, that for the remaining 39 closing on 3 May 2001.

In Brief

$350mn on expanding oil production offshore Qatar over the next three years. The company is also reported to have received approval for the full development of the Al Khaleej field to boost capacity to 80,000 b/d of oil.

Russia & Central Asia

***Chevron is to acquire an additional 5%** increasing its share of Tengizchevroil, operator of the Tengiz field, to 50%. Potential recoverable field reserves are put at between 6bn and 9bn barrels of oil. The field is currently producing 215,000 b/d, a figure which is set to rise to 260,000 b/d once an expansion project completes this year.*

***Lukoil plans to invest $4.7bn in exploration** and development projects in order to boost production from its Timan-Pechora oil fields from 42mn barrels to 200mn barrels over the next 10 years.*

***Russia's State Environmental Protection** Committee is reported to have lifted a ban on the Sakhalin-1 consortium drilling the Chaivo-6 well after a proposal to reinject the drilling muds.*

***Transneft has begun construction of** an oil terminal at Primorsk (at the head of the Gulf of Finland), that will become part of the $460mn Baltic Pipeline System, reports the United Financial Group's* Russia Morning Comment. *The new export route will increase Russia's export capacity by 10% (240,000 b/d).*

Asia-Pacific

***Cairn Energy has made a 'significant'** gas discovery with its first exploration well, CB-A-1, in block CB-OS/2 offshore Gujarat in western India. The well tested at 28.1mn cf/d of gas. Current estimated mean reserves are 400bn cf of gas.*

***Dana Petroleum reports that the Ande** Ande Lumut-1 exploration well has discovered oil in Northwest Natuna block 1 in the West Natuna Sea, offshore Indonesia. Dana and co-venturers Premier Oil and Gulf Indonesia Resources are currently reviewing options for appraisal of the discovery.*

***Nippon Oil Exploration is reported to** be developing the Helang gas field in block SK-10, offshore Sarawak, Malaysia. Drilling has completed and gas production facilities are currently under construction. Reserves are put at*

The ups and downs of Camisea project

Following Shell/Mobil's failed attempts to reach an agreement with the Peruvian Government, the Camisea field development – which is made up of the large, undeveloped Cashiriari and San Martin gas/condensate fields – has been re-tendered and awarded to Pluspetrol (40%; operator), Hunt Oil (40%) and SK Corporation (20%). The consortium won with a flat-rate royalty of 37.24%, according to Edinburgh-based Wood Mackenzie.

As part of the re-tendering process, the government established a Camisea gas price agreement. The wellhead gas price cap has been set at $1/mn btu for electricity generators and $1.8/mn btu for industrial users. With a $0.8/mn btu transportation cost, the maximum city-gate price would therefore be around $1.8/mn btu for power generators, comments the consultancy. Industrial users are expected to pay a maximum citygate price of $2.8/mn btu.

The re-tendered project has been divided into separate components in order to avoid the possibility of vertical integration. Under the terms of the offering, Pluspetrol will not be allowed to bid for a majority stake in the transportation and distribution sectors. The partners have an option, however, to take up to a 20% interest, and Pluspetrol could seek to form a strategic alliance with the winner of the transportation/distribution tender.

According to Wood Mackenzie, while no written assurance has been granted to Pluspetrol to allow the export of gas, there is 'significantly less possibility for export to Brazil at present given the recent increases in Bolivian gas reserves. Other export options such as LNG or gas-to-liquids may be considered.'

Pluspetrol proposes a $400mn first phase development; the total project expected to cost $1.6bn. It is envisaged that these initial development facilities will have a production capacity of 400mn cf/d of gas and 50,000 b/d of liquids. Of the initial gas output, around 200mn cf/d will be reinjected. During its 40-year contract, the field is forecast to produce almost 8tn cf of gas, leaving 3tn cf in the ground.

Wood Mackenzie has completed a cash flow analysis based on its forecast gas and liquids production. In this case, the project shows start-up production of 30,000 b/d in 2004, slowly increasing to a peak of 65,000 b/d in 2016 from both San Martin and Cashiriari. Gas sales will start at around 150mn cf/d, increasing to 350mn cf/d in 2010 and 450mn cf/d in 2015.

However, the analyst points out that the economics of the project are 'relatively marginal and several major uncertainties still surround the future of the development'. The project is reported to show a 'significant sensitivity to liquids production given that the liquids are the primary up-front revenue stream'. Sensitivity to operating costs are also reported to be an issue and Pluspetrol will 'have to maintain its reputation as a low cost operator'. Sensitivity to opex is due to the lower margin on gas and any increase in operating cost rapidly erodes its value.

'One of the biggest questions surrounding the future of the project is the issue of gas penetration into the energy matrix,' comments Wood Mackenzie. 'Short-term demand is expected to come from conversion of existing electricity generation plants. In the mid-term, industrial use will expand but much of the growth in this sector will depend on piping gas south to the large industrial centres. Growth in residential and commercial demand will have to be actively developed as there is no existing infrastructure. Long-term growth in Peruvian gas demand, post 2015, is expected to be slow and gradual, primarily as electricity demand grows.'

For further information, contact Andrew Blakely, Latin America Team, Wood Mackenzie on Tel: +44 (0)131 243 4313.

UKCS accidental release statistics

Details of hydrocarbon releases from offshore oil and gas installations on the UK Continental Shelf over a six and a half year period have been published in a statistical report from the UK Health & Safety Executive (HSE). During 1998/99 a total of 234 releases were reported. Although this was an increase of 16 over 1997/98, the totals for the last six years have fluctuated and the numbers of releases over the last three years are broadly comparable. Of the 1,567 releases reported for 1998/99, 8% were classified as 'major', 59% were 'significant', and the remaining 33% 'minor'.

Each release has the potential to develop into a serious incident. The total number of releases is an indicator of how well the industry as a whole is managing health and safety. HSE is concerned that there has not been continued improvement in this area and is redirecting its resources this year to investigate all reportable hydrocarbon releases and to inspect arrangements for process integrity on all attended production installations.

In Brief

40bn cm of gas. First production is slated for 4Q2003. Gas output is expected to peak at 7mn cm/d.

***Exxon and Santos are reported to have** joined Chevron and Oil Search as partners in the $3.5bn Papua New Guinea to Queensland gas pipeline after agreeing to dedicate gas reserves from the Hides, Kutubu and Gobe fields to the project. First gas is slated for 2002/2003. The project is expected to supply Queensland with up to 600mn cf/d of gas over 30 years.*

***Chevron's Maenad 1 wildcat well is** reported to have found gas – the company's fourth discovery in permit WA-267-P offshore the northwest coast of Western Australia.*

***China is reported by local media to** have found its largest gas field to date. The Kela field in the Talimu Basin in Xingjiang is said to hold reserves of 8.85tn cf of gas.*

Latin America

***Perez Companc of Argentina is reported** to have discovered more than 500mn barrels of oil in block 31 in the Orellana Province of Ecuador. The find will boost the company's reserves by 50%.*

***BP Amoco and Repsol YPF have discovered** gas reserves estimated at 2tn cf in the deep waters offshore southeast Trinidad. The discovery was made by the BP Amoco-operated Manakin-1 well, in which Repsol YPF has a 30% stake.*

Africa

***National oil company Sonangol and Elf** Exploration Angola have announced a ninth oil discovery in block 17 in the deepwaters offshore Angola. The Jasmim 1 well tested at 10,800 b/d of oil.*

***Forest Oil's recent discovery of gas offshore South Africa's west coast has confirmed that Namibia's Kudu project reservoir extends southwards into South African waters, reports** Stella Zenkovich.*

***Following Shell and Elf's pull-out. a** modified consortium including ExxonMobil, Chevron and Malaysian state oil company Petronas will now construct the 1,040-km pipeline linking Doha in Chad to the port of Kribi in Cameroon.*

NEWS Industry

Trading oil and products on the Net

PEPEX has launched what is claimed to be the world's first independent Internet site designed for the purchase and sale of crude oil and refined petroleum products.

It is envisaged that a tender initiator will submit a tender offer with an initial set of material specifications, quantities, delivery dates and other pertinent information. PEPEX will then allow tender receivers to propose modifications to the terms of the tender. Should the tender initiator make any revisions to the original tender, the changes are sent simultaneously to all prospective bidders.

PEPEX will charge a fixed nominal fee per barrel, depending on quantity, to the winner of the tender only. Support services include a search engine for identifying and notifying users of desirable tenders, a function to create personalised tender portfolios, and a real-time supply of industry news, current product pricing and historical market data.

New structure for British Geological Society

The British Geological Society, founded 165 years ago, has implemented a new organisational structure in a bid to make it 'ready for the 21st Century.'

The new programme strategy is focused on customer outcomes; providing solutions and results to address specific needs,' claims BGS. 'NERC's [Natural Environment Research Council] and the UK Government's needs have been clearly marked out, and the BGS is making a major contribution to three of five key areas. These are natural hazards, resource management, and pollution and waste. The BGS also contributes to the understanding of the impacts of global change, with a minor contribution to biodiversity issues.'

The new structure is based on a classic management matrix, with three operational directorates supported by three service and support directorates. A key new support function is the Marketing, International and Corporate Development Directorate.

UK gas awards

The Institution of Gas Engineers has presented six gas industry awards in recognition of 'significant achievement' in the liberalised UK gas industry and to acknowledge innovation.

- The 2000 Gas Industry Support Organisation of the Year Award (sponsored by Transco) was won by specialist gas industry contracting service company Primeshade Contracts.
- The Gas Industry Company of the Year Award (sponsored by The Society of British Gas Industries) was won by BG International.
- The Gas Industry Engineer of the Year (sponsored by International Energy Group) was named as Roger Ashworth of BG Technology.
- The Gas Industry Manager of the Year Award (sponsored by Uponor) was given to Edwin Bannock of Transco.
- The Gas Industry Journalist of the Year (sponsored by The Hong Kong and China Gas Company) was named as Peter Marsden, International Gas Engineering and Management.
- The Gas Industry Chief Executive of the Year Award (sponsored by Arthur Andersen) went to Didier Legros, Elf Aquitaine Gas (UK).

Record profits for BP Amoco

BP Amoco has posted what it claims is a record 1Q2000 replacement cost profit, before exceptional items, of $2,707mn, after adjusting for special charges of $30mn. The result – an increase of 256% on a year ago and 28% on the previous quarter, itself a record – was attributed to stronger oil and gas prices and improved refining margins, along with continued performance improvements across the business.

Chief Executive John Browne also announced that the company plans to concentrate new upstream spending on gas with the aim of boosting output by 50% by the end of 2001. He indicated that gas production would rise from 6bn cf/d in 1999 to 8bn cf/d by the end of 2000, and 9bn by the end of 2001.

In Brief

United Kingdom

Wintershall is selling its UK subsidiaries *Wintershall (UK) and Wintershall Exploration to Highland Energy, an independent oil and gas E&P company, for an undisclosed sum.*

BG has posted a 42% increase in *1Q2000 pre-tax profits to £844mn.*

Shell has attributed a doubling of *profits in 1Q2000 to $3.13bn to the recent recovery in oil price and a company restructuring programme. Earnings in the E&P sector – which posted a 36% reduction in capital expenditure for the quarter to $1.5bn – rose by 222% compared to the same period a year earlier to $2.3bn. The company also reported that it had increased its return on average capital employed to 14%.*

Amec has signed partnering agree*ments with 21 key suppliers and subcontractors across its main areas of activity.*

Williams Caldal has announced that it *has severed all connections with its Spanish tanker supplier, Caldal SL. The company will now trade under its original name of Williams Tanker.*

Europe

Wingas has revised its existing target *for a share of the German gas market from 15% to 20%.*

TotalFinaElf has reported that 1Q2000 *consolidated sales increased by 71.6% to euro 26.1bn from euro 15.2bn in 1Q1999 (proforma).*

Air BP, the aviation division of BP *Amoco, is to purchase ExxonMobil's Turbine Oil Business (ETOB), subject to approval by regulatory authorities, for an undisclosed sum. The sale is a requirement by the US Federal Trade Commission and the European Commission as a result of the ExxonMobil merger.*

Kvaerner has posted a 1Q2000 oper*ating profit of NKr259mn, on turnover of NKr14.2bn, against a loss of NKr391mn a year earlier.*

Statoil is reported to have tripled its *1Q2000 profits to NKr2.3bn.*

Norsk Hydro plans to acquire, over the *course of 18 months, the company's own shares in the market for a total*

NEWS Industry

BP Amoco going green with renewable energy

BP Amoco is acquiring an initial 18.5% shareholding in the US green and clean energy consumer marketer, Green Mountain, for an undisclosed sum. According to BP Amoco, the investment is 'focused on significantly extending the market for competitively priced renewable energy – including solar power – to businesses and households across America.' It is also aimed at 'boosting sales of clean energy products such as natural gas – both as a primary fuel and as natural gas fuelled power.'

Green Mountain is said to be the leading brand marketer of cleaner electricity to consumers in the deregulated states of California, Pennsylvania and New Jersey where households can choose their energy supplier. Using the Internet and other media, it sells environmentally friendly electricity and other independently audited 'green' products. Buyers can choose to purchase electricity generated by renewable sources – solar, wind, water or geothermal – as well as clean-burning natural gas.

BP Amoco also announced a multi-faceted commercial relationship to market and promote Green Mountain's solar energy offerings using BP Solarex's solar technology, products and services.

Scottish oil and gas industry 'Oscars'

The success of seven oil and gas service companies was recognised at the 2000 Scottish Offshore Achievement Awards, the annual industry 'Oscars' organised by Scottish Enterprise Energy Group in May. The award-winners were as follows:

- Overall Company Performance – ASCo Group. Providing offshore logistics, integrated material management, waste management and base services, the Group was particularly commended for its achievements in domestic and international markets, diversification and e-business.
- Small Company – OceanTools. OceanTools develops products for the subsea ROV and survey markets. Established in 1997, the company has managed to more than double turnover and profits over the past year. Export sales now account for nearly 50% of company revenue.
- Export Achievement – Merpro Group. Based in Montrose, this company specialises in the design and manufacture of process technologies and products. It has secured fast-track access to worldwide markets by creating manufacturing alliances with franchise agreements based on process and product intellectual property and by appointing agents in countries where manufacturing is not currently possible.
- Innovative Technology – Baker Hughes Inteq. The award was made for the AutoTrak rotary closed-loop system (RCLS) – a rotary drilling and evaluation system that combines the benefits of rotary drilling performance with enhanced directional control capabilities. Nearly 40% of the company's 1999 revenue was derived from products or services that were less than three years old.
- Succeeding Through People – Production Geoscience (consultancy company) and Aramark (offshore hotel services). The award was made jointly to the two companies for their commitment to best practice in people development.
- Safety Excellence – Coflexip Stena Offshore. This award recognised the company's 'strong safety culture,' its many initiatives to promote safety culture and awareness, and its record of continuous improvement.
- Environmental Performance – Baker Hughes Inteq. This award recognised the HS&E culture that the company has developed over the last three years.

The Alick Buchanan-Smith Memorial Award for personal achievement and contribution to the Scottish offshore industry was presented to John Beaton, MBE, Managing Director of Kolfor Plant of Dundee, and Chairman of the Dundee and Angus Oil Venture Group. The Kolfor company was founded by Beaton 27 years ago with just £250. Today, the company employs 60 people at bases in Dundee and Chesterfield and has a multi-million pound turnover.

Euan Baird, Chairman and Chief Executive Officer of Schlumberger, presented all but the Memorial Award, which was presented by Mrs Janet Buchanan-Smith. He commented that the 'intelligent exploitation of oil and gas' would 'provide the world with a clean, reliable and low-cost source of energy to encourage economic development and improve standards of living'. He also stated that those companies which evolved in response to the changing preferences of society and to the increasingly global scope of the marketplace – such as those recognised by this year's awards – will 'reap substantial rewards.' More of his comments will be highlighted in the July 2000 edition of *Petroleum Review*.

In Brief

nominal value of up to NKr100mn (equivalent to approximately 5mn share or 1.8% of the share capital).

***Technip of France is understood to be** acquiring Stena Offshore's 29.7% holding in Coflexip Stena Offshore for $638mn.*

North America

***Weatherford International is planning** to acquire Alpine Oil Services, headquartered in Calgary, Canada, for $55mn in Weatherford common stock.*

***Ranger Oil posted what it called a** 'record' oil and gas revenue of $156mn for the 1Q2000, up by 109% compared with the same period a year earlier.*

***Enron is reported to be planning to** purchase PG&E's retail energy services unit for $85mn.*

Middle East

***Saudi Aramco has launched a new** corporate identity, consisting of a new logo and associated graphics system, which is to be applied throughout the company's diverse operations. The logo's main feature – which is said to suggest a 'burst of clean, endless energy', is made up of a grid or network of brilliant white dots extending through space.*

Russia & Central Asia

***Lukoil has received a $150mn loan from** the European Bank for Reconstruction and Development (EBRD).*

***The Russian Ministry of State Property is** planning to sell a 4.5% stake in Lukoil, 19.86% of Slavneft, 25% plus one share in Rosneft and 85% of Onaco later this year, reports the United Financial Group's* Russia Morning Comment.

***Lukoil is reported to have acquired a 56%** stake in Parmaneft, a non-producing holder of 365mn barrels of reserves (2.2% of Lukoil's current total).*

Asia-Pacific

***Shell is reported to be planning to** swap its upstream Australian assets for a majority interest in Woodside Petroleum. Shell currently holds a 34% stake in the Australian energy group, and hopes to increase this to 60%.*

Platt's expands oil swaps coverage

Energy information provider Platt's is expanding its coverage of the petroleum swaps market following the dynamic growth in petroleum derivatives trading. 'There is a trend worldwide for companies to report more fully on their derivatives positions,' explained Editorial Vice President Neil Fleming. 'This is typified by the new standards of derivatives disclosure issued by the Financial Accounting Standards Board in the US. These require companies to mark-to-market against appropriate derivatives price benchmarks.'

'Platt's have been the oil spot price benchmark for years. Now we want to bring the same transparency to the over-the-counter derivatives market. There's an urgent need for rigorously researched benchmark assessments in these markets: not only are they volatile and fast-moving, they are also experiencing explosive growth in volume terms,' he said.

Initially, Platt's Petroleum Derivatives service will focus on European crude and refined product swaps with weekly, monthly, quarterly and annual swaps price assessments going forward up to three years. Coverage will also include swaps deals and market summaries, fundamental analysis of key market matters, and price trend analysis based on technical factors.

WBCSD unveils sustainability mobility project

A three-year initiative to assess the global impacts of current transportation modes and developing visions of future mobility was recently announced in Geneva by the World Business Council for Sustainable Development (WBCSD).* The project is co-chaired by Harry Pearce, Vice Chairman of General Motors; Phil Watts, Managing Director of Shell International; and Dr Shoichiro Toyada, Honorary Chairman of Toyota.

The 'Sustainability Mobility' project will sponsor an independent evaluation of the sustainability of the world's current means of mobility. It will follow the report with stakeholder meetings in developed and developing countries that will focus on mobility issues involving land transportation.

The main report, building on the preceding two, will offer visions of sustainable transportation systems of the future, outlining supportive policy options and practical tools for achieving the visions. A key issue will be whether incremental steps in technology by itself can achieve sustainable mobility, or if dramatic changes in public policies and user behaviour are needed. The report will be released in late 2002, the year of Earth Summit 3.

** WBCSD is a coalition of 130 companies from 30 countries united by a shared commitment to sustainable development.*

e-Nymex exchange for OTC trading

The Board of Directors of the New York Mercantile Exchange (Nymex) has approved the formation of e-Nymex, an e-commerce venture that is intended to become the 'premier global exchange for over-the-counter (OTC) forward trading and clearing of a wide range of standardised physical commodity contracts.'

The Exchange plans to use its proven clearing infrastructure to introduce complete counter-party risk management for OTC trading, and create net margining with Exchange futures markets by calculating a consolidated clearing position. e-Nymex will provide a single, Internet-based interface to both the OTC market and the Exchange futures market by routing futures orders to the trading floor and the Nymex Access® electronic trading system, depending on the session.

The vision for the venture also includes pursuing strategic partnerships through which e-Nymex would provide clearing services to external organisations and creating a credit structure that will permit floor members to participate in OTC markets.

The range of OTC products offered would initially focus on swap contracts in crude oil, petroleum products, natural gas and electricity, with some spot cash market products also offered. Over time, this would be expanded into such areas as precious and base metals, coal and, potentially, bandwidth, weather and emissions. Although the initial geographic focus will be on North America, contracts are also expected to be offered for some European and Asian locations.

United Kingdom

***Foster Wheeler Energy has secured a** contract to develop the basic design and engineering package to debottleneck Shell's higher olefins plant at its Stanlow manufacturing complext in South Wirral, UK. Foster Wheeler has also been awarded an extension to its alliance contract with Shell, for a further three years. The company will continue to provide a full range of services including project management, design/engineering and procurement, and construction management services for the oils and chemicals productions units.*

***The Royal Society for the Prevention of** Accidents (RoSPA) has awarded each of Simon Storage's six UK terminals – including the recently acquired Riverside terminal on Teesside – a Gold Award, with a Gold Medal going to the Immingham East and West terminals. The Simon terminal in Shannon was awarded the National Irish Safety Organisation (NISO) Certificate of Merit. Simon's facilities management division, Simon Management, has also been recognised with a Gold Award for its operation of business partner terminals.*

***Exel's Tankfreight division has been** awarded the sole UK and Northern Ireland supply contract for BP Oil UK's third-party fuels distribution, worth £80mn over the next five years.*

***The UK Government has announced** plans to lift restrictions on the construction of new gas-fired power stations in October – earlier than expected. Some industry pundits suggest that the decision has been made in a bid to placate critics of the government's offer of up to £100mn of interim aid to the UK coal industry.*

***As part of the ongoing expansion of its** Q8 Fuelcare distributor business, Kuwait Petroleum GB has acquired the fuel distribution business of Central Farmers Ltd (CFA) in Methil, Fife, which covers the Forth and Tay estuaries and parts of Clackmannanshire, Stirlingshire and Perthshire.*

***Infineum has introduced a new series of** viscosity modifiers for automotive lubricants. Based on ethylene-propylene olefin copolymer (OCP) chemistry, the Infineum V8000 Series will initially be made available for passenger car and heavy-duty diesel motor oil applications.*

Heil Trailer ADR tankers delivered to BP Oil

BP Oil UK has taken delivery of a further five purpose-built ADR urban artic tanker trailers from Heil Trailer International. The all-aluminium tankers – manufactured in Bilston, West Midlands – have an overall length of 9 metres and a capacity of 29,000 litres. They operate at 35 tonnes gross vehicle weight and have a tare weight of 4,500 kg.

The five-compartment tanker trailers will be utilised for the distribution of petroleum and middle distillates between terminals and forecourts throughout the UK.

New vehicle emissions Euro-alliance

The European Commission's Joint Research Centre (JRC), the European Council for Automotive Research and Development (EUCAR), and the Oil Companies' European Organisation for Environment, Health and Safety (CONCAWE) have unveiled plans to collaborate in the field of emissions related to engines and vehicles, lubricants and fuels.

The collaboration will concentrate on technologies for reducing emissions – including engine technologies, types and qualities of fuels and lubricants, and their interactions. The partners will develop capabilities for measuring low emissions in order to measure progress and meet the requirements of the future fleet of vehicles. Technical cooperative efforts will focus on the evaluation of the performance of alternative fuels, advanced future gasoline and diesel fuels in connection with future engines technology, including fuel cells. These evaluations will be compared with existing vehicle/fuel systems.

LPG alliance to develop UK forecourt network

Shell Gas and Calor Gas have formed a new joint venture – Autogas –, which aims to establish 200 LPG refuelling points at forecourts across the UK within 18 months. There is currently of total of 350 LPG refuelling points nationwide, a figure predicted to grow to over 500 by the end of 2000.

Financial incentives by the UK Government, including increasing the difference in fuel duty between LPG, petrol and diesel, have had a major influence on the growth of the market. LPG currently costs around 39p/l on forecourts, compared to approximately 81p/l for unleaded petrol and diesel.

QGPC and Sasal to run Ras Laffan GTL plant

Qatar General Petroleum Company (QGPC), Sasol and Phillips – who have been developing the gas-to-liquids (GTL) joint venture for implementation at Ras Laffan industrial city – have agreed that QGPC and Sasol will revert to 51%:49% two-partner operatorship as per the original arrangement. Phillips is reported to have decided to 'refocus' its Qatari activities on 'those areas where it brings core expertise and proprietary technology.'

QGPC and Sasol plan to enter into the front-end design and engineering phase of the project before year-end. The partners have also announced plans to increase the capacity to 30,000 b/d of diesel and naphtha.

Europe

Securicor Fuelserv is expanding is 500- *strong network of sites currently serving UK and Irish commercial hauliers with fuel storage and distribution facilities with the construction of a new fuel site at the port of Calais, France. The 24-hour, fully automatic site – equipped with four vehicle lanes and four pumps – 'will give access to the more favourable priced European diesel to UK-based commercial fleet operators currently running vehicles across to the continent' comments the company.*

Petrobras is understood to be building *a hydrorefining unit based on the Institut Francais du Petrole's (IFP) hydrocracking technology transfer at its Reduc refinery in Brazil. The facility, part of a 2,400 cm/d capacity lube oil complex, is due onstream in 2003.*

Tractebel, the Belgium-based energy *affiliate of France's Suez Lyonnaise, is to invest $322mn over 11 years at the 1,800 MW Tadeusz Kosciuszko coal-fired power plant in Polaniec, Poland, reports* Stella Zenkovich. *The plant supplies 6% of Poland's current energy needs. Tractebel paid $83mn for a 25% stake in the plant, which is to be converted to gas-fired power generation, and is to acquire majority control in five years.*

Petroplus International subsidiary *Petrocare has secured contracts to build two power plants for biodiesel-fired energy generation in Ireland and the UK. It is claimed that the two projects will significantly reduce emissions of carbon dioxide while producing 90,000 MWh of electricity.*

Shell is reported to be adding three *new service stations to its 124-strong Hungarian network at a cost of $2.5mn this year. Two additional sites are to be upgraded at a cost of $1mn. Meanwhile, OMV Hungaria is planning to increase its 113-strong site network to 120 outlets by 2001 and 130 within five years. Currently placed second behind Mol with 20% of the Hungarian fuel retailing market, Shell plans to increase market share by 4%. OMV, the third largest fuel retailer plans to increase its market share from 10% to 13%.*

The European Union Council of *Ministers has voted to allow Germany to reduce duty on low sulfur fuels (with a maximum sulfur content of 500*

ppm) – from 1 November 2001 until 31 December 2002 – in a bid to reduce pollution, reports Keith Nuthall. The Council has also reached formal political agreement on setting limit values for benzene and carbon monoxide in ambient air across the EU of 5 µg/cm for benzene by 1 January 2010 and 10 µg/cm for carbon monoxide by 1 January 2004.

Statoil of Norway and Swedish food retailer Ica are understood to be planning to invest NKr1.5bn in their joint retail operations in Scandinavia. It is reported that NKr1bn will be spent on a new chain of service station outlets under the Ica Express branding, and a further NKr500mn on existing outlets.

Vopak has agreed in principal to sell its 1.5mn cm capacity Botlek storage terminal to Odfjell of Bergen, Norway, for an undisclosed sum. The disposal is in line with Europen Commission requirements covering Van Ommeren's merger with Pakhoed to form Vopak.

North America

ExxonMobil has announced that customers may now use either their Exxon or Mobil credit card at all Exxon and Mobil branded service stations in the US.

The New York Mercantile Exchange (Nymex) has received approval from the Securities and Exchange Commission on its plan to convert the exchange from a not-for-profit membership structure to a for-profit organisation. Nymex members are to vote on the plan in June.

ExxonMobil Lubricants & Petroleum Specialities Company has introduced Exxon Aviation Oil Elite™ 20W-50 to the US market. The semi-synthetic, ashless dispersant-containing multigrade engine oil is formulated for aircraft piston engines and is claimed to offer 'outstanding viscosity, wear and corrosion control and excellent rust protection.'

Gas-to-liquids specialist Syntroleum has signed a non-exclusive license agreement giving Ivanhoe Energy of Canada rights to use the Syntroleum Process to convert gas into synthetic oil and transportation fuels.

Middle East

JGC Corporation of Japan has won the front-end engineering and design contract for Oman's Sohar refinery with the lowest bid of $2mn, reports Stella Zenkovich.

Russia & Central Asia

Russia's President-Elect Vladimir Putin is to visit Turkmenistan at the end of May to 'provide political support' for Gazprom's 50bn cm/y long-term gas supply contract with the country, reports the United Financial Group's Russia Morning Comment. 'While this contract suits Russia's political interests in the region by directing the bulk of Turkmenistan's gas output to Russia, its commercial merits for Gazprom are dubious,' comments UFG. UFG estimates that Gazprom will lose annually $25–27/mn cm, or $1.2–1.4bn, by replacing its own production with gas from Turkmenistan at $36/mn cm.

Lukoil is making another attempt to acquire the bankrupt 437,000 b/d Norsi refinery, reports the United Financial Group's Russia Morning Comment. However, the company is understood to be insisting that the petrochemical division's production facilities be 'returned' before any deal is agreed – Sibur took over the facilities during a restructuring programme at the refinery. UFG believes that both Lukoil and Sibur will 'fight fiercely' for control of Norsi.

Asia-Pacific

Syntroleum and Methanex have discontinued talks on Methanex' previously announced intention to participate as an equity partner in Syntroleum's Sweetwater project, a 10,000 b/d gas-to-liquids (GTL) speciality products plant under development and to be located in Western Australia. The two companies have been unable to reach agreement on terms for forming the joint venture.

Pertamina and Arco are reported to have awarded a Japanese consortium of Chiyoda and Mitsubishi the engineering design contract for a new LNG plan to be built in Berau Bay in the eastern Indonesian province of Irian Jaya. The 6mn t/y plant will use feedstock gas from the Tangguh field which has proved and probable reserves of 18.3tn cf and a further 5.4tn cf of possible reserves.

UK Deliveries into Consumption (tonnes)

Products	†Mar 1999	*Mar 2000	†Jan–Mar 1999	*Jan–Mar 2000	% Change
Naphtha/LDF	307,602	213,021	875,304	698,792	–20
ATF – Kerosene	709,713	800,117	2,046,107	2,226,092	9
Petrol	1,857,318	1,836,193	5,190,948	5,204,415	0
of which unleaded	1,555,803	1,674,101	4,312,282	4,746,413	10
of which Super unleaded	31,148	37,914	85,424	108,852	27
of which Premium unleaded	1,524,655	1,636,187	4,226,858	4,637,561	10
Lead Replacement Petrol (LRP)	0	162,092	0	458,002	–
Burning Oil	439,410	411,576	1,265,552	1,253,278	–1
Automotive Diesel	1,375,259	1,403,014	3,799,971	3,832,313	0.9
GasOil/Marine Diesel Oil	664,427	636,347	1,829,085	1,919,617	5
Fuel Oil	267,790	140,308	641,959	463,669	–28
Lubricating Oil	66,304	69,564	189,632	200,462	6
Other Products	742,666	785,360	2,240,985	2,102,936	–6
Total above	6,430,489	6,295,500	18,079,543	17,901,574	–1
Refinery Consumption	511,435	401,041	1,637,565	1,311,325	–20
Total all products	6,941,924	6,696,541	19,717,108	19,212,899	–3

† Revised with adjustments * Figures dated from Feb 2000 onwards are the final figures as supplied by reporting companies, they are no longer provisional figures

e-Business impact upstream

E-business has the potential to fundamentally change the structure of the oil industry and the business models adopted. *Nick Lowe* and *David Bramley* of Arthur D Little (ADL) suggest that e-business will do more than just streamline established E&P business processes as it promises to bring the 'Virtual Oil Company' considerably closer. Our Internet correspondent *Brian Davis* reports.

'Speed is the critical element of e-strategy, supported by a readiness to embrace fundamental changes,' says Lowe. He suggests that although many companies have woken up to the opportunities of e-business, most are still only in the early stages of development compared with other business sectors. In the oil industry, new e-business initiatives have mostly been implemented in supply chain management/e-procurement, asset licensing and online services.

Lowe sees e-procurement initiatives burgeoning, with BP Amoco's decision to team up with Shell and others to create an e-marketplace based on the Commerce One platform, Chevron and Ariba's, together with **Petrocosm.com**, and **NetworkOil.com** in the US which involves Enron Oil and Gas, Burlington Resources and Ocean Energy. But he warns that competition is fierce.

'These fledgling e-marketplaces for the oil and gas industry are in a high-speed dash for market leadership. Only one or two will survive in the medium to long term, as transaction cost efficiencies will be rapidly eroded by the need to buy and sell across multiple marketplace platforms and technologies. However, for the winners, the rewards will be significant.'

Fellow ADL Consultant David Bramley remarks that: 'The majors are making all the running in e-procurement, and global trading exchanges. However, the thinking amongst the independents is significantly behind the majors. The smaller oil companies are still watching and waiting to decide the way forward.'

Online asset trading which was introduced in the US by Denver-based Petroleum Place in 1995, is gradually catching on elsewhere. In 1999 the UK License Information for Trading (UK-LIFT) was introduced, supported by the DTI, with UKOOA and Schlumberger GeoQuest. The approach is now being rolled out globally by Schlumberger's IndigoPool, who also plan to offer licensing opportunities and economic modelling.

New competition

New competitors are emerging, such as **PetroleumPlace** which bills itself as an oil and gas asset clearing house. There are also players from outside the traditional market, like Penwell Publishing's **PennNet** site, who is offering dot.com services with the promise of electronic dealing rooms, buyer and seller listings for e-trading and procurement.

Other information-led sites such as **Upstream.info.com** are also rumoured to be making a move into asset trading. Some government licensing agencies are also getting into the act. Gabon is offering licences on the Internet and Brazil is in the process of doing so. Both countries use **IndigoPool.com** as a platform. There is also talk of initiatives by US authorities offering licences online for the Gulf of Mexico.

Specialist groups from geoscientists to engineers and environmentalists also offer sophisticated online services from data analysis, benchmarking to technical and commercial modelling and risk assessment. ADL also provides environmental modelling services on a pay-per-use basis online, and plans to offer drilling and reservoir benchmarking services on the web later this year.

What does the future hold?

Looking forward over the next five years, Lowe and Bramley ask: 'Will there be an extension and consolidation of existing trends or will radically new concepts emerge?'

They predict that supply chain costs will fall significantly as e-marketplaces evolve. 'Links to associated sites will provide full-service, one-stop shops, including logistics, insurance, legal and financial services, along with plentiful industry news and financial data,' says Lowe.

They forecast online asset trading will gain momentum this year, boosted by the introduction of 'virtual data rooms'. These will result in a more liquid market in hydrocarbon assets, with greater opportunities for risk management, portfolio rationalisation and optimisation.

'Fast moving organisations will adopt the role of asset brokers, which may eventually develop into real-time options trading for drilling sites, development projects and production,' he claims.

BP Amoco recently signed a deal with Geoquest to develop a viable virtual data room, and there is a similar initiative by Schlumberger as an offshoot of the LIFT website.

Meeting the challenge

Bramley says the main challenge will be handling the massive volumes of data for transfer between the data rooms and the users via the Internet. 'These virtual data rooms will demand compatability of database architecture between numerous sources and the user. This is a major issue, and many companies are likely to use a pay-per-view approach via an Application Software Provider (ASP) rather than purchase software themselves.'

ADL believes that governments and national oil companies are slower to embrace the opportunities, 'as they are constrained partly by custom and culture, and by limited technological infrastructure in the less developed countries.' However, more innovative authorities will introduce elements of Internet-based licensing within the next 12 months, from information on licensing terms and blocks on offer (see **www.brazil.com**) to fully interactive bidding. Bramley also points out that governments will check out details of companies well in advance via their Internet sites, rather than waiting for companies to pay them a visit when license rounds are offered.

However, the downstream market for gas is using a different route. Gas markets are already more liquid through the flexibility that e-trading brings. With instant access to information there has been an enormous growth in trading options and the opening of gas futures markets. 'LNG e-trading is creating the basis for a global LNG marketplace,' says Lowe.

ADL claims there are four levels of generic e-business innovation as the business process is optimised. This starts with 'market innovation', then 'channel innovation' leading to 'product/service innovation' and finally, 'business model innovation' which marks a fundamental shift in terms of industry competition and value creation.

Lowe claims the upstream oil sector is already witnessing the first two levels, and is driving out inefficiencies and improving transaction processing costs. 'Level three will be achieved with the introduction of innovative bundled services, such as the new joint e-marketplaces. But there is still a question when fundamental change will be achieved.'

The virtual oil company

ADL has been an enthusiastic promoter of the concept of a 'virtual oil company'. This has been a favourite theme for several years, which only now seems achievable thanks to the communications 'glue' offered by the Internet. Lowe says: 'Access to high grade information, with ever-decreasing external transaction costs will erode the advantages of the traditional upstream company.'

He suggests that existing petroleum companies may fragment into (a) 'knowledge-based competitors' who will continue to own the title to the hydrocarbon assets, and feel that they are good at making development decisions, and (b) a new set of 'asset operators' who will conduct the actual operations, from exploration through to production.

Of course, at present, oil companies are desperately reluctant to outsource the interpretation of fields, reservoir analysis and commercial decisions affecting E&P. Lowe argues that: 'Times are changing. Some oil majors will be willing to hive off support functions such as human resources (HR), business planning, geoscience and engineering, to specialist support groups linked through the web.' He points to BP Amoco's Internet-enabled outsourcing of its global HR function, but frankly this seems to be a long way from deciding the commercial potential of an oil field reservoir.

Constraint of caution

Despite the heady promise of the Internet as the 'glue' for oil companies to free themselves from the clutter of non-core activities, and the opportunities for new partnerships and shared services in the online environment, the consultants recognise the hesitancy of the majors to re-model themselves. 'The traditional preference for bricks and mortar assets and demonstrable in-house capabilities could provide a constraint to the most extreme forms of outsourcing,' admits Lowe.

New service companies will need to develop to service the Virtual Oil Company, where niche players could provide specialist web-based services, while mega-service providers take on the role of partners and information managers for their oil company clients.

But the ADL consultants do not believe that fragmentation is inevitable. Bramley admits: 'Some of the majors may resist the trend and compete by internalising e-business to strengthen their traditional advantages. To succeed they will need to re-create themselves as a microcosm of the business as a whole, becoming an organisation of fluid attachments, highly efficient at interacting with the rest of the industry.'

If fragmentation does become widespread, Lowe says: 'Managing external relationships will become a key to success. Cultural and structural barriers between the traditional industry players and the new dot.coms may prove particularly difficult to break down and manage. The winners will have the competencies to move with ease between both.'

Rather more challengingly, he suggests, 'Relationships with service providers will increasingly be managed through payment systems linked to performance, as simple fixed fee or reimbursable cost arrangements will not be flexible enough for the new style outsourcing. Cross-shareholdings may become a common feature.'

The Internet will increase the accessibility of information and know-how to all industry players. Lowe argues: 'Ownership will no longer be necessary or even desirable for the majority of organisations, as competitive advantage will be based on the ability to add the maximum value to increasingly commoditised information. The winners will be those organisations able to filter huge volumes of data, identify opportunities and put value-adding strategies in place.' This is clearly a call for the creation of new business models.

Bramley, says: 'For the Virtual Oil Company, the future of drilling wells doesn't mean owning any rigs or platforms, just having a grip on the value of the oil well.' He says that scarce and expensive specialist resources will no longer need to be physically located at the site of operations in the Internet world, but can be based at global centres of excellence. For example, feeding drilling or reservoir data over an intranet/extranet in real time, and basing decisions on best global practice.

Running out of time

ADL's final message is time is running short. 'Strategy can no longer be based on inflexible five-year plans. The pace of change is too great.' says Lowe. 'Clearly there is no one-size fits all solution, but all companies must identify a migration path to the future.

Although e-business may enable the emergence of genuine Virtual Oil Companies, by making feasible the outsourcing of almost everything apart from core knowledge and decision making, it will certainly redefine the value chain rapidly and change the basis upon which upstream companies compete.'

Roncador – the world's deepest field

When Petrobras starts full-scale production from the Roncador field later this spring, it will be the deepest development yet undertaken in the world, with wells in 1,890 metres of water. An early production system started operation in January 1999 – just over two years after the field was discovered – with a producing well at a then record depth of 1,853 metres (6,079 ft). The early production system has allowed Petrobras to gain a better understanding of the field's complex reservoir, and also provided a test bed for the company's ultra-deepwater technology, writes *Jeff Crook*.

Roncador lies about 130 km from the shore in the northern part of the Campos Basin, a basin that is currently responsible for 70% of the Brazil's oil and gas supply. Water depths reach 3,500 metres (11,483 ft) in places – presenting an enormous challenge. However, the deepwater challenge is mitigated, to an extent, by the relatively benign conditions in the region.

Thirty-seven fields have been found in the Campos Basin to date – seven of which are giants: Marlim, Albacora, Barracuda, Marlim South, Albacora Leste, Marlim Leste and Roncador. At the last count there are 35 fixed and floating facilities, with oil production rising towards 700,000 b/d. Marlim is currently the most productive of these fields – it is forecast to produce more than 500,000 b/d by the year 2002 from eight floating facilities.

Roncador is a more recent discovery (October 1996) and has estimated reserves of 3bn barrels of oil. The field covers 132 sq km in water depths of between 1,500 and 2,000 metres (4,922 to 6,562 ft). The discovery well showed evidence of Cretacean Age sandstone rich in light oil (31° API).

Petrobras maintains that data from appraisal wells made it clear that Roncador exhibited an unusual geological structure, making exploitation of such a deepwater field a challenging prospect. An appraisal well in the southwest portion of the field found oil of a different character (18° API), with an unexpected gas cap. A different oil-water interface was found by another appraisal well in the northern portion of the field.

Early production

Petrobras chartered the *Seillean* floating production, storage and offloading (FPSO) vessel for the early production system (EPS) in March 1998 from the Reading and Bates Drilling Corporation to gain a better understanding of the field characteristics. The dynamically positioned FPSO has a production capacity of up to 20,000 b/d and storage capacity for up to 306,000 barrels of oil.

The vessel was constructed by the Harland and Wolff shipyard in Belfast for the oil major BP, and came into operation in 1990. It was conceived as a vessel which could connect and disconnect from subsea wells without assistance from support vessels. The name *Seillean* – 'bee' in Gaelic – was intended to convey the idea of a vessel that could move freely from field to field.

The Reading and Bates Drilling Corporation acquired the vessel in 1993, and she was operating in Donan field in the North Sea before leaving for Brazil. The vessel was ideally suited for short-term deployment in an ultra-deepwater field – it is held in position solely by thrusters and can thus dispense with cumbersome deepwater mooring systems.

Some changes were needed to the vessel including the installation of a new offloading system, installation of a production heater designed for heavy oil processing, upgrading of the dynamic positioning control system, and changes to the completion tower to allow operation in a 2,000-metre water depth. The subsea Xmas tree and rigid riser for this ultra-deep application were also subject to extensive R&D.

The Brazilian company CBV developed a custom-made Xmas tree for the project through a 'capacitation' deal with Petrobras. The materials and components of the Xmas Tree were re-specified to resist the seabed pressures and multiplex systems were adopted for Xmas tree control. The multiplex data transmission would provide faster shut-off of subsea valves than conventional hydraulic signals, given the long transmission distance to the seabed.

The rigid riser system was based on the original *Seillean* concept but was further developed by Petrobras under the 'Drill Pipe Riser-2000' programme. The drill pipes were treated with Teflon sealing, making them gas tight. The German company Mannesman played a central role in this riser project.

A special umbilical, resistant to collapse under the high water pressure, was developed by Petrobras in association with Multiflex. Kongsberg, part of the FMC Group, was hired as project engineering and procurement contractor for the overall project.

Phase 2 development

The next phase of development involves a permanently moored floating production unit (FPU) connected to subsea wells – a scheme that is being brought onstream in a short time-scale by 'parallel engineering'. Such an approach is said to have cut two years from the programme, and involves conducting field appraisal, detailed engineering and fabrication at the same time.

Petrobras has designated the FPU as *Petrobras-36*. The vessel will have capacity to process 180,000 barrels of oil, 7.2mn cm of gas, and pump 24,000 cm of water every day. The oil produced will be offloaded to the *Petrobras-47* floating storage and offloading system (FSO) while the associated gas will go to the Namorado-1 platform. The oil and gas are exported from the FPU by steel catenary risers, in addition to two oil export flexible lines – a new technical innovation for such water depths.

The FPU will be moored in 1,362 metres of water on the west side of the field, where the water is shallowest. The unit will be connected by flexible riser to 21 producing wells and five injection wells located in water depths up to 1,890 metres.

The FPU must support the weight of these risers – this duty is complicated both because of the large number of risers and because the riser arrangement is asymmetric with all the subsea wells lying east or northeast of the FPU.

The FPU is a converted Trendsetter-class semi-submersible, built in the early 1990s under the name *Spirit of Columbus* by the Fincantieri shipyard in Genoa, Italy. It was originally built as a speculative venture by a subsidiary of Midland and Scottish Resources (MSR). MSR anticipated booming demand for FPUs, and the Italian Government provided a subsidy which helped finance the project.

Unfortunately, MSR went into receivership last year, after production from its Emerald field in the North Sea, failed to live up to expectations. But before going into receivership, the company sold the *Spirit of Columbus* to Petro-Deep for $359.52mn payable over 12 years starting from 1 January 1997. Petro-Deep has chartered the vessel to Brasoil, which in turn chartered the vessel to Petrobras, its parent company.

As part of the charter arrangements Petro-Deep carried out a major upgrade of the vessel, which included raising oil production capacity from 100,000 b/d to 180,000 b/d, and removing the drilling and propulsion equipment. The new topside facilities included two separation trains and three compressor trains.

The hull originally consisted of a water-tight, box-type deck structure, supported on four columns above two pontoons, with a 22-metre diameter central caisson connected to columns and pontoons by cross bracings. A team of engineers from Petrobras worked closely with the contractors on the conversion project. Noble Denton performed marine and structural engineering, while Amec carried out facilities engineering, and Davie Industries in Canada undertook the fabrication work. Petromec was responsible for overall project coordination.

The unit is to be held in place on the Roncador field by a 16-line taut-leg mooring system. These over 2,000 metres long mooring lines are made up of segments. The bottom segment of each line consists of steel wire connected to a vertical loaded anchor. The mid-depth segments of each mooring line consist of synthetic fibre rope, with chain inserts between each segment. Another chain segment is provided at the top.

The design of the mooring system needed to take account of strong currents that run at up to 2.5 m/s at the surface, which decay and change direction as the depth increases. The sea conditions are, however, relatively benign – the 100-year return significant wave height is just 7.8 metres (compared with 27 metres wave heights that have been recorded in the Atlantic Frontier).

Noble Denton developed models that enabled the dynamic characteristics of the moored FPU to be assessed for different phases of the field development. The company was also responsible for engineering the modifications to the hull of the FPU.

Major modifications

One major modification was the installation of spider decks, beneath the main deck, to allow the large number of riser pull-in operations to be performed. A permanent pull-in system for up to 83 risers has been incorporated in the spider decks with necessary winches, monorails, trolleys and ancillary equipment to cater for pull-in loads up to 150 tonnes.

The riser supports needed to be designed in such a way that the risers would not cause loads that would adversely effect the stability of the FPU. The export lines, which consist of 10-inch diameter steel catenary risers, will be supported at pontoon level on the port (west) side of the platform.

The remaining risers will be pulled up to deck level on the other three sides of the platform, most of them through I-tubes mounted on the inside of the pontoons. The purpose of this arrangement is to ensure that the weight of the risers is applied to the FPU at as lower level as possible.

The hull of the semi-submersible was extensively modified to increase its load carrying capability and reduce its draft. The load carrying capacity needed to be increased to taking account of a net increase in deck weight of around 7,800 tonnes, and the weight of 5,000 tonnes of risers. The draft needed to be reduced in order to ensure that there was sufficient air gap for these new spider decks.

Some increased buoyancy was achieved by adding new blisters to all the columns, and inserting stability boxes into the middle of the pontoon sections. Further buoyancy was achieved by closing the bottom of the central caisson.

After all these modifications had been completed by Davie Industries, the 32,767-tonne re-christened *Petrobras-36* was transported from Sept-Iles, in Canada, to Rio de Janeiro on Dockwise's heavy lift vessel, *Mighty Servant 1*. This was the heaviest rig transport operation ever undertaken when it was completed in November 1999.

World record for Coflexip

Coflexip Stena Offshore's pipelaying vessel – *Sunrise 2000* – is claimed to have set a new world record for flexible pipe with the installation of a 6-inch diameter insulated flowline in 1,840 metres water depth on Petrobras' Roncador field offshore Brazil. Designed and manufactured by Brasflex and Flexibras, two Brazilian divisions of the CSO Group, the 9.5km long flowline was installed between the RO-9 wellhead at 1,840 metres and the P36 platform in 1,360 metres water depth. A second 6-inch diameter line is to be installed in May.

The record is the second to be set by *Sunrise 2000* – the first was for the installation of a riser on the Marlim Sul field at a depth of 1,709 metres in 1997.

The vessel's pipelaying capacity was increased in 1999 to enable it to lay three lines simultaneously at a depth of 2,000 metres.

The oilsite.com

***Petroleum Review* recently asked *Bob Watts*, Executive Director of *theoilsite.com* about its new e-procurement inititiative.**

Q theoilsite.com **is an independent procurement portal. Who owns it and what facilities will it offer? Who is it aimed at?**

A **theoilsite.com** is owned by the founders of the company (78%) and by approximately 2000 private investors (22%). It will offer:

- Equipment procurement
- Property trading
- Jobs online (The Pay Zone)
- Links – finance, insurance...
- Industry news and information

Q **When did the site get up and running? Were all features present from the start or did you start with some features/facilities and then add others?**

A The site started during May 2000. The Equipment Procurement module and the Property Trading module were operational from start-up. Other features of the site will become functional during June and July this year – we do not want to introduce any features until they are tested and are robust.

Q **The major oil companies have recently been making a series of announcements about major procurement and trading portals. What is the likely impact on the prospects for** theoilsite.com **and the likely user base?**

A We do not believe that the announcement by the major oil companies that they are, either individually or in consortia, developing their own procurement sites has any serious impact on our potential business. First of all the international market for procurement is huge – possibly $200-300bn annually – and this market will only be partially served by the majors' sites.

Secondly, there are a substantial number of companies that will be reluctant to use sites controlled by the majors. In particular, state-owned oil companies and independent companies will wish to find alternative means of achieving the savings and benefits derived from B2B (business-to-business) electronic commerce – they will not want their procurement to be organised or controlled in any way by the majors.

Thirdly, there are potentially serious anti-trust issues involved which could make the majors' sites either stillborn or dogged by legal challenges which will delay or seriously impact their effectiveness.

Finally, we believe that the suppliers will be very concerned about 'consortia run' sites and will be very supportive of independent sites such as ours.

theoilsite.com is truly independent. It favours neither buyer nor seller and has a major role to play in providing an 'unbiased' marketplace.

Q **You recently raised £2mn with a share floatation on Ofex. Do you plan to raise further funds to develop the site? Is your ability to do this reduced by recent stock market turbulence and the fall from favour of dot.com companies?**

A We will probably raise more money later this year when our site is operational. We don't believe that the recent turbulence has any negative impact on our ability to raise further funds. To the contrary, we believe that venture capital funds and potential investors are becoming more discriminating and will provide substantial support for B2B businesses that have real long-term business potential.

Q **There is a widespread belief that there are too many sites offering services to the oil industry. How do you intend to survive and how do you see this rationalisation developing?**

A It is true – there are too many sites in the oil industry. However, as any serious reviewer of these sites will realise most of them are either information providers or catalogues of goods or services. There are very few fully operational B2B sites. Many of the sites that are not based on sustainable revenues will disappear.

Q **How does** theoilsite.com **earn its money and how quickly do you think it can move into profit?**

A **theoilsite.com** earns its revenues primarily from commissions on completed transactions and advertising fees for of oil and gas properties. There will be other sources of revenues from links, referrals, company advertising etc, but these will probably be modest compared with the primary revenues. We should be operating at a profit before the end of 2000.

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can now organise and book product deliveries online to 900 destinations worldwide using a new freight forwarding service from Webfreight, who are a wholly-owned subsidiary of J2C. International airfreight distributor TWA Cargo is reported to be the first airline to take advantage of Webfreight's service at **www.webfreight.net**

Paradigm Geophysical has launched the web-based delivery of its e-Geoscience™ technology. The company claims that the new Internet service will expand the opportunities for remote collaborative analysis of exploration and production while simplifying data management and IT management. Paradigm has also web-enabled its GeoLog™ well data management, analysis, modelling and petrophysical package. In addition, its PlaNET™ product for the optimisation of gas infrastructure and reservoir simulation is now available from an application service provider (ASP).

A brand-new 'ideas exchange' for business-to-business (B2B) e-commerce executives – EyeForMeetings – first convened in London on 10 May (see **www.eyeformeetings.com**). The monthly e-meetings are designed to get e-business decision makers across all industries to exchange expertise with fellow e-business professionals. Over 200 people from the energy, finance, freight and transport, online exchanges, automotive, aerospace, chemical and telecoms sectors registered for the first meeting, which was hosted by Andersen Consulting. Monthly EyeforMeetings are planned for other major cities around the world.

The British Geological Survey has launched the first phase of its new, commercial, Internet shop at **www.British-Geological-Survey.co.uk** Customers can use their credit card to buy from the BGS's wide range of conventional print products. A picture library and some key digital information such as the World Mineral Statistics are also available. Further advanced products, such as digital map data, are planned for the near future as phase two is implemented. In its third phase of development, the site will offer interactive service for the delivery of site-specific information.

Oil & Gas Journal Exchange (**www.OGJExchange.com**), a new independent trading exchange for the oil and gas industry, is now open for business. Buyers can register and conduct due diligence for the first auction, which will include over $10mn in inventory and is planned to open for active bidding on 6 June 2000. Online bidding will close on 8 June.

The enigma of Libya

Although Libya is considered to have plentiful undiscovered hydrocarbon reserves, oil company executives and investors are finding it difficult to assess the risks – and to know what to expect – regarding a country that has been politically and economically isolated for so many years. *Judith Gurney* reports.

Official Libyan pronouncements tend to be vague, if not contradictory, and the accuracy of information from sources outside Libya, such as the CIA, is questionable. A good example of the problems faced is Libya's recent abolition of its Energy Ministry and placement of the Libyan National Oil Company (NOC) under the control of a central General Popular Committee. Why was this done and what does it mean for companies seeking to acquire exploration blocks in Libya?

The pluses

Despite the difficulties of interpreting Libyan politics, there are geological, economic and historical data to help calculate the risk of a Libyan project. Ibrahim Baggar, NOC Exploration Manager, recently gave an estimate of 82bn barrels of undiscovered oil reserves in the Sirte, Murzuk and Ghadames Basins and offshore (see **Table 1** and **Figure 1**). Many analysts believe this figure to be credible – although the offshore potential is considered to be limited to the western Pelagian Shelf, given the narrow continental shelf and slope along the coast to the east. These analysts are skeptical, however, about Baggar's claims of 25bn barrels of undiscovered reserves in the Kufrah Basin and Cyrenaic platform.

Geological conditions

The geology of the Sirte, Murzuk and Ghadames Basins favours the formation and storage of hydrocarbons. However, these basins are, at the moment, underexplored. The major oil companies that found giant fields in the central Sirte Basin in the 1960s did not bother to delve into deeper strata, and they gave up their concessions in the more remote southwestern Murzuk and Ghadames Basins in order to develop export infrastructure for Sirte production.

After these companies left, NOC lacked the means to engage in extensive exploration and it concentrated on areas close to existing infrastructure in order to reduce costs. The 1.3mn b/d of current oil production comes mainly from these old Sirte fields, with additions from the offshore Bouri field operated by Agip and from the Al Sharara field in the Murzuk Basin operated by Repsol.

It is difficult to estimate the potential for increasing output from the Sirte fields as the Libyan Government has not issued official field reserve statistics since its 1986 estimate of 22.8bn barrels. Exploration and development of Libyan gas reserves has been minimal, due to a small domestic market and the lack of means for large-scale export. Estimates of recoverable Libyan gas reserves are impressive, ranging between 50tn cf and 70tn cf (1.5tn cm and 1.7tn cm). But given the strength of Agip's current involvement in this sector, as evidenced by its $5.5bn Western Libya Gas Project which is designed to develop known reserves and export 10bn cm/y by pipeline to Italy, it is unlikely that there will be many opportunities here for other foreign companies.

Project economics

The development together with production expenses of Libyan oil fields are generally low, and even small fields may be commercially feasible if they are located near existing pipeline systems. The Sirte Basin En Naga fields that Lundin is developing, for instance, have estimated reserves of only 90mn barrels. European markets are close and easily accessible, so final delivery cost is low. In addition, most of the oil found to date is light and relatively sweet and commands a good price. An added bonus at this time for European companies is the lack of competition from US oil companies or companies with significant US operations due to sanctions against Libya.

Stable environment

That oil production has continued, with a few new fields discovered, despite UN and US sanctions and the departure of major oil companies is, ironically, evidence of a stable political environment. Despite Qaddafi's erratic and unfathomable pronouncements and actions, Libya seems to be largely free of the civil strife found elsewhere in North

Basin	Discovered	Forecast to be found	Total
Sirte	91	24	115
Offshore	13	12	25
Murzuk	5	35	40
Ghadames	4	11	15
Kufra	nil	19	19
Cyrenaica	nil	6	6
Total	**113**	**107**	**220**

Source: Statement by Ibrahim Baggar, NOC Exploration Manager, at CWC Associates conference held in Geneva on 26 April 1999

Table 1: NOC estimate of Libyan oil reserves (bn barrels)

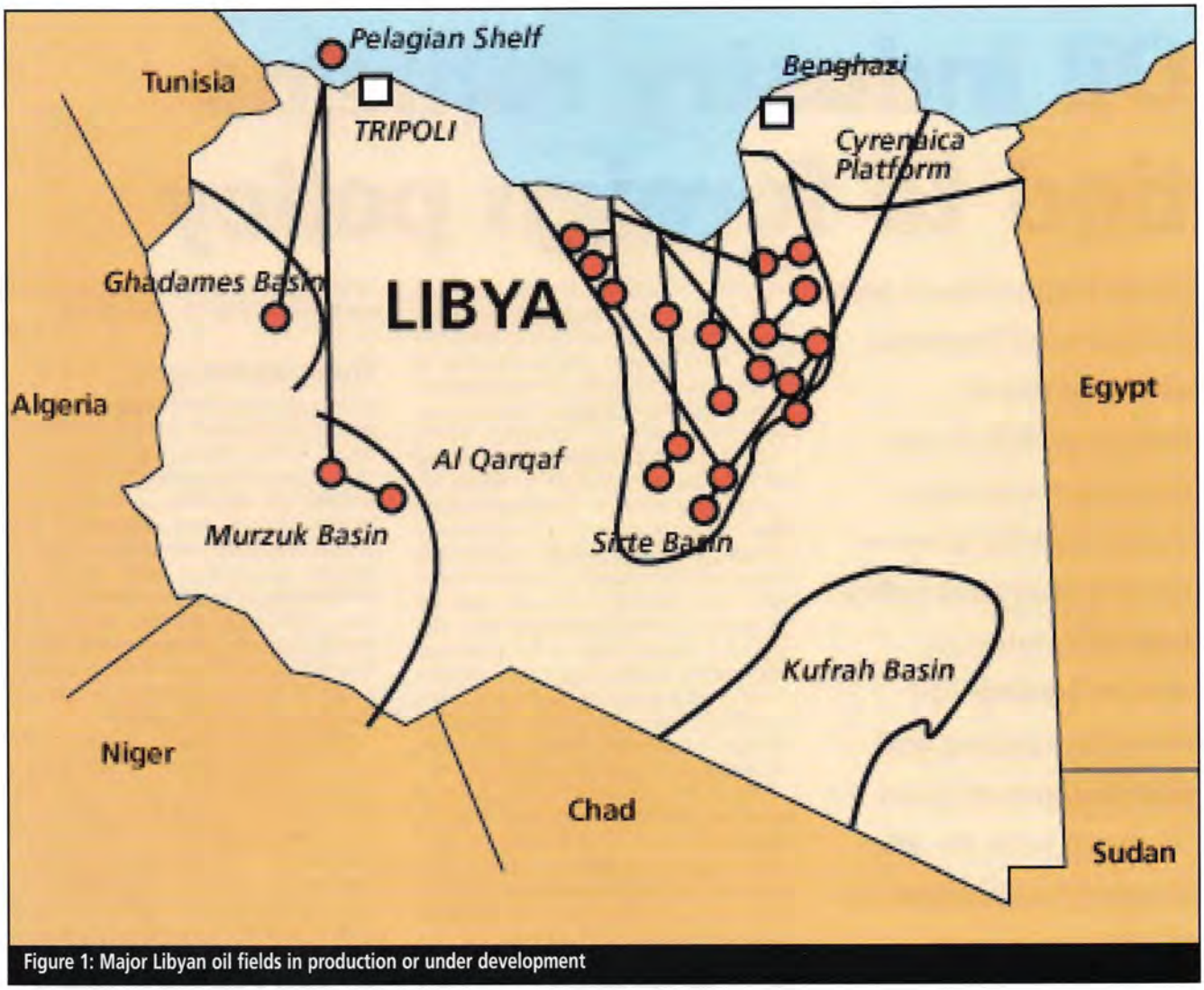

Figure 1: Major Libyan oil fields in production or under development

Africa and the Middle East.

The four NOC subsidiaries who are operating the fields left behind by the majors had an estimated 1999 output of 800,000 b/d. The drop in production in recent years is viewed partly as the result of the ban on US equipment replacements and on technologies and processes under US patents. In addition to NOC subsidiaries, there are six European companies – Agip, Repsol, Wintershall, Veba, OMV and TotalFina – currently serving as operators of producing fields, with a 1999 output estimated at 500,000 b/d. Most of these have been active in Libya for many years.

Two recent new arrivals, Lasmo and Lundin/Red Sea Oil, have development plans accepted by the government – Lasmo for the giant Elephant field in the Murzuk Basin and Lundin/Red Sea Oil for its Sirte En Naga fields. Other companies with exploration and production sharing contracts (EPSA), or with equity in ongoing production, include Saga, Elf Aquitaine, Petronas, Saudi Arabia's Nimr Petroleum and Pedco, a Korean consortium. Some of these, and others, including Ireland's Bula Resources, are reported to be negotiating for exploration contracts.

The minuses

The long isolation of Libya during a period of rapid change in Europe has created a considerable cultural gap. For those accustomed to mergers, instant Internet communication and fast-track development of deepwater discoveries, the Libyan administration seems incredibly slow moving. The Agip gas project, for instance, was originally signed in 1996 but not finalised until 1999. The redrafting of the Libyan 1955 Petroleum Law also began in 1996 and is still not finalised. Last April, Libya designated 81 onshore and offshore blocks as open areas that would shortly be available for bidding and said that its revised 1955 Petroleum Law would describe more attractive EPSA terms. A year later, nothing has happened along these lines. There appears to be ineffective communication between the quixotic administration and the pragmatic NOC, and it is not clear who makes the final decisions on the award of EPSA contracts, nor the basis for such decisions.

What is often overlooked is the fact that the many years of isolation have made Libya more self-sufficient. The government and NOC are proud of their success in keeping production going in oil fields discovered in the 1960s, in consistently finding European markets for oil exports, in maintaining a foothold in European downstream operations, and in securing Agip to develop the country's gas potential.

In addition, these accomplishments have strengthened a resolve to develop the Libyan oil and gas industry on Libyan terms, to favour companies with Libyan experience to bring onstream known reserves and to increase output of older oil fields, and to cherry-pick those that want to do exploration.

Companies that fail to recognise the source of this pride are unlikely to succeed in gaining a foothold in the rejuvenation of the Libyan oil industry. ●

Oil industry remains tied to foreign policy

When Hugo Chávez was inaugurated President of Venezuela in February 1999 it was clear from his statements that his government would shift policy from the outgoing administration's oil industry opening and maintenance of good relations with the US, to one of subordinating the oil industry to domestic and foreign policy ambitions, writes *Maria Kielmas*.

The appointment of Roberto Mandini, a long-serving PdVSA executive, as President of the company was initially seen as positive. It seemed to support the international oil industry's openly-acknowledged hopes that the election of a populist, leftist, retired army lieutenant-colonel would not change the investment climate for oil multinationals in Venezuela. Even the appointment of Ali Rodríguez Araque, a lawyer, former Head of the Congressional Energy Commission – and one who openly criticised the oil opening process (apertura) from the outset – did not dent the companies' confidence. There were even suggestions that given Venezuela's economic problems the government might be obliged to privatise PdVSA, despite its ideological opposition to the concept.

Fifteen months later the oil industry is counting the cost of making one the biggest mistakes in any foreign investment strategy in heeding what is perceived as a host government's economic necessity, instead of listening to what its leading politicians clearly state.

A clear message

The new government made its oil industry priorities clear from the outset:

- All agreements with Opec would be fulfilled.
- National oil production would not be increased beyond what the international market could take without inducing sharp price falls.
- Foreign investment would be invited into the gas, petrochemical and industry infrastructure sectors while new upstream development remained exclusive to PdVSA.
- Venezuela would push for hemispheric energy integration, especially with ventures in Brazil and Cuba.

Fifteen months later this is what has happened. However, the arbitrariness – and often incompetence – of economic policy, its subjugation to populist politics, President Chávez' pre-occupation with constitutional change, and an unending series of elections in the face of deepening economic problems, has united a previously fragmented opposition. A new constitution approved last year required new presidential, congressional and local elections – all scheduled for 28 May.

Opec increases

Energy Minister Ali Rodríguez was a key player in forging accords between Saudi Arabia, Mexico and Venezuela that formed the foundation of Opec's decision to withhold production and increase prices. Any suggestion that PdVSA would be powerful enough to counter government edicts to cut oil production disappeared quickly with the dismissal of Roberto Mandini as PdVSA chief. He was replaced by Héctor Ciavalidini, a former middle-ranking engineer at Bariven, before he too was dismissed for 'incompetence'.

There was no murmur of official dissent in Caracas after the latest Opec meeting which agreed to a net 1.5mn b/d production increase – even though Venzuela's terms are distinctly disadvantageous. The agreement increased Venezuela's quota by 125,000 b/d to a new ceiling of 2.787mn b/d. Saudi Arabia, Venezuela's principal Opec competitor for the US market, will increase by 585,000 b/d to 8.023mn b/d. Mexico – which cut back on oil exports rather than production to support the Opec effort – will increase its exports to 325,000 b/d, mostly to the US market.

Since the first Riyadh pact in March 1998, Venezuela has cut production by 650,000 b/d, all of which has fallen on PdVSA. Only Chevron among the foreign operators in field reactivation contracts was asked to cut production – from the Boscan field – but this was soon reversed. However, local experts believe that PdVSA is unable to return to a production capacity of 3.31mn b/d, its official production level prior to March 1998. The company's fields deplete at up to 25% annually. Budget and production cutbacks over the last two years have made 74 fields drilling crews redundant. After the Opec meeting Energy Minister Rodríguez made a triumphal announcement that 12 new field drilling crews will be redeployed at PdVSA fields to increase production. The critics maintain that this is not enough to stem the long-term depletion. PdVSA must redeploy all 74 redundant crews to boost its current capacity by 600,000 b/d. If this does not happen, Venezuela will be unable to

meet new production ceilings once these are raised later this year, as Rodríguez individually and Opec collectively has forecast. Local experts claim that PdVSA's current production capacity is about 3mn b/d to 3.1mn b/d.

Bailing out

Foreign operators, who initially hoped the new Chávez government would renegotiate 'apertura' contracts which were judged fiscally punitive by the industry, have seen the light and are leaving or holding back investments. Last year both the government and the constituent assembly, which drafted the new constitution, snuffed out all hope for private sector investment in the upstream oil industry. Royalties on oil and gas production have increased to 20% from their former range of 1% to 16%, even though income taxes have fallen from 35% to 24%. At one point legislators were discussing drafting 'flexible' fiscal terms which would respond to the budgetary needs of the country. This would effectively allow the government to strip income from the earnings of any project in much the same manner as successive administration have imposed 'dividends' on PdVSA earnings. This still has to be clarified in upcoming hydrocarbon legislation. The new constitution bans the privatisation of PdVSA, a retriction stronger than even the Mexican constitution ban on upstream risk contracts to the private sector.

BP Amoco sold its Pedernales field reactivation contract to France's Perenco for $55mn. Chevron has halted a plan to develop a $1.5bn aromatics joint venture on the Paraguana Peninsula because of problems with Venezuela's economy. Lasmo is seeking a joint venture partner into its Dacion field re-activation contract. The company paid an upfront cash bonus of $450mn to win the contract, claiming to an astounded industry and investment community that low production costs and high potential reserves will make the deal a money-maker.

Field reactivation contracts are remunerated by a fee based on supplementary production. According to London stock markets analysts, Lasmo's deal with PdVSA depends more on the oil price than production volumes. The British company gambled that world prices would remain low and reportedly agreed a scheme where the lower the world oil price, the higher the fee, and vice versa. But as Venezuelan crude prices hit $24 to $27 per barrel, Lasmo's fee, say the stock market sources, has fallen to mere US cents per barrel rather than dollars. Competing oil company bidders for the Dacion contract had earlier calculated that Lasmo's deal implied production costs of $6.50 per barrel, before taxes and royalties.

A bright spot is the revival of the Cristobal Colon LNG project, albeit on a much smaller scale. In March, PdVSA Gas – the state oil company's gas subsidiary – Shell, ExxonMobil and Mitsubishi, signed a memorandum of understanding to revive the project to produce 4mn t/y of LNG at an estimated project cost of $2bn. PdVSA Gas will hold an initial 33% of the project but hopes to cut this by inviting new joint ventures partners. Shell will hold 30%, ExxonMobil 29% and Mitsubishi 8%. The LNG sales will be targeted at the Caribbean market and the US Gulf coast, with first production estimated to start in 2005. However, no financing has been secured for the project yet. The gas will come from fields offshore of the Gulf of Paria where reserves are now estimated at 18tn cf. When the Cristobal Colon project was still active the official estimated of offshore gas reserves was 11tn cf. PdVSA plans to become a major LNG supplier to the Atlantic basin market.

Windfall tax confusion

Yet more confusion surrounds the extra $4.377bn or so in windfall oil tax revenues that the Venezuelan Treasury received during the past high oil price year. By law, these windfall profits should have been saved in two rainy-day funds: the Investment Fund for Macroeconomic Stabilisation (FIEM), which steers money to social programmes, state investment and debt service, and the Debt Rescue Fund (FRD), which was set up to pay off public debt. Both funds were created in 1998 but no cash has been placed in them until March.

Finance Minister José Rojas later admitted that half of the windfall went to reduce the 1999 fiscal deficit from a projected 7.1% GDP to 2.8% GDP, and other unspecified payments. Of the remainder, $1.7bn has now been deposited in the FIEM and a further $500mn in the FRD. The explanation did little to restore confidence among Wall Street analysts who have become increasingly frustrated at contradictory oil revenue figures emerging with each new administration in Caracas. The two rainy-day funds should hold a total of $7bn, the analysts believe. Energy Mister Rodríguez claims that the extra oil tax revenues are closer to $5bn, of which $1bn should have been transferred to the FIEM. But the transfer process has been slow, he claims.

Cuban crisis

The Washington Administration looks set to be the next party frustrated with the Chávez' government's oil policy – this time because of Venezuela's ambitions to develop business with Cuba. The PdVSA Chief Héctor Ciavaldini explained recently that Venezuela should be in the forefront of supplying Cuba's growing fuel needs, which have risen by 25% over the past year (albeit from a very low base) as a result of increased tourism.

Under a wide-ranging oil industry investment accord with Cuba signed last year, Venezuela hopes to be present in Cuban exploration, production, refining, marketing and in the future, gas and petrochemicals. Part of this involves a $15mn to $30mn investment in the 60,000 b/d loss-making Cienfuegos refinery in Cuba that was built by Soviet firms. PdVSA officials have admitted that any future refinery deal would be just a loss-leader to get a foothold in the future Cuban oil business, as would any suggested exploration deal.

In early April, Brazil and Venezuela signed a wide-ranging energy cooperation accord, a section of which referred to possible joint exploration ventures between PdVSA and Petrobras outside both home countries. However, the most interesting Cuban venture would be that country's lubricants market. At present, Cubaluc, a division of state oil company Cuba Petroleo, controls 85% of the market. The remainder is shared by Micasa, an Ecuadorian company that markets products from PdVSA subsidiary, Deltaven, and the UK's Castrol. Castrol controls the lubes market supplying Cuba's large fishing fleet and operates from a jetty once owned by Standard Oil (Exxon). If BP Amoco's offer for Burmah Castrol is accepted by the latter's shareholders, the new owners certainly will have to hive off the Castrol Cuban operations, or fall foul of US law. According to reports from Caracas, PdVSA has already identified this coming opportunity.

Local reports have suggested that PdVSA has sought legal advice on Cuban investment from a European law firm. The upshot is that PdVSA could form a joint venture between Deltaven and Cubaluc and domicile the company in a European jurisdiction which has passed legislation designed to counter the US' Helms-Burton law which penalises third parties investing in Cuba. Any attempt by a US individual or company to sue the Cuban–Venezuelan joint venture would be met with a counter-suit in Europe.

Venezuela's Cuban ambitions are creating problems for Mexico. Mexico and Venezuela supply crude to 11 Central and Caribbean states on easy credit terms under the San José Pact – but Cuba is not included. The Chávez government regards Cuba as an area of

continued on p35...

Cetane number and cetane index relationship

It is a requirement of the European Specification for Automotive Diesel Fuel that both the Cetane Number and Cetane Index are determined and reported. This article outlines a review of the suitability of the current equation used in IP 380 (ASTM D 4737)/EN ISO 4264 for calculating Cetane Index (CI) and to predict Cetane Number (CN) as measured by IP 41/ASTM D 613.

The Institute of Petroleum runs a monthly diesel fuel engine correlation scheme under which approximately 20 laboratories worldwide determine CN. Most of these laboratories also determine density and distillation recovery temperatures, enabling CI to be calculated according to IP 380/EN ISO 4264.

The samples for the correlation scheme comprise commercially available fuels and special fuel blends to give a wide range of cetane numbers.

Data sets

As the occasional sample can have an undue effect on the trend between CN and CI, it is better to base any comparisons on large data sets. This review looks at two ranges of data – the two years covering 1998–1999, and the five-year period 1995–1999. The former study period provides information on more recent fuels, while the latter provides smoother overall trends as it is less sensitive to individual samples. The five-year study also provides year-on-year information. For the sake of brevity the full monthly data for the five-year period are not given, but are available from the Institute of Petroleum.

Outliers and unusual samples

The data was first checked for unusual individual results. Any outliers detected by Hawkins' test according to EN ISO 4259 statistical methodology were removed from further analysis. Such outliers may be the result of laboratory bias or transcription errors.

The means of the 'good' data were used to provide estimates of the 'true' values of sample CN, density and distillation recovery temperatures. The last two parameters were then used to calculate CI values.

Samples that were well outside the scope of IP 380/EN ISO 4264 were excluded from the analysis. For example the August 1996 sample contained ignition improver giving a CN boost of eight numbers. In addition to this, the February 1998 and December 1998 samples had unusual distillation and density characteristics, respectively, that were outside the scope of the methodology. These two samples appear to have been special narrow fractions and, as such, are considered to be too different from typical samples.

Analysis

There are various ways to assess the appropriateness of IP 380/EN ISO 4264 to predict CN. They include:

- Overall bias between CN and CI, defined as mean (CN–CI).
- Bias standard deviation (SD) – a measure of scatter about the ideal one-to-one line.
- A trade-off between mean bias and bias SD, as measured by the square root of the mean square error (MSE), ie square root of the sum of the squared bias and squared bias SD.
- Correlation between CN and CI, a measure of dependence between CN and CI.
- Bias trend in terms of the slope of the regression line.
- Data consistency, as measured by the root mean square error (RMSE) about the best-fit regression line.

It is not enough to do well in just one of the above. For example, an overall bias of zero could hide either a bias slope very different to the ideal one-to-one slope, or a large scatter of CI about CN. Furthermore, a small RMSE could hide a large bias or a far-from-ideal bias slope. The precisions of the test methods involved imply that some scatter of CI about CN is to be expected. As this scatter is dependent on the choice of samples, then bias SD and RMSE will naturally vary over time. Therefore IP 380/EN ISO 4264 can be considered appropriate when (i) bias is close to zero, (ii) bias SD is small, and

Year	Bias			CN/CI correlation	Bias slope	Trend Line RMSE	CN range	
	Mean	SD	√(MSE)				min	max
1995	0.1	0.8	0.8	0.96	0.97	0.9	47.5	56.5
1996	–0.0	0.7	0.7	0.97	0.93	0.7	48.1	58.4
1997	–0.3	1.6	1.6	0.86	0.82	1.6	45.7	54.7
1998	0.1	1.9	1.9	0.90	1.23	1.9	42.0	57.0
1999	0.1	1.2	1.2	0.84	0.78	1.1	49.7	55.7
1995–1999	0.0	1.3	1.3	0.91	0.96	1.3	42.0	58.4
1998–1999	0.1	1.5	1.5	0.87	1.06	1.6	42.0	57.0

Table 1: Trends in CN and IP 380/EN ISO 4264

(iii) RMSE is consistent with test precisions. The bias slope will usually be close to ideal when both (i) and (ii) are attained, unless the range of CN and/or CI is relatively small, as in 1999.

Results

Trend information about CN and IP 380/EN ISO 4264 is given in **Table 1**. For all date ranges considered, this is (i) mean bias, bias standard deviation and a compromise between the two, (ii) correlation between CN and CI, (iii) bias slope, (iv) trend line RMSE, and (v) the range of CN.

The CN/CI results are shown graphically in **Figures 1** and **2**. **Figure 1** shows the 'best-fit' regression line through the 1998–1999 data, and **Figure 2** shows the 'best-fit' regression line through the 1995–1999 data.

Points to note are:

- IP 380/EN ISO 4264 is unbiased over five years, but slightly biased for some years. Because bias is minimal, the various measures on scatter (bias SD, bias root MSE and RMSE) are all very similar. The apparent increase in the scatter of results in recent years may be due to changes in fuel composition, although an improvement is seen in 1999.
- IP 380/EN ISO 4264 bias slopes were worst in 1998 and 1999. This reflects the risk of using small data sets. Over two (1998–1999) and five (1995–1999) years the bias slopes are much closer to ideal.

In recent years, the CN/CI correlation appears to have become worse. This may be related to a fuel compositional change or to the occasional unusual sample in the scheme.

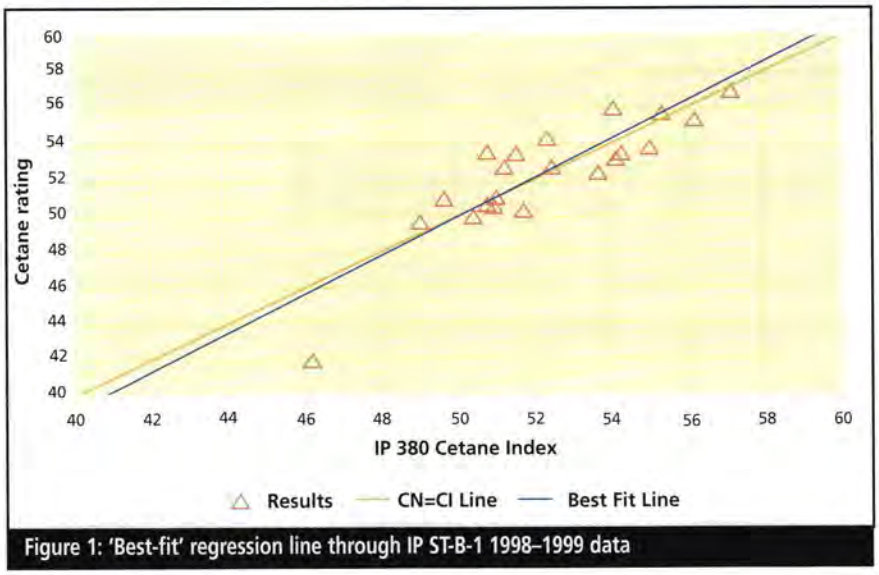

Figure 1: 'Best-fit' regression line through IP ST-B-1 1998–1999 data

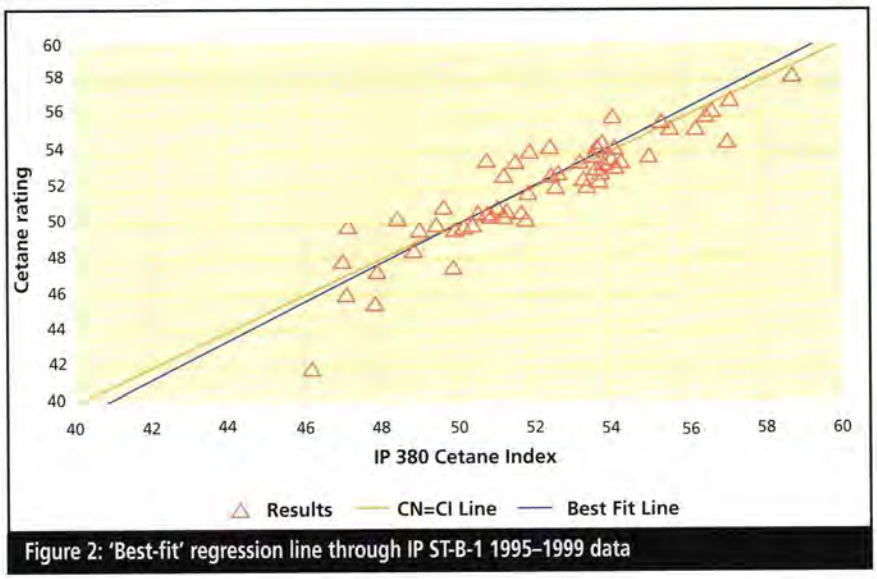

Figure 2: 'Best-fit' regression line through IP ST-B-1 1995–1999 data

Conclusions

Three main conclusions can be drawn from this review:

- IP 380/EN ISO 4264 continues to be mainly unbiased for estimating CN.
- On average, IP 380/EN ISO 4264 estimates CN very well. However, the scatter associated with individual CN estimation may be increasing.
- The equations used in IP 380/EN ISO 4264 for calculating CI are satisfactory and do not require revision at this time. The Institute of Petroleum will continue to monitor the relationship and highlight any major revisions to these conclusions in *Petroleum Review* when necessary.

Working towards a safer environment

The use of high quality specialist oils in industry, including the offshore oil and gas sector, is growing rapidly as their benefits are more widely understood. Industry is also having to change the type of oils used in a bid to reduce impact on the environment. *Ken Wiseman*, Chief Executive of SIP Ltd* examines some recent trends in this sector.

Although lubricants are usually associated with cars, European industry uses an equivalent volume of such oils. More than 6mn litres of lubricants and process oils are consumed in Europe each year. It is little wonder, then, that the choice of oil used by industry can have a significant impact on the environment.

In fact, health concerns about industrial oils are not only driving demand for clean oils in industrial applications but also in new areas such as anti-dusting sprays for animal feed. Recent food scares, for example, mean that regulators are beginning to examine oils in the food chain for carcinogenicity. Increasingly, industry, the public and regulatory authorities see the benefits of new safe, clean oils.

Historical oil use

To understand the importance of the development of new lubricants, we need to review what has been used to date.

After 1945 most lubricant base oils were made by solvent extraction – a process that removes a portion of aromatics. Wax (normal-paraffins) was removed by freezing the oil and filtering it out to meet a pour point of about –12°C. The base oils were then given a hydrogen treatment for colour and odour. In a second blending step, additives were included to make finished lubricants.

By the end of the 20th century, low lubricant quality was restricting the efficiency of automotive engines and European engine producers were insisting that high-cost synthetics be used in the best auto lubricants to meet the required operating characteristics.

However, most of the base oils in lubricants are still made in the old style by solvent extraction with serious flaws.

Lubricant base oil qualities

Base oils contain a large percentage of aromatics, including poly nuclear aromatics (PNA), which are recognised carcinogens. Although today's base oils are limited to a maximum of 3% PNA, many believe this level is far too high. PNA can produce dioxins when reacted with chlorine, for example. In studies of toxicity to marine life, PNA has been directly related to the death of fish, shrimp and shellfish.

Old-style base oils also have limited resistance to oxidation – even when additives are used. This means they have a short life before tar forms, which renders them useless. The used lubricants then become a disposal problem with sizeable quantities simply being dumped. They can then find their way into water sources.

New base oil qualities

With new base oils, hydrocracking and hydrotreating processes remove aromatics and PNA compounds to a level where the US and EU authorities approve them for medicinal use or for limited contact with food. Thus, toxicity problems are minimised or avoided.

New base oils are very resistant to oxidation with a minimum of additives. Under severe conditions they last four to eight times longer than old-style base oils. In certain uses, their lives actually exceed the life of the machines in which they are used and therefore never have to be replaced. This can lead to a significant reduction in lubricant consumption and disposal.

Iso dewaxed (ID) base oils

A recent development has been the use of a catalyst to remove wax from the new base oils, replacing the older method of chilling and filtering out the wax.

This has meant producing oils with an increased iso-paraffin content. These ID oils have a low volatility and are com-

You require a proposer who is an IP Member, or, if you do not know one, a letter of recommendation from someone who knows you professionally

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I, being an individual member of the Institute of Petroleum (membership number .....) or nominated representative of a collective member (company name .....) and having known the candidate personally for ..... years, propose and recommend him/her in accordance with the By-Laws as a fit and proper person to belong to the Institute.

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Date: _____ Name: _____

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I, the undersigned, declare that the statements made herein are correct to the best of my knowledge and belief. I agree, if admitted to membership, to be governed by the rules and regulations of the Institute of Petroleum as they now exist and as they may hereinafter be altered. I agree that the information given on this form may be held at the IP and its branches and that my name may be published in *Petroleum Review*.

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Applications for the year commencing 1st January 2000 must be accompanied by payment, as follows:

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Applicants of under 25 years of age – £10.00

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❑❑ ❑❑ ❑❑

Banks/Building Societies may refuse to accept to pay Direct Debits from some types of account

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9 9 2 5 6 7

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Please pay The Institute of Petroleum Direct Debits from the account detailed on this instruction subject to the safeguards assured by the Direct Debit guarantee

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Do not forget to sign your application overleaf

IP THE INSTITUTE OF PETROLEUM

HAVE YOU TAKEN UP THE MEMBERSHIP CHALLENGE YET?

We reminded you about the Year 2000 competition in February's edition of Petroleum Review. Its purpose is to help continue the growth in individual membership despite the ongoing downsizing of the oil and gas industry.

For the third year running, British Airways agreed to act as the official sponsor to our winter competition. BA will donate two business class return tickets from London to any destination, to the IP Member who recruits the most new members between 1st October 1999 and 31st August 2000.

This year we want as many members as possible to take up the "Challenge", so each member that recruits a new Member will receive a prize or prizes:

Recruit 1 or 2 new members	=	IP pocket diary bound in Navy kid grain leather
Recruit 3-6 new members	=	IP tie in either navy or burgundy silk or equivalent
Recruit 7-9 new members	=	Theatre Ticket voucher worth £30.00
Recruit 10 or more new members	=	Two Eurostar Tickets to Paris or Brussels

Who would you propose?

We believe that our current Members are the best people to recruit new Members and the statistics would seem to prove us right. Over 50% of the IP's Individual Members stated that they joined on the personal recommendation of an existing member.

So it's probably a good time for you to do the same favour that someone did for you and share the benefits of the IP with a colleague or a friend? And now is an excellent time for anyone to consider joining the IP – all new members are entitled to:

- ★ Use of the suffix **M Inst Pet** after your name
- ★ Receive a free monthly copy of **Petroleum Review** magazine
- ★ Join any of our specialist **Discussion Groups** or become involved in the **Branches** network
- ★ Obtain **discounts** on attending IP conferences, seminars or training courses
- ★ Obtain a **free** entry in our Consultants Handbook – published on the IP's award winning website
- ★ Gain **free** access to our Library
- ★ Obtain **discounts** for on-line searches using a variety of databases from our Information Service
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- ★ Gain the opportunity to establish **new contacts** through discussion groups and branch meetings
- ★ Obtain access to the IP's **website** including areas restricted to Members when you click on www.petroleum.co.uk

ABOUT YOU & YOUR INTERESTS

1 HOW WERE YOU INTRODUCED TO THE IP? (PLEASE TICK ONE BOX ONLY)

- ❑ Personal recommendation
- ❑ Company requirement
- ❑ Via library/information services
- ❑ Via IP conferences/meetings
- ❑ Via IP's technical work
- ❑ Via *Petroleum Review*
- ❑ Via Internet
- ❑ By the IP contacting me

2 ACADEMIC OR PROFESSIONAL QUALIFICATIONS AND SUBJECTS (HIGHER FIRST)

Qualification	College/University	Year	Subject

MEMBERSHIP OF PROFESSIONAL BODIES (EG INSTITUTION OF MECHANICAL ENGINEERS)

Professional Body	Grade of Membership	Chartered Status (eg CEng)

3 EMPLOYMENT STATUS

❑ Employed ❑ Self-employed ❑ Retired ❑ Student ❑ Other

4 TYPE OF ORGANISATION BY WHICH YOU ARE CURRENTLY, OR WERE MOST RECENTLY, EMPLOYED (PLEASE TICK ONE BOX ONLY)

- 00 ❑ Major international integrated oil company
- 01 ❑ Other integrated oil company
- 02 ❑ Independent oil company upstream
- 03 ❑ Independent oil company downstream
- 04 ❑ Supply/distribution/storage
- 05 ❑ Other energy industry (gas/coal etc)
- 06 ❑ Eng. contractors/manufacturers/suppliers of equip.
- 07 ❑ Shipping
- 08 ❑ E&P services
- 09 ❑ Inspection/laboratory service company
- 10 ❑ Chemical/additive company
- 11 ❑ Transport industry & retail services
- 12 ❑ Information technology/computing/publishing
- 13 ❑ Traders/brokers
- 14 ❑ Investment/finance/banking/legal
- 15 ❑ Educational/training establishment
- 16 ❑ Government/military/local authority
- 17 ❑ Consultancy
- 18 ❑ Industry association
- 19 ❑ Research establishment
- 20 ❑ Geophysical/seismic company
- 21 ❑ Aviation
- 22 ❑ Other (please specify) _____

5 JOB FUNCTION (PLEASE TICK MAXIMUM OF 2 FUNCTIONS WHICH BEST DESCRIBE YOUR CURRENT OR MOST RECENT JOB)

- 00 ❑ Director/general manager
- 01 ❑ Planning/economics/project management
- 02 ❑ Financial/computer services/information technology
- 03 ❑ Personnel/industrial relations/training
- 04 ❑ Administration/legal/public affairs
- 05 ❑ Product & process research & development
- 06 ❑ Exploration & geophysical
- 07 ❑ E&P services/offshore support/subsea
- 08 ❑ Drilling & production
- 09 ❑ Supply & trading
- 10 ❑ Transport/pipelines/shipping
- 11 ❑ Refining/manufacturing
- 12 ❑ Marketing/sales/distribution
- 13 ❑ Product quality/analysis/testing/measurement
- 14 ❑ Engineering/design/construction
- 15 ❑ Medical/health & safety
- 16 ❑ Environment
- 17 ❑ Academic
- 18 ❑ Gas
- 19 ❑ Media/publications
- 20 ❑ Storage
- 21 ❑ Microbiology
- 22 ❑ Loss control
- 23 ❑ Retail
- 24 ❑ Inspection
- 25 ❑ Lubricants
- 26 ❑ Petrochemical
- 27 ❑ Library/information services
- 28 ❑ Other (please specify) _____

6 INTERESTS PLEASE INDICATE, USING THE CODE NUMBERS IN '5' ABOVE, THE THREE SUBJECT AREAS WHICH MOST INTEREST YOU:

❑ ❑ ❑

7 IS/WAS YOUR WORK PRIMARILY:

❑ Upstream? ❑ Downstream? ❑ Both?

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Any information provided by you may be held by the IP in its computer records. Please tick the box if you do not want to receive details of products or services from other organisations with whom we may associate. ❑

pletely free of toxic aromatics and PNA. This combination of purity and low volatility makes them safe for use in metal working, textile manufacture, drilling oils and in the large number of other lubricant uses where they come in contact with people.

These oils are now being adopted by industry to improve workplace conditions and take advantage of their superior performance.

ID oils are said to offer a number of superior technical characteristics, which include better viscosity index, low pour and high aniline points and a good response to additives in addition to resistance to oxidation and low volatility (see **Table 1**). These make ID products ideal for the future generation of automotive lubricants. They are excellent lubricants that will last longer, do not evaporate, work well in severe climates and are non-carcinogenic if in contact with people or wild-life.

Most producers of ID base oils are targetting the production of the next generation of automotive engine oil and automatic transmission fluids. However, SIP has concentrated on the specialised industrial users who can also benefit from the radically new base oils.

	Old: Spindle oil	New: ID 4
SG at 15°C	0.84	0.825
Viscosity cSt at 40°C	4.0	4.0
Viscosity cSt at –40°C	frozen solid	238
Aromatics wt%	10	0.0
Sulfur wt	2.0	0.0
Pour point °C	–21	<57
Aniline point	70	87
Flash Point PMCC	120	125
FDA	(c)	(a)

Note: The low pour points allow ID oils to replace a portion of the naphthenic oils being used in hydraulics and other low temperature areas. Many naphthenics still contain aromatics and PNA.

Table 1: Comparison of 'old-style' oil with new iso dewaxed (ID) oils

Production of ID oils

The production of the new iso dewaxed (ID) oils is reached in two stages. First, the heavy vacuum distillate from crude oil is hydrocracked rather than extracted. This converts aromatics and normal-paraffins to iso-paraffins and polycyclic paraffins while removing the sulphur and nitrogen.

The resultant light products are excellent diesel and jet fuels while the heavy high boiling streams are lube base oil precursors. To realise the full value of this lube oil stream, Chevron developed an iso dewaxing catalyst that transforms the remaining normal-paraffins and aromatics into iso-paraffins and cyclo-paraffins. This ratio of compounds does not occur in natural mineral oils.

Large iso dewaxed lube base oils plants have been built by Chevron, PetroCanada, Mobil, Pennzoil, Conoco and SK in Korea to produce the next generation of automotive lubes. Production ranges from 250,000 t/y to 1mn t/y. A smaller 50,000 t/y plant has also been build by Neste in Finland that will be expanded in the future. No other large iso dewaxed plants have been built or are under construction in Europe at present. The main products are automotive base oils with viscosities between 20 cSt and 100 cSt at 40°C.

Together with the catalytic conversion of the normal-paraffins to these higher viscosity products, the equilibrium results in the production of a large quantity of lower viscosity oils ranging from 2 cSt to 15 cSt at 40°C. Each of these plants must produce the light products along with the prime heavier products. SIP identified that these light products could meet a greater range of uses than currently found for lower quality mineral oils.

Their broad range of product applications include:

- lube base oils to produce special products
- aviation lubes and hydraulics
- arctic hydraulics
- shock absorber base oils
- automotive hydraulics as in steering
- robotic hydraulics
- metal working fluids
- non-toxic drilling oils
- FDA (b) high quality tech white oil
- FDA (a) grade for pharmaceutical products
- extenders for polymers

Special uses of ID oils

As indicated above, ID oils can be used for a number of specialised applications. A few are looked at more closely here.

Drilling oils

Extensive testing has shown that products such as SIP's ID 4 is non-toxic for all marine animals, non-irritating to human skin and meets FDA requirements for the safety of the workers. The low pour point facilitates easy pumping in arctic conditions. The high VI (viscosity index) means that there is less change in viscosity as the drilling goes deeper into hotter zones. And for worker safety, the high flash point minimises vapours and fire dangers when the hot mud is screened on the drilling platform.

Metal working fluids (MWF)

Many metal workers have requested that vapour in the work place be reduced for health and to reduce fire hazard. Many manufacturers, too, are now demanding a medium level viscosity, enabling them to run entire engine plants on one MWF. They also want a long lasting stable base oil. Oils such as SIP's ID 9 are regarded as the best base oil available to meet these criteria.

Automotive hydraulics

ID products are now used in automotive hydraulics. The low pour points, high aniline points, high VI are all superior to non ID oil blends. Working with leading OEMs, SIP has helped companies to use specialist oils to improve the quality of their products.

ID OILS have a number of qualities compared to old-style base oils that can be summarised as follows:

- Pure with all poly nuclear aromatics removed to less than 1 ppb.
- Water white and odourless – acceptable at the workplace.
- Resists oxidation 4 to 8 times longer than existing lubricants.
- Low pour points, low volatility, high aniline points and high flash points.
- Less costly synthetics, but providing similar service.

To coin a phrase, 'the future looks bright' for ID oils to replace old-style oils and this will be driven by marketplace demands. It will also provide a better environment for consumers and workers, and a lower cost of operation for industry – a combination that should prove too hard to resist.

**SIP Ltd is one of Europe's largest independent suppliers of speciality oils. It provides blue chip companies with white oils for the cosmetics and pharmaceutical industries, as well as white process oils, white industrial oils and drilling base fluids. The products are claimed to deliver a high performance while meeting the most stringent environmental as well as health and safety standards. SIP also offers innovative product development and a responsive logistics service.*

Extending life of Norwegian giant

The installation of the Norsk Hydro-operated Øseberg South production platform will attract more than its fair share of attention this month due to the current scarcity of fabrication work in the Norwegian market. But this project needs to be seen in the wider context of a Norwegian oil giant in mid-life decline. As Øseberg's oil production slows, work is underway to develop satellite fields and recover injected gas – a work programme that will extend Øseberg's life well into the new century, reports *Jeff Crook*.

Øseberg is not the largest oil field in the North Sea – that honour belongs to Statfjørd with its 4.4bn barrels of recoverable reserves – but it is a true giant. Since the field came onstream in December 1988, 1.5bn barrels of oil have been pumped, with another billion still to be produced. Peak production from the central facilities ran at 510,000 b/d, but this had fallen to 415,000 b/d by the end of 1998 and below 350,000 b/d during 1999.

The Øseberg field centre is located 130 km west of Bergen and consists of two bridge-linked platforms. Øseberg A is a concrete-base gravity platform with processing equipment and living quarters, while Øseberg B is a steel-jacket drilling and injection platform. Oil is transported by pipeline to the Sture terminal on the Norwegian coast.

Oil production has, in fact, held up better than expected, largely due to the Troll Øseberg Gas Injection (TOGI) scheme. The scheme allows gas imported 40 km from the giant Troll field to be injected into the Øseberg reservoir. It came into operation in 1991 and is thought to have provided an additional 300mn barrels of oil production, with around 75% of the injected gas available for recovery in the future.

A gas production platform was installed last year to enable the injected gas to be recovered and exported to European markets. The Øseberg gas platform is bridge-linked to the field centre and is equipped to dry and upgrade gas and condensate, and to compress gas for injection and export. Gas production, for injection, started last October, with gas export due to commence in October 2000.

The gas platform is notable as one of the first installations in the North Sea to use the heat from the compressor turbine exhaust to produce steam power. This waste heat system provides 14 MW of power without fuel, and is claimed to reduce carbon dioxide emissions from the Øseberg field centre by 10%.

Norsk Hydro maintains that the building costs of the gas platform were NKr3.65bn and that the project has been kept within the original time schedule despite having a considerable increase in work, particularly the number of offshore hours. The gas module, bridge and flare tower and jacket were the responsibility of Aker Verdal. Kvaerner Oil and Gas carried out offshore hook-up. Umoe carried out offshore modifications during a shutdown in 1997; Saipem carried out the lifting operation; and EMC performed the pipe contract.

The project was, however, a loss-maker for the fabrication yard. Aker Maritime recorded losses of NKr143mn on the project when it reported its second quarter results in August last year.

Gas will be exported from the Øseberg field centre by a new 110-km pipeline which links to the Statpipe system at Heimdal for onward transmission to Continental Europe. Condensate will be transported with the oil stream to the Sture terminal. Øseberg's Sture oil reception terminal has been upgraded for recovering and exporting NGLs (natural gas liquids). Some NGLs will be shipped out by tanker, while the remainder will be piped to the Mongstad refinery.

Work got underway to upgrade Heimdal for its new role as a gas transportation hub after Norsk Hydro took-over as operator from Elf in January 1998. The 14-year old platform, which lies 180 west-northwest of Stavanger, was shutdown during a major re-building programme, which included upgrading of the existing facilities, and the installation of a new riser platform.

In addition to Øseberg gas, Heimdal will receive gas from the Statoil-operated Huldra field which is due to come onstream in October 2001. The field is being developed by means of an unmanned platform standing in 125 metres of water, with a gas pipeline to Heimdal and another pipeline to take condensate to Vestlefrikk.

Heimdal 2000

The Heimdal-2000 project was established to prepare the existing Heimdal facilities for reception and distribution of gas from Øseberg, in October 2000, and later for reception and treatment of the wellstream from Huldra. The project includes the construction and installation of a new riser platform and rebuilding and modifications to the existing facilities.

Contracts with a total value of around NKr1bn were awarded in September 1998 to an alliance formed between Heerema Tonsberg/ABB Offshore Technology for construction and installation of the riser platform. The topside and bridge are being fabricated at the Heerema Tonsberg yard, and the jacket at Heerema Havenbedrijf, in the Netherlands. It is understood the platform will be installed by the heavy lift vessel *Thialf* this summer.

ABB Offshore Technology also secured a contract worth around NKr300mn for the rebuilding and modification to the Heimdal platform. This work covered the gas treatment systems, platform control systems, replacing the power generation facilities with a more environmentally friendly installation. rebuilding and replacement of cranes, disposal of mud-burners, and some structural modifications for connection to the riser platform.

A $95mn contract was placed with Kvaerner Oil and Gas for the Huldra topsides, last February – one of the few major fabrication contracts to be placed in the Norwegian market during 1999 (see *Petroleum Review*, January 2000). Aker Verdal was awarded a NKr250mn contract to build the 5,200-tonnes jacket in September 1998, with completion due this spring. Aker Maritime was awarded another NKr800mn turnkey contract in July 1998 to upgrade the Veslefrikk facilities in anticipation for receiving the Huldra condensate.

Gas from Heimdal will be transported through the Statpipe system to Ekofisk, from where it will travel in the Norpipe line to Emden, in Germany. There is also a pipeline to transport NGLs from Heimdal to the Brae field in the UK sector and thence to Cruden Bay in Scotland. Norsk Hydro says that Heimdal can also be linked up to Frigg which lies 35 km away. It is thus a potential connection point to the gas market in the UK.

Norsk Hydro was allocated its first annual gas export quota in 1996 with gas being delivered from Sleipner. The Øseberg gas scheme – and the forthcoming Aasgard project – will enable the company to deliver far larger volumes of gas. Gas export from the Øseberg field centre is expected to increase over the next few years to 9.5bn cm/y. It is estimated that total gas production from Øseberg will amount to 115bn cm, along with considerable quantities of condensate.

Satellite developments

The decline in oil production at the Øseberg field centre has released spare processing capacity to allow development of some smaller satellite fields. The Øseberg East satellite which came onstream last spring adds to the production of Øseberg C production platform, which is located 14 km north of the field centre.

Øseberg East lies 25 km north east of the field centre in water depth of 156 metres and has recoverable reserves of around 150mn barrels of oil. Production will rise to a plateau level of 75,000 b/d once the drilling programme is completed. The $500mn satellite development consists of an integrated, steel-jacket platform. Oil is exported to the Øseberg field centre where it is further processed before it joins the main production stream piped to Sture.

Norsk Hydro first submitted a plan for Øseberg East to the Norwegian Government in 1991. However, the plan was held back because it did not meet Norsk Hydro's profitability requirements, and also because there would be insufficient spare processing capacity at Øseberg centre as the production levels had held up better than anticipated. A revised development plan was submitted to the government in 1996 with costs reduced by 30%.

The 7800-tonne jacket was delivered by Aker Verdal in May 1998 and was then piled into position. The 7,600-tonne integrated deck was installed by Saipem's heavy lift vessel *Microperi 7000* during the following month. Fourteen wells are being drilled from the platform altogether – six production wells, six injection wells and two water-producing wells to raise the amount of injection water. All water and gas is to be re-injected to increase oil recovery.

The platform uses the newly developed RamRig drilling rig which is a radical departure from the conventional drilling rig. The essential difference is that the hoisting and lowering are carried out by means of hydraulic rams, rather than the more familiar drawworks. Such a design is claimed to make the rig lighter and cheaper than traditional rigs. However, the new technology has suffered from unforeseen teething problems and Norsk Hydro says that it took time to get the RamRig to work in a satisfactory way.

Øseberg South contains just over 340mn barrels of oil and 11.5bn cm of gas. It lies 13 km south of the field centre in a water depth of 100 metres. The satellite development consists of a steel-jacket platform with a topside weight of 13,200 tonnes. The contract was placed with Aker Maritime for fabrication of the facilities with a value of NKr3bn. Offshore installation is due to be performed by the *Saipem 7000* during June. There will be three major topside lifts, the largest of which will be the integrated deck which weighs 9500 tonnes.

First-stage separation of the wellstream takes place on the platform with production capacity of 90,000 b/d. A total of 33 wells are being planned for Øseberg South, with a number of these being pre-drilled before installation of the platform and four being drilled out from the field centre. The latter wells started production in February and are currently producing 15,000 b/d. Two subsea manifolds are also to be installed to develop areas of the field that cannot be reached from the platform.

Getting in Tune

A plan for the first-stage development of the Tune field was submitted to the Norwegian Ministry of Oil and Energy and was approved in December 1999. The Tune field lies 10 km west of the field centre. The total project budget was put at NKr2.6bn. Production start-up is scheduled for mid-2002 with plateau production reaching 3bn cm/y and field-life expected to last until 2010.

Total recoverable reserves are 27bn cm of gas and 7mn cm of condensate. The project involves a four-slot template with the possibility of tying in two satellite wells later. The template will be tied back to the gas platform at the field centre by two flowlines. Kvaerner Oilfield Products was awarded a NKr250mn contract in July for supply of subsea production equipment for this project. A new processing module is to be installed on the Øseberg gas platform under a contract with Umoe.

Looking to a brighter future?

Methanol's erratic history does not provide a proper guide to assess its medium and longer term future. Despite its previous and current irregular existence, there remains sufficient potential to interest certain industry sectors to consider expanded production. Much of the drive originates from resource producers who control large amounts of remote or stranded feedstock natural gas and are facing penalties for flaring or are seeking to monetise their resources. *Fred Thackeray and *James R Crocco*** report.**

Of all the bulk petrochemical commodities, methanol is the one that has been promoted as having the largest number of new market uses. Over the past 20 years new and potentially large outlets for methanol have included gasoline blending, direct mobile and stationary fuels uses, agricultural outlets, single-cell protein manufacture, sewage treatment, and as a co-feedstock for the production of methyl tertiary butyl ether (MTBE). Only the last in this list, MTBE, was eventually commercialised and had a significant and substantial impact on the global methanol industry.

In 1991, before the influence of the 1990 Clean Air Act Amendments (CAAA) took effect in the US, annual world methanol consumption stood at approximately 17.5mn tonnes for an operating rate of about 82.8% of capacity. New capacity was added to keep pace with needs for oxygenated (oxygas) and reformulated (RFG) gasolines in the US. Prompted by federal and state action, this created considerable demand for MTBE. By 1996 global methanol demand had reached approximately 25mn tonnes, for an operating rate of 84.3%, an increase of almost 43% in demand in five years. Some of this increase was attributed to more traditional outlets, such as feedstock for acetic acid production, but the vast majority of the increased demand was for MTBE.

Californian setback

The future of methanol experienced a major setback in 1999 when the US state of California announced a complete phase out of MTBE use in its gasoline by 31 December 2002. MTBE was being found in surface water that was consumed for drinking and household uses. The problem was not with MTBE which, despite many studies, has not been judged to be carcinogenic or otherwise harmful to humans. Rather, the trouble was, and is, with leaking gasoline storage tanks and pipelines. Many of the other ingredients in gasoline dissipate rather quickly, but MTBE takes much longer which results in a greater plume, or spreading. Also, its odour and taste thresholds are very low. The politicians chose to attack MTBE as the problem and not the source – leaking gasoline tanks. This action has spread to other states and the process continues. At first glance this appears to be an impending disaster for MTBE and, consequently, methanol. But there are some caveats that could delay or possibly even abolish the California law.

The law states that, among other things, there should be no significant increase in the price or shortage of gasoline, and no deterioration of air quality. The only alternative that appears viable to replace MTBE to meet the oxygen standards of 2.7 weight percent in oxygas or 2.0 weight percent in RFG (California is an exception wherein the entire state is at 2%, including the oxygas non-compliance areas) is ethyl alcohol (ethanol). Although it is subsidised, ethanol remains more costly than MTBE. It also has a high Reid Vapour Pressure (which creates other problems with RFG specifications) and it experiences logistical and other transportation problems that increase its delivered cost from the Midwest of the US to California. Both oxygen standards are mandated by federal, not state, law that applies to about 33% of the gasoline consumed in the country. Only an act of Congress in Washington can change that. The standard cannot be overruled by individual states. Any changes to federal laws are bound to take a considerable amount of time. This, in itself, can very well result in a delay to California's implementation of a MTBE phase out.

Since definite direction has not yet come forth from the politicians, the refining industry has been standing by. It will not invest the billions of dollars required to revamp facilities until it has

a clear understanding of what it is required to do. It was already hit once with the legislative introduction of cleaner gasolines, which could now change direction in California and other states as well. It will take years for the industry to revamp. In the meantime, with each passing month of no clear direction, the implementation of the law could very well be postponed, or cancelled outright, once the potential impact of alternatives in increasing gasoline prices is fully realised by the public and politicians.

Phase out scenarios

A number of scenarios could be constructed surrounding a MTBE phase out or phase down. These range from nothing happening to a complete ban in all of the US. Assuming that a MTBE ban occurred only in California, the reduction in demand would amount to about 4.5mn t/y, or 1.5mn tonnes of methanol. If this spread to the entire US, then lost demand would amount to approximately 10mn t/y of MTBE, or 3.6mn tonnes of methanol. Depending on the implementation process and which states would or would not participate, a variety of numbers would fall in between. Needless to say, a MTBE phase out across the board in the US would be a disaster for both industries. Should this carry over to other countries it would be a catastrophe.

There certainly appears to be a major problem developing for the methanol and MTBE industries, at least in the US. But the political uncertainties remain and no one can forecast with any degree of certainty what will occur in the long term. Laws must provide more clarity and not just be a tool to appease constituencies. Many observers focus primarily on the US as the problem for MTBE. Other parts of the world are much brighter, provided they do not eventually mirror the US.

Following the US lead

A large portion of the world is following the lead of the US of the 1970s in reducing and eliminating lead in gasoline. West Europe is reaching maximum proportions in this regard and is now embarked on a clean or reformulated gasoline project, again following the lead of the US. Two stages are taking place that, in the next few years, could reverse Western Europe from a net MTBE exporter to an importer. (See, however, *Petroleum Review*, February 2000, p37, regarding the problems for MTBE in Europe.)

Many countries throughout Asia are reducing lead, as are East European countries. Latin America is sure to follow, as well as the Indian sub-continent and Africa. All this will continue to create increasing demand for reasonably priced, readily available, ultra-clean, high-octane gasoline blending ingredients, such as MTBE, to replace lead. Since there are no known MTBE capacity expansion plans, a case can be made for a global shortage of the product should a phase out, or some degree of phase down, in the US fail.

	1991	1992	1993	1994	1995	1996	1997	1998	1999
Rate (%)	82.8	77.6	83.3	83.9	80.7	84.3	81.6	77.2	75.7
Price ($/t)	156	108	118	325	204	145	173	97	91

Source: CMAI

Table 1: Global methanol operating rates and spot prices at Rotterdam, 1991–1999

A number of MTBE plants around the world are believed to have the capability to revamp to produce iso-octane from isobutylene. This product sets the standard for octane values at 100. MTBE has an octane value of 110. This iso-octane would have a higher cash production cost and a lower octane value than MTBE, but at least it could take advantage of stranded capital assets with few, if any, other alternatives. Unfortunately it would not provide a requirement for methanol.

Global trends

From experience we have learned that when global utilisation or operating rates for methanol go above 85%, prices tend to strengthen. The reverse is true when these rates fall below 80%, and there are certainly lag times and special market conditions. **Table 1** describes average annual global methanol operating rates and spot prices in US dollars at Rotterdam for the years 1991 through 1999. In the first three months this year the average Rotterdam price for methanol was $114/t. This was considered rather higher than might have been expected. It was caused by some unanticipated operating problems and feedstock constraints coupled with continuing delayed start-up of world-scale plants in Iran and in Trinidad, which are now expected to come onstream shortly.

Table 1 illustrates that prices tend to follow operating rates both on the increase and decrease. Notable exceptions occurred in 1994, which was a marketing anomaly and probably will not be repeated, and again in 1997 which was a somewhat similar, but not as drastic, condition. Over the next five years or so, global methanol operating rates could be as low as 4%/y. This does not bode very well for the industry or potential new entrants, as far as pricing is concerned, and it could prove a major obstacle to the financing of new projects. The forecast can be found in **Table 2**.

This depressing estimate is based on assumptions that most existing capacity remains in operation and that new plants currently under construction or which appear firmly committed will be built in accordance with present plans. But the outcome may be less bleak than these assumptions imply. Additional rationalisation of less efficient plants could occur. Savings in costs may be feasible, notably by the introduction of larger dedicated tankers for supplies to major markets. Less ambitious objectives for feedstock prices may also prove possible in face of market pressures.

Particularly important could be the phasing out of higher cost production. One significant recent development has been the recognition that, although the methanol market is in a bad way, synthesis gas technology required for the first phase of methanol production can be used alternatively in the first phase of production of synthetic petroleum products by the Fischer-Tropsch gas-to-liquids (F-T GTL) process.

GTL initiatives

Active interest in this prospect has been signaled in two recent initiatives in Australia announced by Methanex, the methanol industry's largest producer and merchant supplier. In one of its initiatives the company undertook to participate in the financing of a 10,000 b/d F-T GTL project in Western Australia proposed by Syntroleum (with a minor participation by Enron). Methanex is putting up $2mn towards preliminary engineering and has agreed to take minority equity of $43mn if the plant goes ahead (as it most likely will – see *Petroleum Review*, March 2000, p12).

Separately, Methanex also signed in early March a letter of intent with Shell and Woodside for natural gas supplies from Timor Sea fields of 110 PJ/y (say 250mn cf/d) to a proposed large-scale synthesis gas plant near Darwin in Australia's Northern Territory. Options that the company has under study to use this gas are methanol, hydrogen and F-T gas-to-liquids. A decision on the project is expected in 2002 and start-up of the plant is planned for 2005. It is

Forecast in ,000 tonnes

	2000	2001	2002	2003	2004
Nameplate capacity	37,545	38,727	39,407	39,752	39,752
Demand	27,779	28,748	29,483	29,391	29,892
Operating Rate	74.0%	74.2%	74.8%	73.9%	75.2%

Source: CMAI

Table 2: World methanol supply capacity and demand

believed that this project was originally contemplated as part of a new plant to replace Methanex's New Zealand methanol plant which faces the probability of declining natural gas feedstock supplies. Now, however, it could perhaps become the first phase of a F-T GTL plant, conceivably with financial support from an enthusiastic Australian government.

Whatever use is made of its projected new synthesis gas facility in Australia, it may be assumed that it will benefit from a radical technological advance under development by Methanex, working with ICI subsidiary Synetix. This has been under research by the two companies since 1996 and has now reached the stage where it is hoped to achieve a process proven in all aspects for commercialisation by 2002. This will make possible large-scale production of synthesis gas to feed methanol plants of up to about 2.5mt/y (7,500 t/d assuming 335 operating days per year) The hope is to be able 'to produce methanol profitably at $80/t or less'.

Therefore, thinking on these lines, the Norwegian company, Statoil, has recently spoken of longer term plans to double the capacity of its 2,400 t/d Tjelbergodden plant, declaring that it foresees in 10 to 15 years time a restructuring of the world methanol business with much larger plants than today. In the short-term also, taking account of its favourable geographical location in supplying European markets via Rotterdam, Statoil is undertaking significant expansion. Speaking at a conference in February, Ola Olsvik, Statoil's Research Manager for Methanol R&D, anticipated an expansion of about 10–15% by May, to be followed soon after by a further expansion of 35%.

Fuel cell future

Carrots-on-sticks continue to entice the global methanol industry. Within the next ten years or so the industry could be challenged by the greatly increased demand for methanol-to-olefins (MTO), as a clean alternative fuel for power generation and mobile uses, and for some of the previous 'carrots' as well. A market that holds high promise presently is its use as the carrier to supply hydrogen to fuel cells to produce electricity. This market can range from sizable banks of cells for large buildings and islands to small ones for laptop computers and cell phones.

Much has been written on the fuel cell. In fact, the world today could be standing at the same threshold that it was 100 years ago when petroleum-based fuels began replacing whale oil, wood, coal, dung, etc. Hydrogen is the most abundant and cleanest fuel in the universe. The primary challenges to developing and commercialising it are transport and its handling by the consumer. There are a number of hydrogen carriers that could be employed, such as natural gas, gasoline, naphtha, clean crude oil (from GTL) and others, but methanol is considered a forerunner for mobile/automotive uses. It will take a number of decades for the fuel cell to reach its full potential, similar to petroleum products during the first half of the 20th century, but there are virtually no dissent about the positive future for the fuel cell. The major question is the fuel or fuels of choice and methanol stands an excellent chance in this regard.

Long-term expansion

Longer-term expansion for methanol is foreseen by Statoil and the industry generally, mainly on the expectation that methanol will be the preferred source to provide hydrogen for automotive fuel cells. Today, it is clearly the source which most automobile manufacturers are favouring in their R&D work. If this comes about it will provide an immense boost for the methanol industry and of course, for the related natural gas feedstock supplies needed for methanol production.

The scale of the prospect may be judged from estimates that methanol requirements to supply hydrogen for automobiles in any given market will be approximately the same or better, gallon-for-gallon, as requirements for gasoline. The American Methanol Institute estimates that, within 15 to 20 years, there could be 36mn methanol-fuel cell vehicles on the road worldwide, each consuming approximately 1.5 t/y of methanol. A typical world-scale methanol plant of today rated at 2,500 t/d – requiring natural gas feedstock of some 90mn c/d. – produces about 19,800 b/d of methanol. On this basis the potential long-term need for methanol is huge.

New prospects

On the other theme of cutting back unprofitable methanol production, a new prospect has recently been pioneered by Rentech, a Denver-based company which has its own proprietary and patented F-T GTL technology. Jointly, 50/50, with Republic Finance Corp, it has formed Sand Creek Energy, which has acquired a small unprofitable methanol plant at Sand Creek near Denver, Colorado. It is converting this to an F-T GTL plant to produce 800–1,000 b/d. By using the existing synthesis gas unit and other existing infrastructure, Rentech anticipates it will cut capital expenditure by 30–40%. It will also greatly speed up construction, with a targeted onstream date of mid-2001. As a further measure to gain profitability Rentech plans a production slate of 68% high-value waxes plus 18% low-emission diesel and 14% naphtha. It says it has lined up prospective markets and intends to seek a loan backed by offtake agreements.

Rentech has for some time been surveying the possibilities for the conversion of ailing methanol plants internationally, where natural gas feedstock prices may be lower than in the US. Since it announced its Sand Creek project, it says that it has been inundated with approaches from owners of methanol plants interested to consider the same concept.

Once again, the methanol industry has been severely hit; but although it is out now it certainly won't lie down. Short-term perhaps there could be a wave of conversions to F-T GTL plants, fostered by the growing needs for environmentally friendly diesel. Medium-term there is the prospect of larger plants and significant reductions in costs. Longer-term, methanol has high hopes as the favoured hydrogen carrier for automotive fuel cells.

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Networking in Calgary

On 11–15 June 2000, over 3,000 delegates from 80 countries will be attending the first World Petroleum Congress (WPC) ever to be held in Calgary. 'We've had a lot of interest from the UK, and we expect a good delegation,' says *Jim Gray*, WPC Chairman, talking to *Petroleum Review*'s Canadian correspondent *Gordon Cope*.

The theme of the 16th WPC is *Petroleum for Global Development; Networking People, Business and Technology to Create Value*. 'This is the new century, and everyone is going global,' says Gray. 'Making new contacts and establishing relationships is what it's all about – whether you're a junior, intermediate or major company.'

The event is divided into four major programme blocks: Upstream; Natural Gas, Petrochemicals and Transportation; Downstream; and Business Management.

Upstream

Discussion in the Upstream programme block will focus on finding new basins, reducing exploration and drilling costs, improving production rates, and exploiting non-conventional petroleum resources.

A wide selection of international players, including His Royal Highness Prince Faisal Bin Turki Bin Abdul-Aziz Al-Saud, Adviser to the Ministry of Petroleum and Mineral Resources (Saudi Arabia); Sir John Browne, Group Chief Executive, BP Amoco (UK), and Olav Fjell, President and CEO, Statoil (Norway), will be giving keynote speeches.

Forums will cover such topics as new petroleum provinces, non-conventional hydrocarbon production and deepwater production development options.

Finally, review and forecast papers will look at remaining crude oil resources, new concepts in exploration data management and new environmental protection techniques for E&P

In addition, the National Petroleum Show – said to be the world's largest oil and gas technology tradeshow – will be running concurrently at the nearby Stampede Grounds, where delegates sporting WPC badges will gain free admission.

Gas, petrochems and transportation

This programme block explores a diverse area of industry concerns, from integrating refinery and petrochemical processes to new concepts for increasing natural gas supply and linking natural gas to new markets. 'The host country gets to choose one of the blocks, and natural gas is very near and dear to Canadian hearts,' says Gray. 'We're one of the biggest natural gas exporters, and delegates from Canada are very interested in the international scene.'

Forums range from non-conventional natural gas applications and gas transportation links to future business trends in the petrochemical industry. Review and forecast papers will look at novel technologies and their role in shaping the petrochemical industry, GTL technology updates and new tends in pipeline technology.

Noted speakers include Victor Chernomyrdin, Chairman, Gazprom (Russia) and Linda Cook, CEO, Gas & Power, Shell (UK), and Robert B Peterson, Chairman, President and CEO, Imperial Oil Limited (Canada).

Downstream

The Downstream programme block will focus on linking vehicle and fuel technologies, fuelling global transportation, and meeting environmental expectations.

Relevant keynote speakers include Professor Jürgen Hubbert, who sits on the Board of Management, Passenger Cars, Mercedes-Benz and smart, Daimler-Chrysler (Germany).

Forums comprise new fuels, lubricants and additives, technologies to upgrade heavy crude oils, and optimising refineries by controlling emissions and energy consumption. Review and forecast papers will examine new concepts in catalysts and the opportunities for networking between the petroleum and automobile industries over issues of fuel quality and emissions control. 'With the new environmental standards and growing sensitivities [of the general public], fuel quality and emissions control are front-burner stuff for many countries,' says Gray.

Business management

Finally, the business management programme will examine the evolution of business rules that impact the petroleum industry.

Topics in the forum section include operating in environmentally sensitive areas, developing partnerships to enhance and balance economic, environmental and societal needs, and people management in the restructured petroleum industry. Review and forecast papers will dissect the role of service companies in the petroleum business structure, public involvement in the decision-making process, and the impact of information technology on the petroleum industry.

Street entertainment

While most of the action at WPC will take place within the confines of the new Telus Convention Centre, police are preparing for a different kind of bustle out on the streets.

The Ruckus Society, a California-based organisation dedicated to teaching demonstrators how to outwit law enforcement, recently managed to paralyse the World Trade Organisation (WTO) meeting in Seattle and disrupt the proceedings of the International Monetary Fund (IMF) meeting in Washington, DC. The Co-Motion action group, which has links to the Ruckus Society, announced plans to target the WPC in Calgary.

Inspector Bill Webb, Co-ordinator of the Calgary Police Service's planning team for the Congress, noted in a recent interview that the police are monitoring the situation. 'Everyone has a right to express their views and if it is done in a peaceful way, that's fine. But if it got out of control, it would then become an issue which would be of concern to us.'

While Gray doesn't want to downplay the situation, but he sees a difference between the WTO and the WPC. 'Big decisions and policies were being made at the WTO, but the Congress is not a decision-making event – there's no mandate for it. It's an exchange of opinions. We don't anticipate any serious issues (with demonstrators).'

Rather, Gray anticipates a successful event that will spur attendees onto attending the 17th Congress in Rio de Janeiro. 'When delegates leave the 16th WPC, they will have gained a leading edge update on the issues and developments affecting the petroleum industry, and a host of valuable contacts. Delegates will hear first-hand the news, views and opinions of our industry's leaders. Where else would you have the opportunity to network with these and thousands more key members of the international petroleum industry?'

The drilling revolution

The drilling industry has been undergoing a quiet revolution over the last decade – one that has been instigated by innovation and technological progress on a broad range of disciplines. *Petroleum Review* looks at some of the major advances.

Earlier this year, while drilling a tight hole in the Far East, contractor Baker Hughes performed a feat that has never been done in a century of punching hole – they drilled a well uphill for 233 metres.

'The crew had been drilling the hole horizontally, then the operator wanted to test a zone further up, so they drilled 223 metres in the positive vertical direction, and the final inclination achieved was 164°' explains Harry Schaepsmeyer, an Engineering Supervisor for Baker Hughes' Inteq division. 'You just can't do that on a conventional directional drilling well because the hole drag would prohibit you. But, with a rotary steerable system, it was done.

Driven by the tremendous pressure to control costs, the drilling service industry has advanced a broad spectrum of new and old technologies, including coiled tubing, measurement while drilling, directional drilling, logging while drilling and drill bits.

Kinks in coiled tubing

One of the major advances in drilling technology over the last few years has been the widespread adoption of coiled tubing rigs within the industry.

Unlike conventional rotary drilling, where 20 metres stands of drill pipe are attached at the surface and turned by means of a rotary table, a coiled tubing system uses a single, lengthy strand of flexible, non-rotating steel pipe. 'A conventional rig can drill at 30 m/h, but it must stop for pipe connections,' says Shaepsmeyer. 'A coiled tubing rig can drill at 150 m/h, and never needs to stop for connections.'

The most common use for coiled tubing in North America is drilling shallow vertical holes. 'It is used a lot in the Southern Alberta region to drill shallow gas wells,' comments Schaepsmeyer. 'There are 500 conventional rigs in Alberta, and only three or four coiled tubing rigs, but coiled tubing accounts for 10% of all wells spudded.'

Coiled tubing is also used for 'underbalanced' drilling. Certain types of reservoirs, such as those encountered in the heavy oil regions of Venezuela, are easily damaged by mud invasion. The mud system is therefore designed to exert less pressure than the reservoir (hence the term underbalanced).

But drilling at low mud pressure raises the potential for a catastrophic blowout, where reservoir fluids enter the borehole and surge to the surface unimpeded. 'Because you can seal around a coil better at the injection head, you can maintain pressure integrity and reduce the potential of a blowout,' says Schaepsmeyer. 'Also, once the bottom-hole assembly is in place, the coiled tubing unit can be controlled remotely (thus avoiding the necessity of standing near the wellhead).'

Offshore drilling is coiled tubingss third major area of use. Several years ago, Baker Hughes developed the Galileo system, a built-for-purpose coiled tubing drilling unit with a small foot-print allowing it to be readily situated on offshore platforms.

The North Sea was one of the first areas that the Galileo system was deployed. 'Coiled tubing units can be placed on production platforms and can re-enter dead wells,' explains Schaepsmeyer. 'The slimhole (27/8-inches) can go through existing tubing, and then be deviated in different directions.'

Although coiled tubing has many advantages, it also has several distinct drawbacks. The main limitations are depth (3,000 metres onshore) and hole size (6 1/4-inches). 'Offshore, they can use bigger reels, but onshore, a large reel of coiled tubing is just too big to move on a normal road.'

Metal fatigue is also a concern. As the coil is un-spooled and lowered into the ground, it suffers severe stress. 'Think of crinking an empty pop can repeatedly – eventually it fails,' says Schaepsmeyer. 'Most tubing only lasts three or four jobs, then has to be replaced; a 30-foot piece of conventional pipe can last hundreds of holes.'

Finally, a coiled tubing system doesn't have the weight-fluid capability of a conventional rig. 'That means you can't increase the penetration rate, and sometimes there is insufficient volume of fluid to clear the hole of debris,' says Schaepsmeyer.

In an effort to alleviate some of the limitations, researchers are looking at new materials and devices. Composite coil tubing made of carbon fibre, currently under test, doesn't show the problem of fatigue. Danish scientists have also devised a tractor device that sits near the drill bit. 'It pulls the end of the tubing and helps reduce sidewall pressure, which can build up to the point where you get lock-up.'

Polishing up drill bits

One of the most-overlooked, but important, contributors to the increased efficiency of drilling is the lowly drill bit. 'A drill bit can be less than 5% of the cost of a well, but have a huge impact, because 70% of the costs of a well are time-driven,' explains Dale Straub, an Engineer for bit-manufacturer Hughes Christensen. 'About four years ago, a 300-metre run for a drill bit was common. Now, 1,200-metre runs are not uncommon.'

There are two major types of drill-bit used in the petroleum industry: fixed cutter and rolling cone. Rolling cones (with three rolling cone bits) crush the rock, and fixed cutters, such as polycrystalline diamond compact (PDC), sheer the rock. A rolling cone bit costs approximately $8,000, penetrates at 15 m/h and can last up to 1000 metres. A fixed cutter is more expensive, typically costing $30,000 or more, but it also penetrates at 35 m/h and lasts for three wells.

The trend has been toward increased use of PDCs. 'In 1990, 15% of all bit revenues were PDCs,' comments Straub. 'The rest were steel tooth and rolling cutter insert bits. Now, PDCs make up 40% of the market (with the remaining comprised of 15% steel tooth and 45% insert). By the end of the decade, we predict PDCs will represent around 70% of all bit revenues.'

Over the last decade, the three major advances in bit technology have been in materials, design and customisation. 'In terms of materials, there has been continuous research into improving the quality of tungsten carbide and PDC inserts,' says Straub.

Elastomer and metal-face seals have also reduced the amount of abrasive that can get into the bearings. 'We have a new slimhole line, the Star 2, with new bearing and seal geometry designed for increased lifespan.'

As far as design is concerned, a great deal of progress has been made in the emplacement of the nozzles to distribute the drilling fluid more effectively. 'The fluid nozzle can be positioned to clear away crushed debris that sticks to the bottom, such as bottom-balling shales,' says Straub. 'Other types of debris stick to the cones, so you point the nozzles at the cones. We have a new model, the HydroBoss X-stream, that has a nozzle location that does well on both. It's all optimised using computational fluid dynamics, or CFD.'

Finally, a greater selection of bits allows an operator to customise their bit selection. 'A decade ago, most bit companies had a single line of rolling cutter and fixed cutter, and would bundle features into a specific line' says Straub. 'Now, Hughes Christensen has many lines, each with a set of features, and we do application-suited engineering. One handles high strength rock, such as limestones and some sandstones. Other lines handle balling shales, slimhole applications, reaming while drilling, and oversize holes. The market has completely segmented.'

While drill bits have made tremendous advances in reliability and efficiency, most experts foresee even greater improvements. 'Stability of the drill bit is the Holy Grail,' says Straub. 'The most common cause of PDC failure is instability, which can damage the cutters.'

By making the bit more stable, wear upon bearing and cutting-structures is reduced dramatically. 'Diamond is brittle,' says Straub. 'It's strong when loaded the correct way, but it can crack when it is dragged by lateral vibration and torsional vibration. Over the next decade, improvements in stability will double the length of time that a bit can remain in the hole. One bit per hole size will be possible.'

Over the next 20 years, Straub also predicts that manufacturers will develop intelligent bits by emplacing infernal temperature and stability gauges. 'You don't want to pull the bit prematurely, but you want to know if a bit is about to fail. If it's acting up, is it the lithology or the bit talking to me? A gauge transmitting real-time information will be able to help you decide.'

Information please

One of the most significant advances in the last decade has been the collection and transmission of data from the borehole to surface, (and back again), while the well is being drilled. 'Operators are primarily interested in achieving maximum rate of penetration while limiting the damage to the reservoir and maximising directional control,' says Rick Ryan, the President of Ryan Energy Technologies, a supplier of downhole information tools. 'The more information we have, the better we can do our job.'

Measurement while drilling

One of the first technologies developed to supply downhole information is MWD, or Measurement While Drilling. Pioneers of directional drilling needed a way of pinpointing the location of the drill bit as they deviated from the vertical, and MWD was devised to determine the exact location relative to the wellhead.

Ryan Energy Technologies' MWD device, less than two metres long, is positioned in the bottomhole assembly behind the drill bit. It contains a magnetometer and accelerometers to measure drift (off vertical), azimuth (compass direction) and tool face orientation.

Because a fixed link, such as a wireline, would become hopelessly tangled by the rotating drill string, the MWD's location parameters are sent to the surface using a mud pulse device, a communications system that transmits data through the drilling fluid medium. A sensor at the surface collects the data, which is then calculated and plotted on a 3D computer display to show the operator the exact location and orientation of the drill bit.

One of the most recent advances to affect MWD is electromagnetic (EM) communication technology. It uses low-frequency radio waves rather than traditional mud pulse telemetry to transmit data to the surface. 'EM allows three to five times faster data rates, but

some geological layers with high resistance interfere with transmission, so you can't use it everywhere,' explains Ryan. 'Our next generation of wireless transmitters will be able to send more data more reliably.'

Directional drilling

Directional drilling is the technique of intentionally drilling a non-vertical wellbore in order to reach a specific reservoir target or expose the wellbore to a greater portion of the reservoir. Typically, a downhole mud motor rotates the drill bit in conjunction with the rotary table at the surface. When the operator wants to change direction, the drilling process is stopped, a location measurement is taken with an MWD device, then the drill bit is oriented before drilling recommences.

In 1996, however, Baker Hughes Inteq division, in conjunction with Eni-Agip, designed a rotary closed loop drilling system – called AutoTrak – that doesn't require the operator to pause while orienting the drill bit. 'It's 30% to 40% faster than conventional mud-motor drilling,' says Schaepsmeyer. 'It also leaves a smoother well bore, which reduces friction and allows you to go out further.'

The ingenious device, which is approximately two metres long, sits directly behind the drill bit. AutoTrak has three non-rotating stabilisers, or pads, that can independently extend and thus push the drill bit in any direction. 'You can signal down to the tool any well path changes, and it has two-way communication to let you know what it is doing,' says Schaepsmeyer. 'It's used mostly offshore to save time and money. The cost savings are around $250,000 to $500,000 per well.'

Ryan Energy Technologies' directional drilling device, named Geological Steering Instrumentation (GSI), uses logging while drilling (LWD) technology to supply the operator with information regarding lithology. 'If you can steer geologically, rather than geographically, then you're better off,' says Rick Ryan.

LWD technology relies on a gamma detector to distinguish between various types of rock. Shale, for instance, naturally emits more gamma radiation than sandstone. Ryan's GSI device contains a gamma detector that scans the entire circumference of the wellbore, providing critical information about the type of reservoir surrounding the bottom hole assembly. If, for instance, the drill bit is about to leave a sandstone and wander into non-productive shale, the operator can adjust the wellbore path and keep the drill bit in the pay zone.

GSI has proved very valuable to horizontal well drillers, and further improvements are reaching the deployment stage. 'Currently, our device requires the operator to stop and survey the well bore, and operators would appreciate it if they could continue to rotate,' says Ryan. 'We'll have a new version out in the next few months that allows them to do that.'

Logging while drilling

Other companies are working to expand the repertoire of LWD beyond gamma detection into the full range of well logs.

Traditionally, operators wait until after the well has been drilled, then contract a well-logging company to lower down a series of tools on a wireline in order to record lithological data such as porosity, density, permeability and fluid phases. 'Unfortunately, wireline can't help the driller drill more effectively, or the geoscientist to target pay,' says Kyel Hodenfield, the LWD Business Manager at Schlumberger Oilfield Services. 'We developed our Visions services to acquire all data while drilling and tripping.'

The Visions device, which is connected to the bottom hole assembly, contains resistivity, density neutron, acoustic and downhole pressure capabilities. 'The system is omni-directional, so it doesn't matter if you're rotating,' says Hodenfield. 'You can bin the data (in a downhole computer memory chip) and interpret later, but some data is sent real-time by mud pulse.'

The real-time information is valuable to drillers. 'We collect data on the mechanics of the drill string, such as downhole weight, annular pressure and vibrations so that we can understand what the drilling process is doing to the well bore,' says Hodenfield. 'Our goal is to reduce overall costs, and we do that by increasing the rate of penetration (ROP) and reducing the risk of getting stuck and damaging the bottom hole assembly.'

The information also helps the well site geologist. 'The geoscientist wants

to get the most production out of the formation, so we have formation evaluation quality measurements; porosity, permeability and phase contacts,' says Hodenfield. 'If there is a drop in porosity, we can compare differences azimuthally, either the top of the bore hole or bottom, and steer accordingly.'

Although acquisition costs for a full suite of LWD are about twice that of wireline, the system has proven to be very popular in certain situations. 'LWD is used on almost all offshore wells,' says Hodenfield. 'But, as you get closer to shore, the use of LWD decreases. On land, around 95% of wells are still logged with wireline, where the deciding factor is rig time. Rig time on land is $6,000-700/d, but $200,000/d offshore.'

Most of the recent advances in LWD devices have focused on longevity and data transmission. 'On older systems, you had to pull the unit out of the hole to download memory and replace the power supply, but now we've increased the memory and added batter chargers so it now lasts for 10 days,' explains Hodenfield. 'We've also been working with mud pulse and we've made big advances on the data rate by increasing the signal rate and improving the processing of the signal.'

In the near future, Schlumberger hopes to add a new tool to the LWD suite that will allow operators to steer through reservoirs as narrow as one metre in thickness. 'We are field testing two imaging devices based on resistivity and density,' says Hodenfield. 'It images the rock surrounding the well bore and can measure the dip of a bed as you go through the formation contact.'

After that, LWD developers will need to expand the ability to send data back to the surface. 'The next big leap will be to increase telemetry rates by a couple of orders of magnitude, but that's going to take a while,' says Hodenfield.

The future

The telemetry rate barrier is not only a concern to LWD experts, surpassing the current limitation to the amount of data transmitted to surface (a modest 12 bytes per second) is critical to the entire drilling industry. 'When you're five miles into the ground, you can turn the rotary table five times before the bit even moves,' says Ryan. 'There is a greater and greater need for real time downhole information.'

Ryan foresees the development of a drilling system in which a complex series of sensors at the bottom of the hole will be able to transmit large volumes of data in real time to the surface, where it will be collected and correlated, then adjustments made to take in changing conditions. 'You will bring in all the disciplines – the geologist, the drilling foreman, the directional driller – and make sure they make the best decision based upon good information. You could even set up a system where the information is fed to an automatic control system on the rig.'

Ryan Energy Technologies has already developed the hardware and software for part of that process, a dynamic data management system called TruVur. While the system is capable of accepting an unlimited number of analog or digital inputs from virtually any source, it is primarily designed to collect and analyses drilling and other industry data.

According to Rick Ryan, TruVuR creates both time and depth databases for displaying and analysing all measured and calculated parameters. 'The goal is lower drilling costs, lower drilling risks, and a higher element of success. Already, systems like the above are being used in the Gulf Coast and the North Sea, where wells are high risk and high cost.'

There is little doubt that drilling technology will advance much further, thanks to the amount of money being invested into research and development. 'Schlumberger is the largest spender on R&D in the oil industry,' comments Linda Silinsky, a spokesperson for Schlumberger Oilfield Services. 'We now spend over $1mn/d, and have spent almost $3bn over the last decade. It's the future of our business.'

Rates of penetration will eventually plateau, and Schlumberger is gradually shifting its R&D focus toward another challenge for the oilfield industry; increasing oil field recovery rates. 'With new technologies, we hope to raise the recovery rate for fields from an average of 25% to over 50%,' says Silinsky.

Still, when it comes to the basic task of punching hole, there is much left to be done. 'When you look at drilling, there is a continuum between art and science,' says Ryan. 'We're a lot closer to the art part than we are to the science. We need to move toward the science end.'

Latin America Venezuela

...continued frpm p21

Venezuelan national interest. Even though Cuba still owes $60mn to Venezuela for past oil supplies, the Chávez government believes that geopolitical considerations are more important than economics.

Strained relations

All of this is straining further an increasingly tense relationship between the US and Venezuela. The US buys over 80% of Venezuela's oil exports while the US capital markets service most of PdVSA's debt and investment needs. US policymakers have become ever more concerned with the future of Venezuela believing that violence and the drugs trade in Colombia will spill over into Venezuela. President Chávez and Foreign Minister Vicente Rangel have not helped matters by making ambiguous statements which have been interpreted both in Washington and Bogota as supporting the Colombian armed groups waging an internal war against the Colombian Government. Matters soured further when Venezuela refused to grant permission for US military aircraft to fly over the country during their anti-drugs operations. The answer, or perhaps deterioration, may come in any attempt to solve Venezuela's territorial dispute with Guyana, where Venezuela is seeking a US intervention.

Venezuela claims that the Essequibo region in Guyana, approximately two-thirds of Guyana's territory. Venezuela has never formally accepted the colonial boundary arrangements. The government chose the 100th anniversary of an October 1899 Paris tribunal award of 159,000 square kilometres of the Essequibo river basin to Britain, then the colonial power in British Guyana, to re-awaken its claim. As a result all oil exploration on Guyana's side of the border has been halted until the latest squabble is patched up.

President Chávez has asserted that Venezuela would never use force to press its claim. The Caracas position is that Venezuela is prepared to recognised Guyana's claim on condition that Guyana and Venezuela jointly decide on how the region's natural resources – oil, minerals, forestry – are exploited, a position Guyana can never agree to. Georgetown's response has been to award a contract to a Texan company, Beal Aerospace, to build a rocket-launching base in the Essequibo. The real fear now, in both North and South America, is that the Chávez administration's pre-occupation with radical foreign policy could re-ignite the border dispute between Colombia and Venezuela. This could become a serious danger should the economy, or Chávez' popularity, slump further.

ip : / / awards / 2000

The IP Awards 2000 represent a significant new opportunity for the achievements of companies and individuals to receive acknowledgement at the most senior level in the industry. This exciting venture promises to be a keenly contested and prestigious event, enjoying the support of major international companies.

The IP Awards will be presented at the Savoy, London in November 2000. The deadline for entries is 30 June.

The IP welcomes entries and nominations for the seven categories of Award (see featured). Entries may be self-nominated, or accepted with the knowledge of the nominee, and must be based on a project or achievement which took place or was completed in the last 12 months. A 500 word project summary is required to support each entry.

Entries for all categories can be made using the printed Entry Form available from the IP or via the Awards website: **www.ipawards.com/2000**. For further information, visit the site, or contact Sarah Frost Mellor on +44 (0)20 7467 7150. e:**sfm@petroleum.co.uk**

International Platinum Award

(the achievement with the greatest global impact)

Judging Criteria

- Strategic innovation or development
- New benchmark
- Global impact
- Shareholder value

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Innovation Award

(most outstanding innovation)

Judging Criteria

- Major advance or development
- Cost effective
- Wide application for industry
- Good development prospects

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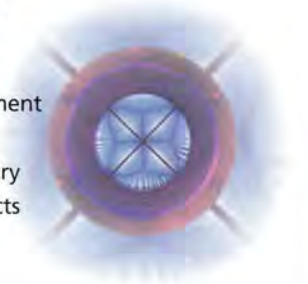

Safety Award

(best example of safe practice)

Judging Criteria

- Best safety initiative or innovation
- Management commitment
- Effective communication
- Good prospects for wider application
- Sustainable benefit

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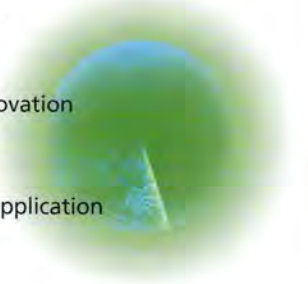

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Information Technology Award

(best application of new IT)

Judging Criteria

- Innovative
- Commercially available
- Wide application for industry
- Good development prospects

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Communication Award

(greatest contribution to awareness of industry issues)

Judging Criteria

- Innovative strategy
- Effective targeting
- Raised awareness
- Global impact

Environment Award

(best new initiative to benefit the environment)

Judging Criteria

- New initiative or development
- Proven benefit to environment
- Management commitment
- Good prospects for wider application
- Sustainable benefit

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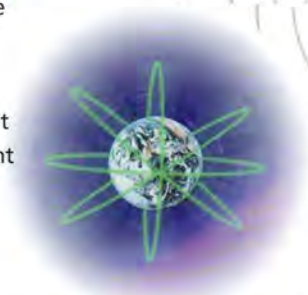

Community Initiative Award

(best new initiative to benefit the community)

Judging Criteria

- New initiative
- Proven benefit to community
- Sustainable benefit
- Global application

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community initiative award

recognising your contribution to the community

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Captain to join '100k Club'

The last month (May) has seen the completion and sailaway of the three main facilities making up the Captain B development. Once fully onstream, production from the Captain field will rise to 100,000 b/d or more. Over the last nine months the only other single fields in the UK sector to have achieved over 100,000 b/d are Schiehallion and Nelson, reports *Chris Skrebowksi*.

Shrinking field sizes

Over recent years UK North Sea oil production has held steady at around 2.6mn b/d. This has been achieved by bringing on large numbers of relatively small fields to offset the declines in the early large fields.

The latest figures outlined in Wood Mackenzie's UK Upstream report reveal that in 1999 only two individual fields – Nelson and Schiehallion – averaged over 100,000 b/d, although there is a third and fourth if the Tern group of fields (Eider/Merlin/Osprey/Pelican/Tern) and the ETAP fields (Machan, Monan and Marnock, Heron, Egret and Skua) are included. A further nine fields averaged over 70,000 b/d – Alba, Alwyn group, Andrew/Cyrus, Brent, Foinaven, Forties, Harding, Magnus and Scott.

At the moment, the 13 largest fields produce around 1mn b/d. In 1980 Brent, Forties and Ninian collectively produced over 1mn b/d.

The Captain field was actually discovered in 1977, but was viewed as being so difficult and unpromising that it was not fully appraised until 1989. At the time of its discovery, suitable production technology was not available, and for a company seeking to develop the accumulation virtually everything was difficult.

The accumulation is viscous, heavy and only 3,000 ft below the seabed. The reservoir is an unconsolidated sand (much like oily builders sand) spread over a large area measuring roughly 10 km by 4 km. Adding to the problems, the reservoir is low pressure, cool and has a low GOR (gas/oil ratio) As if this was not enough problems, the oil forms stable emulsions with water that require heat and chemicals to break. The oil also has a high acid number.

Testimony to Texaco technology

It is a considerable testimony to Texaco's production technology that it has managed to make Captain a key North Sea producer. The first horizontal wells on the field were drilled in 1990 and an extended well test in 1993 produced 700,000 barrels and proved the viability of the field. Current estimates are that Captain has 900mn barrels in place, and that over 300mn barrels should be recoverable.

The three key technologies enabling the development are:

- horizontal drilling,
- the development of reliable down-hole electric pumps, and
- FPSO technology.

The field gained development approval and is being developed in two phases. The £800mn phase 1 involved the development of the Captain A area using a series of horizontal wells linked to the Captain A wellhead platform and exporting via an FPSO and shuttle tankers. Captain A came onstream in March 1997 and production has built to the current level of 55–60,000 b/d. Some 50mn barrels, or 16%, of field life production has so far been produced, with 107 cargoes loaded from the FPSO. Production comes from 19 oil producers, with five water injectors and two water supply wells also in operation.

The £450mn phase 2 development of the eastern part of the field received development approval in January 1999. First oil is scheduled for December 2000, with peak production from the whole field rising to 100,000 b/d. The phase 2 facilities include a gas export line linking to the Frigg-UK pipeline.

The £350mn phase 2 facilties comprise:

- a bridge-linked platform and integrated deck built by Kvaerner Oil & Gas at its Methil yard under a conventional $110mn contract;
- a £40mn subsea template awarded to a joint venture of Cameron and Brown & Root and fabricated at Barmac's Ardersier facility;
- a £29mn pipelines contract awarded to Coflexip Stena Offshore; and
- £8.5mn worth of hydrate submersible pumps supplies by Weir Pumps.

The drilling of 12 production wells and two injection wells in the B area has already been sanctioned and are expected to cost around £85mn. In addition, the Ross sand (a different production zone) is still being evaluated. Development of this would involve a further four wells (two production, two injection). Texaco confirms that these are likely to go ahead. In addition, the facilities have been sized to accept a four-slot step-out.

There is a small area at the eastern extremity of the field not accessible by the horizontal wells, even though the longest of these has a 6,000 ft horizontal length. This small portion of the field may be accessed at a later date by a small subsea template tied back through the main subsea template.

Field innovations

The new facilities include those for polymer and chemicals injection should this be required to enhance recovery. A key difference between the development of the A and B areas is that the initial development was done with electric submersible pumps, but the new facilities will make use of hydraulic submersible pumps. According to Donald MacRaild, the Captain expansion Project Manager, although the Captain GOR is fairly low, larger than initially anticipated gas flows were leading to lock-ups in the electrical submersible pumps. Following extended trials at Texaco's Humble test facility in the US, various state-of-the-art technology was included in the Captain B facilities, including:

- A multi-phase meter for well testing in place of test separator. This gives space and weight savings.
- Hydraulic submersible pumps developed in conjuction with the pump manufacturer.
- Enhanced cyclonic inlet devices to assist with gas break-out in the free-water, knock-out (FWKO) vessels.

Another key area of development has been the gravel placement techniques for horizontal wells to ensure consistent drainage of the reservoir.

Another field innovation is the decision to export gas flows via the Frigg UK pipeline to St Fergus while there is excess gas and so avoiding flaring, but later to import gas for reinjection and to power the field facilities. At peak, the facility will produce 80mn cf/d.

When the Captain B facilities commence production at end 2000/early 2001 it will conclusively prove that with the application of the right technology even the North Sea's most difficult accumulations can become major producers.

Clair to save fabricators?

Reports that BP Amoco has placed a FEED (front-end engineering and design) contract in the market for the Clair field could not have come a moment too soon for the UK's beleaguered platform fabricators. However, even if industry rumours prove correct and BP Amoco goes for a two-platform development, there will still be far more construction capacity than work. If other industry rumours – that economics favour fabrication in the US – prove correct, Clair will have little to offer UK fabricators. A final decision is not expected before mid-2001.

Of the UK's three largest yards Ardersier is now empty following the sailaway of the Captain B subsea template and the earlier completion of the two Terra Nova modules. The other Barmac yard at Nigg Bay is completing the delayed Elgin/Franklin platform, but will be empty and without work later this summer. Kvaerner's Methil yard has just completed the Captain B jacket and the Snorre B semisubmersible centre section, and will shortly complete the integrated deck for Captain B. By June/July 2000 the only work will be on Phillips' small jacket for the Jade field, due for completion by year-end/early 2001. Employment in the yard will fall by over 1,000 workers at end-June, leaving just 140–150 workers and 50 staff for the Jade work.

The smaller platform and module yards are in similar straits. Amec's Wallsend yard is being mothballed following April's departure of the Shearwater integrated deck. The Lewis Offshore yard in Stornoway, Orkney, went into receivership earlier in the year. Kvaerner's Teesside yard is up for sale and Heerema's Hartlepool yard is also virtually empty. Prospects for the small East Anglian yards are slightly better as Shell will be looking for fabrication for the Skiff gas field.

Although the UK North Sea development prospects appear to be improving, many of the likely developments are subsea completions and tie-backs. These offer little in the way of fabrication.

In sharp contrast to the current situation in the fabrication yards, the latest UKOOA survey is extremely positive about future prospects, with future expenditures estimated to be rather higher than the DTI survey which was done when oil prices were lower. UKOOA anticipates 68 subsea tie-back cluster projects over the next three years and possible orders for 25 jackets/platforms over the same period. Over half of these would be for the southern sector and consequently quite small. UKOOA anticipates just one FPSO order in 2000 and none thereafter.

However, despite UKOOA's optimism, the only certain large fabrication contracts are likely to come out of Norway. The Methil yard has already indicated that it would be keen to bid on the Kvitebjorn, Grane and Ringhorne field facilities, although work on these is unlikely to start before March 2001. Other potential work sources include Canada, West Africa and the Caspian. An excess of fabrication capacity in Europe and the oil companies' restrained pace of development means that intense competition and more yard closures appear inevitable.

Focus remains on cost reductions

A key attraction of the annual Offshore Technology Conference (OTC), held in Houston, is that it caters for many varied interests. This year – the 32nd such event – some 46,000 visitors could ponder exhibits from 2,000 companies, based in 30 countries. The technically-minded could attend some of the 275 papers presented at 46 sessions. Additionally, apart from about 15 press conferences, several general sessions allowed senior industry figures to opine on subjects ranging from the role of e-commerce, to opening up US federal lands to the drill bit, to prospects offshore West Africa. Cost reduction proved to be a key issue throughout, reports *Philip Algar*.

This event also creates the potential for many individual conversations, restricted only by the time available. Attempting a generalisation after such intensive activity is inevitably subjective, but this year it seemed that the industry is, in the words of Sir Ian Wood, the Chairman of Scottish Enterprise and leader of the UK delegation in the absence of the Energy Minister, 'cautiously optimistic'.

Last year, the Brent Dated price at the time of the show was hovering around $16.70/b and the contrast between the rejuvenated Gulf of Mexico, and, for example, the North Sea was plain. Now the price is around $25/b, but the industry, aware that levels could fall again, is reluctant to invest. This may result from pressure from the financial sector and shareholders anxious to see improved returns, but many contacts expressed concern that if the necessary investment in upstream capacity is not made soon, increasing demand could cause another crisis.

Some technical experts, maintaining that few exhibits were innovative, attributed this to pressure on the margins of supply side groups by the leading oil companies – but it was clear that the displayed equipment and services were designed to reduce costs. The most obvious manifestation of this was the range of 'dot.com' companies and the proliferation of Internet portals now available to the industry, especially in the fields of procurement and trading. However, the sheer numbers of such groups and the abysmal standard of some of their marketing efforts suggest that many will not survive.

From the platform

Sir John Browne, Chief Executive of BP Amoco, argued that the industry could meet increases in global demand for oil and gas, respectively, of more than 20% and 30% by 2010 thanks to technical advances, especially in deep water. However, the wider challenge was how the companies behaved as corporate citizens.

Recent industry activity had resulted in the creation of three large companies each of which had market capitalisations greater than the gross national product of more than 160 countries. These combinations had not been driven by the decline of the industry, nor by a desire to accumulate market power, but by the need for scale and reach in the face of growing demand. Sir John conceded that the power of the companies worried some people and suggested that the only response was to accept 'our responsibility as part of society'. 'If we're to thrive and to fulfil our basic purpose, we have to have an unshakeable commitment to progress on many fronts and to work for it in open and transparent ways.'

He also stressed the need to learn what people expected of the companies, 'so that we can better understand how large and apparently very powerful companies should behave in all the many varied circumstances they face.'

Ole Lund, Chairman of Statoil, argued that Norway, nearing its peak in oil production, faced a choice. 'Should we primarily concern ourselves with reaping what has been sown or should we further develop our competence and our market positions in the international industry?' A continuation of the *status quo* was a great risk and he advocated reduced state exposure in hydrocarbons and 'commercial care' of the resources in the State Direct Financial Participation (SDFP). All, or a significant part, of the SDFP could be placed in Statoil, he said, thus making it a more robust operator. 'Statoil's ownership structure is adapted to the role of being an instrument for the state, but that is a role the company no longer has and a role that the owners cannot and will not give Statoil in future.' The company needed the same freedom as its competitors and he favoured privatisation, with perhaps a third of the company being offered to a partner.

John Brooks of the UK Department of Trade and Industry revealed that he had been involved in interesting talks with US independents keen to become involved in the North Sea, and US trade associations made their annual appeal for more federal lands to be released for exploration. Dick Cheney, Chief Executive of Halliburton, ruled out the possibility that his company could operate acreage and Robert Edwardes of ExxonMobil said that, within a decade, the coast off West Africa could match peak North Sea production.

NEW Publications and Data Services

Who's Who in World Oil & Gas 2000

(FT Energy, Maple House, 149 Tottenham Court Road, London W1P 9LL, UK). ISBN 1 84083 174 X. Price: £215 ($366).

This directory, which has more than 5,000 entries, provides biographical details and full contact information for leading figures in all areas of the oil and gas industry, including exploration, production, refining, storage, trading, distribution and marketing. Profiles include company directors, senior executives, eminent scientists and academics, consultants and specialists.

Well Completion and Servicing

Denis Perrin, in association with Michel Caron and Georges Gaillot (Éditions Technip, 27, rue Ginoux, 75737 Paris Cedex 15, France). ISBN 2 7108 0765 3. 352 pages. Price (hardback): FFr 470 (euro 71.65).

This book provides technical information on well completion, from drilling in the pay zone to production start-up. It covers the main methods for artificial lift and well servicing, and discusses the concepts and equipment that are indispensible for scheduling and designing completion and servicing operations. The text is fully illustrated.

International Oil and Gas Finance Review 2000

(Euromoney Institutional Investor, 11 North Hill, Colchester, Essex CO1 1DZ, UK). ISBN 185564 731 1. Price: £47.50 ($85).

Now in its fourth edition, this yearbook looks at the latest trends and developments of the global oil and gas project finance industry, based on analysis from over 30 oil and gas financial and legal experts. It looks at the markets of over 16 countries and regions, and includes a directory listing details of over 700 companies active in the oil and gas sector. Specific areas of interest covered, including the financing of LNG terminals, risk mitigation, trends in acquisition and dispositions of oil and gas assets, the Alliance Pipeline Project in the US and China, and the financing of mega-projects in emerging markets. The book also has an extensive appendix of industry statistics.

Oil & Gas 2000

(FT Energy, Maple House, 149 Tottenham Court Road, London W1P 9LL, UK). ISBN 1 84083 172 3. Price: £215 ($366).

This directory provides details on the activities and financial performance of over 650 of the world's leading oil and gas organisations and associations, both upstream and downstream. A summary of each company's operations is provided, together with the latest reported accounts, current production and consumption statistics, and details of mergers and acquisitions. Full contact details are listed for each organisation and key personnel, including e-mail and website addresses where available.

Geophysics of Reservoir and Civil Engineering

Jean-Luc Mari, Georges Arens, Dominique Chapellier and Pierre Gaudiani (Éditions Technip, 27, rue Ginoux, 75737 Paris Cedex 15, France). ISBN 2 7108 0757 2. 456 pages. Price: FFr 645 (euro 98.33).

This book is intended for earth science specialists who will need to use geophysical methods, which are applicable to reservoir studies as well as to many cases of civil engineering. The text explains the principles of reflection seismic, well seismic and acoustic logging methods, as well as refraction seismic and radar. The use of logs in geotechnics and their application to soil mechanics is also analysed. Each chapter includes theoretical concepts, practical rules and examples of applications. The book is also available on CD-ROM, in both English and French languages, at a cost of FFr800 (euro 121.96). A number of animations illustrate the principles behind the methods discussed.

Latest from the Library

Information for Energy Group (IFEG)

The IFEG Members Directory is now available on the IP website (**www.petroleum.co.uk**) – but only for IFEG members. It provides names, contact details, (including clickable e-mail addresses), and URLs for members or their organisation's websites (also with clickable links). If you are interested in joining IFEG please contact Catherine Cosgrove or visit our web page at **www.petroleum.co.uk/ifeg.htm**

Water cooler

Visitors to the library will find that we now have a cold drinking water dispenser in the library.

New editions to library stock

- *Automotive Fuels – Unleaded Petrol: Requirements and Test Methods*. BS EN 228: 2000. British Standards Institute, London, UK.
- *Decommissioning in the UKCS: Best Practice Guidance for Companies Entering Decommissioning Market 2000*. Northern Offshore Federation; Department of Marine Technology, University of Newcastle upon Tyne, Washington, Tyne & Wear, Cameron Publishing, 1999.
- *Energy for Tomorrow's World – Acting Now!: WEC Statement 2000*. 1st edition. World Energy Council; Atalink Projects, London, UK, 2000.
- *Eurasia Pipelines of the 21st Century* (map). Rosneftgazstroy. 1st edition. Petroleum Economist, London, UK, March 2000.
- *Guidelines for the Calculation of Estimates of Energy Use and Gaseous Emissions in Removal & Disposal of Offshore Structures*. Institute of Petroleum; Cordah, Aberdeen, Scotland, June 1999.
- *Managing Outside Pressure: Strategies for Preventing Corporate Disasters*. By Matthias Winter. Ist edition. John Wiley & Sons, Chichester, West Sussex, UK, 1998.
- *World Energy Yearbook 2000*. Ernst & Young; Petroleum Economist, London, UK, March 2000.

Contact details

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  Information Officer, +44 (0)20 7467 7115
- Library holdings and loans queries to:
  Liliana El-Minyawi, LIS Assistant, +44 (0)20 7467 7113
- Careers and educational literature queries to:
  Information Assistant, +44 (0)20 7467 7116
- WebSite queries to:
  Perry Hackshaw, Webmaster, +44 (0)20 7467 7112
- LIS management queries to:
  Catherine Cosgrove, Head of LIS, +44 (0)20 7467 7111

Fax any of the above on +44 (0)20 7255 1472 or e-mail: **lis@petroleum.co.uk** Visit our website at **www.petroleum.co.uk**

Bench top analysis and one-stop-shop for shaker needs

Philip Harris Scientific has added a new range of six bench top balances (ranging from 410 grammes to 12 kg capacity) and one analytical balance (up to 210 grammes capacity) to its Status product portfolio.

Simple menu driven operation is claimed to make the balances simple to use. Automatic calibration to one of four preset standard weights is possible with one touch of a button. The operator also has 16 weighing units to choose from, including gramme, milligramme, kilogramme, ounce, grain, pound, carat, pennyweight and a unit of choice. The user can also 'toggle' between two units.

Bench top balance

A batch and check weighing option is also offered for inventory purposes. There is also a RS 232C standard interface for connection to other systems such as LIMS for quality assurance.

The company has also recently added the Lab-Line Shaker agency to its Premier Product range. The shakers cover all applications from small bench top to large floor standing shaking, with both standard incubated and low temperature incubated models. The units are powered by a smooth triple eccentric drive, which is claimed to ensure uniform results whatever the load. Each shaker comes with a five-year parts and labour warranty, together with a lifetime warranty on the drive mechanism.

A wide range of accessories, many interchangeable, offer maximum flexibility of use. Platforms, both fixed and universal, are available, ranging from 9 x 250 ml flasks to 70 x 250 ml flasks. A number of two-tier platforms are offered to further enhance shaker capacity and reduce the cost of testing per flask. Additional accessories include variable angle tube test racks, beaker clamps and adjustable flask platforms. The shakers can be adapted to accommodate the majority of vessels up to 6-litre flasks, states Philip Harris.

The Lab-Line range is available in both low-cost analogue and high precision digital versions. A microprocessor controls speed, time and temperature in the digital models. The incubated units are said to have a ±0.1°C acccuracy and ±0.5°C temperature uniformity.

Tel: +44 (0)1530 418000
Fax: +44 (0)1530 419300

Lab-Line shaker

Drilling hat-trick of tools

Arbroath-based BBL Downhole Tools' new Casing Drill Shoe allows customers to drill with the casing instead of first drilling the well-bore using conventional means and then installing the casing in a separate operation. 'This product could save oil and gas operations hundreds of thousands of pounds as conventional methods often mean that whole rigs have to be temporarily shut down – a costly procedure,' explains Managing Director Jim Bain.

The company has also designed and built a variation called the DiamondBack Reamer Shoe which has a unique cutting pattern that enables the tool to be rotated or reciprocated in the well bore, assisting the casing running operation.

In addition, the company has launched a drill-pipe-deployed, non-rotating Torque Reduction Tool that is claimed to reduce torque during the drilling process allowing longer and deeper wells to be drilled and giving access to larger oil reserves from existing fixed platforms.

Tel: + 44 (0)1241 434400
Fax: +44 (0)1241 434555

Petrotest expands flashpoint tester portfolio

Petrotest Instruments has expanded its range of flashpoint testers with the addition of the ABA 4 automatic unit. The standard apparatus measures flashpoints between 0°C and 110°C, while the low-temperature version measures flashpoints to –30°C. Temperatures can be cooled to –20°C with tap water. An optional coolant circulator is available for lower temperatures.

The ABA 4 sample cup is filled externally and then inserted into the apparatus that contains the automatic shutter and stirrer. After the multi-detector (inflammation sensor and sample temperature probe) is plugged in, the measurement head is pivoted into measuring position, thus connecting all other mechanical and electrical couplings. The test is complete when an inflammation is detected and the flashpoint temperature is indicated on the display.

The unit measures flashpoint according to standard tests IP 170, IP 304, ISO 13736, ISO 1523, NF M 07-011 or NF T 06-009. In addition to standard tests, the menu offers a search mode for unknown flashpoints or the user may customise programs to suit specific applications.

The tester features an automatic safety shut-off plus automatic long-life electric igniter and sensor controlled gas igniter. The unit can also be controlled by a PC.

Tel: +49 33 708 56 300
Fax: +49 33 708 56 556

NEWS Technology

Gas moisture analysis

Michell Instruments has developed a new heavy-duty moisture analyser. Incorporating the company's Cermet II IS hygrometer, the Promet analyser is claimed to be a highly reliable and rugged online device suitable for use over a wide dewpoint range from –100°C to 20°C.

Measurements can be displayed in a choice of hygrometic units, including ppm(v), lb/mn cf and gm^{-3}. Active pressure compensation can be achieved with the addition of an optional pressure transducer.

The modular design of the unit allows each instrument to be tailored to the requirements of individual customers and applications, states the manufacturer. The analyser can be used in a range of industrial applications, ranging from the prevention of hydrate formation and corrosion in pipeline operations, to monitoring trace moisture contents in gas to ensure compliance with quality specifications.

Promet has an analysis pressure of up to 300 bar and is protected against contamination from substances including glycol, hydrogen sulfide, mercapatans and other sulfides.

Tel: +44 (0)1223 424427;
0800 975 4770 (UK only)
Fax: +44 (0)1223 426557

Intelligent completion solutions

Shell and Halliburton have signed a Memorandum of Understanding for a 50:50 joint venture to further develop and market Halliburton's SmartWell™ technology and Shell's iWell™ technology to the oil and gas industry on a global basis. The joint venture company will be known as WellDynamics and will be based in Aberdeen, Scotland.

Intelligent completion technology is currently in its early growth stage, explains Shell. It provides downhole sensing, communication and remote control of tool functions. This combination is said to allow real-time surface interpretation of downhole conditions and the manipulation of production control devices to optimise reservoir performance.

Producers can reconfigure a well's architecture at will and acquire real-time data without well intervention. The ability to actively manage the reservoir permits the operator to maximise fluids production while also improving total recovery, a combination that has a dramatic positive impact on the net present value of the asset.

Currently the most common applications for intelligent completion solutions are deepwater, subsea and remote locations, which generally require substantial costs for well support work. However, as the technology expands, intelligent completion solutions will be used to add value to a broader segment of the market, including land and platform developments. The total market for such solutions is expected to develop to more than $1bn over the next decade.

Tel: +31 70 311 3022
Fax:+31 70 311 2142

Fern adds to 3D modelling capabilities

Fern Computer Consultancy, an authorised Autodesk reseller, has included the latest release of leading 3D modelling package Autodesk Mechanical Desktop 4 in its product list. Release 4, with AutoCAD® 2000 functionality, boasts over 400 new or enhanced capabilities and adds 800,000 2D and 3D standard parts, holes, features and profiles in 18 different standards, plus intelligent engineering calculations.

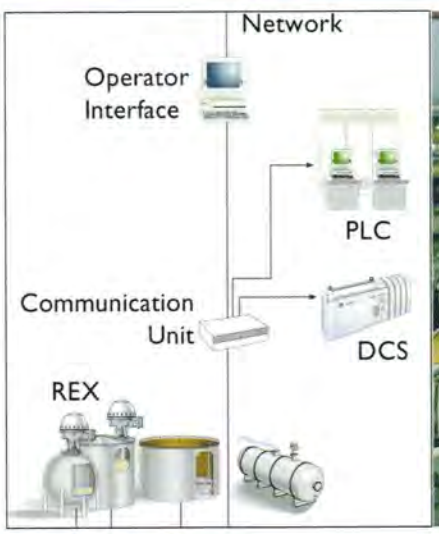
Tel: +44 (0)1332 780790
Fax: +44 (0)1332 780788

Tank farm management

Saab TankRadar's new Rex radar tank gauge is designed with an open interface to fit into existing tank gauging systems, whether designed by Saab Tank Radar or other manufacturers.

The unit provides status, level, temperature, pressures and other input values, which are displayed on the customer's inventory control system. It can replace both servo- and radar gauges. The power supply can be made to fit the existing voltage available on the tank and no extra wiring is required, states the manufacturer.

Tel: +46 31 33 70 000
Fax: +46 31 25 30 22



If you would like your new product releases to be considered for our Technology News pages, please send the relevant information and pictures to:

Kim Jackson
Deputy Editor, *Petroleum Review*
61 New Cavendish Street, London W1M 8AR, UK

Membership News

NEW MEMBERS

Mr B A Akinpelu, London
Mr M Al-Abduljader, Kuwait Aviation Fuelling Co (KSC)
Mr H Aoyama, Cosmo Oil (UK) plc
Mr J-P Celis, Systems Union Ltd
Mr A G Cook, LGC
Mr A J Deighton, Witham
Mr E O Ebohon, Nigerian Agip Oil Company Ltd
Ms S Y Eggert, Texaco Ltd
Mr S Etherington, Commodity Traders International
Mr C G Fox, Wantage
Ms A Gibson, Bel Valves
Mr D M Griffiths, TransSedco Forex
Mr P J E Hayward, Wotton Under Edge
Dr I Ismai, API Petroluem Refining & Marketing Corporation Ltd
Mr P Jerome, Systems Union Ltd
Mr B Jovan, Makpetrol AD
Mr P Maga, Tatrimex Ltd
Mr S McCrudden, Stuart McCrudden Associates
Mr I Middleton, HRH
Mr D W Nelson, London
Mr T H Nguyen, London
Mr J Nieuwenhuijze, London
Mr M Ozbek, Turkey
Mr J R Raehse-Felstead, Hayes
Mr B Regoeng, Ministry of Commerce & Industry Botswana
Mr I T Roche, Australia
Mr L S Sagoo, Safeway Stores plc
Mr G Scott, Hartlepool
Dr R B Stokes, Surbiton Geological Services
Mr F Sullivan, EDS Ltd
Professor U Tuzun, Burpham
Dr I Wadi, Trust Group
Mr D O Wagbatsoma, Ali Razi Nigeria Ltd
Mr K L Wallace, Tua Solutions Ltd
Mr H W M Webster, Huntingdon
Mr L A Winter, London

STUDENT

Mr M D Brooks, Bournemouth

NEW FELLOW

Ms Lynne Morgan
Ms Morgan joined BP International in 1966 working in the Analytical Branch, at the Sunbury Research Centre initially performing routine, analytical quality control testing of white oil products. During the 1970s she moved onto the gas chromatography testing of products, eventually moving into the research and development of novel sampling and analytical methods for the determination of airborne contaminants. In 1982, she was transferred across to the Group Occupational Health Centre as a hygiene technician, moving up to assistant occupational hygienist, and was made senior occupational hygienist in 1994. Currently Ms Morgan is involved in all the aspects of occupational health protection for BP Amoco.

While in the Occupational Hygiene Team, Ms Morgan obtained the British Examining & Registration Board in Occupational Hygiene, Certificate in Operational Competence (1985) and the Diploma in Occupational Hygiene (1989). She was made a Fellow of the British Institute of Occupational Hygienists (FBIOH) in 1994 and is a long standing active member of the British Occupational Hygiene Society.

Ms Morgan joined the IP Occupational Hygiene sub-committee in 1988, becoming Chairman in 1994 as well as a member of the IP Advisory Committee for Health (ACH). During this

NEW FELLOW CONTINUED

time Ms Morgan was involved in the publication of several IP guidance documents, including the 1993 'Code of Practice for Occupational Hygiene Audits'; 1998 'IP Guidance on the Declassification of Tanks Previously in Leaded Gasoline Service'; 'The Application of Substances Hazardous to Health (COSHH) Requirements for Carcinogens at Oil Refineries and Terminals' documents. In addition, she has helped to run and Chair IP workshops on occupational health protection matters.

NEW CORPORATES

Fairbanks Environmental Ltd, The Technology Management Centre, Moss Lane View, Skelmersdale, Lancashire WN8 9TN, UK
Tel: +44 (0)1695 51775 Fax: +44 (0)1695 728898
Representative: Mr Bob Conlin, Director

Fairbanks Environmental reduces petroleum storage wetstock losses with its BS/EN/ISO9001 accredited 'Wetstock Wizard'™ management system. Using its statistical analysis and investigation techniques, Fairbanks provides early warning of excessive losses from underground and above ground storage systems. Other petroleum related services include leak & spill crisis management, technical support on vapour recovery, system testing, fuel auto replenishment, petroleum installation, compliance auditing, tank and pump layout design and petrol forecourt facilities management. Fairbanks also provides wetstock management training for petroleum retailers and petroleum licence enforcement officers. An expert witness service is also available. Fairbanks also provides a Quality Management Consultancy Service (ISO9001 or 9002) to the Industry.

theoilsite.com plc, 1 Cornhill, London EC2V 3ND, UK
Tel: +44 (0)20 7743 6050 Fax: +44 (0)20 7743 6051
e: info@www.theoilsite.com
Representative: Mr Michael Doherty

theoilsite.com plc provides a global e-commerce platform to enable oil companies and suppliers to trade equipment, assets and services via the Internet.

Stanley Services Ltd, Third Floor, Morley House, 314–322 Regent Street, London W1R 5AB, UK
Tel: +44 (0)20 7323 2248 Fax: +44 (0)20 7323 2258
e: office@stanley-services.co.uk
Representative: Mr Graham Fradgley

Stanley Services Ltd is licensed by the Falkland Islands Government to provide fuel to the Islands, including a requirement to hold strategic fuel stocks.

It has a modern storage and loading facility at Stanley where fuels are imported, stored and delivered to various customers. Fuels handled include domestic, transport and marine gas oils; domestic and aviation kerosenes and transport and aviation gasolines. LPG and lubricating oils are also handled.

Stanley Services is looking to expand its operation, providing expertise and opportunities to other island communities.

Saab Tank Control (UK) Ltd, Pentos House, Hogwood Lane Industrial Estate, Finchampstead, Wokingham, Surrey RG40 4QW, UK
Tel: +44 (0)118 973 6670 Fax: +44 (0)118 973 6671
e: info@saabtankcontrol.co.uk
Representative: Mr D Machon, Sales Director
Supply of tank gauge systems to the industry.

IP Discussion Groups & Events

Energy, Economics, Environment

The British Institute of Energy Economics invites you to the launch of

'The BP Amoco Statistical Review of World Energy'

Wednesday 21 June, 14.30 at Britannic House

Prof. Peter Davies, Chief Economist, BP Amoco

Contact: Mary Scanlan BIEE Tel +44 (0)20 8997 3707 (prior registration essential)

Energy, Economics, Environment

Thursday 6 July, 17.00 for 17.30

Kirby Owen of Wood Mackenzie will speak on the subject **'Towards the Total Energy Company'** (title to be confirmed)

IP contact: Jenny Sandrock

IP Benevolent Fund

Do you know of any past or current members, their dependents or families who are in need of financial help or assistance?
Please suggest they contact in confidence:

The Secretary to the Trustees of the IP Benevolent Fund
61 New Cavendish Street, London W1M 8AR, UK
The Benevolent Fund is there to help them

Obituary

Charles S Windebank FInstPet

It is with regret that we announce the death of Charles Windebank in March after a brief illness. He was a long-standing supporter of the Institute of Petroleum, becoming a 'free' Fellow in 1993, having been a Member for 50 years. He served on the IP Council from July 1964 until May 1973, and acted as Chairman of the Research Advisory Committee until June 1973. He was awarded the Eastlake Medal for long and meritorious service to the Institute in 1972.

Erratum

Please note there was an error in an email address published in the Lifetime Learning section of *Petroleum Review* May 2000. The error appeared in the directory for the entry of SGS Redwood on pages V and XII, The correct email address should read: **bcerny@sgsgroup.com** not **bcemy@sgsgroup.com** We apologise for any inconvenience caused to SGS Redwood and our readers.

IP THE INSTITUTE OF PETROLEUM

Branch Activities

Aberdeen
Contact: *George Wood Tel: +44 (0)1224 205736*
13 June: Visit to Peterhead Power Station

London
Contact: *Carol Reader Tel: +44 (0)20 8852 9168*
21 June: Gatwick Airport Fuel Depot visit

Southern
Contact: *Veronica Cloke Browne Tel: +44 (0)23 80896303*
June 14: Visit to Wytch Farm

Energy, Economics, Environment Discussion Groups

Please notify the contacts if you plan to attend any of the advertised events
All events will take place at the IP unless stated otherwise
Institute of Petroleum , 61 New Cavendish Street , London W1M 8AR, UK
Tel: +44 (0)20 7467 7100 Fax: +44 (0)20 7255 1472
***e:* jsandrock@petroleum.co.uk**

THE ROYAL INSTITUTE OF INTERNATIONAL AFFAIRS

The RIIA is a registered Charity, No. 208 223

Energy and Environmental Programme

DEPUTY HEAD

A Deputy Head is needed to help oversee the work and financing of Chatham House's largest and most active research programme. We require an energy specialist to take management responsibility for all energy policy projects and individually pursue research on international oil and gas issues, especially those relating to sustainability and corporate responsibility.

In the energy policy area you will supervise the work of administrators, oversee research projects, coordinate fund-raising, promote meetings, organize workshops and shape the future direction of research. You will need knowledge and, ideally, experience of the oil and gas industry. Fund-raising experience is advantageous.

Salary £33K.

Closing date for applications: 13 June 2000.

For application details email ayoud@riia.org or write to Assistant Director (House & Personnel), RIIA, Chatham House, 10 St James's Square, London, SW1Y 4LE. Website: www.riia.org

IP Conferences and Exhibitions

International Conference on

Oil and Gas Accounting London: 6–7 November 2000

The following topics will be discussed:

- New OIAC SORP – what has changed?
- Accounting and Reporting for joint ventures and consortia
- Decommissioning, dismantlement, removal and restoration – a revolution in accounting, resulting from FRS 12
- Business combinations
- Cost ceilings and impaired issues
- Oil and gas reserve definitions, measurement and valuation – the SPE and IP recommendations and disclosure
- Problems arising from the use of commodity-based and financial-based derivatives
- Accounting for risk sharing and financial arrangement
- Accounting for and reporting commodity-based derivatives
- Accounting for and reporting financial derivatives
- International accounting developments affecting the petroleum industry

Please see below for contact details

International Conference and Exhibition

INTERSPILL 2000 Brighton, UK 28–30 November 2000

A major conference and exhibition featuring the activities of the European spill response industry, both at sea and on land, under the direction of the **British Oil Spill Control Association** and organised by the **Institute of Petroleum**. It is planned that **INTERSPILL 2000** will be the first in a regular series of such events.

Speakers

Keynote address delivered by:
William O'Neil, Secretary-General, IMO

Confirmed speakers:

- Dr Alessandro Barisich, DG XI-EU
- Archie Bishop, Hollman Fenwick & Willan
- Ulf Burstoff, Waterways and Shipping North
- Kevin Colcomb, Maritime and Coastguard Agency
- G H Davis, Environment Agency Wales
- John Dawes, British Oil Spill Control Association
- Lord Donaldson of Lymington
- Norwegian Pollution Control Authority
- Sjon Huisman, Ministry of Transport, Public Works and Waste Management
- Mans Jacobsson, International Oil Pollution Compensation Funds 1971 and 1992
- Alasdair MacDonald, Dovre Safetec Ltd
- Robin Middleton, SOSREP, Maritime and Coastguard Agency
- Joe Nichols, International Oil Pollution Compensation Funds, 1971 and 1992
- Edward Owens, Polaris Applied Science Inc.
- Maurice Storey, Maritime Coastguard Agency
- George Sutherland, Shetland Islands Council
- Gustav Törling, National Rescue Services Board
- Carla de Vries-Hess, Legal Affairs, Commission of the European Communities, Directorate General of the Environment
- Hans Wallenkamp, International Salvage Union
- Dr Ian White, International Tanker Owners Pollution Federation
- Peter Wood, Postgraduate Research Institute for Sedimentology, University of Reading

Topics to be covered

The topics to be discussed during the conference sessions, and through the exhibition and its associated poster presentations, will include:

- nature of the response problem in all its aspects
- avoidance of secondary releases in marine casualty situations and the implications for response provision
- influence of shoreline and inland characteristics, and the different response requirements for water and solid surfaces
- strengths and weaknesses of available techniques and equipment in respect of operational factors
- waste disposal options and the impact of regulations on option choice, storage, handling, and transportation
- need for ways of minimising the amount of waste arising from pollutant clearance operations resulting from limited capacities of authorised waste disposal facilities
- means by which pollution response can be improved through the pooling of all available expertise and resources within governments and the private sector plus
- scope for further innovation in equipment, techniques, and operational planning

Who should attend?

INTERSPILL 2000 will be of interest to all who are concerned about the environment and those involved in its protection, including:

- national and international environmental agencies
- oil, chemical, and transport industries
- port and harbour authorities
- offshore oil field operators
- central and local authorities
- emergency services

For further information on either of the above conferences please contact:
Pauline Ashby, Conference Department, Institute of Petroleum,
61 New Cavendish Street, London W1M 8AR, UK
Tel: +44 (0)20 7467 7100 Fax: +44 (0)20 7255 1472
e: **pashby@petroleum.co.uk**
or view the IP Web Page: *www.petroleum.co.uk*

EVENTS Forthcoming

JUNE 2000

5 **Aberdeen**
Advances in Riser Technology
Details: IBC Global Conferences Ltd, UK
Tel +44 (0)20 7636 6858
Fax: +44 (0)20 7453 2058
e: cust.serv.ibcuk.co.uk

7 **Aberdeen**
Practical Developments in Gas Flow Metering
Details:National Engineering Laboratory, UK
Tel: +44 (0)1355 220222
Fax: +44 (0)1355 272999
e: stough@nel.uk

8–9 **London**
Internet Strategies for Manufacturing 2000
Details: Access Conferences Ltd, UK
Tel: +44 (0)20 7840 2700
Fax: +44 (0)20 7840 2701

11–15 **Calgary, Canada**
16th World Petroleum Congress
Details: 16th World Petroleum Congress, Canada
Tel: +403 218 2000
Fax: +403 218 2002
e: cdn.assoc@wpc2000.com
www.wpc2000.com

12–13 **Vienna, Austria**
The Chemicals and Petrochemicals Industries in Russia and the CIS
Details: Global Business Forums (UK) Ltd, UK
Tel: +44 (0)20 8960 3822
Fax: +44 (0)20 8960 3899
e: Gbusforums@aol.com

11–14 **Finland**
9th Nordic Symposium on Tribology
Details: VTT Manufacturing Technology, Finland
Tel: +358 9 456 5347
Fax: +358 9 460 627
e: irina.granfors@vtt.fi

12–16
Introduction to Oil Industry Operations
Details: Pauline Ashby, The Institute of Petroleum

19–21
Introduction to Petroleum Economics
Details: Pauline Ashby, The Institute of Petroleum

19-21 **Hannover, Germany**
World Engineers's Convention
Details: VDI The Association of Engineers, Düsseldorf, Germany
Tel: +49 (0) 211 6214 400
Fax: +49 (0) 211 6214 167
e: taguingen@vdi.de

19–23 **Oxford, UK**
Understanding a Liberalised Gas Business – Markets, Open Access and Impact of Legislation
Details: The College of Petroleum and Energy Studies, UK
Tel: +44 (0) 1865 250521
Fax: +44 (0) 1865 791474
e: registrar@colpet.ac.uk

20 **Geneva, Switzerland**
Sales Purchase and Charter Parties

21–22 **Geneva, Switzerland**
Petroleum Measurements

23 **Geneva, Switzerland**
Risk Control & Quality Management of Liquid Bulk Products during Cargo Transfer
Details: GHB Consultants, Switzerland
Tel: +41 22 348 7378
Fax: +41 22 348 7978

25 June–7 July **Paris**
Oil and Gas Management
Details: Enspm Formation Industrie, France
Tel: +33 1 47 52 72 93
Fax: +33 1 47 52 71 09
e: josee.foucault@enspmfi.com

26–28 **Stavanger**
5th SPE International Conference on Health Safety and Environment in Oil and Gas Exploration and Production
Details: Society of Petroleum Engineers Ltd, UK
Tel: +44 (0)20 7408 4466
Fax: +44 (0)20 7408 2299
e: cgill@london.spe.org

MOVES People

Phillips Petroleum has announced the resignation of **Kirby Hedrick**. Hedrick was Executive Vice President of the company's upstream business and has left to pursue other interests. The company has also appointed **Kevin Meyers**, President and Chief Executive of Arco Alaska to the position of Senior Vice President of Phillips and President and Chief Executive of Phillips Alaska. Other appointments include **Dodd DeCamp**, currently Vice President for Exploration for Arco, being elected Vice President for Worldwide Exploration and **B Z Parker**, Executive Vice President of Downstream becoming Vice President for Worldwide Production of Operations, excluding Alaska.

Caxios, UK contractor in the engineering and construction sector, has appointed **Keith Noden** to the position of Company Planning Manager. Noden's previous employment includes ICI, MW Kellogg, John Brown and Simon Carves.

AMEC plc has appointed **Stuart Siddell** as Group Finance Director. Siddall joins from Alpha Airports Group plc where he was Finance Director. He is expected to take up his position towards the end of June.

Richard Matthews **has been promoted to Sales and Marketing Manager for BJ Pipeline Inspection Services. In his new role, Matthews will be responsible for the global management and coordination of all sales and marketing activities for BJ Pipeline Inspection Services.**

Logic, (Leading Oil and Gas Industry Competitiveness), the UK industry body set up to achieve a £1bn improvement in performance in the UK oil and gas sector, has added three more professionals to the team responsible for delivering the bodies objectives. Following on from the appointment of **Chris Freeman** as Chief Executive in Janaury, Logic has recruited a Supply Chain Management Adviser – **Orietta Fioroni**, a Collaborative Project Co-ordinator – **Alistair Punt** and a PA – **Suzanne Fleming**.

Charles Davidson, President and Chief Executive, of Vastar Resources Inc, has been elected to the additional post of Chairman following the resignation of four board members who were executives of Atlantic Richfield Company.

Stephen Buscher, formerly Head of Merrill Lynch's investment banking activities in Russia, has joined the United Financial Group as Head of Corporate Finance.

Former UK Minister for Energy and Industry, **Tim Eggar**, has joined ABN Amro Corporate Finance as Vice Chairman with responsibility for the energy sector worldwide. He will be resigning his non-Executive Director role from the board of Lasmo Oil & Gas following their takeover of Monument Oil & Gas where he was Chief Executive.

Global Marine Inc has promoted **Thomas J Morrow** to the position of President of Challenger Mineral Inc (CMI), the oil and gas subsidiary of Global Marine. Since 1997, Morrow has served as Vice President and General Manager of CMI. He joined the company in 1990, and he has previously worked for Amoco Production Co and TXO Production Corp as Land Manager.

Keith Wright **has been appointed Managing Director of sealing product manufacturer Flexitallic. Wright was previously a Director of the ELS Group plc and Managing Director of Flexibox.**

New York Mercantile Exchange has appointed **Robert Halper** to their Board and reappointed public directors **John Conheeney** and **E Bulkeley Griswold** to their third terms.

BJ Services Company has appointed *David Harris* to the role of Business Development Manager for the Americas Region on behalf of BJ Tubular Services. Harris will oversee all business development activities in North and South America.

Roy Kelly has been appointed Petroleum Engineering Director in the integrated consulting group of Exploration Consultants Ltd.

Simone R Gregori, Chairman of Texaco Overseas (Nigeria) Petroleum Company Unlimited (TOPCON) and Managing Director for Texaco's exploration and production activities in Nigeria has elected to retire. He joined Texaco in 1980 as a senior representative in New York and worked for the company in Argentina, Trinidad and Nigeria.

Alan Halsey has been elected his successor and will take over his responsibilities in Nigeria. Most recently, Halsey held the position of President of Texas Petroleum Company, Colombia.

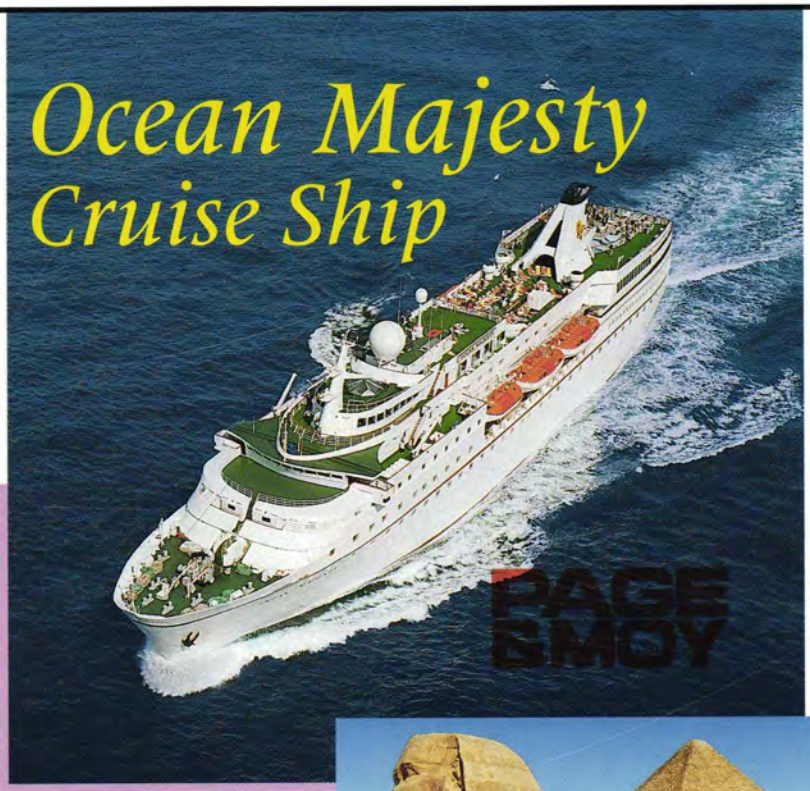
Amec plc has appointed **Martha Hesse** as a non-executive Director with effect from 1 June 2000.

Jonathan Fry **has been appointed non-Executive Director and Chairman designate of the Control Risks Group. Fry, who is currently Chairman of Burmah Castrol plc is also Chairman of Christian Salvesan plc and Elementis plc and Deputy Chairman of Northern Foods plc. He will be replacing Ian Tegner who is retiring after eight years as Chairman of the company.**

INSTITUTE OF PETROLEUM MEMBERS

SPECIAL READER OFFER

Ocean Majesty Cruise Ship



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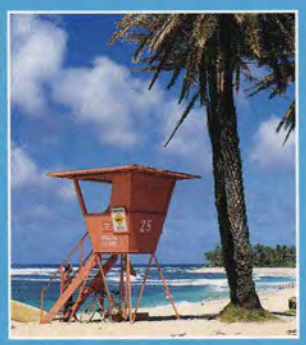

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