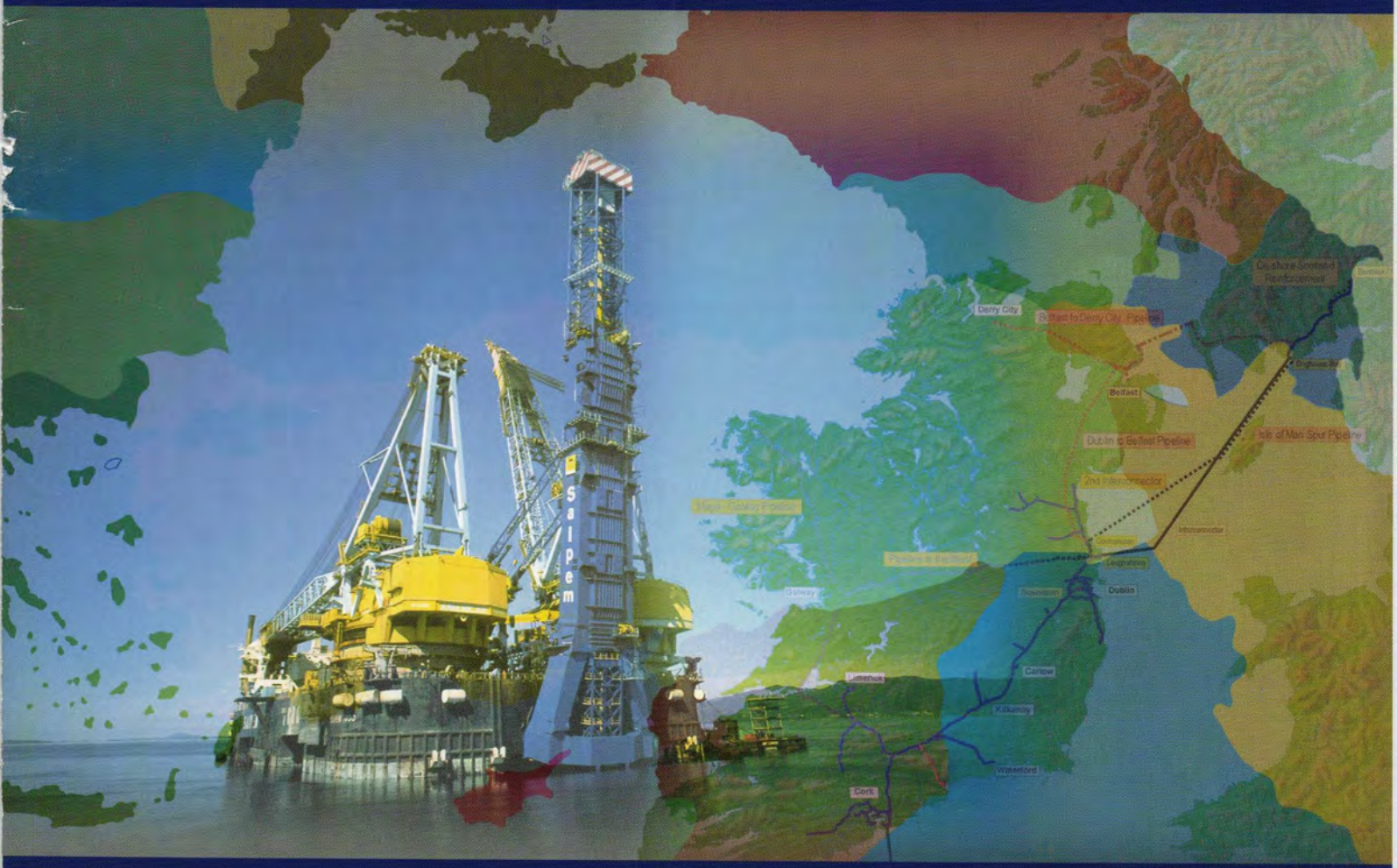
# Petroleum review

MAY 2002




## Pipelines

- Blue Stream to help meet Turkish gas demand
- Ireland steps on the gas

## Africa

- Southern Europe turns to North Africa for gas

## Alternative fuels

- Whither natural gas as a road fuel?
- The future is bright for bioethanol

Covering the international oil and gas industry from field to forecourt – exploration, production, refining, marketing and e-business

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# IP TRAINING COURSES 2002

## Trading Oil on the International Markets

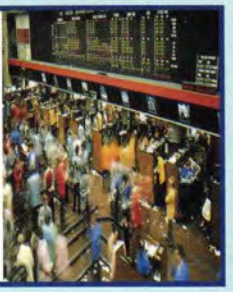
In association with INVINCIBLE

***Course Dates:***
**13 - 17 May 2002**

***Course Venue:***
**The Møller Centre, Cambridge**

***Registration Fee:***
**IP Member: £2600 (£3055.00 inc VAT)**
**Non-Member: £2800 (£3290.00 inc VAT)**

During this **five-day course** delegates become part of Invincible's fictional trading team, taking decisions about the company's activities to maximise profits through an understanding of the economics of trading and the management of inherent price risks. Delegates trade the live, crude oil and refined product markets worldwide under the guidance of an expert team of lecturers reacting to events and using real-time information from Reuters and Telerate screens and daily price information from Platt's and Petroleum Argus. The course expects a high degree of participation from delegates.



## Environmental Impact Assessment and Management

In association with BMT Cordah Limited

***Course Dates:***
**15 - 17 May 2002**

***Course Venue:***
**Institute of Petroleum, London**

***Registration Fee:***
**IP Member: £1300 (£1527.50 inc VAT)**
**Non-Member: £1500 (£1762.50 inc VAT)**

This new, **three-day course** is designed to give delegates real practical training in the assessment and management of critical environmental issues relevant to the upstream oil and gas industry. It is essential for the industry to be able to assess, manage and minimise its impacts, and to demonstrate continuous improvement with respect to its environmental performance. Companies need a thorough understanding of environmental issues not only to meet regulatory requirements but also to win stakeholder approval and achieve internal project sanction.

## Fundamentals of Petroleum Refining Processes

In association with ensprm FORMATION INDUSTRIE

***Course Dates:***
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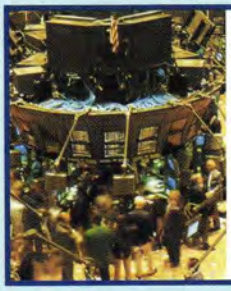
***Course Venue:***
**Institute of Petroleum, London**

***Registration Fee:***
**IP Member: £1800 (£2115.00 inc VAT)**
**Non-Member: £2000 (£2350.00 inc VAT)**

The **four-day course** examines the composition, main characteristics and new trends of petroleum products, examining the roles of the different refining units and their process characteristics.

Participants will gain an understanding of the main manufacturing schemes encountered in the oil refining field and look at the overall economic context of this industry.



## Price Risk Management in the Oil Industry

In association with INVINCIBLE

***Course Dates:***
**17 - 21 June 2002**

***Course Venue:***
**The Møller Centre, Cambridge**

***Registration Fee:***
**IP Member: £2600 (£3055.00 inc VAT)**
**Non-Member: £2800 (£3290.00 inc VAT)**

During this **five-day course**, delegates will become part of Invincible's fictional trading team identifying and managing its exposure to price risk. The course explains the workings of futures, forward, swaps and options markets and how they can be used for hedging and price management purposes. The costs and relative benefits of the instruments are explored as well as technical analysis and the principles of management control. Exercises are performed in syndicates, with comprehensive debriefs assessing the consequences of the decisions taken.

## US SEC and FASB Accounting and Reporting Requirements for Oil and Gas Enterprises

### (including comparisons with UK and International Accounting Standards)

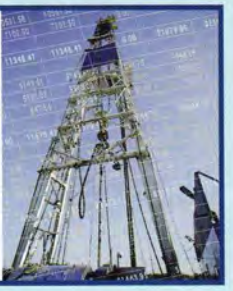
In association with pdi Professional Development Institute University of North Texas

***Course Dates:***
**19 - 21 June 2002**

***Course Venue:***
**Institute of Petroleum, London**

***Registration Fee:***
**IP Member: £1300 (£1527.50 inc VAT)**
**Non-Member: £1500 (£1762.50 inc VAT)**

This **three-day course** provides a basic understanding of current SEC and FASB accounting and reporting requirements for oil and gas producing companies. Comparisons of US requirements to the UK Oil Industry Accounting Committee's 2000 Statement of Recommended Practice (2000 SORP) and relevant UK Accounting Standards Board pronouncement are made.



## Accounting for International Petroleum Contracts: Production Sharing and Risk Service Contracts and Joint Operating Agreements

In association with pdi Professional Development Institute University of North Texas

***Course Dates:***
**24 - 26 June 2002**

***Course Venue:***
**Institute of Petroleum, London**

***Registration Fee:***
**IP Member: £1300 (£1527.50 inc VAT)**
**Non-Member: £1500 (£1762.50 inc VAT)**

This **three-day 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. The terms of a typical production sharing contract are explained and the accounting procedure associated with PSC's are examined in detail. Accounting provisions that create controversies are given special attention.

**For more information, see enclosed inserts or contact Lynda Thwaite at IP Training or visit: www.petroleum.co.uk**

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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: Deepwater lay barges to bring pipeline gas to Ireland and Turkey

# inside...



## news



## special features



## features



## regulars

# ROUNDUP From the Editor

## Grudging acceptance for UK Budget?

Chancellors of the Exchequer do not expect to be lavishly praised by the oil industry so Gordon Brown will not be surprised that the industry and its lobbying bodies were quick to point out that the surprise 10% surcharge on North Sea profits could undermine investor confidence (see p3). They did, however, welcome the improved capital allowance and the proposal to abolish the 12.5% royalty tax.

The UK Government is faced with a difficult balancing act to perform. The Chancellor knows that the North Sea is a high-cost province where favourable terms must be conceded to maximise exploration, development and reserves recovery. But he must also maximise the tax yield to the nation from a highly successful and profitable industry. And, one must observe, an industry widely seen as too rich and too powerful.

The latest issue of the now independent analyst Wood Mackenzie's North Sea report gives some fascinating insights into the current status of the province. In the last three months only two fields have averaged over 100,000 b/d – Foinaven and Schiehallion, both BP operated. A further 13 fields averaged over 50,000 b/d. Of these only two are liable for royalty having started up before 1982. Nine started up after 1993 and so are only liable to corporation tax plus the new surcharge. This means that only six of the largest fields are liable to petroleum revenue tax (PRT) and corporation tax, and only two to PRT and royalty and corporation tax.

It is certainly true that the current UK Government appears to favour tax complexity. However, the acid test will be the degree to which the new tax regime actually reduces investment and development.

### Centre stage

Over the last month, for good or ill, the oil industry has rarely been out of the headlines – the Iraqi embargo, potential Arab embargo, Venezuela, soaring prices, slumping prices and, of course, the ever popular outrage that petrol prices might be raised.

With the obvious and dramatic exception of the Gulf War in 1991, the oil industry had enjoyed nearly 20 years in which it was, in news terms, treated much like any other industry with comment focused on prices and new supplies. In 1998 it was low prices, in 2000 it was high prices.

Now, however, we have almost daily echoes of the 1970s – will the Arab/Islamic oil producers mount a boycott/embargo in pursuit of political ends? Iraq has started, Iran and Libya are talking about it, and while Saudi Arabia is notionally guaranteeing supplies, it has so far offered no additional supplies. Western politicians are increasingly talking of lessening dependence on Opec/Middle East/unpredictable suppliers.

### Decline and fall?

The case of Venezuela is particularly intriguing. The country has now reached the point where depletion runs at 20–25%/y. Now there is no immediate lack of resource, so all this means is that to maintain capacity drilling campaigns have to be large-scale and sustained. Any faltering or cutbacks and the country's production capacity shrinks.

However, President Chavez appears to have backed himself into something of a corner. His hostility to investment by the international oil industry means he has effectively cut off that source of drilling cash, throwing the investment burden onto the state oil company PdVSA. However, the more PdVSA spends on drilling, the less there is for a government that has made all sorts of expenditure pledges to help the poor. In the belief that PdVSA was being recalcitrant, its Board was replaced with Chavez appointees. We then had, arguably, the most incompetent coup in history, with Chavez ousted for 48 hours.

The question now is: 'Will Chavez augment state income by (i) encouraging international investment, (ii) raiding PdVSA and allowing capacity to shrink, (iii) becoming an even more nationalistic member of Opec, encouraging rigid quota compliance to drive prices higher, or (iv) will there now be a successful coup?

In the Middle East there seems to be a sense in which the world is getting used to the uncertainty and instability, and concluding it may not be as bad as first feared. As a result, prices are easing back.

For the moment, supplies are being

*cont'd on page 36...*

The opinions expressed here are entirely those of the Editor and do not necessarily reflect the view of the IP.

### eworld

BTopenworld has teamed up with BP to make broadband registration CDs available from 450 BP service stations across the UK in a bid 'to make high speed Internet access even easier to buy and install.'

The CD will contain all the software and instructions needed to register for BTopenworld's Home 500 Plug & Go broadband product. For details, visit **www.btopenworld/broadband**

Tokyo-based classification society ClassNK has launched its new safety management system online service – NK-SMART: Safety Management Audit ReporT. The system allows a management company to obtain the current status of documents of compliance (DOCs) and ship management certificates (SMCs) for ships under their management.

The service is offered to ClassNK clients who are registered for ISM audits and certification with the Society. Information will be available only for those ships under their ownership or management. The service is available, free of charge, at **sms.classnk.or.jp** – although registration will be required.

The Oxford Princeton Programme (formed in July 2000 through the merger of The College of Petroleum and Energy Studies and the Princeton Energy Programme) has unveiled its latest web-based training course – 'Gas Markets and Deregulation'. For details visit **www.oxfordprinceton.com**

**Globalenergyjobs.com** is a site dedicated to recruitment in the energy sector. It is currently offering companies the opportunity to post their first job listing for free; subsequent job postings and resume searches are offered on a tiered price basis. Those seeking employment in this sector may search the site for free. Visit **www.globalenergyjobs.com** for more information.

Subscribers to Sibneft Datafeed can now compare the latest monthly data with historical data contained in the company's extensive online archive, hosted in the Newsroom section of Sibneft's website at **www.sibneft.com** Visitors to the site can also access a more extensive range of data, including drilling data and well statistics.

The UK Department of Trade and Industry has launched its new-look website at **www.dti.gov.uk** The new site has been designed to allow for a more customer focused online service, utilising three main sections catering to the needs of key DTI customers – business, consumers and employees. For the first time the site has an interactive element, allowing regular users to receive e-mail alerts of updates and additions to their sites.

# In Brief

## UK

***Foster Wheeler has been awarded a*** *£60mn contract to build the onshore gas processing facilities at St Fergus for Shell's North Sea Goldeneye development. The plant will process 300mn cfd of wet gas and some 10,000 b/d of condensate.**

***Phillips Petroleum is reported to*** *looking for buyers for its assets in the producing Rubie and Renee fields, and the Rochelle oil discovery, located in North Sea blocks 15/26a, 15/27 and 15/28b.*

***Talisman Energy reports that the*** *results of two appraisal wells on the Kildrummy discovery in North Sea blocks 15/12b and 15/17 indicate that the reserves are not sufficient for field development under current economic circumstances.*

***Talisman Energy has brought onstream*** *the Hannay oil field in the central North Sea, reports* Monica Dobie. *The field is currently producing 15,000 b/d from a single well tied back to the nearby Buchan Alpha facilities. Reserves are put at 10mn barrels.**

## Europe

***The Norwegian Petroleum Directorate*** *has released February production figures. Tables for the different products for each field/area on the NCS can be viewed at* **www.npd.no/norsk/npetrres/prod_tal/produksjon_2002.htm***

***Shell is reported to be evaluating data*** *from exploration wells recently drilled*

## Complete news update

The 'In Brief' news items in *Petroleum Review* represent just a fraction of the news we regularly publish on the IP website @ **www.petroleum.co.uk** via the 'News in Brief Service', together with our daily News 'ticker' on the main home page.

Furthermore, those news stories marked with an asterisk (*) in the magazine are covered in more detail on the News in Brief Service.

Why not visit the site to find out more about the latest developments and trends in your industry? Click on

**www.petroleum.co.uk**

# NEWS Upstream

# Tax changes offshore UK

**In his April 2002 Budget, the UK Chancellor of the Exchequer Gordon Brown announced changes to the North Sea tax regime in a bid to 'ensure a regime that raises a fair share of revenue while promoting long-term investment.' With effect from Budget day, the new regime introduces a 10% supplementary charge on North Sea profits, in addition to the current 30% corporation tax on these 'ring fence' profits. UKOOA, the UK Offshore Operators Association, fears that this could 'undermine investor confidence in the long-term viability of the North Sea, the very thing that the industry has been working with government, through Pilot, to achieve.'**

**The new regime also introduces an enhanced first year allowance for capital investment in ring fence trades. These first year allowances will mean that 100% of most North Sea capital expenditure will be allowable for corporation tax (including the 10% supplementary charge) in the year that the expenditure is incurred.**

**Subject to consultation with the industry, the government is also proposing to abolish North Sea royalty tax – a move welcomed by UKOOA as it could 'help prolong the life of pre-1982 field.' Royal is a 12.5% tax on production from fields that received development consent on or before 31 March 1982. Government tax take from UK offshore fields ranges from 30% to nearly 70%.**

# Norwegian North Sea assets up for grabs

The Norwegian authorities have been selling off a number of State Direct Financial Interests (SDFI) on the Norwegian Continental Shelf. Norsk Hydro is to acquire interests in eight licences in the North Sea for NKr3.45bn. The licences cover the Øseberg, Øseberg Øst, Øseberg Sør, Tune and Grane fields. In the Øseberg area, Norsk Hydro is to acquire a 14.4% stake in licence PL 053, a 7.5% interest in PL 079 and divest a 6% stake in PL 171B. The company is also to purchase a 10% stake in each of PL 190 and PL 034 in the Tune area and a 17% interest in PL 169B, in addition to 5% in each of PL 169, PL 169B and PL 028C in the Grane area.

The deal increases Norsk Hydro's equity from 22.23% to 34% in Oseberg, from 32.02% to 34% in Øseberg Sør, from 19.6% to 34% in Øseberg Øst, from 30% to 40% in Tune, and from 24.4% to 38% in Grane.

The acquisition of SDFI shares in the fields will boost Norsk Hydro's production by 35,000 boe/d for the remainder of 2002, with an estimated daily peak production increase of 60,000 boe in 2005. Oil will account for 80% of the additional production up to 2006, with the proportion of gas gradually increasing from then.

Meanwhile, Paladin has increased its stake in the Njørd field to 15% following its acquisition of the Norwegian State's 7.5% interest, and is also to acquire a 20% stake in the Brage field, for a total consideration of £26mn. The Norsk Hydro-operated Njørd field came onstream in 1997 and in 2001 produced on average 50,000 b/d of oil through an FPSO. Production is forecast to last until at least 2009. The Brage field, which came onstream in 1993, produced 39,000 b/d of oil on average in 2001 and some 18mn cf/d of gas. The field is expected to produce until at least 2006.

TotalFinaElf has also signed an agreement with the Norwegian authorities aimed at rearranging and increasing its interests in the fields located within the Øseberg area. The company now holds a 10% stake in each of the four permits that make up the zone (PL 53, PL 079, PL 104 and PL 171B) and, in this way, takes an interest in the Øseberg South field. Production from the Øseberg zone currently stands at 380,000 boe/d.

The Norwegian Government sale has also allowed Dong of Denmark to purchase a larger share in two of the fields in which it become co-owner through its takeover of Pelican in December 2001. It has acquired an additional 30% in the producing Gyda and Tambar fields, bringing its total share in the fields to 34% and 45% respectively and doubling the company's oil production.

Other companies buying SDFI stakes include Shell, Conoco, Marathon Oil, Gaz de France and Idemitsu Kosan.

***Want to know what the latest oil price is?***

**Visit the IP website home page @ www.petroleum.co.uk to find out.**

# NEWS Upstream

## Tengizchevroil loses environmental fine appeal

Tengizchevroil, the joint venture developing the Tengiz oil field in Kazakhstan, is reported to have lost an appeal against a $72mn environmental fine in a recent Supreme Court ruling as questions continue about the country's relations with foreign investors.

The operator was charged earlier this year with causing environmental damage by storing 5mn tonnes of sulfur in the western Kazakhstan region of Atyrau. The Kazakh Ministry of Natural Resources and Environmental Protection had argued that the sulfur was classed as industrial waste and that it was creating a public health hazard. Tengizchevroil argued that the sulfur was a raw material or product, not an industrial waste – the Court did not agree.

The joint venture has, however, been working on a number of plans to handle the 4,500 t/d of sulfur that is accumulating by the oil field. It has found new buyers for the granular and lump forms of sulfur and is currently building a plant to turn the sulfur into coated pellets for export.

## Recent Russian E&P developments

*Stella Zenkovich* outlines some recent developments in the Russian and Central Asian upstream sector.

- Rosneft has secured licences for 21 oil fields in the Chechen Republic.
- Tatneft – Russia's fifth largest oil producer – is to invest Rbs 22bn on E&P projects in 2002, up 35% on last year's budget, according to Director General Shafagat Takhautdinov.
- Indusmin Energy Corporation, part of the Itera Group, reports that it has completed the first of 10 planned re-entry workovers on the Krasnopoloanskoye gas field in the western Crimea.

## Gulf of Mexico licensing round awards

**Although there was only a moderate degree of interest in the US Minerals Management Service (MMS) 20 March 2002 auction of offshore blocks in the central region of the Gulf of Mexico, it was well above that of previous auctions held in times of low oil and gas prices, writes *Judith Gurney.* Some 77 companies made a total of $363.2mn in high bids for 506 blocks off the coasts of Alabama, Louisiana and Mississippi.**

**Despite variations in volumes of interest, the last three annual auctions in this region have followed a similar pattern, with around 30% of bids made for blocks in water depths of more than 800 metres and around 60% for blocks in water depths of less than 200 metres. Although Gulf of Mexico shallow waters hold little promise for more oil, they are believed to contain ample, but deep, gas reserves. The MMS incentive for deep gas exploration, which allows the first 20bn cf of production from 15,000 ft or more to be royalty free, appears to be sufficient to maintain bidders' interest despite the dramatic fall in gas prices over the past year.**

**Of the apparently successful high bids, Dominion E&P had the largest total of $37mn. Spinnaker, BP and Chevron all had apparently high bid totals of over $25mn, and Phillips, Kerr-McGee, Shell, BHP, Nexen Petroleum and Mariner Energy of over $10mn.**

**Phillips' single bid, of $17.5mn for a deepwater Green Canyon block, was the highest bid in the auction. The second highest, for $14.9mn, came from Chevron and partners Enterprise and PanCanadian, for an ultra-deepwater block, also in Green Canyon. BP, Shell and the Chevron partnership made other large bids for deepwater and ultra-deepwater blocks in Green Canyon and Mississippi Canyon.**

**Most bidders were independent companies seeking shallow-water blocks, with major companies and a few large independents dominating deepwater bidding. Dominion and Spinnaker, however, were noteworthy exceptions, exhibiting a wide range of interest. As partners, and in one instance joined by Murphy, they made four of the ten highest single bids of the auction, two for ultra-deepwater blocks, one for a deepwater block and one for a shallow-water block.**

**All in all, the auction showed a steady, if somewhat muted, interest in the Gulf of Mexico potential. It seems likely that this scenario will continue.**

# In Brief

*on the President structure in the Norwegian sector of the North Sea.**

### North America

***ChevronTexaco, as operator (58%), has** announced what it claims is a major discovery at the Tahiti prospect in Green Canyon block 640 in the Gulf of Mexico. Partners are PanCanadian (25%) and Enterprise Oil (17%).*

***Aker Kvaerner and partner Peter** Kiewit & Sons have secured a $400mn engineering, procurement and construction (EPC) contract from Husky Energy for the complete topsides facilities for the White Rose FPSO offshore Newfoundland. The field is due onstream in late 2005. Recoverable reserves for the South Avalon pool of the oil field are put at between 200mn and 250mn barrels.*

***Australian company Santos is reported** to have acquired Esenjay Exploration of Texas for $80mn in a bid to increase its presence in the US gas market. The deal adds 47.4bn cf of proved and probable gas reserves to Santos' portfolio, as well as 1mn barrels of oil reserves.*

### Middle East

***Arabian Oil Company of Japan is** reported to have agreed a deal with the Kuwaiti Government that will allow it to continue operating the Khafji oil field after its drilling rights expire. Under the new agreement, Arabian Oil will be involved as a contractor and will be required to provide training and other technical services to the public companies that will now hold the drilling rights. Some 100,000 barrels of oil are expected to be exported daily to Japan under the new deal.*

***Hyundai Engineering and Construction** Company is reported to have secured a $1.2bn contract from Agip Iran to build a natural gas processing plant for Phases 4 and 5 of the Iranian South Pars field project. Construction is expected to finish in 2005, producing 2bn cf/d of natural gas.*

### Russia & Central Asia

***The sale of the Russian Government's** 36.8% stake in Siberian oil producer Eastern Oil Company is reported to be*

# In Brief

*back on, following auditing delays, with a starting price set at $225mn. Both Yukos and TNK are understood to be planning to bid in the auction, which is to close on 21 May 2002.*

***Lukoil is not going to participate in the** Baku–Ceyhan pipeline project. The Russian company holds a 10% interest in 100,000 b/d producer AIOC and a 10% stake in the Shakh-Deniz project.**

## Asia-Pacific

***US independent EEX is reported to be** selling its Indonesian assets to EPT Medco Energi Internasional for $27mn.**

***US company Unocal is reported to have** successfully tested a fourth appraisal well on its Ranggas field offshore Indonesia. The Ranggas-4 well flowed 8,158 b/d of oil and 6.4mn cf/d of gas. Reserves for the main structure are put at between 200mn and 350mn boe.**

***The China National Offshore Oil** Corporation (CNOOC) is reported to be planning to drill 40 wells in 2002. The company is also understood to have added 324mn tonnes (2.3–2.4bn barrels) of oil reserves and 12.9bn cm of gas reserves to its portfolio in 2001.*

***Cairn Energy has discovered oil below** the main gas reservoir in the Lakshmi field offshore western India, with a well testing some 5,250 b/d of 44.5° API oil. The Lakshmi gas development project is on schedule to produce first gas in August 2002.*

***Shell is reported to have sold its** remaining 22.5% interest in the Kupe oil field offshore New Zealand to Genesis Power (20%) and New Zealand Oil and Gas (2.5%) for an undisclosed sum. Shell is also understood to have sold its remaining stake in the Ngatoro field to Greymouth Petroleum.*

***ChevronTexaco is reported to have** secured a 70% stake in block A in the Gulf of Thailand. The remaining 30% interest was awarded to a subsidiary of Mitsui Oil Exploration.*

***ExxonMobil is understood to be planning** to jointly develop the Bintang gas field offshore Malaysia in partnership with Petronas Carigali via two remotely operated platforms. Expected onstream in 2003, the field is forecast to produce 355mn cf/d of gas.*

# Slight fall in UK oil production

**UK oil and gas production fell by 6.4% in January 2002 following December 2001's highs, reports the latest (March) Royal Bank of Scotland *Oil and Gas Index*. Oil output in January 2002 fell on the month to 2.27mn b/d, but was only marginally down (0.2%) on year earlier levels, states the report. Average daily production in the 12 months to January 2002 was 9.1% lower than in the 12 months to January 2001.**

**Gas output was down in January 2002 and on the year as a whole. Gas production fell by 2.5% to 12.3mn cf/d in January, down on December 2001and 4.5% lower than during January 2001 (13.1mn cf/d). Combined oil and gas revenues decreased by 4.5% on December's 2001 figure, and January 2002's output was 2.4% lower than January 2001. Gas production continues to trend upwards, with average daily output 2.2% higher in the 12 months to January 2002 than in the 12 months to January 2001.**

**However, Tony Wood, Senior Economist at the Bank, is bullish about UKCS oil production for the coming year. 'We expect average production to rise by 5% on the year to 2.27mn b/d. However, this will still be down 6% on 2000's level of 2.41mn b/d.'**

**Turning to recent events in the oil markets, he added: 'Prices have risen to around $25/b as a result of the combined effects of stronger than expected recovery in the US economy and recent events in the Middle East. We believe the potential impact of recent price movements have been overstated and it would require prices to be sustained at a level of over $30/b for a number of months before a detrimental effect would occur.'**

| Year Month | Oil production (av. b/d) | Gas production (av. mn cf/d) | Av. oil price ($/b) |
|---|---|---|---|
| Jan 2001 | 2,274,671 | 13,061 | 25.80 |
| Feb | 2,206,542 | 12,293 | 27.50 |
| Mar | 2,301,409 | 12,465 | 24.50 |
| Apr | 2,223,924 | 11,918 | 26.00 |
| May | 2,170,520 | 9,155 | 28.30 |
| Jun | 1,993,483 | 8,639 | 27.60 |
| Jul | 2,033,323 | 8,841 | 24.70 |
| Aug | 2,018,982 | 8,815 | 25.60 |
| Sep | 1,984,388 | 9,091 | 25.90 |
| Oct | 2,169,226 | 8,909 | 20.60 |
| Nov | 2,161,755 | 11,949 | 18.80 |
| Dec | 2,425,159 | 12,621 | 18.60 |
| Jan 2002 | 2,270,322 | 12,303 | 19.30 |

*Source: The Royal Bank of Scotland* Oil and Gas Index

North Sea oil and gas production

# New oil spill response atlas put to the test

A new oil spill response atlas (OSRA) has been developed in Australia which should help the petroleum industry minimise coastal and marine environmental pollution from oil spills, reports *Matthew Brace*. The electronic mapping system developed by the Australian Marine Safety Authority (AMSA) measures and tracks the size, speed and direction of slicks. It calculates the risk from the leaked petroleum and other chemicals and allows emergency services and rescue planners to organise preventative resources in a more effective manner.

The authority reports that the system buys teams crucial time in which to prepare for the slick coming ashore on biologically diverse coastlines, breeding grounds for birds and animals, reefs, sea grass beds or, in Australia's case, protected Aboriginal sacred sites.

OSRA has had three unplanned test runs that have gone some way to proving the system's worth. A car container ship temporarily lost power in gale force winds off the South Australia coast. By the time it had regained power OSRA had already analysed the currents and storm conditions and worked out when and where any oil would come ashore if the ship's hull was breached or if it went down. It has also been used to calculate the potential damage of spills from a timber carrier that grounded off New Zealand and a Malaysian cargo ship that crashed into the Great Barrier Reef.

# NEWS Upstream

## Libya tops 2002 exploration ranking

For the third successive year, Libya has topped the rankings of Robertson's International New Ventures Survey as the country most favoured by oil companies for new ventures in 2002. The survey polls oil companies involved in E&P ventures outside North America, asking them to rate their level of interest in new ventures in 146 countries.

The top ten countries of 2002 are: 1 – Libya; 2 – UK; 3 – Australia; 4 – Algeria and Iran; 5 – Egypt; 6 – Indonesia; 7 – Brazil; 8 – Mexico; 9 – Angola and Qatar; 10 – Trinidad & Tobago.

Despite the slow pace of new contract negotiation and award, and despite the continuance of US sanctions, Libya's hydrocarbon potential appears to be a great attraction. Meanwhile, after three years of falls down the rankings, the UK has bounced back to second place while Mexico, Qatar and Trinidad have entered the top ten for the first time in the survey's 15-year history. Also, despite concerns about the proposed 'multiple service contract' formula announced by Pemex, the prospect of upstream involvement in the Mexican petroleum sector for the first time in over 50 years is obviously exciting many companies, comments Robertson.

Some 57% of those surveyed stated that they plan to increase total worldwide E&P spending in 2002, although there is an atmosphere of caution and uncertainty. An average annual oil price of $19.60 has been used for 2002 budgeting purposed. A total of 87% of companies said they expected the current phase of mergers and acquisitions to continue this year.

## Dana and Agip agree North Sea asset deal

**Dana Petroleum has signed a conditional exchange agreement resulting in the acquisition of a number of UK North Sea production, development and exploration assets from Agip (UK) and its affiliates. The company has taken:**

- **a 19.5% stake in the producing Hudson oil field and surrounding exploration blocks 210/24a and 210/24b including the Melville oil discovery;**
- **a 12.4% interest in the producing Banff oil and gas field and unit area which contains the MacDuff exploration prospect;**
- **a 19% holding in block 210/5a, including the Otter oil field which is currently under development with first oil anticipated around end-2002, and a 26% stake in exploration block 210/20d;**
- **a 0.64% interest in the Brent oil pipeline system and a 0.38% stake in the Sullom Voe oil terminal in the Shetland Islands;**
- **a 13.% stake in exploration block 29/2a, around the Banff field, which contains the 29/2a-2 gas condensate discovery and the large Deep Banff exploration prospect; and**
- **a 53.5% interest in exploration block 211/8a which includes the 211/8a-2 oil discovery, immediately north of the Penguins group of oil fields currently under development, and a 25% interest in block 211/11a.**

**In exchange for the above assets, Dana is to assign to Agip a 3% interest in UK North Sea quadrant 23 exploration blocks 23/16c, 23/16d and 23/17a and pay a cash consideration of £48.15mn adjusted for an effective date of 1 July 2001. Two contingent cash payments, each of £3mn, would become due should the Banff field produce firstly 17mn barrels of oil and, secondly, 30mn barrels of oil as measured from the effective date. Dana will retain a 27% stake in the quadrant 23 exploration blocks where a well will shortly be drilled to test the Barbara exploration prospect.**

**Not proven and probable reserves associated with the new assets are put around 19mn boe. Significant further discovered, but as yet undeveloped, possible reserves have also been identified and there are a number of attractive exploration targets, reports the company.**

## Adnoc promotes sour gas use in EOR

A joint Adnoc-Shell team is reported to have completed a feasibility study regarding the use of Abu Dhabi's undeveloped sour gas reserves – which have hydrogen sulfide levels ranging between 13% and 30% – for gas injection programmes to optimise liquids recovery and increase levels of sweet gas for export.

Adnoc is currently using clean, sweet gas for its gas injection schemes. The use of sour gas is expected to raise levels of oil recovery by up to 10% as it is more efficient in recovery than sweet gas. Adnoc is also reported to be interested in developing new technologies for using sour gas in enhanced recovery projects.

## In Brief

***Apache is reported to be planning to** commence production from its 'string of pearls' discoveries offshore north-western Australia in 1Q2003. It is planning to tie-in discoveries in the Flag oil play to the Harriet complex on Varanus Island.**

### Latin America

***Brazilian oil production in March 2002** averaged 1.501mn b/d, 1.7% above month earlier levels. The Campos Basin produced 1.217mn b/d.**

***Lukoil is reported to have signed an** agreement with Ecopetrol to explore the Condor block in eastern Colombia. The Russian company is to initially invest some $55mn.*

***The Venezuelan authorities are** reported to have presented Shell, ExxonMobil and Nippon Mitsubishi Oil with a new set of terms for the $3bn North Paria gas project that assigns 60% of the equity to the Venezuelan state.*

***Petrobras of Brazil is reported to have** applied for a joint venture contract with Ecopetrol of Colombia to develop the onshore Guando oil field, estimated to hold 120mn barrels of reserves.*

### Africa

***Nigeria and Equatorial Guinea are** understood to have resolved a maritime border dispute that will simplify the allocation of oil blocks in the Gulf of Guinea.*

***Algerian state-owned company** Sonatrach and US independent Anadarko Petroleum are reported to have brought onstream the fourth oil production train at the Hassi Berkine central processing facility in block 404 in Algeria. The 75,000 b/d train boosts the facility's total capacity to 285,000 b/d.*

***ExxonMobil is reported to have** recently begun development drilling as part of a $3.5bn project to export oil from Chad.**

**A FURTHER 17 OF THE MONTH'S UPSTREAM NEWS STORIES NOT INCLUDED ABOVE CAN BE FOUND ON THE NEWS IN BRIEF SERVICE @ www.petroleum.co.uk**

# In Brief

## UK

***The UK Government is planning to*** *launch the Industry Mutual Hold Harmless (IMHH) scheme later this month that will establish a contractual relationship among contractors working alongside each other. The government predicts that such a scheme could potentially save the oil and gas industry millions of pounds a year in legal fees and administration of claims.*

***BP has reported a 1Q2002 oil and gas*** *production of just under 3.5mn boe/d, in line with production levels in 1Q2001 and on track to deliver 5.5% growth for the year. In its latest trading update, the company also reported that: 'Refining and marketing margins were down approximately 30% and 45% respectively from 4Q2001, with the downstream environment aggregate reported to be 'at its weakest levels since the early 1990s.' The chemicals trading environment for 1Q2002 was reported to be similar to 4Q2001.*

***Tullow Oil has posted a 2001 turnover*** *of £76.7mn, up 882% from £7.8mn in 2001. Some 90% of the turnover was derived from the company's southern North Sea assets.**

***BP is reported to be cutting 500 jobs in*** *a bid to secure the long-term future of its North Sea operations, 200 of which will go from the company's Aberdeen-based headquarters.*

***Stolt Offshore has posted a 1Q2002*** *net profit of $0.2mn on net operating revenue of $294.1mn, compared with a net loss of $15.5mn on $191.1mn for the same period last year.*

***Dana Petroleum has posted a 2001*** *profit of £5.6mn, up 15% from 2000.*

***BP has announced its intentions to*** *implement FRS 19, the new UK accounting standard, with effect from the beginning of this year.*

***The World Petroleum Congress (WPC)*** *has extended the submission deadline for its WPC Awards to 1 May 2002. Companies may enroll their employees in the categories of 'Technological Development' and 'Social Responsibility'. For more details, visit* **www.world-petroleum.org**

***Aberdeen-based oil services and*** *drilling company Abbot is reported to have*

# NEWS Industry

# Shell proposes merger with Enterprise Oil

**Shell has made a recommended cash offer of £3.5bn (inclusive of net debt of £0.8bn) for Enterprise Oil. The Directors of Enterprise are reported to consider the terms of the offer to be 'fair and reasonable' and are expected to recommend that shareholders accept the offer.**

**Shell reports that the deal is 'attractive' as 'it offers a strong complementary fit for Shell E&P in the UK North Sea and supports Shell's commitment to Norwegian growth. Elsewhere, it provides an attractive growth opportunity in Italy and improves Shell's position in Brazil.'**

**The proposed merger is forecast to deliver annual synergies of some $300mn. It would add 6% to Shell's hydrocarbon production and some 1.5bn boe to the company's reserve base.**

## Aventail unveils new Internet services

Aventail Corporation has launched what is claimed to be the UK's first clientless VPN (virtual private network) service and a new roaming Internet access service under its Aventail.Net™ portfolio.

The Aventail.Net Secure Web Access service offers clientless access to web applications, making it convenient for users and cost effective for companies. Users can securely access their applications from any location such as at home or at a hotel over a broadband network, behind a firewall on another company's network, or at an Internet café or other shared computer. Administration is reported to be simplified because there is no VPN client to install, distribute and manage. In addition, IT labour costs and capital expenditures are reduced because there is no need to replicate data in the demilitarised zone (DMZ) or install agents on each application, explains the company.

The Aventail.Net Roaming Internet Access service allows mobile users to gain secure access to applications using a local phone call rather than an expensive long distance or 800 number. The service relies on iPass' 14,000 local access points worldwide, creating what is reported to be a seamless global network with redundancy in key business centres. Delivered as a full managed service, customers receive the benefit of working with one vendor to activate, train, support and monitor the hardware and software for cost-effective Internet access.

## BP trades UK emissions allowances

BP reports that it has used the UK's newly introduced emissions trading scheme to carry out trades including the sale of 1,000 carbon credits to international mineral processing group IMERYS, enabling both companies to gain first-hand experience of trading early in the life of the scheme.

The UK Government introduced a climate change levy, applied to energy used in the business and public sectors, in April 2001. An 80% discount is allowed in the levy rates for those in energy intensive sectors of the industry that agree to meet challenging targets for improving energy efficiency or reducing carbon emissions within a climate change levy agreement. Participants in these agreements are now able, with the start of the UK emissions trading scheme, to achieve their target either by trading emissions allowances with other companies in a climate change levy agreement or by participating in the wider UK emissions trading scheme.

BP has made a 353,500 tonnes of carbon dioxide equivalent emissions reduction commitment to the UK emissions trading scheme. The company was the first to introduce an internal emissions trading scheme which is reported to have helped it meet its commitment to reduce greenhouse gas emissions by 10% below 1990 levels some eight years early and at no net cost. In a recent speech, BP Chief Executive Lord Browne made a commitment that BP would hold net greenhouse gas emissions at current levels through to 2012 despite significant growth plans.

## EC and EU news update

European Union heads of government have signalled an end to 10 years of negotiations over a European energy taxation directive, agreeing at their recent summit in Barcelona that legislation should be passed by December 2002, writes *Keith Nuthall.* The law could impose minimum rates of fuel duty close to the current EU average, but Presidents and Prime Ministers agreed it should also 'bear in mind the needs of professionals in the road haulage industry.' This has been interpreted as a bid to mollify protests from Member States where duties are below the EU average, such as in Spain and Greece.

Meanwhile, the European Parliament is reported to have heavily amended the proposed new gas liberalisation directive. For instance, MEPs voted to insist that Member States ensure legal unbundling of the transmission network, allowing fair and non-discriminatory access to pipelines and laying down guidelines on the establishment of gas regulators, namely that they be 'wholly independent of the gas industry.'

The Parliament also called for the European Commission to frame proposals regulating third-country access to the EU gas market to avoid price dumping.

Other recent news includes:

- The European Investment Bank has lent euros 90mn to the Turkish National Oil and Gas Company for the establishment of Turkey's first major gas storage facility, by converting two depleted gas fields in Thrace and off its coast.
- France, Germany, Britain, Italy and Spain are being taken to the European Court of Justice by the European Commission for allegedly failing to implement the directive allowing consumer access to fuel economy and carbon dioxide emissions data. Italy and Britain are being taken to Court for not abiding by an amendment to the fuel standards directive, and Germany the directive on the sulfur content of liquid fuels.
- An investigation launched by the European Commission into allegations of cartel-like behaviour between companies shipping gas on the large gas pipeline linking Britain and Belgium has been closed after it 'found no evidence' of illegal collusion.
- The EU Council of Ministers has allowed the Netherlands to charge lower duty on low sulfur fuels; Denmark to vary duty on heavy fuel oil and domestic fuel; Italy to cut duty on biodiesel hybrid fuels; and France on biofuels. EU Ministers have also been asked to allow Britain to lower duties it charges on pure biodiesel and hybrid fuels and Luxembourg to reduce duty on low sulfur fuels.
- The European Commission has exempted Austria from detailed public procurement rules when issuing contracts for oil and gas exploration on its territory.

## Surgut posts disappointing figures

**Surgutneftegaz has posted its 2001 RAS results, which were significantly below analyst expectations and reflected the aggravated situation with cost controls at the company despite moderate external inflationary pressure, reports UFG.**

**The company performed predictably at the top-line level – its sales mix and pricing are very transparent given that most of the oil is exported in exchange for either crude or refined products. Net sales of $5,610mn were 8% lower than in 2000, which is a slightly steeper decline that the 5% figure expected for the rest of the industry and is fully explained by Surgut's low exposure to the continued recovery of domestic downstream prices throughout 2001, comments UFG.**

**As a result, the main disappointment was on the cost side, as the company increased its total operating expenses by 28%. Surgut suggested that its depreciation was 30% higher and UFG estimates that taxes other than on income were down by 23% due to the lower royalty taxes and the elimination of a portion of revenue-based taxes with the introduction of the Tax Code. UFG estimates that this led to the company's production costs rising by 50% year-on-year, way above the headline inflation and other companies' figures.**

## In Brief

*posted a 2001 turnover of £264mn, a 57% increase over last year, and a 37% rise in operating profit to £18.5mn.*

***Soco International has posted a 2001** profit before taxation of £22.9mn, slightly down on the £24.1mn reported for 2000.*

***The oil and gas extraction, chemicals** manufacturing and petroleum industries Sector Skills Council (SSC) has received a licence to operate under the name 'cogent'. The SSC will be chaired by John Mumford, Director of BP Oil UK.**

### Europe

***Gaz de France is reported to have** more than doubled its net profit in 2001 to euros 891mn ($785mn) from euros 431mn the previous year. Operating profit rose to euros 1.76bn in 2001 from euros 969mn in 2000.*

***Wintershall of Germany has reported** that 2001 net revenue (after mineral oil taxes on natural gas) increased by euro 0.7bn on its 2000 figure, reaching euro 4.9bn.*

***DONG of Denmark has posted a 2001** net profit after tax of DKK1,586mn.*

### North America

***US independent Devon Energy is** understood to be planning to sell its non-core US and Canadian assets for $953mn. The assets are reported to have estimated reserves of 127mn barrels of oil.*

### Middle East

***The Great Wall Drilling Company of** China is reported to be planning to open up an office in Saudi Arabia, enabling it to participate in future E&P projects in the Middle East country. The Chinese company is understood to have committed $1.3mn to such projects in Saudi Arabia.*

***It is understood that Egypt has not** revoked plans to sell gas to Israel despite severing economic and commercial relations with the Israeli Government.**

**A FURTHER 30 OF THE MONTH'S INDUSTRY NEWS STORIES NOT INCLUDED ABOVE CAN BE FOUND ON THE NEWS IN BRIEF SERVICE @ www.petroleum.co.uk**

# In Brief

## UK

***General Trailers is soon to launch a new*** *petroleum tanker – the GT Fruehauf Hydroline – on the UK market. The sealed flow tanker has a 41,5000-litre capacity in six compartments. Manfactured from 5186-H111 aluminium, the barrel is circular in section with a minimum thickness of 5 mm.**

***IPE, Europe's leading futures and*** *options exchange, has announced that EasyScreen is the first independent software vendor that has committed to connecting to the IPE. EasyScreen will be able to offer connectivity from the initial launch of the IPE's major contracts – Brent Crude and Gas Oil futures – planned for autumn 2002 and marks a move forward in the exchange's plan to transition its products to a fully electronic trading environment.*

## Europe

***Gasunie of the Netherlands is*** *to be divided into three entities. Shareholders Shell and ExxonMobil (25% each) are understood to be planning to divide between them the trading and distribution assets of the gas company, while the Dutch Government (50%) is to take over the transportation network.*

***Foster Wheeler has been awarded two*** *projects for LNG terminal expansions in Cartagena and Huelva by Enagas of Spain. Plans are to increase handling capacity at the Cartagena terminal to 600,000 cm/hr from the current 450,000 cm/hr, and at the Huelva facility from 450,000 cm/hr to 900,000 cm/hr.*

## Eastern Europe

***Statoil is reported to be planning to*** *acquire a total of 61 Shell service stations in three Baltic countries for an undisclosed sum – 26 outlets in Estonia, 19 in Latvia and 16 in Lithuania.*

## North America

***ExxonMobil Chemical has selected*** *Honeywell's Industry Solutions Business to provide process control systems for a multi-year migration programme at a number of facilities*

# NEWS Downstream

## Freeze on UK fuel duty and VED rates

**UK Chancellor of the Exchequer Gordon Brown announced a freeze on all road fuel duties, including ultra-sulfur petrol and diesel in his April 2002 Budget. Duty incentives favouring sulfur-free fuels are to be introduced in 2003, while hydrogen is to become exempt from fuel duty in the future in a bid to promote the production and take-up of this environmentally-friendly fuel. A freeze was also placed on vehicle excise duty (VED) rates and a new low-carbon VED rate introduced that will offer a £30 discount for the very cleanest cars producing less than 120 g/km. Van VED rates have also undergone reform, with a new discounted rate for vans which meet the challenging euro-IV emissions standard.**

**Brown has also introduced enhanced capital allowances for the purchase of business cars with the cleanest engines, and on a revenue neutral basis restructured the fuel scale charge from 2003–2004 to relate it to carbon dioxide emissions rather than engine size. He also announced further details of plans to introduce a distance-based road-user charge for lorries operating in the UK, within the next three to four years, in order to ensure that lorry operators from overseas pay their fair share towards the cost of using UK roads while ensuring that the overall cost to the UK haulage industry does not rise.**

**Brown also unveiled a comprehensive strategy to tackle the rising problem of oil fraud by tightening controls on the distribution and use of rebated fuels and increasing detecting and investigation of their misuse.**

## Funding alternative energy solutions

P/S BI New Energy Solutions is a new venture company that has DONG of Denmark as lead investor and the BankInvest Group as asset manager. The new venture fund, which has raised initial capital of DKK 250mn, is claimed to be one of the first in Europe to specialise in alternative energy solutions.

Global demand for energy is rising by 2%/y and the need to reduce the emission of greenhouse gases is becoming increasingly important. Energy production has so far been based on large power stations and combined heat and power (CHP) plants, but in the last decade several new energy solutions based on small, decentralised plants have become a real supplement to the traditional form of energy supply. Market growth within new energy technologies is forecast to be between 20% and 30% annually, exceeding the growth forecasts for most other sectors. By 2060, more than half of the world's energy consumption is expected to be covered by alternative energy sources, states DONG.

## Developments downstream Russia

Stella Zenkovich reports on some recent downstream developments in Russia and Central Asia.

- Gazprom has stated that it will not build a pipeline to Yugoslavia without being assured of a solvent market there and the payment of the $500mn already owed, Board Member Bogdan Buzdulyak has declared. In late 2001, the Serbian oil and gas company NIS contracted to buy 840mn cm of gas from Gazprom in the first quarter and indicated that it would need to increase gas supplies for the year from 1.6bn cm to 2bn cm.
- Itera is to handle the export of 34bn cm of Turkmen gas to the Ukraine in 2002, acting as an operator of Turkmen gas deliveries there on the basis of contracts signed with Nafrogaz Ukrainy, Gazprom and gas transportation companies in Kazakhstan and Uzbekistan. Over the past three years, Itera has supplied 47bn cm of Turkmen gas to the Ukraine.
- BP is reported to have signed two contracts with the Turkish-Azeri joint venture Tekfen/AzFen to expand the Sangachal oil terminal located south of Baku in Azerbaijan.

## Petroleum products on the waterways


**Total Butler is replacing more than 5,000 lorry movements between TotalFinaElf's refinery in North Lincolnshire and the Total Butler oil depot in Castleford, West Yorkshire, with the carriage of 500 tonnes of petroleum products via the *Rix Eagle* barge on the Aire & Calder Navigation canal.**

**The depot took its first delivery of 600,000 litres of gas oil for industrial and agricultural use on 3 April.**

## Nigerian LNG

Welcoming the go-ahead for the Nigeria LNG Plus project which will enable Shell and its partners to unlock $7.5bn of new projects in Nigeria, Shell has announced that it intends to sign two 20-year agreements to take a total of 3.8bn cm/y of gas from NLNG.

NLNG's commitment to the construction of the fourth and fifth liquefaction trains, due to begin production in 2005, brings its overall production capacity to 17mn t/y of LNG, together with 1mn t/y of condensate and 2.3mn t/y of LPG. The two new trains will utilise some 9.6tn cf of gas, 53% of which will be supplied by Shell's joint venture upstream operations (Shell 30%).

## *Chinese joint venture*

The Chinese Petroleum Corporation (CPC), one of Taiwan's largest state-owned enterprises, is setting up a joint company with the China mainland counterpart company China National Petroleum Corp (CNPC) to extract and refine oil, reports *Mark Rowe*. CNPC does not have the means to refine crude oil and currently contracts out this work to Japan, but is keen to use Taiwan because it can offer lower costs and is closer to markets in southern China.

For reasons of national security, Taiwan cannot sell the refined product directly back to China, but would have to go through a third port, probably Hong Kong, to get the oil back into China.

## US energy bill to boost ethanol use

A rewritten US Senate energy bill would see the use of ethanol in cars tripled and the unpopular gasoline oxygenate MTBE phased out in four years, writes *Philip Fine*. A compromise was recently struck that tried to please the oil and gas, environmental and agricultural sectors. The bill will scrap the requirement that at least 2% of gasoline is oxygenated in areas with heavy air pollution.

In exchange, the package will see a renewable fuel standard in which part of the US' fuel supply, growing to 5bn gallons by 2012, must be provided by renewable domestic fuels such as ethanol and biodiesel.

The oil industry wants to ensure the ethanol requirement does not cause supply problems and will probably have its opportunity when the bill is merged with another energy law backed by the Republican controlled House of Representatives.

## In Brief

*in North America and Europe. Honeywell's PMX control system, which was installed at the sites in the 1970s and 1980s, is to be replaced with the next generation control technology currently under development.*

***ExxonMobil is reported to be investing** $10mn in promoting its new high-tech synthetic motor oil, Mobil 1 with SuperSyn.**

***Shell is reported to be acquiring motor** oil manufacturer Pennzoil-Quaker State Company for $2.9bn, making Shell the largest global lubricants retailer. If approved, the merger is expected lead to a 15% reduction in the workforce (1,230 jobs) and the disappearance of the Shell Havoline brand.*

***ChevronTexaco has signed an agreement** to sell its 33.33% interest in the Discovery pipeline system to Duke Energy Field Services for an undisclosed sum.**

### Middle East

***Alstom of France is reported to have** won a $330mn order to supply the National Iranian Gas Company with 50 industrial gas turbine compressor sets to be installed in 18 compressor stations on the IGAT pipeline system for gas transport in Iran.*

### Russia & Central Asia

***Lukoil is reported to have announced** plans to close down its Petrotel refinery in Romania for two years in order to fully upgrade the 90,000 b/d plant. The upgrade programme will cost some $200mn.**

***Foster Wheeler Italiana has been** awarded a $43mn basic and front-end engineering design (FEED) contract by Emeral for the revamp of a delayed coker unit at the company's refinery in Turkmenbashi, Turkmenistan.*

***Sibneft has unveiled plans to increase** its sale of oil products in Russia by more than 18% from 2.3mn tonnes in 2001 to over 2.7mn tonnes in 2002. Overall investment in retail enterprises will reach $34mn, while the company will spend nearly $27mn on building and acquiring service stations to expand its forecourt network in Siberia and Central Russia where it currently controls 1,000 service stations.*

# In Brief

## Asia-Pacific

***Japanese gas supplier Osaka Gas is** reported to have abandoned plans to construct a third LNG terminal at Tsuruga City in Japan due to increasing competition following the progressive deregulation of the Japanese gas sector and the need to cuts costs.**

***The Indian Government is reported to** have abolished state price controls on its $15bn oil and refining industries. State subsidies have been lifted on all petroleum products, except some domestic household necessities such as kerosene and cooking gas that the government will continue to subsidise over the next three to five years. In addition, under the new regime, any oil company – including foreign players – can now operate forecourt networks provided that they commit to investing 20bn rupees (£288mn) over 10 years.*

## Latin America

***The Brazilian authorities are reported** to have put on hold plans to expand the Brazil–Bolivia gas pipeline import route that would help resolve the country's acute electricity shortage, while they await new government plans for the development of gas-fired power stations.*

**A FURTHER 14 OF THE MONTH'S DOWNSTREAM NEWS STORIES NOT INCLUDED ABOVE CAN BE FOUND ON THE NEWS IN BRIEF SERVICE @ www.petroleum.co.uk**

# NEWS Downstream

## M. East downstream developments

*Stella Zenkovich* reports on some recent downstream developments in the Middle East:

- The Lebanon authorities have invited a tender for the design, construction and operation of a 34-km gas pipeline running from the Syrian border to the Deir Ammar/Beddawi power station near Tripoli. Construction of the pipeline is expected to take nine months to complete.
- The Yemeni President Ali Adullah Saleh has laid the foundation stone for a $890mn, 100,000 b/d private refinery – the country's first – in the oil-rich eastern province of Hadrar. The local General Investment Authority is to build, operate and maintain the new refinery, with funding provided by Saudi Arabia and the United Arab Emirates. There are two state refineries currently operating in Yemen – Marib and Aden. A further two facilities are planned in Dhamar Province and in Hodeida.

## Bright outlook for Stiller Group tanker


**The Stiller Group recently invited children at the Whitehouse Primary School in Stockton to decorate the dish end of one of its road tankers as part of the haulier's increasing involvement in community initiatives. The children created a colourful pastiche of animals in a jungle setting.**

**Stiller also made a financial contribution to the school and presented it with a framed picture of the unveiling ceremony that is to grace the walls of the assembly hall.**

## UK Deliveries into Consumption (tonnes)

| Products | †Feb 2001 | †Feb 2002 | †Jan–Feb 2001 | †Jan–Feb 2002 | % Change |
|---|---|---|---|---|---|
| Naphtha/LDF | 100,623 | 117,754 | 306,029 | 188,129 | –39 |
| ATF – Kerosene | 803,035 | 648,506 | 1,617,243 | 1,289,633 | –14 |
| Petrol | 1,539,455 | 1,621,303 | 3,263,364 | 3,294,822 | 1 |
| of which unleaded | 1,467,355 | 1,581,681 | 3,108,002 | 3,206,147 | 3 |
| of which Super unleaded | 25,310 | 41,563 | 54,875 | 82,771 | 51 |
| of which Premium unleaded | 1,000,579 | – | 2,172,086 | – | –100 |
| ULSP (ultra low sulfur petrol) | 441,466 | 1,540,118 | 881,041 | 3,123,376 | 255 |
| Lead Replacement Petrol (LRP) | 72,100 | 39,622 | 155,362 | 88,675 | –43 |
| Burning Oil | 448,740 | 404,338 | 967,962 | 819,289 | –15 |
| Automotive Diesel | 1,187,559 | 1,375,313 | 2,462,130 | 2,725,286 | 10.7 |
| Gas/Diesel Oil | 500,429 | 499,047 | 1,072,074 | 1,087,198 | 1 |
| Fuel Oil | 216,739 | 177,304 | 431,681 | 389,749 | –10 |
| Lubricating Oil | 84,901 | 79,976 | 158,068 | 154,574 | –2 |
| Other Products | 536,183 | 632,251 | 1,151,775 | 1,232,556 | 7 |
| Total above | 5,417,664 | 5,555,792 | 11,430,326 | 11,281,236 | –1 |
| Refinery Consumption | 365,291 | 479,835 | 836,167 | 889,951 | 6 |
| Total all products | 5,782,955 | 6,035,627 | 12,266,493 | 12,171,187 | –1 |

† Revised with adjustments

All figures provided by the UK Department of Trade and Industry (DTI)

# Ireland steps on the gas

**Booming gas demand, major infrastructure projects, increasing cross-border cooperation and energy market competition are all factors that will bring profound change to the Irish gas market over the next couple of years, reports *Jeff Crook*.**

Ince terminal near Cork
*Source: Marathon*

The overall population of the island of Ireland is about 5.2mn, with around 70% living in the Republic and 30% in Northern Ireland. While the island is best known for its rural scenery, much of the population is concentrated around the two principal cities – Dublin, which has a population of more than 1mn, and Belfast, which has a population of more than 500,000. Gas distribution systems are rapidly expanding around each of these cities, and are developing rapidly in the south where the network is fed both by an interconnector from Scotland and by indigenous gas production.

## Irish gas production

The Irish natural gas market was founded on production from the Kinsale Head field, discovered by Marathon Oil in 1971. The field has gross recoverable gas reserves of around 1.65tn cf and was brought into production on 28 August 1978. The nearby Ballycotton and Southwest Kinsale satellite fields have been subsequently developed.

The Kinsale Head production facilities currently comprise two nine-slot, steel jacket production platforms (Alpha and Bravo), each standing in 300 ft of water, together with four subsea satellites. Bravo has been converted to a normally unmanned installation leaving all processing facilities now on Alpha. A 24-inch infield pipeline runs 4.8 km from Bravo to Alpha, with the commingled gas stream then transported from Alpha to the Inch terminal via a 56-km long, 24-inch diameter pipeline.

Production has been declining sharply, falling from 44.8bn cf in 1999 to 36.bn cf in 2000 and then to 33.7bn cf in 2001. While there was some press speculation that the field would shut down in 2004, this no longer seems likely since the existing facilities have recently been converted for a gas storage role and there is also potential for the tie-in of Seven Heads as a satellite.

The gas storage project involved installing new gas compression equipment on Alpha, modifying the existing process equipment and drilling two new wells into the partially depleted Southwest Kinsale gas field. These facilities will be used to inject surplus gas production from nearby fields into the Southwest Kinsale reservoir when available supplies exceed market demand. The gas will then be held in storage until needed, when it can be withdrawn at high flow rates through three wells at short notice.

Marathon says that the new facility has increased the peak deliverability of the Kinsale area reservoirs by a wintertime average of about 100mn cf/d and will, initially, be dedicated to optimising the recovery of gas from the Kinsale Head and Ballycotton gas fields in accordance with existing commercial agreements with Bord Gáis. However, the company is evaluating the feasibility of making a storage service available to third parties in the future.

## Seven Heads field

The Seven Heads field, with an estimated 500bn cf of gas in place, is a possible Kinsale satellite. A statement by operator Ramco, issued with news of a successful appraisal well during October 2001, said that it would be economic to develop Seven Heads as a 32.5-km tieback to the Kinsale facilities. However, a decision on this approach depends, in part, on the appraisal results from another field called Galley Head.

An alternative development scenario would involve laying a 47-km pipeline from Seven Heads to the nearest potential landfall at the Old Head of Kinsale. The economics of this scenario would be greatly enhanced if Galley Head proves to hold commercial reserves, since the latter is situated between Seven Heads and the Irish coast. The attractiveness of this latter approach is enhanced because Ramco, Island Petroleum Developments together with Sunningdale Oils have interests in both the Seven Heads and Galley Head licenses.

The Seven Heads Group was granted the licensing option for the Seven

Heads oil and gas accumulation in October 1999. The group includes Ramco (operator; 49%); a subsidiary of Duke Energy (26%); Island Petroleum Developments (20%); Northern Petroleum (4%), and Sunningdale Oils (Ireland) (1%). Five wells were drilled on the structure over the period 1974–1990, by holders of a previous lease that expired in 1994.

## Irish gas market

Competition in the Irish gas market is currently restricted to the largest gas customers. New legislation was announced last year to reduce the threshold for competition in supply from 25mn cm/y to 2mn cm/y. This was an important step towards full market opening, which the government aims to achieve by 2005.

The Irish Government says that the new legislation will open up more than 80% of the gas market, considerably more than the 28% required under the EU Gas Directive. Under the new legislation, the Commission for Energy Regulation will have responsibility for regulating access to the natural gas transmission network, giving consents for the construction of gas pipelines and licensing natural gas undertakings.

Bord Gáis has originally held the monopoly for gas supply in Ireland. This was a statutory body established under the 1976 Gas Act for the supply, transmission and distribution of gas in the Republic. The company says that there are around 500,000 homes within economic reach of its supply network, and figures indicate that the company has connected 326,000 homes to date. But a huge programme of work is currently underway to extend the system, particularly to the west. Much of the strategic planning is based on the 'Gas 2025' study, a project initiated by Bord Gáis in conjunction with the Department of Public Enterprise during 1999.

This study showed that Bord Gáis had shipped 4.53bn cm through its transmission system in 1998, with 38% supplied from the Inc terminal and 62% from Moffat in Scotland. Gas demand was forecast to rise to 10.80bn cm in Ireland and 3.2bn cm in Northern Ireland by the year 2025. It was concluded that an investment of IR£1bn of infrastructure investment would be needed to cope with the increased demand, with IR£800mn of this investment needed within 10 years.

However, subsequent studies suggested that growth would be faster than anticipated, and this raised fears of a shortfall in supply for the winter of 2002/2003. Various options had been investigated to deal with a shortfall and, after an independent assessment, it was decided to build a second interconnector pipeline from Scotland. The throughput of the existing interconnector is also to be increased by 50%, through the installation of additional compressor capacity.

The €292mn project for this second interconnector was approved by the Irish Government in February 2001. It will run parallel to the first, and consists of a 30-inch diameter subsea pipeline from Beattock, in southwest Scotland, to Gormanston, on the east coast of Ireland, just north of Dublin. It will also be necessary to lay a 13.7-km, 30-inch diameter pipeline to connect the subsea pipeline to the existing network.

The gas pipeline will normally operate at around 150 bar in the subsea pipeline, and this will be reduced down to 70 bar for the onshore pipeline. Construction is expected to take around 18 months, giving a completion date in 3Q2002 – in time to meet the winter demand for 2002/2003. An IR£30mn order for manufacture of the steel pipe was awarded to the ILVA pipe mill in Taranto, southern Italy, during June 2001.

## Irish power generation

The demand for clean fuel for power generation has been a key driver for gas demand, with the construction of new gas-fired power stations and the conversion of older coal stations to gas. The total Irish generation capacity is 4,700 MW – the previous demand peak of 4,000 MW achieved during 2001 was surpassed earlier this year. An electrical interconnector with Northern Ireland Electricity (NIE) was brought back into service in April 1995 after a 20-year period during which it remained out of service because of security problems on the border.

Many early Irish power plants burned peat, and this is still an important fuel, but today's power industry has a far more diverse range of generation systems. The government is keen to maintain this diversity of fuel supply, while at the same time recognising the importance of meeting emission targets set out in its 'Climate Change Strategy.'

Peter O'Neill, head of the Gas Division of the Department of Public Enterprise – speaking in the John Healy Luncheon debate at the International Humbert School on 23 August 2001 – said that the conversion of the 915-MW Moneypoint coal-fuel power plant to gas firing would make the single biggest contribution to reducing Ireland's output of greenhouse gas in line with the Climate Change Strategy.

The Moneypoint site on the Shannon Estuary, near Kilrush, County Clare, was originally chosen for its magnificent deepwater berthing facility for coal handling. But there is now the possi-

**The Kinsale A platform was recently converted for gas storage.** *Source: Marathon*

bility of supplying gas to this site, following the extension of the gas network to the west.

The renewable generation capacity, which includes hydroelectric, wind farm and land-fill gas units, is currently 350 MW – but this is set to rise to 500 MW in the next five years. This increase in capacity will also greatly assist efforts to meet carbon dioxide emission targets.

However, emission controls must be set against the rapidly increasing electrical demand – a 6.8% increase in the past year. New capacity is being brought onstream to cope with rising demand and much of this is being provided by independent operators following the introduction of competition into the market. Modern peat-fuel units and gas-fuel combined cycle gas turbine (CCGT) plants, under construction, will be supplemented with combined heat and power (CHP) units and renewable energy generation.

A gas-fuelled CCGT plant was completed by ESB during 1999 at Poolbeg, Dublin. The plant consists of two 150-MW combustion turbine (CT) units and one 160-MW steam turbine (ST) unit. The ESB has formed a joint venture company with Statoil to build another CCGT plant at Ringsend, near Dublin.

Viridian, the Northern Ireland power utility, is in the final phase of construction of Ireland's first fully independent power station, the 343-MW Huntstown power station in north County Dublin. Full combined cycle operation of this plant is scheduled for December 2002.

Another important project is the new 250-MW CHP plant that is being built on the Aughinish Alumina site on the Shannon Estuary in County Limerick. This gas-fuelled plant is expected to reduce Irish greenhouse gas emissions by 1%, making a significant contribution to Ireland's Kyoto Protocol commitments when it comes onstream in 2002.


**Map of the Irish gas transmission system.**

## Corrib to supply gap

Kinsale Head once supplied the entire Irish market but, as production has declined and demand has increased, it now accounts for around 20% of the market's annual gas consumption. Aside from the Ballycotton and South Kinsale satellites, the next commercial discovery was Corrib in 1996. The Corrib field lies 70 km off Achill Island, in County Mayo, on the west coast.

With imports through the interconnector rising sharply, there was considerable urgency to bring Corrib into production as soon as possible, but development of the field posed a number of problems, both offshore and onshore.

The offshore challenges included water depth of over 1,100 ft, which precluded the use of a conventional production platform, and the 70-km tie-back distance to the shore (see *Petroleum Review*, January 2002). But despite these challenges, operator Enterprise Energy Ireland (45%), Statoil Exploration (Ireland) (36.5%), Marathon International Petroleum Hibernia (18.5%) gave the go-ahead for the £400mn development of the field on 26 February 2001. Production is due to start by 2H2003.

The terminal will be located at Bellanaboy Bridge, in County Mayo. Planning permission was granted for the terminal in August 2001, although this is subject to appeal. Enterprise says that it has agreed key terms with the trading arm of Bord Gáis for sales of approximately 60% of its share of Corrib gas and is actively discussing opportunities with other major gas users to place its remaining uncontracted gas into the Irish market.

The location of the terminal presented a headache due to its remoteness from the existing Irish gas network, which was previously concentrated in the east and south of the country. Connecting Corrib into the natural gas network will thus involve a large onshore construction programme.

## Evolution of gas network

Natural gas from Kinsale Head was first supplied through the Ince terminal to customers in the Cork area in 1978. Then, after completion of a cross-country pipeline, gas became available to Dublin four years later. The system was then extended to Limerick and Waterford in 1986, and to the north-east in 1988. Provision was made for

the import of natural gas from Scotland, with construction of an interconnector in 1993 after studies showed that Kinsale's capacity would be inadequate to meet demand.

The gas network has recently been extended south of Dublin to the coastal region of Arklow and Wicklow. Another recent project was the extension of the network from Kingscourt, County Cavan, to Carrickmacross and Lough Egish. These projects are typical of the in-fill projects that are taking place on the east coast of the country.

The proposed Corrib terminal, on the west coast, was a great distance from any of the existing transmission lines. Whilst this created problems, it also offered potential strategic benefits – opening up gas supplies to the west and northwest, regions that have previously been poorly provided with power. So, a decision was made in 1999 to complete a IR£200mn ring main around the southern part of Ireland, connecting Dublin, Galway and Limerick.

The route of one new pipeline runs northwest from the existing transmission system in the Limerick area, to Galway, where the route turns towards the east, crossing the midlands, to connect with the existing transmission system near Dublin. This new pipeline will close a ring with the original Cork to Dublin pipeline, and its spur to Limerick.

A public consultation into the 334-km pipeline route for the ring main was conducted over the summer of 2000. The pipeline, which is due for completion by the end of 2002, will open up the potential of gas supply to towns along its route. These include Trim, Mullingar, Athlone, Ballinasloe, Athenry, Longford, Loughrea, Gort, Ennis, Killaloe and Shannon, together with 150,000 homes in the Galway and Oranmore area. The system can readily be extended to supply of gas to power generation facilities at Moneypoint and Aughinish.

Gas from the Corrib field will be transported by another new pipeline which is being constructed by Bord Gáis at a cost of IR£100mn from the terminal at Bellanaboy to connect with the ring main near Craughwell, County Galway. It is anticipated that this new pipeline will facilitate natural gas supply to the towns of Castlebar, Claremorris, Tuam and Athenry.

## Gas to the northwest

There are also plans for another spur from Bellanaboy terminal to Sligo, with possible extension to the northwest. This project will benefit from government subsidy. The subvention was forthcoming because of government recognition that the northwest suffers from a lack of energy infrastructure and that extension of the natural gas network into the region would be uneconomic. The government has expressed its readiness to invest and boost the region's attractiveness for inward investment. But the funding will require European Union approval.

To expedite supply of gas to Sligo, the Irish Cabinet announced a decision in September 2001, to go ahead with detailed engineering and planning for the next stage pipeline – from Pollatomish to Sligo. The estimated cost of the Sligo pipeline is IR£40mn, for which the government is expected to make a contribution.

Another proposal to supply the more remote parts of the northwest involves cross-border supply from Northern Ireland.

## Links with the north

The Director General of Gas for Northern Ireland approved a natural gas transportation license on 15 February 2002 for a new system that will eventually lead to cross-border links between north and south. As a first step this would involve extending the Northern Ireland system to Londonderry (Derry) from where there are Irish proposals to extend the line over the border to Donegal, in the extreme northwest. The second step involves a Belfast–Dublin link.

The announcement was welcomed by Bord Gáis Chairman Ed O'Connell who said: 'This is a tremendously exciting development for Bord Gáis and for the energy market on the island of Ireland. It will provide unlimited access to competitively priced, environmentally friendly natural gas for residential and business use and for power generation. I believe it will provide enormous development opportunities for the northwest and along the pipeline route.'

The proposed 450-mm diameter pipeline will run a distance of 260 km. It will be developed in two phases over a five-year period. Phase one will comprise a 110-km pipeline connecting the Scotland to Northern Ireland Pipeline (SNIP), outside Belfast, with a new CCGT power plant at Coolkeeragh, near Derry. Phase two will comprise a 150-km pipeline to link the transmission system near Belfast with Gormanston, in County Meath, where the second Irish interconnector is due to come ashore.

Although US energy company Questar has withdrawn from its partnership with Bord Gáis to undertake this work, Bord Gáis has confirmed that it is still committed to the project.

Another proposal for a pipeline from Belfast to Dublin was tabled for public discussion in early 2000 by Phoenix Natural Gas, on behalf of a joint venture between BG International and KeySpan. The Northern Ireland distribution system is currently concentrated around the Belfast area, and is operated by Phoenix that was awarded a license in 1996 for gas supply in Belfast and other specified areas of Northern Ireland. The gas is transported to Northern Ireland by SNIP, which is owned and operated by Premier Transmission.

SNIP was originally built to supply gas to the 1,067-MW Ballylumford power station, near Larne, after this plant was converted from oil to gas in the early 1990s. But since that time Phoenix has developed a substantial distribution network with connections to 33,000 customers in the Greater Belfast area by October 2001.

The integration of the market north and south of the border would offer many practical benefits, including increased competition and greater security of supply from the multiplicity of supply routes. Various studies have been commissioned into this subject. One key document – *The Final Report on North/South Energy Studies* – was published in August 2001, produced by IPA Energy Consultants for the Northern Ireland Department of Energy, Trade and Investment and the Republic of Ireland Department of Public Enterprise.

## The way ahead

But, despite the increased cooperation that arose from the Good Friday Agreement, there are still many political sensitivities and establishing strong links between the two systems is likely to prove a difficult process. The Irish Government's decision to make a £10mn grant available toward the development of the Northern Ireland gas network, in order to facilitate the south–north gas interconnector and the interconnection between Derry and Donegal, has been a useful step along this path.

# Smaller producers target foreign investment

**In the second of our two-article series,* *Mojgan Djamarani* reviews development prospects in Kuwait, the Emirates and the smaller regional producers in the Middle East.**

According to the US Department of Energy, the Middle East producers must increase oil production capacity from about 39mn b/d to 70mn b/d by 2020 in order to meet rising global demand. However, there is a question mark as to whether the Middle East producers can undertake the scale of investment required as their economies are still subject to the vagaries of oil price fluctuation.

The smaller Middle East oil producers – Bahrain, Kuwait, Oman, Syria, Qatar, the United Arab Emirates and Yemen – are leading the way in offering incentives to foreign investors in the upstream oil sector in order to ensure that they don't lose out to the big regional producers Iran, Iraq and Saudi Arabia (see *Petroleum Review*, April 2002).

## Bahrain

Following the favourable ruling by the International Court of Justice on the border dispute between Bahrain and Qatar over the Hawar Islands, Bahrain is inviting international oil companies to explore its territorial waters for oil and gas. Bahrain currently produces 40,000 b/d from its Awali field and gets 140,000 b/d from the Abu Safa offshore oil field that it shares with Saudi Arabia.

November 2001 it signed an oil and gas exploration agreement with ChevronTexaco for block 5 in the eastern offshore area of Bahrain that includes the Hawar Islands. The first of two oil wells to be drilled is scheduled by the end of the year. Bahrain has also signed two production sharing agreements (PSAs) with Petronas for offshore blocks IV and VI in southeastern Bahrain. Petronas has 100% equity in both blocks and acts as operator on both. Exploration drilling in the two blocks is to begin before the end of this year.

Most of Bahrain's gas reserves consist of associated gas from the Awali field that is in the final stages of depletion. It will become a gas importer in the very near future and is looking into gas imports from Qatar. Earlier this year it signed a Memorandum of Understanding (MOU) with ExxonMobil for gas imports from the North field that it could receive via the proposed Qatar–Kuwait pipeline. A feasibility study for the project was commissioned in mid-2001.

## Kuwait

Very little has taken place on the Kuwaiti scene in the last year, with the National Assembly still blocking attempts by the Oil Ministry to open up the upstream oil sector to foreign investment. A new company, Kuwait Gulf Oil Company, has been created to take over production at the Khafji field that it shares with Saudi Arabia when the Japan Arabian Oil Company's 40-year concession runs out in 2003.

Kuwait has no proven reserves of non-associated gas, therefore the level of gas production is dependent on its Opec oil production quota. The government's plans to develop and expand the petrochemical sector, therefore requires imports of natural gas. Kuwait has a MOU with Qatar and ExxonMobil for imports of natural gas from the enhanced gas utilisation (EGU) project at Qatar's North field, which is expected to be finalised by the middle of the year. Currently, Arthur D Little is carrying out a feasibility study on a pipeline from Qatar and its cost. Kuwait's $2bn Equate II petrochemical complex project, which is being discussed with foreign countries, is based on the availability of significant supplies of Qatari gas.

Were Kuwait to reach an agreement with Iran on the demarcation of their maritime border it could tap into the reserves of its offshore Dorrah gas field that it shares with Iran and Saudi Arabia. It already has concluded an agreement with the Saudis and the two countries are now in negotiations with the Iranians. Dorrah's gas reserves are considered to be quite significant and could remove the need for imports of natural gas.

## Oman

Although not a member of Opec, Oman has agreed to cut oil production by 40,000 b/d in January–June 2002 to help Opec bolster oil prices. Petroleum Development Oman (PDO) cut production from 850,000 b/d to 815,000 b/d while other producers in the Sultanate have cut output by 5,000 b/d.

In spite of the lower oil prices the country is determined to continue with plans to raise production capacity to 1mn b/d by 2004. According to statistics released by PDO, of its $888.5mn expenditure budget, $368mn was spent on oil exploration and production. As a result of new oil exploration in southern Oman in 2001, the company added 250mn barrels to the country's reserve base of 5bn barrels. The new discoveries include the Mazakhin well which contains more than 2bn barrels of heavy oil. PDO also claims to have reduced extraction costs by $0.43/b to $4/b. In 2002 it expects to sign a number of new PSAs.

Natural gas is the cornerstone of Oman's diversification plans. It has implemented a number of gas-based projects to enhance the value added to natural gas. Its natural gas reserves are estimated at 30tn cf and a number of recent gas discoveries are likely to significantly add to this figure. According to PDO, two discoveries were made last year, at Khazan and another at the Kauthar field, which could be the largest gas find in the country in the past six years. To expand its gas reserves, PDO has signed a number of joint ventures (JVs) with foreign oil companies to carry out exploration and development activities. In the latest JV Gulf Stream Resources is to spend $60mn over the next eight years on development of a gas field in Haffar block 30. PDO has also reached an agreement with Iran. This will provide for Iran's share of the gas from the Henjam/Bukha offshore field, which straddles the territorial waters of both countries, will be exported to Oman once Iran's development of the field

begins. The field currently produces 40mn cf/d.

Oman's Qalhat LNG plant near the southern port of Sur has two production trains with total annual capacity of 6.6mn tonnes and there are plans to add a third train at a cost of $2bn to lift capacity by 50% to 9.9mn t/y. The Omani Government controls 51% of the Qalhat plant and Shell 30%, with the remaining stakes held by TotalFinaElf (5.54%), Korea LNG (5%), Mitsubishi and Mitsui of Japan (2.77% each), Partex (2%) and Itochu (0.92%). The main customers for Omani LNG, which began shipments in 2000, are Kogas with 4.1mn t/y and Japan Osaka Gas with 700,000 t/y under a 25-year agreement.

In 1998 Oman also signed a 20-year, 1.6mn t/y agreement with India's Dabhol Power in which Enron had a 65% stake. Shipments were to begin between November 2001 and February 2002 but have been delayed because Enron pulled out of the Dabhol project last year. This could slow down Oman's plans for expansion of the Qalhat plant. Last year Oman LNG also signed short-term and spot sales contracts with BP, TotalFinaElf, Gaz de France, CMS Energy, Cabot Energy and Sempra Energy which came from Oman LNG's extra production.

On the domestic front, Oman is expanding its gas processing facilities in Seih Rol and Nahayda and is expanding the country's gas transmission network. Earlier this year the gas transportation system was transferred from PDO's domain to the new Oman Gas Company (OGC). BC Gas International, Canada's Enbridge International and OHI's Petroleum Energy Services are partners in the OGC. Canadian Energy Services will act as the operator of OGC for the next five years after which OGC will take over.

CES has also been granted a $20mn concession for the construction, ownership, operation and maintenance of two new gas pipelines from Fahud to Sohar and from Saih Nihayda to Salalah. Dodsal of India is building the Fahud–Sohar line and a European Japanese consortium, which includes Snamprogetti and Saipem, is building the Saih Nihayda–Salalah line at a combined cost of $304mn. The pipelines will take the current capacity of the gas transmission system to more than 15mn cm/d.

## Syria

According to the Syrian Ministry of Petroleum, at the current rate of oil production of 600,000 b/d, the country will exhaust its remaining 20mn barrels of oil reserves by 2020. In its search for additional oil and gas reserves, Syria has opened negotiations with Cyprus for a demarcation of the continental shelf and establishment of a territorial economic zone in the Mediterranean.

In 2001 Syria offered new oil and gas blocks for exploration and issued tenders to increase recovery from existing fields. Australia's BHP, TotalFinaElf and Conoco are competing for gas field development projects in the Palmyra region. BHP is reported to have offered to invest $400mn in the fields.

The Syrian Government has made large investments in boosting the role of natural gas as a substitute for oil. The $400mn Desgas project using associated gas production from the eastern region of Deir Ez Zour reached full production capacity this year. Desgas was awarded in 1999 to TotalFinaElf and Conoco on 50:50 basis, with Conoco as the operator. The project involves the collection, treatment and export of associated gas from Deir Ez Zour to the national transmission network and the production of condensate from the Tabiyeh field through gas re-injection. The 170-km gathering system transports up to 5mn cm/d to a new gas processing plant with a capacity of 13mn cm/d. The facility also processes 8mn cm/d of gas from Tabiyeh before its re-injection. The processed gas that is not re-injected is shipped via a 250-km pipeline to the Syrian national grid and the condensate is transported to the Banias terminal.

The completion of the Desgas project will eliminate the need for gas imports that currently stand at 40% of domestic needs. Syria produces 13mn cm/d of natural gas but expects to raise it to 25mn cm/d with the start of Desgas.

Syria also plans on expanding its gas exports. It began supplies to Lebanon of 3mn cm/d in 1999 and last year to Turkey. Its agreement with Turkey also allows it to transit gas through to Europe. Cyprus is also considering, among other options, Syria's proposal for the supply of natural gas via a pipeline that is estimated to cost between $200mn and $250mn.

## Qatar

Qatar plans to continue with plans to increase oil production capacity from the current 748,000 b/d to 825,000 b/d by the end of 2002, in spite of Opec production cutbacks and lower oil prices. Presently, the Dukhan field, discovered in 1939, still accounts for the largest share of oil production at 350,000 b/d. Most of the remaining production comes from offshore fields operated by foreign oil companies.

The increase in production capacity is to be achieved from TotalFinaElf's offshore Khaleej field, where production is slated to increase from 30,000 b/d in 2001 to between 50,000 and 60,000 b/d in 2002, as well as from Maersk's offshore Al-Shaheen field where production is to increase from 112,000 b/d in 2001 to 170,000 b/d in 2002. Last year Maersk awarded Hyundai Heavy Engineering Industries a $250mn contract as part of its $1.2bn development plan to increase output at the field to 200,000 b/d by 2004.

Qatar is also offering two new offshore blocks to foreign oil companies as a result of the International Court of Justice's ruling on its dispute with Bahrain over the Hawar Islands. Although the Court ruled in favour of Bahrain, it confirmed Qatar's right to the nearby waters.

Qatar has ambitious, multibillion dollar plans to expand its natural gas sector both through increased exports of LNG and through pipeline via ExxonMobil's enhanced gas utilisation project at the North field to domestic gas-based industries and then to the markets in the region and in the Indian sub-continent. Qatar has already invested some $17bn and reportedly is planning to spend a further $27bn to tap its vast gas reserves in the near future.

LNG production from the Qatargas and RasGas projects is expected to rise to 30mn t/y by 2008, from 13mn t/y in 2001. Two-thirds of the increase in capacity will come from RasGas and the remainder from QatarGas. Qatargas has three trains with a capacity of around 8mn t/y and currently supplies Spain and Japan with 7.5mn t/y of LNG. Technip and Chiyoda were last year awarded a $90mn contract for debottlenecking of the three trains at Qatargas and expanding capacity of each of the three trains to 3mn t/y. The planned completion date is 2005.

RasGas has two trains with a capacity of 6.6mn t/y and a single client – Kogas. Under a 25-year agreement effective from 1999 Kogas lifts 4.9mn t/y. RasGas also has a 25-year agreement with Italy's Edison Gas, effective from 2005.

Last year, RasGas began construction of a third train with a capacity of 4.7mn t/y to boost output capacity to 11.3mn t/y by 2004. The project is part of the $1.4bn RasGas II expansion project that is to supply India's Petronet with 7.5mn t/y of LNG over a 25-year period. RasGas II – which is a joint venture of Qatar Petroleum (70%) and ExxonMobil (30%) – will operate the third and a fourth train, also of 4.7mn t/y, plans for which are already under way. A fifth train may also be added at a later date. India's Oil and Natural Gas Corporation (ONGC) is

reportedly taking a 5% stake in RasGas II in exchange for a 10% stake in Petronet. Financing for RasGas II is to consist of 70% debt and 30% equity. This will further raise Qatar's debt burden that in 2000 stood at 80% of its GDP.

Qatar Petroleum also has a development and production sharing agreement with ExxonMobil to develop a gas pipeline from the North field via the enhanced gas utilisation (EGU) project for sale to domestic users and exports. The EGU project has a nominal capacity of 1.7bn cf/d.

Qatar's potential gas pipeline export projects include 1bn cf/d to Kuwait. It expects to finalise a sales and purchase agreement with Kuwait by the middle of this year. It also hopes to meet Pakistan's increasing natural gas demand under the GUSA (Gulf–South Asia) pipeline project. Sharjah-based Crescent Petroleum is behind the project and has completed a feasibility and engineering study of the 1,610-km pipeline. The line will be partly subsea and will follow the Iran–Pakistan coastline up to Jiwani near Karachi. It will have a capacity of 1.6bn cf with an off-take of 1bn cf/d from a proposed date of 2005 onwards. Disagreement among the three parties over tariffs is reportedly holding up the $3.2bn project.

At the end of 2001, Qatar also signed a $3.5bn development and production sharing agreement with UAE-controlled Dolphin Energy (TotalFinaElf 25% and UAE's Offset Group 75%) for the first transborder gas pipeline project in the Middle East. The 25-year agreement calls for the development of upstream facilities for the production of natural gas from the Khuff reservoir and its transportation to gas gathering and processing plants at Ras Laffan. From there, 2bn cf/d of sweet gas will be pumped via a 440-km, 3.2bn cf/d subsea pipeline to receiving terminals at Taweelah in Abu Dhabi and Jebel Ali in Dubai. The project suffered a set back when, last May, Enron pulled out of the project selling its 24.5% to the Offset Group. Enron was to have built the subsea pipeline to UAE. Several companies, including TotalFinaElf, are interested in acquiring Enron's stake. The Offset Group is expected to make a decision soon. The Dolphin project and GUSA project are bogged down in differences over gas prices among the interested parties.

Qatar is also fast moving into the gas-to-liquids (GTL) industry. According to the Energy Minister Qatar is developing and studying GTL projects with a total capacity of 800,000 b/d. Two GTL projects are underway. In one, ExxonMobil is carrying out a feasibility study for an 80,000–90,000 b/d GTL facility at a cost of $1bn. The other is a joint venture of Qatar Petroleum (51%) and Sasol (49%) for an $800mn GTL facility at Ras Laffan industrial city. Commercial production is expected to start in 2005. A front-end engineering and design (FEED) contract for the 34,000 b/d facility was awarded to Foster Wheeler of the UK last year.

Canada's Ivanhoe Energy recently completed a feasibility study for a plant to produce up to 185,000 b/d in two stages. Talks are under way with Conoco and Marathon.

Conoco has also proposed a GTL complex of 5,000 b/d rising to 300,000 b/d, and Marathon an 80,000 b/d plant.

Last month Qatar signed preliminary agreements with Shell for a GTL

| Country | Type of Contract | Date | Company | Field | Capex | Status |
|---|---|---|---|---|---|---|
| Oman | Concession | Mar 2001 | Maersk Oil | blocks 45 & 48 | $18mn | Exploration |
| | Production Sharing Agreement (PSA) | Sept 2001 | Novus Petroleum | blocks 15 & 47 in northern Oman | $33mn; 3 years | Exploration and production |
| | Agreement | Oct 2001 | PGS Geophysical | offshore block 41 | – | Conduct seismic survey and assess reserves over a five-year period. Right to market and promote the block in international markets. |
| | PSA | Nov 2001 | Hunt Oil Company | block 50 offshore Oman | – | Exploration and production |
| | To be finalised by Mar 2002 | | Petrogas (subsidiary of MB Petroleum) | block 5 in northwest Oman | – | To purchase JAPEX's oil concession and raise production from current 5,600 b/d to 20,000 b/d. |
| UAE | Production service contract (PSC) | Oct 2001 | Kellogg Brown & Root | EPC management work on west Super Complex located offshore Abu Dhabi | $47mn | The two-and-a-half-year-contract involves a tie-in to Umm Sharif Super Complex and 14-inch pipeline between the complex and a remote wellhead tower. |
| Yemen | PSA | Jan 2001 | Occidental (75%) and Yemen's Ansan Wikfs (25% plus 7% carried interest) | block 44 in Hadramout Province | – | Exploration |
| | PSA | Jun 2001 | Nexen | block 59 in Hadramout Province | – | Exploration |
| | PSA | Aug 2001 | PanCanadian (39% operator), Austria's OMV (33.2%), Cespa (12.8%) and Yemen Company (15%) | block 60 in northern Yemen in Rub Ali-Khali Basin | $23mn over 5 years | Exploration. Seismic survey and one exploratory well. |
| | Joint Venture | Sept 2001 | MOL Yemen Oil & Gas, and Pakistan Oilfields Ltd | blocks 48 and 49 in Sir-Sayun and Marib Basins | – | Exploration |

Table 1: Field development projects in Oman, the United Arab Emirates and Yemen

scheme based on Shell's Middle Distillates Synthesis Technology to convert gas into middle distillates such as kerosene. Once finalised it could come onstream by 2007.

## United Arab Emirates

It is estimated that in the last decade the UAE invested at least $15bn in oil projects that increased its oil production capacity by 500,000 b/d. In 2000, $2.2bn was invested in the development and maintenance of onshore and offshore oil fields through injection of water and gas. Of this figure, $1.85bn was invested in Abu Dhabi's oil sector that accounts for 85% of all the Emirates' production and 90% of its oil reserves. The UAE's expansion plans call for increasing oil production capacity to 3mn b/d within five years from the current level of 2.65mn b/d.

Abu Dhabi Oil Company (ADCO) which operates three offshore fields – Neewat Al Ghalan, Umm al Anbar and Mubarraz – now injects all associated gas from its Mubarraz offshore field and Mubarraz Island into the Umm Al Anbar and Neewat Al Ghalan fields to boost oil recovery rates. This is in addition to injections of sour gas into these fields. ADCO is planning a limited opening up of upstream oil production to foreign investors by offering a 28% stake in the offshore Upper Zakhum field with a current production of 500,000 b/d.

A recent oil field discovery on the Sharjah–Fujairah border, with potential reserves of 12.5bn barrels, could turn Fujairah into an oil producer for the first time. US company Matco Oil is believed to have signed a 39-year revenue sharing agreement with the two Emirates for the development of the field. First drilling was to have been started last December.

As part of the Vopak ENOC consortium (Vopak, Emirates National Oil Company, Vitol Group, Kuwait's IPG and the Government of Fujairah), Fujairah has been trying to turn itself into a major oil and bunkering hub. So far, the consortium has spent $124mn in increasing the capacity of the Fujairah terminal to 800,000 cm and upgrading its facilities to cater for an increased number of the larger crude ships.

Last year saw the completion of the second phase of the UAE's $1bn onshore natural gas development programme, OGD-2, at Habshan complex above the Bab oil and gas field. It included the addition of four trains to process 1bn cf/d. In September 2001 tenders were offered for FEED contracts for the addition of two more trains in phase three of the OGD programme.

UAE gas consumption is estimated to be growing at a rate of 10%/y largely due to increased use of gas in power generation and transformation of the Taweelah Commercial District into a gas-based industrial zone. Natural gas is also being used increasingly in enhanced oil recovery (EOR) schemes in Dubai.

In Abu Dhabi, gas demand has doubled over the last decade and is expected to reach 4bn cf/d by 2005. In Dubai, gas consumption is growing at a rate of between 8% and 9%/y and currently stands at 885–965mn cf/d. Dubai's own gas reserves at its onshore Margham field only meet 300mn cf/d of its needs. It has finalised a long-standing plan to invest between $40mn and $45mn in developing the gas and condensate-bearing structures at Margham. Canada's VECO Engineering was appointed last year as the project manager and a decision is expected soon on the winner of the engineering, procurement and construction (EPC) contract. The project, which is due for completion by the end of the year, will not in itself be sufficient to make up for the shortfall in gas production.

With the completion last year of the 500mn cf/d Maqta-Jebel Ali gas pipeline, ADNOC has become Dubai's largest source of supply. ADNOC subsidiary, Abu Dhabi Gas Industries Company is planning to double the throughput capacity of the line by early 2003 at a cost of between $15mn and $20mn.

Dubai gets a further 220–250mn cf/d of natural gas from Sharjah where BP operates three fields and the 800,000mn cf/d Sajaa processing facility.

Once the Dolphin gas project gets up and running, Dubai would have another source of gas supply. It has an MOU with the Offset Group for supplies of 200–700mn cf/d. Under the 1999 agreement between ADNOC and Offset Group, the Dolphin project will also supply the gas for ADNOC's contracts with Dubai. It will use ADNOC's distribution network until it develops its own network. Technical bids have already been submitted for a pipeline to transport Dolphin's gas between Abu Dhabi and Dubai.

Dolphin would leave Abu Dhabi with more natural gas for exports. Last October, Abu Dhabi Gas Liquefaction announced plans for expanding its facilities. A new LPG facility with a capacity of 1mn t/y is to be built on Das Island, with plans to add a LNG plant at a later date. The company currently operates three LNG trains with an aggregate capacity of 5.5mn t/y.

## Yemen

Yemen currently pumps 456,000 b/d but plans to increase production to 550,000 b/d by the end of 2002. Since resolving its border dispute with Saudi Arabia it has gone on the offensive with attractive financial terms to get foreign oil companies to invest in oil and gas exploration in new territories. At present, over 26 foreign companies operate in oil and gas exploration at 33 blocks and, according to the Oil Ministry, 16 are taking part in exploration activities to increase oil production to the new target.

A consortium led by Dove Energy active in the Hadramout Province at the beginning of the year brought onstream three oil wells. Its Sharyoof field on block 53 was put onstream at 13,500 b/d and is expected to reach peak production of 25,000 b/d by May 2002. The other partners in the consortium are MOE Oil and Gas (21.4%), Petrolin Trading (13.33%), and Yemen Company (25% carried interest). The block has probable reserves of between 20mn and 25mn barrels.

On block 43, First Calgary Petroleum is to proceed to the second exploration phase undertaking to drill at least two additional wells. To partner it and operate the block FCP has signed an MOU with Norway's DNO.

Australia's Oil Research and Kuwaiti KUFPEC have been awarded a contract to develop the first offshore field in Hadramout Province in southern Yemen, while Vintage Petroleum and TransGlobe Energy are to begin test production from their Harmel discovery in concession block S1 in Shabwa Province. A second appraisal well is to be drilled before the companies proceed with full development as the first well had to be acidised before it would flow at a rate of only 500 b/d.

Among the new oil and gas projects are two MOUs signed for offshore oil concessions. One is with a US consortium led by Pan American Resources Corporation together with the US Reduction Company for concession rights to blocks 16 and 62 in Gulf Aden in southeast Yemen near Mabra Coast. The consortium is to invest $33mn in two explorations phases. Block 16 is both onshore and offshore while block 62 is a frontier block in deep water. Another MOU has been signed with a joint venture of Australian and Korean companies for offshore block 60.

Onshore, Russneftegazstroy has signed an MOU for blocks 37 and 39 in Mahra Province.

Yemen is keen on marketing its LPG but, so far, negotiations with Korea, China and India have failed to bear fruit. It does not yet have any LPG projects since marketing of gas is based on finding a buyer first and then building the export related infrastructure. ●

** Part one of the series, which reviewed development prospects in Iran, Iraq and Saudi Arabia, appeared in the April 2002 issue of* Petroleum Review.

# Fischer-Tropsch – the future refinery technology?

**Fischer-Tropsch technology based on oil feedstocks may provide the answers for European oil refiners as they grapple with the problems and costs of meeting future environmental specifications for diesel and gasoline. The technology has been developed to high efficiencies and much lower costs for the production of high quality, low emissions liquid fuels using natural gas feedstocks. But it can start with virtually any hydrocarbon feed. As environmental specifications become even more stringent in the next five to 10 years, the Fischer-Tropsch oil refinery could provide the way forward, writes *Fred Thackeray*.**

A recent analysis* of European refinery prospects sheds an entirely new light on the potential of the Fischer-Tropsch technology to provide clean road transport fuels. This could be through its incorporation in oil refineries. The analysis points out that even if expected European Union (EU) specifications for 2005 can be met at acceptable costs, further tightening of requirements thereafter could prove much more demanding and costly. Although these requirements will be partly met by importing clean products supplied by the first new gas-to-liquids (GTL) plants, these will not be sufficient.

Currently, the EU specifications for 2005 have been 'agreed' but not yet finalised by the necessary joint acceptance by the Council of Ministers, the EU Commission and the Parliament. However, it is generally expected that the specifications eventually legislated will be those now agreed. (See **Tables 1** and **2**.)

After 2005, it is generally expected that 10 ppm sulfur content will be specified for both diesel and gasoline as compared with 50 ppm in 2005 (today's levels are 350 ppm for diesel and 150 ppm for gasoline). The debate is whether these levels are to be made mandatory by 2008 or 2011, or even under one proposal as early as 2005.

## Unrealised prophecies of doom

Simon Clarke, the author of Foster Wheeler's analysis has taken a careful look at the fact that the doom-laden prophecies of the European refinery industry in the late 1990s have not been realised. He points out that in 1997, when the products specifications for 2000 were first being assessed, the industry foresaw 'mass closures, unemployment, not enough time to implement large-scale hydrogen plant requirements and a bill for around 40bn Ecus.' His description of the tools used by the industry to meet the demands without such drastic results, lists:

- Crude oil selection
- Hydrogen management
- End point management (cut backs)
- Intermediate swaps
- Clever blending
- Moderate revamps

He draws attention to the fact that many refiners have changed their crude slate towards lower sulfur crude. The quantities of North Sea crude used in European refineries has been 'dramatically increased' as compared with the mid-1990s, whilst imports of high sulfur Middle East feedstocks from the Middle East have dropped correspondingly. But for 2005, as shown in **Table 2**, a much lower sulfur specification of 50 ppm is expected. To meet this requirement crude selection may no longer be an option. 'Very few crudes in the world,' Clarke says, 'can make 50 ppm gasoline without some form of hydrotreatment.'

Another option that proved valuable in meeting year 2000 specifications was the availability of incremental hydrogen by managing existing hydrogen resources. This possibility has now been virtually exhausted, leading to a steady increase in the number of planned new hydrogen plants.

However, the main tool which European refiners used to meet specifications was end-point management. This comprised fractionating out the heavier products in which the highest sulfur content is usually concentrated. The procedure requires virtually no investment but has the effect of some reduction in the yield of final lighter products. An example is cited by Clarke of how this was done in the UK following the introduction of a tax incentive for low sulfur diesel. The entire UK diesel pool was switched to 50 ppm diesel, whilst the heavy tail of the diesel 'was routed to heating gasoil and to fuel oil' [swamping the EU market in the process]. 'This gives us a clue,' he says, 'to a potential strategy refiners might use for 2005 compliance, provided a market can be found for the unwanted heavy tails.' Also, if sulfur content is further reduced after 2005, to achieve this would prove unattractive in view of the increasing reduction of product diesel.

A fourth means followed in policies to meet 2000 specifications is defined by Clarke as 'intermediate swaps.' By

| | Current | Agreed**2005 |
|---|---|---|
| Sulfur (wt ppm) | 350 max | 50 max |
| Density (kg/cm³) | 845 | 845 |
| D-86 distillation 95% (°C) | 360 max | 360 max |
| Cetane number | 51 min | 51 min |
| Polyaromatics (wt%) | 11 max | 11 max |

***Agreed but still under discussion prior to legislation*

**Table 1: Diesel specifications**
*Source: Foster Wheeler (February 2002)*

| | Current | Agreed**2005 |
|---|---|---|
| Sulfur (wt ppm) | 150 max | 50 max |
| Benzene (vol%) | 1.0 max | 1.0 max |
| Aromatics (vol%) | 42 max | 35 max |
| Olefins (vol%) | 18 max | 18 max |
| E100 (vol%) | 46 min | 46 min |
| Oxygen (wt%) | <2.7 max | <2.7 max |

***Agreed but still under discussion prior to legislation*

**Table 2: Gasoline specifications**
*Source: Foster Wheeler (February 2002)*

this he means rationalisation measures leading to opportunities where refiners view all their assets as a single refining block and are more willing to move intermediate products around their refineries to optimise revenue.

However, although hitherto successful, Clarke believes 'the methods employed by refiners thus far are not going to work much longer.' Indeed, in some cases, such as the reforming of FCC (fluid cat cracking) naphtha, existing methods have already reached the end of what they can achieve and additional investment is being made in extra advanced hydrotreatment facilities. If there are further curbs on aromatics and benzene in gasoline after 2005, these will rob the refinery of its sole source of self-generated hydrogen from the naphtha reformer at a time when increased hydrotreatment is needed to meet more stringent diesel specifications.

A further important aspect of these developments is that EU refineries export products and intermediates to the US and southeast Asia and will be relying on these markets to take unwanted lower quality products in order to maintain their refinery margins. However, higher specifications are now being imposed also in the US and will be imposed within a few years in southeast Asia, ruling out this solution.

## Future refining strategy

In the light of the above considerations, Clarke claims that 'the question the European refiner must answer is whether to invest to meet the specifications of the day one by one or invest in making the refinery "future proof" for several years to come (or longer), whilst at the same time ensuring product slate flexibility due to the changing market.' His answer is to incorporate Fischer-Tropsch technology in the refinery.

The feedstock will be crude oil that is gasified to produce synthesis gas (syngas). Sulfur and nitrogen will be removed from the syngas, a simpler and cheaper process than removing them 'from the complex molecules in the conventional oil stream,' according to Clarke. The syngas is fed into the Fischer-Tropsch unit for synthesis into paraffinic hydrocarbons, which are then upgraded to produce high-grade diesel and gasoline.

This route to meeting future specifications for road transport fuels would bring with it some other significant benefits, Clarke claims, including:

- Heavy metals would not be accumulated in the heaviest products but would instead be rejected from the gasification process as a dense vitreous solid that could be landfilled or processed for metals recovery.
- Production of carbon dioxide from the plant 'can be in very pure form,' allowing cheap application of disposal technologies.
- The high performance qualities of the fuels would allow next generation of engine development to progress without being limited by the qualities of conventional refinery products.
- The refinery would be ideally suited to making the products required for fuel cells when these arrive in future.

To these benefits one could also add that the diesel produced would be above 70 Cetane, far higher than is, at present, obtainable or specified by conventional refineries.

It is a fascinating possibility that the Fischer-Tropsch process, discovered nearly 80 years ago, could now prove to be the solution to meet today's environmental demands for clean fuels in face of increasingly sulfurous crude supplies. Simon Clarke and Foster Wheeler could be onto something very important. ●

** 'Managing the Molecule II,' presented by Simon Clarke, Manager Gas to Market Technology, Foster Wheeler, at Petrotech Conference in Bahrein, November 2001.*

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# Southern Europe turns to North Africa for gas

**North Africa is an increasingly attractive source of relatively cheap natural gas for countries bordering the northern shores of the Mediterranean. Demand for gas in these countries, as elsewhere in Europe, is expected to increase substantially as market liberalisation and environmental policies that favour the use of gas for electricity generation kick in, writes *Judith Gurney*.**

A recent IEA (International Energy Agency) analysis of new gas supply for southern Europe indicated that, taking both production and transport costs into account, gas from North Africa – especially pipeline gas from Algeria and Libya – would be cheaper than gas from elsewhere. North African oil is also comparatively cheap, but reserves lie mostly in Libya where exploration and development is proceeding very slowly.

Algerian gas reserves are abundant and those of Libya and Egypt have considerable potential. For their part, the governments of all three countries are making efforts to be more accommodating to foreign investment and to promote export programmes. A relatively new Egyptian law allows the export of gas, while both Algeria and Libya are currently drafting new legislation with better terms for foreign companies involved in the exploration and production of oil and gas. In addition, a new Algerian law expected to enter in to force soon will remove government functions from state-run oil and gas company Sonatrach and replace production sharing upstream with a tax and royalty system. The contents of a proposed Libyan law are still unknown. Tunisia and Morocco have also made overtures, but neither country is believed to have significant oil or gas potential – except possibly offshore.

## Algerian gas

Algeria has the largest natural gas reserves in North Africa, with its giant Hassi R'Mel gas field functioning as a hub for gas gathering and pipeline transport to the coast. LNG exports began in 1964, for many years on a small scale due partly to the government's pricing policies. Pipeline exports to Italy via Tunisia and Sicily began in 1983 through the Trans-Med pipeline, whose capacity now stands at 24bn cm/y. The 7.2bn cm/y Maghreb–Europe GME pipeline, which opened in 1996, sends gas through Morocco and across the Straits of Gibraltar to Spain. Its capacity could be expanded by 8bn cm/y with additional compression.

The government recently announced goals of increasing gas exports from the current 60bn cm/y to 65bn cm/y by 2005, and to 85bn cm/y in the near future. An important source for increased gas production will be the In Salah project in central southern Algeria, currently under development by a partnership of BP and Sonatrach. Development costs, including a 460-km pipeline from In Salah to Hassi R'Mel, are estimated at around $2.7bn, with 65% of these costs borne by BP. First output is expected in 2003 and the project expects to meet southern European gas contracts of 9bn cm/y for up to 15 years. Total reserves are estimated at 7.5tn cf net sales, possibly more.

In order to increase its gas exports, Algeria is considering the construction of a second pipeline to Italy running through Sardinia and Corsica. Although such a line would reach customers in Italy's industrial north more directly than the existing Trans-Med pipeline, and could be linked to the French market, its benefits would have to be weighed against the much lower cost of expanding further the capacity of the Trans-Med line.

Expansion of the capacity of the Mahgreb–Europe GME pipeline could face difficulties due to the Moroccan Government's continuing friction with Algeria over the political status of the Western Saharan territory. A proposal to circumvent this difficulty and increase exports to the Iberian peninsular involves a pipeline from El Aricha, at the Algerian end section of the GME line, to the Algerian seaport of Beni Saf and a 200-km subsea line from Beni Saf to Almeria in Spain.

## Libyan gas

The development of Libyan gas reserves has been minimal until recently due to a small domestic market and the lack of means for large-scale export. Estimates of Libyan gas reserves vary, ranging from the 46.4tn cf (1.31tn cm) of the *BP Statistical Review* (see **Table 1**) to 70tn cf (1.96tn cm) by some Libyan officials.

Agip, the Eni subsidiary, dominates the Libyan gas scene. Its $5.5bn Western Libya gas project is scheduled to produce 10bn cm/y, exporting 8bn cm/y of this output by pipeline to Italy, with start-up scheduled for late 2003 or early 2004. In partnership with the Libyan National Oil Company, Agip is also developing offshore gas fields north of Tripoli and the onshore Wafa field that lies some 550-km southwest of Tripoli in the Ghadames Basin close to the Algerian border. Output from these fields will go to a coastal gas processing plant at Mellita, and from there through a 600-km pipeline across the Mediterranean to Sicily. Agip has signed a 24-year take-or-pay contract to supply 4bn cm/y of Libyan gas to Italian energy company Edison.

There are unlikely to be many opportunities for foreign companies other than Agip to develop large-scale Libyan gas projects. Agip is the largest foreign operator in Libya and has been producing from Libyan oil fields for over 40 years.

## Egyptian gas

Egypt has been producing small amounts of natural gas for a number of years but it was only after new technologies led to the discovery of significant deepwater fields that exports became feasible. The *BP Statistical Review* lists Egyptian gas reserves as 35.3tn cf; the Egyptian Government as

55tn cf.

The bulk of Egypt's gas is produced by foreign oil and gas companies dominated by BG, Eni, BP and Shell. BG was awarded the Rosetta and Western Delta Deep Marine concessions in 1995 and its subsequent $3bn exploration and development programme has yielded discoveries with more than 10tn cf of gas. The offshore Rosetta project has been delivering gas to Egypt's domestic gas grid since last year, with an output of 200mn cf/d – this is scheduled to increase to 275mn cf/d in July 2002.

The Western Delta deepwater project is designed to export output through a LNG plant to be constructed at Idku, 50-km east of Alexandria, by a joint venture consisting of the BG Group and Edison International of Italy, along with state-owned Egyptian General Petroleum Company and the Egyptian Natural Gas Holding Company. BG and Edison recently signed an $8bn, 20-year agreement to supply 3.6mn t/y of LNG to Gaz de France that is taking a 5% share in the project. The first train of the LNG plant is expected to be in operation in mid-2005 with a capacity of 3.6mn t/y. BG believes that the deepwater reserves are sufficient for a second LNG train.

Shell International, in partnership with the Egyptian General Petroleum Company, is considering the construction of a $1.7bn gas-to-liquids (GTL) plant, with start up in 2004/2005. A second LNG project is under consideration for the Egyptian port of Damietta, with Spanish Union Fenosa the main sponsor. Eni and Shell have also talked about LNG projects.

Export pipeline projects are also under consideration. The Egyptian Government has signed an agreement to consider the construction of a pipeline to transport Egyptian gas to Jordan, and has signed a Memorandum of Understanding regarding the pipeline export of Egyptian gas to Lebanon.

**Oil**

| Country | Proved reserves end 2000 (,000 b/d) | R/P ratio | Production (,000 b/d) | Change 2000 over 1999 |
|---|---|---|---|---|
| Algeria | 9.2 | 17.4 | 1,580 | 4.8% |
| Egypt | 2.9 | 10.4 | 795 | –4.5% |
| Libya | 29.5 | 55.3 | 1,475 | 3.8% |
| Morocco | + | n/a | n/a | n/a |
| Tunisia | 0.05 | 10.7 | 3.7 | –6.0% |

**Natural Gas**

| Country | Proved reserves end 2000 | R/P ratio | Production (bn cm/y) | Change 2000 over 1999 |
|---|---|---|---|---|
| Algeria | 159.7 | 50.6 | 89.3 | 4.9% |
| Egypt | 35.2 | 55.2 | 18.0 | 23.1% |
| Libya | 46.4 | n/a | 5.5 | –0.7% |
| Morocco | + | n/a | n/a | n/a |
| Tunisia | n/a | n/a | n/a | n/a |

*+ Insignificant reserves*

**Table 1: North Africa oil and natural gas**
*Source: BP Statistical Review of World Energy, June 2001*

## Libyan oil

The most significant oil reserves in North Africa lie in Libya, but it is not clear when and how fast these will be developed. In the absence of official

Libyan data, the *BP Statistical Review* for many years has listed Libya's proved oil reserves as 29.5bn barrels. A recent Libyan estimate of 82bn barrels of undiscovered reserves in the currently producing Sirte and Murzuk Basins and offshore areas is seen by many as plausible, although its estimate of 25bn barrels of undiscovered reserves in the Kufra and Cyranaic areas is regarded as unrealistic.

The central Sirte Basin, the main area currently under production, is believed to hold plentiful undiscovered reserves and has processing and pipeline infrastructure constructed by major oil companies to export the output of their giant field discoveries of the 1960s. After these companies left Libya following the nationalisation and expropriation of the early 1970s, the Libyan National Oil Company (NOC) became operator of the Sirte projects. Short of funds, NOC has concentrated on keeping existing fields in production, rarely investing in exploration and development.

A few companies, including Agip, Wintershall, Veba, OMV and TotalFinaElf, stayed the course after the exodus of the majors, maintaining equity in fields held in conjunction with NOC. Repsol, whose interests lie in the remote Murzuk region, Lasmo and Lundin were later entrants.

The last few months have seen changes in this group of Libyan players. Eni's takeover of Lasmo increased Agip's reserves by the estimated 500mn barrels of Lasmo's Elephant field which is currently under development. PetroCanada has become an important player after having acquired the Libyan interests of Lundin, including its En Naga development, and, more recently, the upstream assets of Veba. PetroCanada now has eight Libyan concessions, mainly in the Sirte Basin, plus equity in pipelines and export infrastructure. Unlike its southern neighbour, Canada seems keen to get involved in the Libyan oil potential. This January, David Kliffone, Canadian Minister of State for Africa and Latin American affairs, visited Libya to open a Canadian embassy in Tripoli.

The lifting of UN sanctions in 1999 was expected to herald a burst of exploration activity in Libya but, so, far this has not happened. A new Libyan hydrocarbons law, designed to offer more advantageous terms than the current production sharing agreement, has yet to be issued, nor has a broad new licensing round occurred – although discrete areas have been offered by the government and agreements made with interested companies regarding these.

There may soon be significant new opportunities for European companies as the Libya Government is stepping up pressure on the American companies to take an active part in the Sirte fields still nominally in their name or to modify their claims. Wintershall is reported to have requested permission to drill in the fields held by the Oasis Group of Conoco, Amerada Hess and Marathon. If Libya were to transfer NOC drilling rights to Wintershall and make it chief operator of these fields, the Oasis Group, if it were to return later (it can only do so if the US Government ends sanctions) would face costs of using pipelines and other equipment installed by Wintershall.

Though the US Government still remains firm regarding continuing sanctions, the US State Department is reported as having given the Oasis companies permission to renegotiate their oilfield contracts with Libya.

## Algerian and Egytian oil

Although Algeria and Egypt are believed to hold far fewer undiscovered oil reserves than Libya and need

*...continued on p33*

# The future is bright for bioethanol

**Speaking for the Opposition in a Parliamentary debate on 'non-food crops' this past January, James Paice MP (South-East Cambridgeshire) said that they would reduce the duty on bioethanol road fuel to that of LPG, thereby making it comparable in price to petrol and diesel. This follows the decision of the European Commission (EC) to propose Directives allowing differential tax concessions and requiring Member States to ensure that bioethanol, together with bio-diesel, accounts for 6% of all transport fuels sold by 2010. *Brian Warshaw* reports.**

When, in 1908, Henry Ford unveiled the Model T car, it was his expectation that it would run on ethanol made from renewable biological materials. He subsequently backed this judgement by investing in a fermentation plant to manufacture 38,000 l/d of such fuel. Marketed under the name *gasohol*, over 2,000 service stations in the US Midwest sold this ethanol which was manufactured from corn (maize). However, low gasoline prices forced the plant at Atchison, Kansas, to close in the 1940s.

Today, Brazil, Canada and the US are well versed in the production and use of bioethanol. Typical blends at the pump are designated E10, which is 10% ethanol and 90% petrol, with other blends ranging from E85 to E100. The E10 blend essentially uses ethanol as a substitute for the oxygenate additive methyl tertiary butyl ether (MTBE) and can safely be used in all modern vehicles. In the higher volume ethanol blends, the small amount of petrol in the blend is used to enhance the starting capability of the engine that, apart from a higher compression ratio, is comparable to a standard vehicle engine. For equivalent energy values, 1.5 litres of E100 is required to replace one litre of standard grade petrol.

## Boosting bioethanol production

Soaring crude oil prices in 1973 caused the Brazilian Government to create the National Alcohol Programme to encourage bioethanol production and ensure that all petrol sold in the country was blended with 22% anhydrous ethanol. However, during the 1980s, a combination of poor distribution and industrial disputes resulted in bioethanol becoming uneconomical and, by 1997, only 1% of new cars used it.

More recently, the government has sought to encourage 200,000 taxis, along with 80,000 of its own vehicles, to be replaced with those operating on E95. It has negotiated for local car manufacturers to raise the number of new vehicles operating on E95 from 1,200 in 1998 to 150,000 during the early years of the new millenium, while increasing the standard blend to 26% bioethanol. Bioethanol processed from sugar cane currently fuels the needs of more than 40% of the country's transport system.

More than 1.5bn US gallons of bioethanol is produced each year in the US, mainly from corn but also from rice hulls, cheese whey and beer waste. In New York, Masada Resource Group is intending to build a $130mn waste disposal and recycling facility which will turn an estimated annual 230,000 tonnes of solid waste and sludge, into 9.5mn US gallons of bioethanol. The bioethanol industry is being supported by a federal tax subsidy that ends in 2007.

Meanwhile, Canada announced in 2000 that it was intending to raise indigenous production of bioethanol to 750mn l/y, most of it derived from the fermentation of corn.

Within Europe, Sweden is the only country that has seriously considered bioethanol as a substitute for petrol and diesel. Some 100 heavy-duty vehicles, 600 cars and 300 buses currently run on the fuel in Sweden. The bioethanol blend E85 is available from some 50 service stations at 37 locations around the country, with prices at the pump for ethanol E85 around Swedish Kroner (SEK) 8.43 per litre, diesel SEK 8.40, and unleaded 95 octane petrol SEK 8.95.

Since 1990 Stockholm Transport (SL) has built up an ownership of around 250 Scania buses operating within the City, about half of them articulated and capable of carrying 120 passengers. The engines were not designed for ethanol but are a standard diesel engine with adjustments and, as a consequence, maintenance and replacement engines are more common than with a diesel-fuelled fleet. Engine modifications include the compression ratio being raised from 18:1 to 24:1; an enlargement of the injector orifices; a larger fuel pump with changes to the injection timing; and substitute gaskets and filters that are alcohol resistant.

Jonas Stromberg, SL's Environmental Manager, said that over the period that the buses had been operating, the City's air quality had greatly improved with vast reductions in carbon dioxide ($CO_2$) and oxides of nitrogen ($NO_x$). Additional annual operating costs are between SEK 100,000 and 200,000 (euros 11,000 to 22,000) per vehicle, he said, with most of this going on fuel which has to be imported. He anticipated that SL's demand for between 10,000 cm and 15,000 cm/y of E85 fuel would soon be met by Swedish bioethanol supplies.

Beyond providing a small amount of tax relief on pilot plants, the UK Government has done nothing to encourage the use of bioethanol as a transport fuel. In contrast, Italy's national agricultural plan includes the production of bioethanol and ethyl tertiary butyl ether (ETBE), derived from combining bioethanol with isobutylene, which might be a possible replacement for jet fuel. In Spain, Repsol is using in excess of 220mn litres of locally processed grain bioethanol as a component in its high-octane petrol.

## Environmental benefits

Studies undertaken in Canada suggest that E85 fuel can reduce greenhouse emissions by over 37%, while even E10 shows reductions of nearly 4%. Based on the use of E85 fuel, carbon monoxide (CO) is reduced by between 25% and 30%, $NO_x$ would show a decrease of up to 20%, and $CO_2$ emission levels are eliminated to the extent of the included ethanol. Volatile organic compound emissions would decrease by around 30%, according to the research, while carcinogenic aromatics would be reduced by a significant 50%.

Feedstock for this automotive fuel is all around us. Householders take it in vast quantities to collection points in the form of waste paper; rural dwellers see the crops growing in the fields. Bioethanol is already widely produced from a variety of starch and sugar renewable plants – wheat, barley, sugar beet and cane, potatoes, corn, and sweet sorghum. However, the medium and long-term future will probably depend upon the development of commercial facilities for the biological enzymatic processing and fermentation of lignocellulosic biomass such as wood, bagasse, straw, flax, hemp, nettles and waste paper.

Several commercial processing and fermenting technologies are currently available, using either diluted or concentrated acid, or enzymes. The technology for converting energy-crops or lignocellulosic biomass is essentially the same, and a typical continuous process for producing grain alcohol would incorporate four basic steps:

- milling,
- starch conversion,
- fermentation, and
- distillation and dehydration.

Dry milling involves passing the grains through hammer mills to reduce them to 1-mm diameter particles. The introduction of enzymes causes the long starch molecules to split into shorter dextrines that are then converted to sugars, after which the feedstock is cooled and fermented by the addition of yeast to develop into alcohol and $CO_2$. This alcoholic mash is preheated and passed through a degassing column where the $CO_2$ is removed, and then into a distillation column where the alcohol and stillage are separated. The raw alcohol at this stage is not excessively purified, but is strengthened to 96% and dehydrated with azeotropic distillation or via a molecular sieve.

Agroetanol, a Swedish producer of bioethanol on Händelö Island, near Norrköping, produces 50,000 cm/y of bioethanol, all of which is blended with petrol and sold as E5. As bioethanol attracts a zero rate of tax, E5 sells for the same price in Sweden as unleaded 95 octane petrol. The company claims that 2.65 kg of wheat produces 1 litre of ethanol, 0.85 kg of high protein cattle feed (distiller's dry grains and solubles – DDGS), and 0.7 kg of $CO_2$ which can be sold for carbonated drinks, cooling groceries and for water treatment plants.

## A case of economics

It is difficult to determine the true economics of converting energy-crops or biomass to ethanol. Each side of the debate can find studies that support their case, although most would agree that in terms of energy inputs and outputs, bioethanol, irrespective of the crop used as a feedstock, indicates an energy gain. What is indisputable is that there are political and environmental imperatives for a reduction – or at least a non-growth – in the use of hydrocarbon fuels.

The US has between 20mn and 30mn hectares of set-aside land, while in the EU there are currently some 5.6mn hectares of land that could be used to grow energy-crops, which would offer the potential for much needed rural development and employment.

## Looking to the future

The visionary who brought the world the first mass-produced motor car may have been a century too soon in his prediction for this replacement for gasoline.

Growing recognition that petroleum products are a major factor in producing greenhouse gases, together with the recent adoption of the Kyoto Treaty, should help fuel the growth of a bioethanol industry. However, such growth will be reliant on a favourable fiscal policy at the pumps and political action to ensure the wider use of bioethanol throughout the developed world, especially while crude oil prices remain so low by historical reference. ●

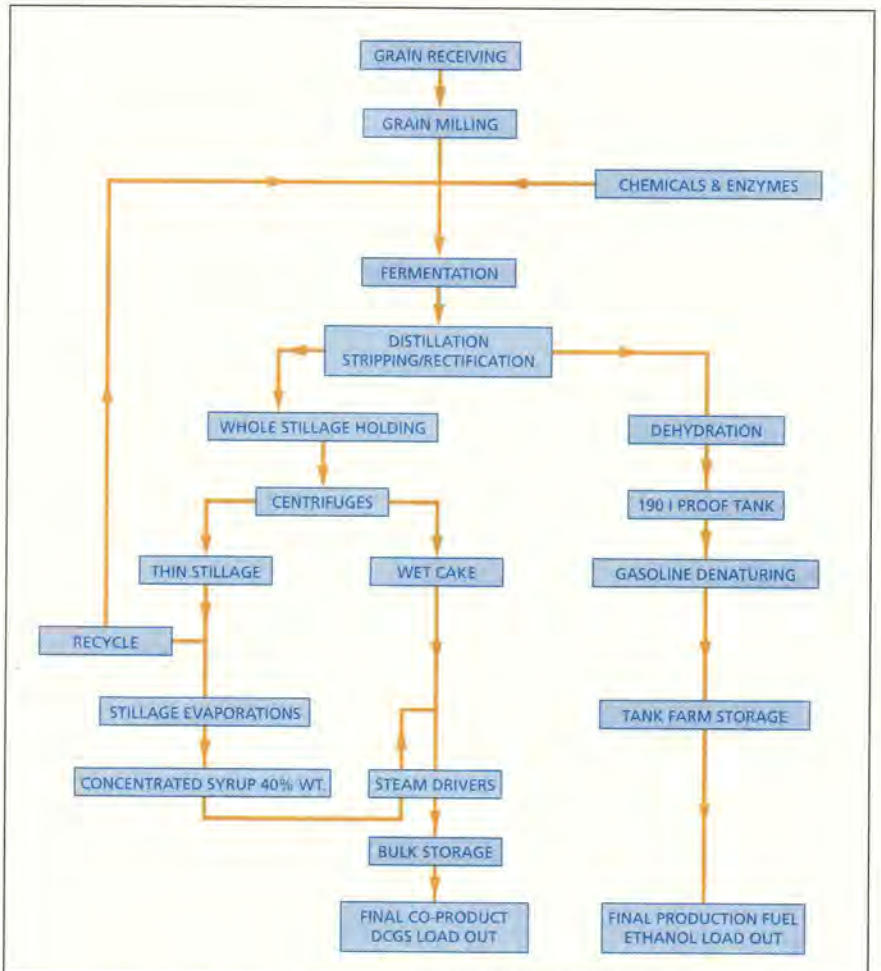


**Figure 1: Process flow diagram of a typical 300,000 l/d bioethanol plant designed by Vogelbusch of Austria.**

# Biodiesel makes it into the UK market

**GlobalDiesel, a 5% biodiesel blend, was launched on the UK market this February by Green*ergy*, a UK independent supplier. The blend is marketed directly to large end-users – with Kingston-upon-Hull City Council being the first – and is supplied with a certificate that details the reduction in emissions compared with the alternative use of ultra-low sulfur diesel. *Brian Warshaw* reports.**

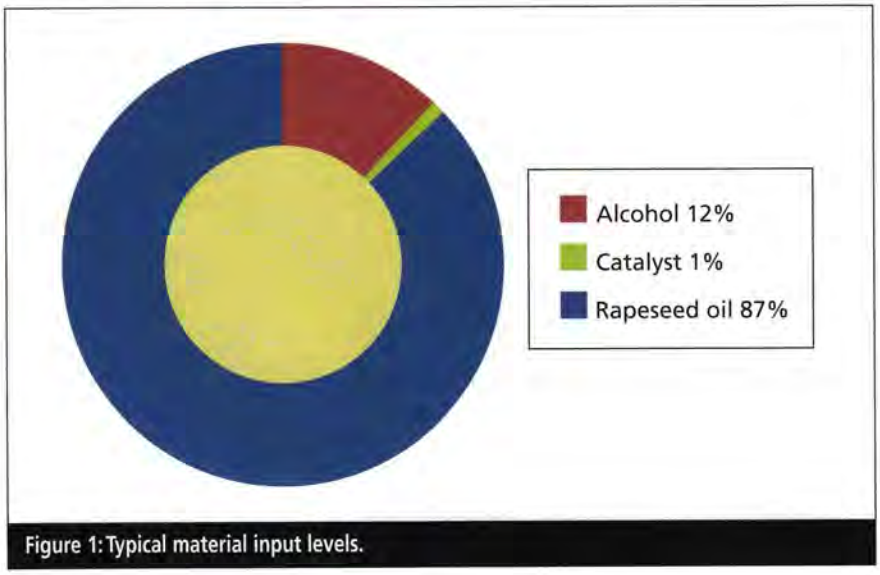


Figure 1: Typical material input levels.

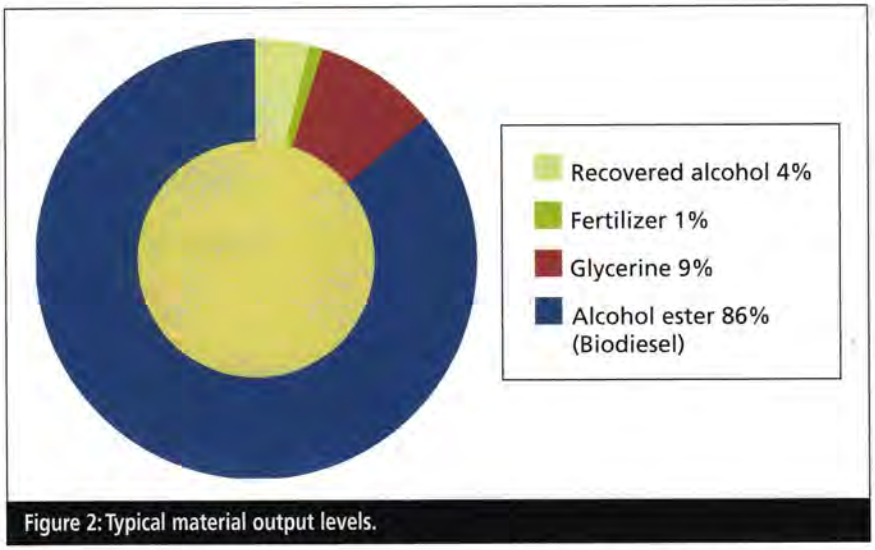


Figure 2: Typical material output levels.

Europe leads the world in the production of biodiesel that, at around 700,000 t/y, is almost 20 times greater than that of the US. This is targetted to rise to 2.3mn tonnes by 2003 and 8.3mn tonnes by 2010. Despite this, no commercial production of biodiesel is planned for the UK.

For the production of biodiesel, most commercial producers use a process known as *transesterification*. The process involves reacting an alcohol with vegetable oil or rendered animal fats in the presence of an alkaline or acidic catalyst, whereby esters are produced. The ester depends upon the alcohol used. For example, methanol produces methyl ester; ethanol gives rise to ethyl ester. The process reduces the viscosity of the original oil to less than double that of diesel in its ester formulation. **Figures 1** and **2** show typical material inputs and outputs using transesterification.

Rapeseed oil is by far the most commonly used feedstock, representing 84% of the plant oils, but sunflower, soyabean and white palm oils are also processed. During the period 1998–1999, when oilseed prices were high and hydrocarbon prices were low, other feedstocks were investigated. In Austria, recycled frying oil from the fast-food outlets of McDonald's was transesterified into fatty-acid-methyl-ester (FAME) and successfully used as 100% FAME in the buses of the city of Graz. Other waste cooking oils and fats originating from vegetables and animals have been used successfully, albeit with some restrictions such as winter use and oil stability.

Recent agricultural research should lead to a reduction in the price of the basic feedstock for biodiesel. A new variety of rapeseed – Canola – has raised the content of mono-unsaturated oleic-fatty-acid from 60% to 87%, while farming techniques have led to oil yields on farms in northern Germany achieving 2.9 t/hectare.

## Modern-day processing

A modern production plant accepts a multi-feedstock that enables it to switch its blend recipes, daily if necessary, due to unavailability or cost changes in raw materials. Processing improvements have increased the yield achieved by transesterification from an initial 85–95% to 98–100% ester. A simplified process flow diagram is shown in **Figure 3**.

When methanol is used as the acid, powdered caustic soda is introduced as the catalyst before being combined with the plant oil in a reactor, where it is maintained at approximately 66°C and vigorously agitated for between one and eight hours. The methanol converts the oil to methyl ester and glycerine, while the catalyst reacts with the free fatty acids to form soap, as well as catalyse the reaction. If the methanol

is replaced with ethanol as the acid, with sodium methoxide as the catalyst, the process becomes even more sustainable as ethanol can be produced from biomass.

The mixture is transferred to a gravity separator where differences in density between the methyl ester and the remaining mixture separate, and the glycerine and soap are drawn off to a neutralising vessel. Hydrochloric acid neutralises the unused caustic soda and soap, and the crude glycerine is despatched to storage. If potassium hydroxide is used as the catalyst and phosphoric acid as the neutraliser, sodium chloride is created, which can be sold as fertiliser.

Transferred from the separator to a washing vessel, the methyl ester is gently cleaned in warm water to remove any residual catalyst and soap. It is dried and sent to storage ready for use as a transport fuel.

## Niche marketing

Even with the ambitious targets set for European production, it is estimated that only 8% of current diesel usage could be satisfied by biodiesel production. In a recent presentation made by Werner Körbitz* of the Austrian Biofuels Institute, it was suggested that the marketing of biodiesel might be more sensibly directed at niche markets, rather than as a replacement for fossil diesel. In particular, he pointed towards its use in drinking water zones, and lakes and waterways, where the biodegradability and non-toxicity of biodiesel could command a premium price.

* *'New Markets for Biodiesel in Modern Rail Diesel Engines', Altener Seminar, University of Graz, Austria, 22 May 2000.*

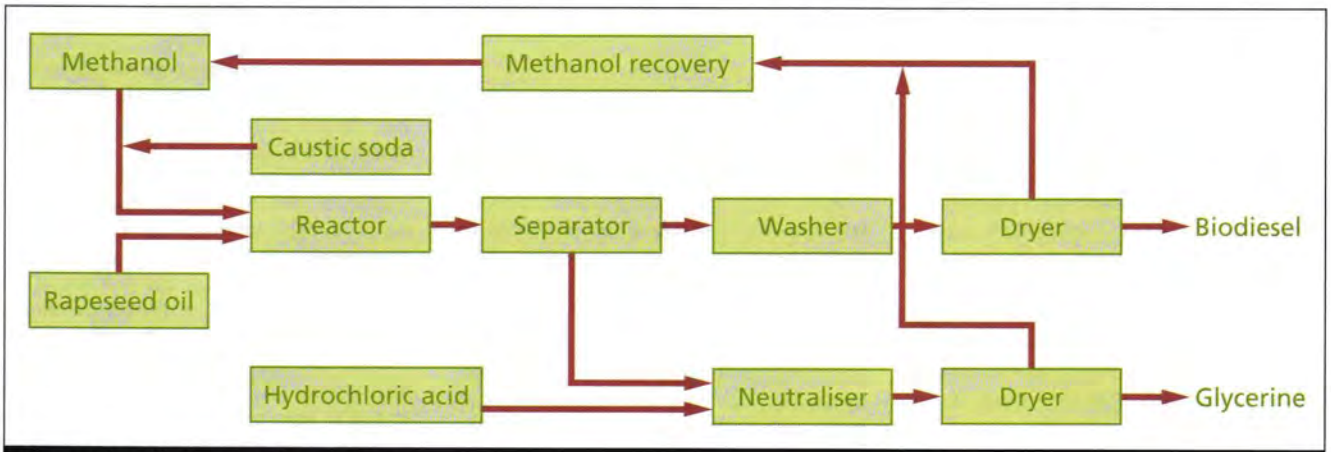


Figure 3: Simplified process flow diagram.

# Meeting Mexico's growing energy demands

**Shell Gas & Power has thrown its hat into the ring in the fight to provide a major liquefied natural gas (LNG) receiving terminal for Baja California to meet the growing energy demands of the Mexican peninsula. *Simeon Tegel* reports.**

The proposed £350mn project to dock and re-gasify up to 1.3bn cf/d of gas is the fourth such plan to be unveiled for Baja California's rocky northern Pacific coast, near the US border. All are strategically placed to provide power to the giant Californian market as well as meet local needs. Currently, the only LNG terminal on the North American Pacific coast is in Alaska.

The other proposals have come from three consortia led respectively by San Diego's Sempra Energy and two firms based in Houston – El Paso Corporation and Marathon Oil. Analysts believe the market will not support more than two of the projects, leaving the rival groups racing to gain approval from the authorities and complete construction around 2005.

## Shell plans

According to John Chadwick, Director of Shell Gas & Power, the global connections of parent Royal Dutch/Shell Group gives its plan advantages – such as assured supplies of gas from the eastern edge of the Pacific rim and economies-of-scale, with Shell's terminal having the largest capacity of the competing plans. 'We were the fourth to announce but we are not the fourth project, he told *Petroleum Review*. 'We believe we are well positioned.'

Shell's plan is to supply the Mexican market first, including the numerous US assembly plants in the nearby Mexican border city of Tijuana, and to send any surplus through a 55-mile pipeline to California. 'We would have great difficulty if we were just relying on customers north of the border,' said Chadwick, denying claims that the main customer would be California where tough environmental legislation makes it harder to get permission for infrastructure projects than in Mexico.

Shell's strongest competition is likely to come from Sempra, which wants to build a mile-long pier and a reception terminal with capacity for 1bn cf/d of gas from Bolivia. Sempra already has a strong presence in the region. It owns and runs three natural gas distribution networks, a pipeline between San Diego and a Mexican power plant. The company is also building another 215-mile pipeline between Arizona and Tijuana, as well as a 600-MW power plant.

'We think we have distinct advantages,' said Sempra spokesman Michael Clark, who also expects most of Sempra's gas to be consumed primarily by the Mexican rather than US market. 'We are a LNG pioneer in the area and already have a reputation as a good neighbour.'

Mexico's energy sector remains dominated by Petroleos Mexicanos, or Pemex, the state-run monopoly that has a constitutionally-shielded exclusive right to develop all of Mexico's sub-soil energy sources. However, in 1995 natural gas storage, transmission and distribution was opened by the government to private and foreign firms.

Those new laws did not include LNG and at the time of writing Mexico's energy regulatory commission, the CRE, was on the point of publishing revised rules for the sector. However, CRE spokesman Victor Ochoa said all four Baja California projects would be given the green light if they met environmental and legal criteria, regardless of the fact that the market would only support two projects. 'Each company can do its own market studies,' Ochoa said.

## Tougher test

But a tougher test is likely to be posed by state and municipal authorities, which must also give their permission.

Chadwick has already met with State Governor Eugenio Elorduy Walther, and says the Shell plan has been 'warmly welcomed.' Nevertheless, local environmentalists are starting to muster while the business community is keen to protect Baja's pristine coastline, a major tourist attraction.

Shell's plan to build its terminal inland in the town of Ensenada may help it circumvent such concerns. Meanwhile, El Paso Corporation's plan to build its terminal on the coast at Rosarito has already run into problems after the local council refused to grant a land use permit. Governor Walther also appeared to give the thumbs down to the El Paso project when he noted in a radio interview that the Mayor of Rosarito would be unlikely to approve a terminal 'on his own doorstep.'

## Energy crisis

Mexico, like California, is facing an energy crisis. With Pemex struggling to meet the rising demand, wildly fluctuating LNG prices here appear to have failed to deter foreign investors. Since 2000, prices have soared to around £7/mn BTU before falling back to around £3/mn BTU.

The Energy Ministry predicts national demand for LNG will rise by more than 8% a year, hitting 9.45bn cf/d in 2010, nearly 2bn cf/d more than national production will provide. Electricity plants are expected to consume some 42% of the total.

George Baker, Director of Houston-based consultants Mexico Energy Intelligence, said Baja California's competing LNG projects demonstrated how Mexico's energy market had stalled while President Vicente Fox's Government looked unsuccessfully for ways to radically modify Pemex and impose market discipline on the oil giant. He also suggested the terminals would mainly serve the US. 'It is interesting that the hottest competitive point in Mexico doesn't have anything to do with Mexico,' Dr Baker told *Petroleum Review*. 'Basically, the industry is saying we give up on trying to compete with Pemex or having anything meaningful in Mexico.'

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# Cetane number and cetane index relationship

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

The Institute of Petroleum (IP) runs a monthly diesel fuel engine correlation scheme under which approximately 25 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 larger data sets. This review looks at two ranges of data – the year 2001 and the five years covering 1997–2001. The former study period provides information on more recent fuels, whilst 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 IP.

## Outliers and unusual samples

The data were first checked for unusual individual results. Any outliers detected by Hawkins' test according to IP 367/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 then used to provide estimates of the 'true' values of sample CN, density and distillation recovery temperatures. The last two parameters were then used in IP 380/EN ISO 4264 to derive the CI values.

Samples that were well outside the scope of IP 380/EN ISO 4264 were excluded from the analysis. For example, 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 mean bias.
- A trade-off between mean bias and bias SD, as measured by the root mean square error ($RMSE_b$), ie the 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 ($RMSE_r$) 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 CN=CI slope or a large scatter of CI about CN. Furthermore, a small $RMSE_r$ could hide either 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 $RMSE_r$ 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 (iii) $RMSE_r$ 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 $RMSE_r$, 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 2001 data, and **Figure 2** shows the 'best-

| Year | Bias | | | CN/CI correlation | Bias slope | Trend line $RMSE_r$ | CN range | |
|---|---|---|---|---|---|---|---|---|
| | Mean | SD | $RMSE_b$ | | | | Min | Max |
| 1997 | -0.3 | 1.6 | 1.6 | 0.87 | 0.82 | 1.6 | 45.7 | 54.7 |
| 1998 | 0.1 | 2.0 | 2.0 | 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 |
| 2000 | -0.6 | 0.7 | 0.9 | 0.96 | 0.88 | 0.7 | 47.8 | 56.4 |
| 2001 | 0.0 | 1.2 | 1.2 | 0.96 | 0.85 | 1.0 | 45.5 | 54.7 |
| 1997–2001 | -0.1 | 1.3 | 1.3 | 0.90 | 0.90 | 1.3 | 42.0 | 57.0 |

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

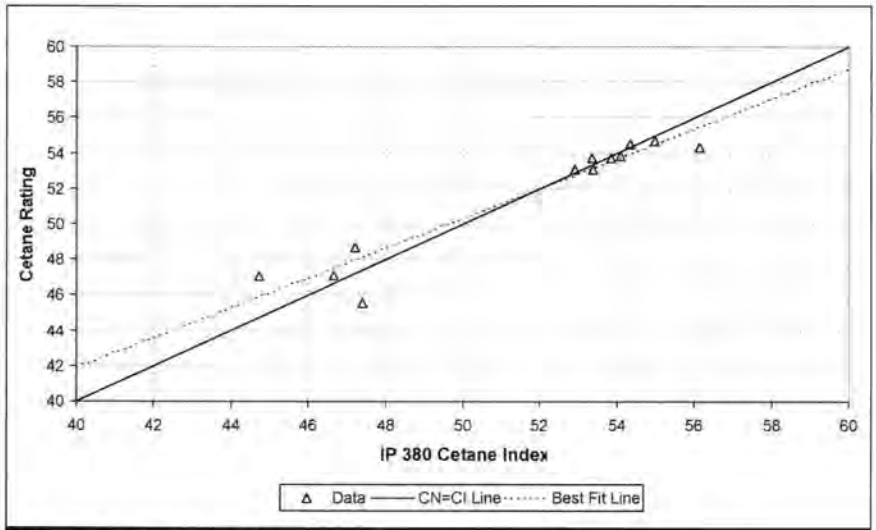


Figure 1: IP SP-B-1 Data 2001

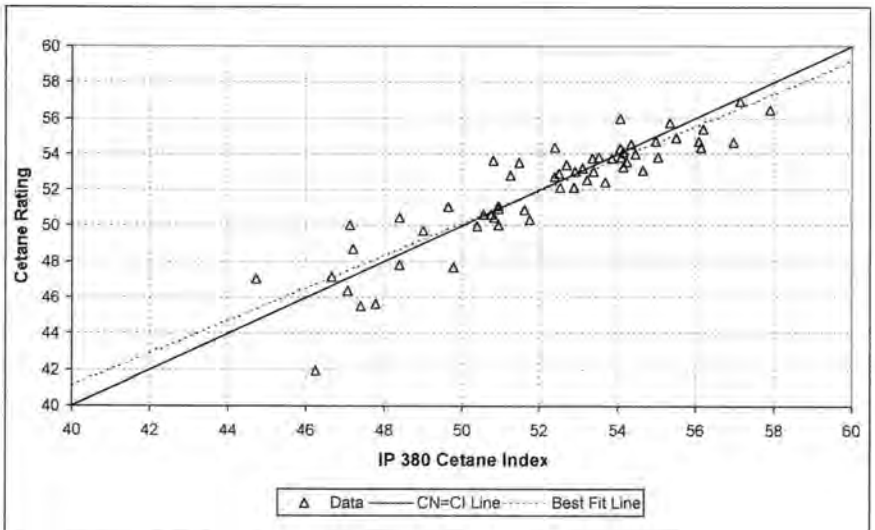


Figure 2: IP SP-B-1 Data 1997–2001

fit' regression line through the 1997–2001 data.

Points to note are :

- IP 380/EN ISO 4264 is slightly biased over five years, more so in 2000. Because mean bias is generally small, the various measures on scatter (bias SD, bias $RMSE_b$ and $RMSE_r$) tend to be very similar. The larger scatter of results in some years may be due to changes in fuel composition, or to the occasional unusual sample.
- IP 380/EN ISO 4264 bias slopes were worst in 1998 and 1999. This reflects the risk of using small data sets. Over five years, the bias slope is much closer to ideal.
- For the second successive year, the CN/CI correlation was good. This could reflect the chance of the occasional unusual sample in some other years (eg May 1999).

## Conclusions

Three main conclusions can be drawn from this review:

- IP 380/EN ISO 4264 has a small mean bias for estimating CN. The unexpected bias in 2000 looks to be due to chance when selecting a small number of samples.
- On average IP 380/EN ISO 4264 estimates CN very well. The scatter associated with individual CN estimation fluctuates year-on-year, suggesting a chance element.
- The equations used in IP 380/EN ISO 4264 for calculating CI are satisfactory and do not require revision at this time. The IP will continue to monitor the relationship.

*If you would like further information about this article or the IP's Gasoline and Diesel Fuel Engine Correlation Scheme, you can contact John Phipps, Technical Manager–Standards on Tel: +44 (0)20 7467 7130; e:* **jp@petroleum.co.uk**

*continued from p25...*

most of these for their domestic markets, foreign companies are involved in exploration in both countries with some success. Anadarko, Agip and others have discovered oil fields in Algeria in the Berkine Basin near the Libyan border. Anadarko, with partners, hopes to have a gross oil production of 500,000 b/d by 2002/2003 from the Hassi Berkine fields.

Current Algerian oil production comes largely from the giant Hassi Messaud field and its surroundings. The government is trying to attract foreign investment in enhanced oil recovery projects here, but with limited success. It hopes to increase production from 1mn b/d to 1.5mn b/d in 2005, Opec quotas permitting, and possibly to 2mn b/d by 2010, largely as a result of Hassi Berkine output.

In Egypt, Apache and Repsol have made some discoveries of oil reserves in the Western Desert, but this area is remote and high risk and recent licensing rounds aimed at attracting more companies to explore it have been largely unsuccessful. There are some oil plays in the mature Gulf of Suez but, on the whole, there is little prospect of any substantial increase in oil production.

## What to expect

Continued interest in the North African oil and gas potential depends largely on the political situation in Algeria and Libya. Algeria's severe problems with foreign debt and 30% unemployment, with half of its population aged under 20 years, suggest that political unrest will continue. And, although the new law extracting Sonatrach from its governmental powers should improve conditions for foreign companies, the latter may want to see proof of disengagement given that Sonatrach has been so long embroiled in politics and administration.

Libya has a small domestic market and no foreign debt to service, and it will probably leave Agip to decide the pace of the development of its gas reserves. The government has been reluctant to increase the role of foreign companies in oil exploration and development projects. This could change now that the legal proceedings regarding the 1988 PanAm Flight 103 bombing have ended following the court's rejection of an appeal of its original ruling. Some analysts foresee a financial settlement regarding this incident which would loosen the restrictions of the US Government on American companies operating in Libya.

# Blue Stream to help meet Turkish gas demand

**Barring a last minute hitch, gas was scheduled to start flowing from Russia to Turkey through the Blue Stream pipeline as *Petroleum Review* went to press. *Jeff Crook* takes a closer look at the new pipeline, which creates a 'ring-main' with the existing overland pipeline that runs around the western coast of the Black Sea, and its impact on the Turkish gas market.**

The overall length of the Blue Stream pipeline totals 1,250 km. Comprising separate Russian, Black Sea (offshore) and Turkish sections, the $2.3bn project will transport 16bn cm/y of Russian natural gas to the Turkish market. However, Blue Stream, by itself, will be insufficient to meet rapidly increasing gas demand in Turkey and so the country is to import further supplies from its Caspian and Middle Eastern neighbours.

The first 370-km section of the Blue Stream pipeline in Russia was built and is being operated by Gazprom. It runs from Izobilnoya to a new $300mn compressor station built by Bouygues Offshore at Beregovaya, close to the Black Sea landfall at Dzhubga.

## Black Sea pipelaying

The Black Sea pipelaying operation has posed a number of challenges, including water depth, complex seabed morphology, earthquake risk and highly corrosive conditions due to the elevated levels of hydrogen sulphide ($H_2S$) in the deeper water. The majority of the route extends over a smooth 'abyssal plain' formed of silt, at a depth of 2,150 metres. The in-shore legs of the route have more difficult seabed terrain, with steep slopes and complicated topological features.

The Blue Stream Pipeline Company, a joint venture between Eni and Gazprom, was formed to build and operate the offshore section of the pipeline. The company awarded a design, engineering and procurement contract valued at $1.7bn to a consortium consisting of Saipem, Bouygues Offshore and a Japanese consortium that includes Mitsui, Sumitomo Corporation and Itochu Corporation.

The offshore section includes a compressor station, a short stretch of overland pipeline to the Russian landfall at Dzhubga, and two, 24-inch diameter sealines across the Black Sea from Dzhubga to a landfall near Samsun in northern Turkey. Saipem, an Eni subsidiary, was responsible for laying the subsea pipelines, together with 3-km of overland pipeline at the Russian landfall. The contractor has also completed a temporary compression station near the Russian landfall that will be used to de-water the pipeline if this is found necessary.

The deepwater pipelaying operation was performed by the *Saipem 7000*, whilst shallow water pipelaying was undertaken by the *Castoro Otto*. The 94-metre long light construction vessel *Polar Prince* provided support, with Sonsub's Innovator remotely operated vehicles (ROVs) deployed for seabed survey work (see *Petroleum Review*, October 2000) and other subsea tasks.

The Turkish public came to appreciate the awesome size of the *Saipem 7000* during its transit of the Bosporus, the most difficult leg of its long voyage from the Gulf of Mexico to the Black Sea. Whilst thousands of spectators crowded the waterside on 6 August 2001, 400 guests – including Victor Khristenko, Deputy Prime Minister of the Russian Federation – gathered at a special ceremony to witness the event. All other shipping traffic was stopped during the transit, a difficult decision for the authorities as over 350 ships would normally pass through this busy waterway during an average day.

Strict precautions had been taken to ensure that the pipelaying vessels would pass safely under the 'Bogaziçi' and 'Fatih Sultan Mehmet' suspension bridges that link Asia and Europe across the Bosporus. Extra ballast was pumped onboard the *Saipem 7000* prior to the transit, and much of the upper structure was removed in order to lower the height of the vessel to 61 metres. Despite these measures, the huge vessel barely scraped under the highest point of the span. (The port authorities had waived rules that would otherwise require a minimum 6-metre clearance for vessels passing under these bridges.)

The 118,000 gross tonne *Saipem 7000* is the largest heavy lift vessel in the world, with two cranes whose combined lift capacity is 14,000 tonnes. A major conversion project was carried out in 1999 in preparation for the vessel's new duty as a deepwater pipelayer. This work included installing a 6,000-tonne J-lay tower at the stern of the vessel, between the two cranes. New underwater propulsion units (thrusters) were installed, together with new generators to provide the 70,000 kW power output needed for station keeping.

The J-lay method adopted for the *Saipem 7000* involves launching the pipeline into the sea at a near vertical angle, from the 130-metre high tower mounted at the stern of the vessel. The pipe is welded together and tested within this tower, and is supported by three track-type tensioners, each with capacity of 175 tonnes, as it is slowly lowered to the seabed. The J-lay technique eliminates the bending stresses that would otherwise be created as a pipeline is launched into deepwater from a conventional pipelayer.

One drawback of the J-lay system is that access for welding and testing of joints is somewhat limited in comparison to a conventional pipelayer where the pipeline is fabricated on a horizontal deck. The transfer of pipe to the vertical tower also involves some complicated handling operations. To mitigate these problems, and to achieve economic laying speed, the pipeline is assembled within the tower from 'quadruple joints,' or joints that are four times the length of standard sections.

Prior to the start of pipelaying, Saipem set up a prefabrication yard at Samsun for preparation of these quad joints, thus reducing the volume of work to be performed on the pipelayer. Each quad joint is assembled by welding together four standard 40-ft (12.2-metre) pipe sections into a single 160-ft (48.8-meter) long joint. After assembly, the quad joints are loaded into 1,400-tonne pipe racks. Two of these racks were loaded on to pipecarriers each day for transport to the *Saipem 7000*.

## Work progress

After dredging the landfall, Saipem completed the pull ashore on the Turkish coast at Carcamba, near Samsun, using the more conventional self-propelled derrick/lay vessel *Castoro Otto* on 25 September 2001. This vessel also carried out inshore pipelaying in depths of up to 170 metres and the pull-ashore on the Russian coastline, which was completed on 15 November 2001. The *Castoro Otto* then undertook the tie-in work between the inshore sections and deepwater segments of the pair of Black Sea pipelines.

The 191-metre long *Castoro Otto* is equipped with conventional pipelaying facilities in which individual pipe sections are joined together at five welding stations sited at intervals along a horizontal deck. The vessel is held in place and pulled forward by anchors. As the vessel moves forward, so the newly fabricated pipe is launched into the sea from a 'stinger' – a sloping, ramp-like structure that extends from the stern of the vessel.

The *Saipem 7000* began its deepwater pipelaying operations during October 2001 after work had been completed to replace the upper structure that was previously removed for the Bosporus transit. Dynamic positioning was used during all the deepwater pipelay operations as it is impractical to use anchors in ocean depths. The vessel has ten different thrusters, powered by 12 different generators located in four segregated engine rooms, to hold it in position.

Completion of the first deepwater pipeline segment was announced by Eni on 19 February 2002. Tie-in work to the shallow water segment on the Turkish coast took only a few days, so, allowing for de-watering, pigging and testing, it seems more than likely that gas will be flowing on schedule by April 2002. Work on the second subsea pipeline, and compressor station will, however, continue for some months to come.

## Turkish gas market

The overall Blue Stream project also involves a 500-km overland pipeline from Samsun to the Turkish capital, Ankara. The pipeline connects with the main transmission system and will also permit natural gas to be distributed to the towns of Samsun, Çorum, Kirikkale, Amasya and Çankýrý close to its route. This section of the pipeline was completed by the Botas, Petroleum Pipeline Corporation during 2001. Botas currently holds the monopoly for the import, distribution, pricing and sale of natural gas in Turkey.

With a population of 65mn, 35% of whom are under the age of 15, Turkey is in a phase of rapid growth. Although the nation has abundant reserves of coal, its oil and gas reserves are quite limited. The quantity of imported fuel, particularly natural gas, will therefore need to rise sharply in coming years to meet national needs. According to Eni, Turkish gas consumption rose from 14.5bn cm/y in 2000 to 16bn cm in 2001, and is expected to rise to between 45bn and 55bn cm/y by 2010.

The Turkish natural gas industry was founded on supplies from the former Soviet Union after a 25-year natural gas sale and purchase agreement was signed in 1986. This gas has been transported by a Soviet-era pipeline which runs down the western side of the Black Sea, through Romania and Bulgaria, crossing the Bulgaria/Turkish border in the Malkoçlar area, from where it has been extended on to Istanbul, Izmir, Bursa, Ankara and other major industrial centres.

The original Russian gas sales agreement covered volumes that would gradually rise to reach a plateau of 5 - 6bn cm/y of gas by 1993. But the capacity of the pipeline has recently


Figure 1: Main gas transmission lines in Turkey (at end of current construction programme)

been increased to 14bn cm/y, with new sales agreements for Russian gas to be carried via this route.

The Turkish natural gas industry has, meanwhile expanded extremely rapidly with the construction of new transmission lines (see map), compressor stations, liquefied natural gas (LNG) import facilities, gas-fuelled power stations and local distribution networks. Botas forecasts that the number of cities with residential gas supplies will increase from five to 57 as a result of recent projects.

The recently completed 1,545-km long Eastern Anatolia natural gas main transmission line already transports gas from Iran and will permit imports of gas from the Caspian region. Long-term agreements have been signed with plateau flow rates of 10bn cm/y from Iran, 16bn cm/y from Turkmenistan and 6.6bn cm/y from the Shah Deniz field in Azerbaijan. Further plans and studies have been tabled for the construction of an overland pipeline from Iraq and for a subsea pipeline to transport gas from Egypt across the Mediterranean Sea.

The Turkish section of the Eastern Anatolia line starts on the border at Doðubayazýt, and then passes through Erzurum, Sivas and Kayseri to connect to the main transmission system at Ankara. A branch also runs from Kayseri to Konya. A further project involves the construction of a transmission line from Konya to Izmir on the west coast, where it will tie-in with the existing system to complete a ring main around the western part of the country. There is also another major project to build a transmission line from Sivas to Mersin on the southern coast.

LNG is currently imported from Algeria and Nigeria to a terminal at Marmara Ereglisi on the northern coast of the Marmara Sea, where it is connected by a 24-km pipeline to the main transmission line. Botas is also discussing further LNG supplies from producing countries including Algeria, Norway, Egypt, Yemen, Qatar, Trinidad and Nigeria. There has also been speculation about a new reception terminal at Izmir.

In the longer term, Turkey could play an important role in the transit of gas from the massive reserves in the Middle East and Caspian region to the energy consuming nations of Europe. Studies have been undertaken, with EU support, to look at the feasibility of extending the Turkish natural gas transport system to Greece, thus forming part of a Southern Europe ring main. Senior officials from Greek and Turkish energy utilities signed a gas pipeline deal on 28 March 2002 under which 500mn of gas will flow from Greece to Turkey by 2005. The signing ceremony was witnessed by government ministers from each country.

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maintained at levels that appear adequate to meet requirements. Actual levels of stocks are rather more comfortable than for some time.

The situation is fraught and uncertain, but it is starting to look as though supply will be adequate for the lower demand summer months. Real pressures may reappear in the late summer, however, as winter stocking gets under way and seasonal demand is augmented as the economic recovery kicks in.

## Great mystery

It remains one of the world's great mysteries as to why even the smallest of fuel price changes becomes headline news in the papers and features on the television news. You never see 'Shock rise in refrigerator prices' headlines or 'Carpet costs to soar', but these could easily involve more money than any petrol price changes.

It seems that petrol prices have become as politically sensitive and totemic as bread prices were in the nineteenth century. It will be interesting to see if, as the proportion of diesel fuelled vehicles grows, this continues to command such attention.

*Chris Skrebowski*


# Whither natural gas as a road fuel?

Gas-powered Iveco truck.

**After nearly a decade of incentives of one sort or another, natural gas has yet to make a significant impact on either the transport of goods or people in the UK. While there is still an underlying belief that gas powered vehicles are beneficial to the environment, the vehicle manufacturers remain wedded to diesel and the future of the road fuel gas business is far from secure, writes *Gibb Grace*.**

In the last 12 months, two major suppliers of natural gas – BG Group and Mobil CNG – have revamped their road fuel gas businesses with a view to expanding sales. In March 2001, BG Group relaunched its road fuel business as Iqara Eco Fuels, and in November the same year Mobil CNG was renamed Esso CNG.

Tom Jaworski has been with Mobil since 1987, selling gas to industrial and commercial users and working offshore on oil and gas production before becoming General Manager of Mobil CNG in 1998. Now Manager of Esso CNG, he remains characteristically upbeat: 'Our new identity represents a strong start to an exciting future. As the name suggests, we intend to build on our position as the UK's leading CNG supplier to the road transport industry.'

If Esso CNG is focusing on selling CNG, Iqara Eco Fuels is concentrating on LNG sales to heavy truck users, be they local authorities or road transport companies. Jan Chmiel, who was brought in to head up the business last September, also has many years' experience of the international fuels scene and has overall responsibility for expanding the business. 'I believe the case for natural gas is undeniable,' he says, 'as it benefits both the environment and the all-important transport operator's bottom line.'

## Uphill struggle

Despite such optimism, however, the short to medium outlook for CNG and LNG is not good. Gas vehicle production is peripheral to the European heavy vehicle industry and is still vulnerable to the diesel. Although the diesel engine is 100 years old, its development has never stopped and the pace of technological advancement has never been greater than over the past decade.

The European vehicle manufacturing and road transport industries remain firmly wedded to the diesel and, according to Peter de Kok, Chief Engine Engineer with DAF, the next six years will be crucial to the future of gas engines. The reason, says Kok, is that the pace of diesel engine development is such that, by 2008, big diesels will be no more polluting than engines running on natural gas.

This may seem hard to believe, but since 1990 when heavy diesel emissions legislation was introduced, the engine manufacturers have met a series of ever tougher emissions targets starting with Euro 1 in 1992, followed by Euro 2 in 1996 and most recently by Euro 3 in October 2001. Euro 3 engines are already very clean and only 0.16%, or 1.6 parts in 1,000, of the exhaust emissions consist of substances that are considered to be harmful in any way. Nonetheless, the European Union has already announced even tougher targets for Euro 4 and Euro 5 that are due to be introduced in 2005 and 2008 respectively.

Legislation has focused on $NO_x$ (oxides of nitrogen) and more recently on PM (particulate matter). As an indication of the progress made, the required $NO_x$ level will have fallen by nearly four fifths, from 9.0 g/kWh to 2.0 g/kWh, between 1992 and 2008. And over the same period, PM emissions will have fallen to one 200th of its original level, from 4.0 g/kWh to 0.02 g/kWh. It is true that the best gas engines can achieve and even surpass these levels today, but what hard pressed hauliers want to know, is whether changing to a new fuel at this stage is really worth the cost, let alone the risk.

## Vehicle manufacturers backing diesel

Political pressure to improve diesel emissions may be paying off but it has hit gas engine development hard. Over the last decade, Europe's seven major vehicle manufacturers have been obliged to spend hundreds of millions of pounds on diesel engine research and development, and there has been precious little left for gas engines.

Even where development time and money has been spent, the experience has not always been good. DAF for example, has supplied hundreds of LPG engines – which are noted for their absence of exhaust smoke, diesel smell and lower operating noise – for buses over the last few years. Nonetheless, orders dwindled to practically zero and production of these engines was halted last year. DAF's de Kok thought the euros 30,000 on-cost per vehicle for the engine was not a factor in most cases, and said the real stumbling block was fuel consumption and rising fuel costs versus diesel.

DAF's Peter de Kok says come Euro 5, big diesels will be as clean as gas engines.

In short, Europe's preoccupation with the diesel has starved gas engine development and although there is an excellent environmental case for using natural gas as a road fuel, without supporting legislation or the driving force of the manufacturers, any momentum that there might have been has been largely lost.

Against this background, the UK has managed to maintain a small gas vehicle industry based around indigenous manufacturers such as ERF, Seddon Atkinson and Dennis Eagle, but even this low-level involvement is under increasing pressure. Seddon Atkinson is now part of Iveco and no longer makes gas-engined vehicles. ERF has been taken over by the German truck builder MAN and, although it has continued to build vehicles powered by American Detroit Diesel gas engines, there is some doubt over future policy. Meanwhile, Dennis Eagle uses a Cummins' 8.3-litre gas engine, but this cannot meet the methane limit in place for Euro 3 and production has ceased pending Euro 3 certification. None of this bodes well for the vehicle industry or natural gas suppliers such as Iqara Eco Fuels and Esso CNG.

## Dwindling possibilities

In the meantime, the UK Government continues to talk up natural gas and backs it with grants through initiatives such as Powershift (see *2001 Retail Marketing Supplement*) and, more recently, the CleanUp Campaign aimed at tackling nine pollution hot spots. The UK gas vehicle parc is measured in hundreds rather than thousands and without new vehicles entering the arena gas sales will be, at best, static. As it is, the Powershift directory lists relatively few vehicles that can receive the top grant of 75%, and even fewer that run on natural gas. The only medium-sized van listed is the Mercedes-Benz Sprinter and the only light truck is an Iveco Daily City Truck. The Sprinter has a dedicated CNG engine and the Daily can be specified with both CNG and LNG engines.

Of the heavy truck manufacturers, only Iveco merits a 75% award for its 9.5-litre engine. A state of the art design with electronically controlled, sequential gas injection, this engine meets the EU's tough EEV (environmentally enhanced vehicle) requirement, but it has been largely ignored by UK operators because it uses stoichiometric combustion which is said to be less fuel efficient than the learn-burn American engines. Iveco is undeterred, however, and promises to introduce a second engine, a dedicated gas version of its 7.8-litre Cursor 8 engine, later this year which will also be certified to the EEV level. This new engine will be offered in both Iveco and Seddon Atkinson chassis, adding to the current list.

Apart from these top-performing engines, Chmiel points to other examples such as the re-engineered diesel engines offered by Scania and dual-fuel engines like the American Caterpillar engine. A UK company, Feather Diesel, takes Scania trucks that have been in front line service for up to three years and converts their 11-litre diesel engines to run on LNG. The engines meet Euro 3 requirements, but as they are re-engineered, they are subject only to a 'notifiable alteration' procedure rather than full new vehicle type approval.

Dual fuel engines are popular in the US, but have never caught on in Europe. They are conventional diesel engines that are fitted with an additional gas injection system that allows them to run on both diesel and gas at the same time. At high load, gas usage can be as high as 85%, leading to substantial reductions in PM and $NO_x$ emissions. The attraction from the operator's point of view is clearly reduced fuel costs and, not least, the retention of diesel levels of power and torque. Here again though, no vehicle manufacturer is involved and the vehicles available in the UK are Caterpillar-engined Foden vehicles that are modified by a Foden distributor. The beauty of these engines from the gas supplier's perspective is that they offer up to 400 hp and can power 44-tonne trucks which tend to cover high annual mileages and thus use large amounts of fuel. The downside is that the modifications are expensive, although not as expensive as dedicated engines, and as yet do not qualify for a Powershift grant.

Iveco Ford's Ken Moore believes the EEV concept could be expanded to include a low noise requirement, to the benefit of gas vehicles.

## No lack of demand

Ken Moore, Iveco Ford's Technical Director, is sceptical of such developments and believes that gas vehicles deserve to prosper solely on their environmental credentials. Moore says: 'To some extent, the scene has already been set with the introduction of the Environment Act in 1995 as it has made individual local authorities responsible for their own urban air quality.' That act, says Moore, has led directly to the concept of Low Emission Zones which, in the case of some London Boroughs, could be in place by 2005. Access would be granted to suitably clean vehicles, while old or poorly maintained vehicles, the so-called gross polluters, would be banned.

He also points to the European Alter project, to which some 120 cities are signatories, and the likely advent of UK Clear Zones, typically urban areas that are only accessible by say buses and taxis using alternative fuel. CNG and LNG are ideal fuels for buses, but at the moment any progress is stalled because of the existing Fuel Duty Rebate scheme. Bus operators can reclaim the duty on diesel, making it cheaper than natural gas or LPG, thus precluding any incentive to change. Thanks to industry lobbying on this point, government recognises the dilemma and has tasked the Commission for Integrated Transport to come up with a suitable alternative to the Fuel Duty Rebate scheme that will provide the necessary funding incentive.

However, whatever happens, if natural gas is to give diesel a run for its money, many more refuelling points will be needed. Esso CNG is ready for this and Jaworski says that, providing the throughput warrants it, the company is prepared to manage the design and installation of a tailor made refuelling station to suit individual requirements. Typically, in cooperation with Transco, gas can be taken from a 2-bar mains supply and pressurised to 250 bar to produce CNG. Once the site has been commissioned, Esso CNG undertakes to maintain it in line with the manufacturers recommendations throughout the duration of the contract.

Iqara Eco Fuels is planning to add fuel stations too. Early last year the Energy Savings Trust provided a grant to cover the building of eight natural gas stations – three, at Reading (CNG), Nottingham and Penrith, are already completed or currently under construction. Chmiel says three other depot-based sites with third-party access are under negotiation, but adds that plans for the last two have been dropped and the grants returned.

## Too little too late

It is clear that there is no lack of will on the part of the gas suppliers or, for that matter, at a strategic level within government. Local authorities and truck operators would switch to gas tomorrow providing the price was right and they could be convinced about the long-term viability. What could prove to be an insurmountable problem, however, is the paucity of suitable chassis from either the major European manufacturers or what is left of the UK vehicle manufacturing industry.

Unfortunately, given what has been achieved in the last ten years, time is short. The vehicle manufacturers and the oil companies, orchestrated by Brussels, are working to a plan that was agreed years ago and, come the end of the decade, it seems inevitable that the gas engine's emission advantage will be nullified. So, that by the time we get Low Emission Zones and Clear Zones in our cities, the gas vehicle could well have had its day.

**Esso CNG's Tom Jaworski remains bullish and is ready to build new CNG stations.**

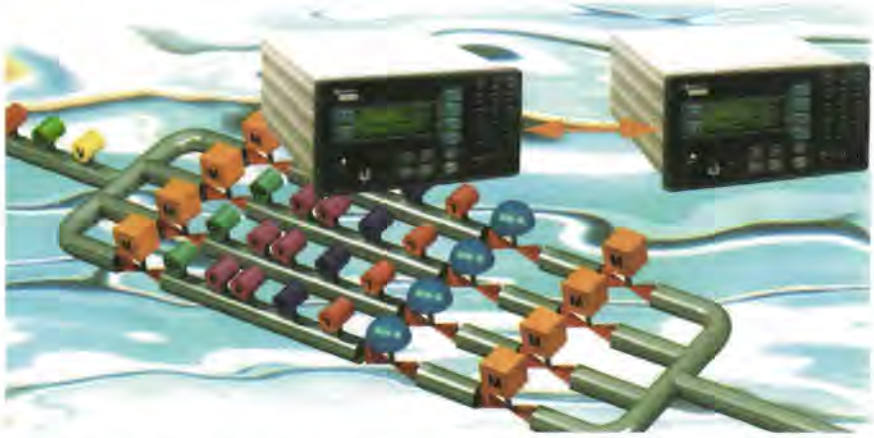
# Complete redundancy solution for flow monitoring

*Solartron Mobrey's multistream liquid and gas flow computers are now available with a 'hot duty/standby' option. The new feature allows full redundancy to be built into the system using just two flow computers for up to four meter runs, and is said to be ideal for both fiscal and custody transfer monitoring applications.*

*European and North Sea operators have traditionally monitored flows using multiple meter runs, each with its own single stream flow computer. 'The advantage of the US practice of using just two multistream computers in a duty/standby configuration are now being recognised elsewhere,' reports the company. 'This system provides full redundancy with no loss of data in the event of failure, and easier, more efficient data processing.'*

*The hot duty/standby feature from Solartron synchronises the logging of flow data between two multistream flow computers, for seamless handover in the event of a failure. Both computers are connected to each metering point. One computer is designated as the main monitoring device (duty) and the other is the back-up (standby).*

*Automatic synchronisation of the two machines takes place at start-up and at user defined intervals throughout operation. In the event of a failure of the duty computer, alarms are raised, a handover takes place and the standby system becomes the duty device automatically. The accuracy and integrity of the flow data is maintained, without losing any flow, states the company. The system is claimed to be highly efficient, accurate and – especially for metering systems with many metering points – highly cost effective.*



*The use of multistream flow computers also aids the management and analysis of flow data. Rather than having to collect results from a number of different single-stream computers, totalised flow data is available immediately for analysis and reporting.*

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# Combating valve violations and vandalism

**Castell Iso-Lok has developed a stainless steel version of its V-Safe valve cover, offering greater safety and security. The highly visible device secures the regulation of liquids and gases by enclosing wheel operated valves, protecting against inadvertent or unauthorised operation and ensuring that potentially hazardous maintenance can be carried out safely.**

**Available with either a highly visible yellow polyester resin coat or in a high polish, natural stainless steel finish, the tamper proof cover comes in four different sizes to fit wheel diameters from 100 mm up to 350 mm. It consists of two hinged, half-moons with a multi-hole padlocking facility. Perforations in the edges reduce weight and prevent build-up of fugitive emissions.**

**When locked, the cover completely encloses a valve handwheel, making operation impossible except by authorised personnel. When used as a maintenance lock-out up to seven products can be fitted at one time and valve operation can only be restored once all personnel have completed their work and removed their padlocks.**

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# It's a well known FACT offshore

UWG Group recently introduced its flow activated circulating tool (FACT), designed to improve the cost-effectiveness of offshore wellbore clean-up operations. The tool relies on a simple pump open/pump close mechanism and was developed in response to concerns regarding the operability and performance of existing 'drop ball' and 'weight set' tooling options.

The pump open/pump close mechanism ensures that there is no limit to the number of cycles that the tool can perform, states the company, and critically provides a way of confirming the tool's position. The tool is run in the bottom hole assembly at a predetermined distance above the drill bit, to provide the option of diverting circulation away from the bit and through a communication port to the drilling annulus. FACT can be used during both drilling (open hole) and circulation (cased hole) operations to provide increased circulation and flushing rates to remove cuttings prone to settling in large hole diameters.

A comprehensive engineering support package is offered, incorporating predictive analysis software for the optimum tool placement in the string and mud rheology comparisons.

Tel: +44 (0)1603 767438
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## Cutting plant energy costs by up to 30%

**Linnhoff March has launched its latest version of SuperTarget, a software suite that is reported to improve plant design through cutting energy costs by up to 30%, reducing capital expenditure as well as increasing throughput. SuperTarget 6 builds on the tried and tested foundation software with a host of new enhancements aimed to improve ease of use and broaden the range of applications.**

**One new feature is a new powerful approach to data handling which facilitates multiple case management by making it possible to simultaneously compare multiple solutions across a range of operating cases. Other improvements include general data entry and interface enhancements, a more flexible handling of heat transfer coefficients and the ability to define temperature links between streams to model heating circuits or desalters.**

**'Environmental, legislative and commercial pressures mean that energy efficiency can no longer be viewed as an option or a luxury,' comments the company. 'For energy-intensive process industries it is often a vital element in commercial survival.'**

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## Monitoring plant performance online

Simulation Sciences (SIMSCI) has released ARPM™ (automated rigorous performance monitoring) software, a new online plant performance monitoring solution designed for the refining, chemical and gas processing industries.

The software has been developed to enable plant engineers and management to automatically access raw, real-time plant data and to use rigorous simulation models to extract validated process and equipment performance information.

APRM is claimed to be the only commercially available performance monitoring solution that integrates rigorous simulation, data reconciliation, gross error detection and performance monitoring into a single user environment.

In addition, the software is also reported to enable users to directly access real-time process data and provides a unique scheduling system for automation of performance monitoring tasks.

Based on SIMSCI's ROMeo technology, ARPM is a component of the company's On-Line Performance suite of advanced process control (APC), performance monitoring and online optimisation applications designed to help users obtain peak performance from their operating units.

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## A helping hand for calibration across industry

*SI Pressure Instruments has unveiled a new range of hand-held pneumatic and hydraulic pressure pumps for calibration checks on pressure transmitters, transducers, switches and gauges. The range comprises three models designed for low, medium and high pressure. The low/medium pressure units feature dual source of pneumatic pressure and vacuum, and are claimed to be capable of generating from –0.95 to 40 bar in a fully portable hand-operated system. The high pressure model uses oil or water with an option of skodrol/brake fluid, with a hydraulic pressure up to 700 bar or 1,000 bar. Included is a high pressure/priming selector with fine adjustment control.*

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# NEWS Technology

## Cost-effective checking of flash point

*Setaflash 3 is the latest generation of flash point tester to be developed by Stanhope-Seta. The new instrument is designed for rapid testing and spot checks on most types of product.*

*Its compact and portable size makes it ideal for use in the laboratory, production line or field, states the company. 'It is inexpensive, simple to use and speeds up the measurement of flash point, making this an affordable and safe procedure for most user applications.' The method is reported to be internationally specified and approved by leading regulatory authorities.*

*Checking flash point is important during inspection and analysis of many products. For example, in the classification of potentially hazardous substances where storage, transport and disposal charges are based on flammability and where incorrect classification can lead to significant added costs, explains the company. The flash point is also a rapid indication of changes in product batch consistency or of contamination.*

*The Setaflash 3 tester incorporates automatic flash detection and easy to operate controls designed to minimise operator skill and guarantee reliable results. A precise and repeatable 'flash/no flash' result is shown on a digital display in less than two minutes, reducing waiting periods. Operation requires just 2 ml of test sample (or 4 ml for tests above 100°C), minimising exposure to harmful fumes and also reducing problems of disposal.*

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## Constant pressure sample receivers

The new Jiskoot CPC1 and CPC2 constant pressure sample receivers are designed for the receipt, handling and storage of liquid and gaseous hydrocarbon samples that are maintained at constant pressure by pre-charging the cylinders with gas. Made from 316L for durability with a rugged, yet light and compact portable design, the 1 or 2-litre units are designed for use with systems automatically sampling crude oil, refined products and gas. They are reported to be ideal for applications where the fluids are unstable at ambient temperature or where samples should be maintained at process temperatures for analysis. The operating temperature range is between –20°C to +100°C, with a maximum operating pressure of 100 bar.

Normal or arduous duty seals are offered, allowing use on corrosive and non-lubricating fluids. Design features include a stable 'non-roll' square section construction, a built-in sample volume indicator with an easy to read scale and rugged glycol filled gauges. Integral valves are mounted within a safety shroud to prevent accidental operation or damage. The cylinder internals are designed with a minimal trapped volume to avoid cross contamination between sample batches.

The receivers have no external rods that can be damaged during handling or cause operator hazard, which also makes them easy to use in small housings and cabinets. Cylinders are available for sour (NACE) service and can be fully drained.

They are reported to be easy to mount, and standard brackets can be supplied with integral receiver-full sensors for simple operation and removal.

Tel: +44 (0)1892 518000
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## BoltSafe offshore

**Offshore Crane Engineering (OCE) of Aberdeen has become the sole UK installer of Norwegian company Scan-Sense's innovative BoltSafe system – an 'intelligent' load sensing system claimed to offer considerable safety benefits as well as long-term cost savings to operators and contractors both onshore and offshore.**

**BoltSafe is an 'intelligent' washer that accurately measures residual bolt pre-tension, from initial assembly and then continuously through the operating life of the bolted connection. 'By constantly monitoring the tension within the bolts on the slewbearing on cranes, the system can identify any undue stress or overloading, and determine the need for replacement of the bolts within the connection,' explains the company. The measurement can either be taken in units of force directly from the washer by means of a probe and handheld reader or continuously through a PC link.**

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**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, Associate Editor, *Petroleum Review*, 61 New Cavendish Street, London W1G 7AR, UK or e:** petrev@petroleum.co.uk

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## METALCUTTING FLUIDS CONFERENCE
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It has been four years since the last Conference on Metalworking Fluids and in this period major changes in legislation, fluid formulation, health and safety, machining methods, fluid management systems and attitudes have continued. This conference will present an invaluable update on these and other issues. Designed specifically to address future trends, it will provide a significant insight into the future development of the Metalcutting Fluids market.

The programme covers a wide breadth of metalcutting fluid issues and will provide essential information for:

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- Service engineers and chemists
- Environment managers
- Metalcutting fluid wastetreaters
- Equipment manufactures
- Production engineers and other fluid users
- Health and safety representatives
- Machine tool suppliers
- Additive suppliers
- Consultants

Organised by the Institute of Petroleum, in association with *PERA* Technology

PERA TECHNOLOGY

For more information on this conference please contact Andrea Fulton at the Institute of Petroleum
tel: +44 (0)20 7467 7106 e: **afulton@petroleum.co.uk**

IP THE INSTITUTE OF PETROLEUM

**New publications**

## Speciation of VOC Emissions from UK Oil Refineries

At the end of 1999 the Institute of Petroleum was asked by UKPIA, on behalf of the refineries based in the UK, to provide a means through which emissions of Volatile Organic Compounds, reported annually as a part of the Environment Agency's Pollution Inventory, could be speciated.

In 2000 the Institute commissioned AEA Technology, under the guidance of the IP Emissions Working Group, to investigate the possibility of producing a generic protocol to enable refineries to speciate VOCs. This was to be used in conjunction with the IP's existing Protocol for the Estimation of VOC Emissions from Petroleum Refineries and Gasoline Marketing Operations.

These three reports detail the work undertaken to achieve the above and draws conclusions from the results obtained. Part 1 presents an overview of the work carried out and of the results obtained. Part 2 presents the findings of the literature survey, the objective of which was to identify existing species data entry for refinery VOC emissions. Part 3 describes the detailed results of the measurements carried out at the nine UK refineries.

| | | |
|---|---|---|
| Part 1- Overview | ISBN 0 85293 345 2 | £20.00 |
| Part 2-Literature Survey | ISBN 0 85293 346 0 | £20.00 |
| Part 3- Experimental Results | ISBN 0 85293 347 9 | £40.00 |
| **COMPLETE SET** | | **£60.00** |

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**For a complete listing of IP Publications, see our website, www.petroleum.co.uk**

# NEW Publications

## ANEP 2002 – Yearbook of the European Petroleum Industry

*(Available from Urban-Verlag, Postfach 70 16 06, D-22016 Hamburg, Germany. Tel: +49 40 65 69 45 10; Fax: +49 40 65 69 45 52; e:* **t.vieth@OilGasPublisher.de***) 380 pages. Price: euros 126.80. Also available on CD-ROM, priced at euros 212.40.*

Now in its 35th edition, this yearbook is subdivided into four sections. Section 1 includes information on individual oil and gas fields/finds both onshore and offshore, supplemented by an index. For each country there is a detailed map on which all fields and finds are shown, as well as oil and gas pipeline routes. A table of European refineries is also included, supplemented by a map of locations and pipelines. Section 2 lists statistics related to the energy, oil and gas economies of OECD countries, central and eastern Europe and the former Soviet Union in some 200 tables, including energy consumption, demand and imports/exports. Section 3 contains a list, ordered by country, of firms involved in the oil and gas business, from exploration and production through to storage and transportation, as well as the various organisations, institutes and administrative groups involved in this sector. Section 4 offers an insight into the European supply and service market, listing firms categorised by specialist area and supplemented by an indexed 'Buyers' Guide'.

## An Illustrated History of Road Tankers

*Hinton J Sheryn (Ian Allen Publishing, 4 Watling Drive, Hinckley, Leics LE10 3EY, UK. Tel: +44 (0)1932 266600; Fax: +44 (0)1932 266601; e:* **info@ianallenpub.co.uk***) ISBN 0711028192. 128 pages. Price: £19.99.*

Fully illustrated throughout with photographs and drawings, this book provides a detailed examination of the development of the road tanker from the earliest days of the horse-drawn tankers to the modern day tri-axle articulated bulk tanker.

## Reservoir Engineering Handbook*

*Tarek Ahmed (Elsevier Science, Linacre House, Jordan Hill, Oxford OX2 8DP, UK. Tel: +44 (0)1865 310366; Fax: +44 (0)1865 310043;* **www.elsevier.com***) ISBN 0884157709. 1,186 pages. Price: £105.*

Now in its second edition, this publication provides a comprehensive and up-to-date reference tool for the reservoir engineer or reservoir engineering student. It covers reservoir fluid behaviour and properties, including laboratory analysis and reservoir fluid flow. It provides a guide to predicting oil reservoir performance through analysis of oil recovery mechanisms and performance calculations, and explains the fundamentals of reservoir engineering and their practical application through a comprehensive field study. Two new chapters have been added to this second edition, covering the principles of water flooding and vapour-liquid phase equilibria.

## Energy Law and the Environment*

*Patricia D Park (Published by Taylor & Francis. Available from ITPS, Cheriton House, North Way, Andover, Hants SP10 5BE, UK.) ISBN 0415271894. 266 pages. Price: £29.99.*

This book on energy law considers the inter-relationship between energy law and the legal environment imperatives for the industrial sector. Written in order to be accessible to both lawyers and non-lawyers, the publication covers the regulation of the energy sector, the regulatory bodies in the UK, international environmental law issues, European energy law and policy, issues concerning the oil and gas, coal and nuclear industries, the history and current state of the electricity supply sector, and the future of energy with a view to sustainable resources.

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Please note that we are now open from 9.15 am to 5 pm, Monday to Friday (except Bank Holidays).

### New editions to library stock

This is but a small selection of what has recently been added to the the IP Library's stock. Please visit the IP website at **www.petroleum.co.uk** for a complete list of our holdings. IP Members are welcome to suggest potential purchases – please contact Catherine Cosgrove (see below).

- *Energy Law and Environment.* Patricia D Park. 1st Edition. Taylor & Francis, London, UK, 2002.
- *Energy Policies of IEA Countries: 2001 Review.* International Energy Agency (IEA); Organisation for Economic Cooperation and Development (OECD), Paris, France, 2001.
- *Pipeline Rules of Thumb Handbook: Quick and Accurate Solutions to Everyday Pipeline Problems.* E W McAllister. 5th Edition. Gulf Professional Publishing, Houston, US, 2002.
- *RAC Report on Motoring 2002: Going Too Fast, Going Too Slow?* RAC Motoring Services (RAC). 14th Edition. RAC, Feltham, UK, 2002.
- *Reservoir Engineering Handbook.* Dr Tarek Ahmed. 2nd Edition. Gulf Professional Publishing, Boston, US, 2001.
- *Security of Energy Supply: Second Report of Session 2001–2002. Volume 1: Report, together with Proceedings of the Committee.* House of Commons Trade and Industry Trade Committee HC 364-1, The Stationery Office, London, UK, 2002.
- *Strategic Energy Policy Challenges for the 21st Century.* Edward L Morse, Amy Mayers Jaffe. Energy Task Force, Rice University, Houston, US, 2001.
- *The Tanker Register 2002.* 42nd Edition. Clarkson Research Studies, London, UK, 2002.
- *White Paper: European Transport Policy for 2010: Time to Decide.* European Commission, EU, Luxembourg, 2001.

### Contact Details

- **Information queries to:**
  *Chris Baker*, Senior Information Officer, +44 (0)20 7467 7114
  *Sally Ball*, Information Officer, +44 (0)20 7467 7115
- **Library holdings and loans queries to:**
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- **Careers and educational literature queries to:**
  *Information Assistant*, +44 (0)20 7467 7116
- **LIS management queries to:**
  *Catherine Cosgrove*, Head of LIS, +44 (0)20 7467 7111
- **IFEG queries to:**
  *Sally Ball*, IFEG Secretary, +44 (0)20 7467 7115

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**

# EVENTS Forthcoming

## MAY

**6–9** **Houston**
*2002 Offshore Technology Conference*
Details: Offshore Technology Conference, USA
Tel: +1 972 952 9494
Fax: +1 972 952 9435
**www.OTCnet.org**

**7–8** **Aberdeen**
*Titanium Alloys and Polymer Composites*
Details: QinetiQ, UK
Fax: +44 (0)1892 544735

**7–8** **Seoul**
*2nd Asian Petrochemicals Technology Conference*
Details: EPC Conferences
Tel: +44 (0)20 7357 8394
Fax: +44 (0)20 7357 8395
e: **Conferences@EuroPetro.com**

**7–8** **Singapore**
*Power and Gas*
Details: IBC Asia, Singapore
Tel: +65 6732 1970
Fax: +65 6733 5087
e: **Audrey.Chen@ibcasia.com.sg**
**www.ibc-asia.com/regyform.htm**

**7–8** **Dubai**
*Middle East Petrochemicals: The Next Wave*
Details: Nexant, UK
Tel: +44 (0)20 7950 1512
Fax: +44 (0)20 7950 1550
e: **jkilbane@nexant.com**
**www.nexant.com**

**7–9** **Glasgow**
*Basic Principles & Practice of Flow Measurement*
Details: NEL, UK
Tel: +44 (0)1355 272017
Fax: +44 (0)1355 272999
e: **mhughes@nel.uk**
**www.nel.uk**

**8** **Coventry**
*Tank Storage Association Conference & Exhibition 2002*
Details: Tank Storage Association, UK
Tel: +44 (0)1244 335627
Fax: +44 (0)1244 335627
e: **hugh.bray@tankstorage.org.uk**
**www.tankstorage.org.uk**

**8–10** **Warsaw**
*Service Station 2002*
Details: Polish Chamber of Fuels, Poland
Tel/Fax: +48 22 828 68 41
e: **izba@paliwa.pl**

**11–14** **Cairo**
*Seventh Arab Energy Conference*
Details: Organization of Arab Petroleum Exporting Countries, Kuwait
Tel: +44 965 484 500
Fax: +44 965 481 747
e: **oapec@qualitynet.net**

**12–13** **Abu Dhabi**
*Oil & Gas Pipelines in the Middle East*
Details: The Energy Exchange, UK
Tel: +44 (0)1242 529090
Fax: +44 (0)1242 570820
e: **c.hodson@theenergyexchange.co.uk**
**www.theenergyexchange.co.uk**

**13–14** **London**
*Sustainable Development in the New Trade Round*
Details: The Royal Institute of International Affairs, UK
Tel: +44 (0)20 7957 5700
Fax: +44 (0)20 7957 5710
e: **conferences@riia.org**

**13–14** **Madrid**
*Spanish Power and Gas 2002*
Details: IBC Global Conferences, UK
Tel: +44 (0)1932 893 851
Fax: +44 (0)1932 893 893
e: **cust.serv@informa.com**
**www.ibcenergy.com/em1180**

**13–14** **London**
*Gas Utilities 2002*
Details: Alphatania, UK
Tel: +44 (0)20 7650 1430
Fax: +44 (0)20 7650 1431
e: **events@economatters.com**
**www.alphatania.com**

**14** **London**
*2002 Gas Industry Awards Luncheon*
Details: Society of British Gas Industries, UK
Tel: +44 (0)1926 334357
Fax: +44 (0)1926 450459
e: **events@sbgi.org.uk**

**15–16** **London**
*Safety Cases*
Details: IBC Global Conferences, UK
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Fax: +44 (0)1932 893 893
e: **cust.serv@informa.com**
**www.ibcglobal.com/is1171**

**15–16** **London**
*Capacity Trading Seminar (CTS)*
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Fax: +44 (0)20 7650 1431
e: **training@alphatania.com**
**www.alphatania.com**

**21–23** **Aberdeen**
*Subsea Pipeline Design Essentials for Engineers*
Details: Trevor Jee Associates, UK
Tel: +44 (0)1892 544725
Fax: +44 (0)1892 544735
e: **admin@tja.co.uk**
**www.tja.co.uk**

**22–23** **Aberdeen**
*Paving the Way*
Details: LOGIK, UK
Tel: +44 (0)1224 562910

**26–31** **KitaKyushu**
*Offshore and Polar Engineering*
Details: ISOPE, USA
Tel: +1 408 980 1787
**www.isope.org**

**23–24** **London**
*Angola Oil & Gas Summit*
Details: IBC Conferences, UK
Tel: +44 (0)1932 893851
Fax: +44 (0)1932 893893
e: **cust.serv@informa.com**
**www.ibcenergy.com/angola**

**22–23** **Amsterdam**
*Subsea Tie-Backs*
Details: IBC Global Conferences, UK
Tel: +44 (0)1932 893851
Fax: +44 (0)1932 893893
e: **cust.serv@informa.com**

**23–24** **Belgrade**
*Advanced Knowledge Management Strategies in Oil and Gas*
Details: IQPC, UK
Tel: +44 (0)20 738 9300
Fax: +44 (0)20 768 9301
e: **enquire@iqpc.co.uk/1797a**
**www.iqpc.co.uk/1797a**

**28–29** **Aberdeen**
*All Energy Opportunities 2002*
Details: Media Generation Events, UK
Tel: +44 (0)20 8241 1912
Fax: +44 (0)20 8940 6211

**28–29** **Helsinki**
*Central European Gas Conference*
Details: Overview Conferences, UK
Tel: +44 (0)20 7650 1430
Fax: +44 (0)20 7650 1431
e: **events@economatters.com**
**www.overview-gas.com**

# Membership News

## NEW MEMBERS

Miss N P Abba, Nigeria Liquified Natural Gas Limited
Dr A Al-Baho, Kuwait Petroleum Italia SpA
Mr T Allwright, Co Dublin
Mrs E Bowie, University of Aberdeen
Mr B J Caines, M C Integ Limited
Mr P Chambers, Safeway Stores plc
Mr C Chan, Prestwick
Mr G A J Clifton, Andersen
Mr S Davis, Safeway Stores plc
Mr A Donadelli, ENI UK
Mr F Farahi Yazdi, Iran
Miss M L Goodall, Witham
Mr W F Hamilton, Burgess Hill
Mr J R G W Humphreys, Aker Maritime A/S
Mr P Johnson, West Malling
Mr D S Lungu, Zambia National Oil Company
Mr P T Munn, Stittingbourne
Major M Owsley OBE, WWAV Rapp Collins Group Limited
Mrs E Patriniche, Nexaut Limited
Mrs T N Russell, Le Riche Group
Dr A M Samsam Bakhtiari, NIOC
Mr R Sinnen, BASF AG
Mr J M Taylor, Wincanton
Mr A L Woodhead, Ludlow
Mr T A Wright, Richmond

## STUDENTS

Mr F Acuna, Middleton
Mr R M Andrews, Bradford University School of Management
Miss N Hussain, London
Mr E J Omonbude, University of Dundee
Miss J Sossak, London
Mr J J W York, Southampton University

IFEG

**INFORMATION FOR ENERGY GROUP**

*Cool Sites for Hot Energy Information*

**Thursday 9 May 2002**
**2 pm – 4.45 pm (1.00 pm buffet lunch)**
**Institute of Petroleum, 61 New Cavendish Street, W1G 7AR**
**Attendance FREE for IFEG Members,**
**£25 to non-IFEG Members**

This seminar provides an insight into the upgraded and improved websites of the DTI and the Institute of Petroleum, plus the Free Pint site – a site providing researchers of business information the opportunity to ask questions and get answers from fellow information workers. Speakers will be Danny Stocker, DTI; William Hann, FreePint; and Aideen Mooney, Institute of Petroleum.

*The seminar is sponsored by* Energy Day
***www.energyday.com***

*Andy Dawson, Lecturer of Information Studies University College London will chair the seminar.*

**For more details, contact:** Sally Ball, IFEG Secretary, 61 New Cavendish Street, London W1G 7AR
Tel: +44 (0)20 7467 7115; Fax: +44 (0)20 7255 1472
e: **ifeg@petroleum.co.uk**

## STUDENT PRIZEWINNER

Mr C Diaz Merino, Spain

## NEW FELLOW

**Mr K Salter F Inst Pet**

Mr Salter is currently assigned to Integrated Process Safety Limited which specialises in process safety for the petroleum industry. He is currently responsible for preparing training course material and manuals, directing courses and handling safety studies for large international companies worldwide. Mr Salter has been a member of the IP Stanlow branch committee for the past five years and became Vice Chairman two years ago.

## CORPORATE MEMBERS

***Bruker AXS***
Meadowside
Mountbatten Way
Congleton
Cheshire
CW12 1DN
Tel: +44 01260 29600
Fax: +44 01260 296909
e: **info@bruker-axs.co.uk**
**www.bruker-axs.co.uk**

Representative: *Andy Scothern, XRF Sales & Applications Manager*

Bruker AXS is a leading worldwide supplier of analytical x-ray equipment. Included in Bruker's product range are both energy-dispersive (ED-XRF) and wavelength dispersive (WD-XRF) x-ray fluorescence (XRF) spectrometers. XRF instruments can be used for a wide variety of elemental analysis of petrochemical products. Applications include the determination of lead in gasoline, sulphur in diesel and nickel and vanadium in fuel oils.

***Laroute SA***
Gotthard strasse 3
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6301 Zug
Switzerland
Tel: +41 41 7271900
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e: **admin@laroute.net**

Laroute focuses on two activities; additives and freight forwarding for major project management. The geographical areas are Russia and the CIS countries, the Baltics, the Black Sea and the Caspian Basin. The additive service operates on a 24/7 basis in these areas to enhance gasoil, fuel oil and crude oil properties. The freight forwarding activity has been contracted to the CPC and Blue Stream pipeline projects.

***World Markets Research Centre***
Cardinal Tower
12 Farringdon Road
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EC1M 3NN
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## OBITUARY

**Peter Jones FInst Pet**

***1923-2002***

The Institute of Petroleum regrets to announce the death of Peter Jones, who was Technical Secretary of the Institute of Petroleum from 1972 to 1988, on Palm Sunday (24 March). Some months before his retirement from the IP he became one of only 24 individuals in the last 50 years to be awarded the IP's Eastlake Medal for long and meritorious services to the Institute.

Peter spent all his working life in the oil industry first with BP and then with the IP. After taking a first class Chemistry degree at the University of Wales, he joined BP in 1943. Over the next 12 years he worked at Sunbury and Llandarcy with a two year spell at Abadan in Iran. He relocated to Iran in 1955 and spent the next 16 years working for BP in Abadan ending his overseas service as Technical Advisor in Teheran.

He joined the IP at the end of 1972 as Assistant General Secretary-Technical. Over the next 16 years he built up the Technical Department in both numbers of staff and in its recognition by the industry. He continued to work part time for the Institute for a number of years after his retirement in 1988.

The Institute and all his friends send their condolences to his daughter Stephanie, her husband and the three grandchildren.

**CONGRATULATIONS – Anne Poynter, the longest serving member of the IP Accounts Department (15 years), at Buckingham Palace after receiving her MBE from Her Majesty the Queen on March 19. Anne received her award for services to the Institute of Petroleum in this year's New Year Honours List.**

## Award of the API's Certificate of Appreciation

The IP is pleased to announce that the American Petroleum Institute (API) has awarded Alan Chamberlain, Chairman of the IP's Petroleum Measurement Committee, with its Certificate of Appreciation. This was awarded to Alan in acknowledgement of his meritorious service to the petroleum industry and for playing a key role as liaison between the API and the IP. This role has lead to a free exchange of technical information between the measurement committees of both institutes and a close working relationship between the technical experts from the US and Europe.



## *London Branch Activities*

**21 May, 18.30 hours**
*Why Recycle?*
by Cleanaway Ltd (at the University of Surrey, Guildford)

Contact:
Ian K Robinson,
Tel: +44 (0)1932 783774

# MOVES People

***Clair Brown*** has been appointed Development Engineer with the special Engineering Projects department of AnTech. In her new role, Brown serves as Project Engineer, spearheading the development of COLT, AnTech's suite of cutting edge electrically coiled tubing drilling tools for the international oil and gas industry. She is engaged in all stages of design, production and international sales initiaves dedicated to COLT.

With more than 20 years of experience in the offshore energy industry, **Al Cook** has been appointed Managing Director of Briggs, to build upon the company's reputation as a world leader in the field of counter-pollution and environmental protection. Cook, an engineering graduate of Aberdeen University, leads an expanding Senior Management Team committed to exploiting new opportunities in its rapidly growing specialist field.

InterContinentalExchange has announced the appointment of **Richard V Spencer** to CFO and the new office of Chairman. The expansion of the ICE executive structure enables ICE to further its growth strategy and continue to build momentum in the marketplace. Spencer brings extensive experience with investment advisory and corporate finance organisations.

**Yuri Komarov** has been appointed Gazprom's Deputy Chairman in charge of foreign economic activity. Komarov graduated from the Moscow Energy Institute, where he specialised in industrial electronics, and the All-Union Academy of Foreign Trade, specialising in industrial economic relations. In 1996 Komarov became the General Director of Gazprom's Gazexport and in 1998 headed the company's Foreign Relations Department and has been a member of the Gazprom Board.

UK Environmental Minister **Michael Meacher** and Energy Minister **Brian Wilson** have announced that **Peter Lehmann** will be the first Chair of the Fuel Poverty Advisory Group, which will advise on the delivery of the Fuel Poverty Strategy for England. Lehmann serves as Chair of the Energy Saving Trust and is a former Commercial Director of Centrica.

Kerr-McGee has named **John M Rauh** as Corporate Controller. Rauh joined Kerr-McGee in 1981 as an Assistant Corporate Controller. He served as Vice President and Controller from 1987 to 1996, when he became Vice President and Corporate Treasurer.

**Sergei Demin** has been appointed General Director of the Moscow oil refinery. Denim previously held the position of Vice President of the Moscow Oil Company and was Deputy Head of the office of British Sibir Energy.

3i has appointed **Graeme Sword** as Director of its Oil and Gas Business. He succeeds Lawrence Ross, who leaves 3i after 22 years to join a US private equity fund. Sword, who joined 3i's Aberdeen office in 1995, was previously Director of 3i's Southern Transactions business, and, in his new role, leads a team focused on investment opportunities in high growth oil and gas businesses across the world.

**Professor Thomas Waelde,** Executive Director of the Centre for Energy, Petroleum and Mineral Law and Policy has stepped down as Head of Department after 10 years of service before starting a research sabbatical. **Dr Philip Andrews-Speed**, a former Executive with BP and Academic Direcor of CEPML, has been appointed as Waelde's successor.

**Hilde Myrberg** has been appointed Sector President of Hydro Energy. Myrberg is a lawyer and holds an MBA from Insead. She has held various positions within Norsk Hydro since 1985 and currently heads Power Sourcing and Marketing within Hydro Energy.

ExxonMobil Gas Marketing Company (EMGMC) has announced three senior management appointments. **Roberta A Luxbacher** will become Director, Europe Gas Marketing, ExxonMobil International; **J J Kelly** will become Vice President, Americas, EMGMC; and **William M Colton** will become Vice President, Asia-Pacific, EMGMC.

**John Augustine** has joined Paragon Engineering Services of Houston as Senior Vice President to serve as one of the company's top executires, reporting to **James R Gattis**, President of Paragon. Augustine brings to Paragon extensive global expertise in administering lump sum EPCI – engineering procurement, construction and installation – projects.

**Peter Nelson** has been appointed as the Group Director responsible for Industry at WS Atkins. Nelson is now responsible for all services offered by the company to the nuclear, power, process (including oil, gas and pharmaceutical), telecommunications and water industries. These businesses have been reorganised into the Industry Business Unit in order to increase customer focus and concentration within strategic market sectors.

**Dr Roger Cairns** FInstPet has been appointed to the Supervisory Board of Technip-Coflexip. This French Company, headquartered in Paris, is one of the top five companies in the field of oil and petrochemical engineering, construction and services.

Duke/Fluor Daniel has appointed **Michael F Wolf** as Managing Director of the company's operations in Europe, Africa and the Middle East (EAME). Wolf has relocated from the US and will be based at the company's recently opened European headquarters in Camberley, Surrey.

United Financial Group, Russia's leading independent investment bank, has announced five senior hires in Moscow and London as it further strengthens its equities and corporate finance businesses. **Martin Smith** has been appointed Head of Equity Product. He joins from Nomura International in New York, where he was the Director responsible for equity sales and trading in EMEA emerging markets and Western European securities. **Benedict Morgan** has been appointed Managing Director and the Head of Oil, Gas and Energy team in Investment Banking. He joins from Dresdner Kleinwort Wasserstein, where he was Managing Director and Head of the Natural Resources Corporate Finance Team. **David Walker** has been appointed a Managing Director in Investment Banking. He joins from Nomura International in London, where he was Director of Investment Banking. **John Lewin** has been appointed Chief Operating Officer of UFG. He joins from Renaissance Capital in Moscow, where he was Managing Director, Group Chief Operating Officer. **Nur Pekin** has been appointed Director of UFG. Prior to that she was Director, Merrill Lynch Emerging Markets Equity Sales, responsible for Emerging Europe and South Africa.

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