Petroleum review August 2000

Independent bulk storage

Round-up of European developments Tank calibration methods Terminal automation

North America

The changing face of the UK forecourt
 Record year for Canadian oil patch

Cloudy future for weather derivatives

E-business

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

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▼ Canopy and totem detail for IP. Italy

▲ Petrol station design for IP, Italy ▼ Prototype of totem sign for IP

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A Packaging for BP ▼ Interior of Heathro





Proposal for Heathrow Express ▼ Identity for IP's self-service stations





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kW = kilowatts (103)

MW = megawatts (106)

GW = gigawatts (10⁹)

sq km = square kilometres

kWh = kilowatt hour

km = kilometre

b/d = barrels/day

t/d = tonnes/day

ABBREVIATIONS

The following are used throughout Petroleum Review:

- $mn = million (10^6)$ $bn = billion (10^9)$ $tn = trillion (10^{12})$ cf = cubic feet
- cm = cubic metres
- boe = barrels of oil
- equivalent
- t/y = tonnes/year

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

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Front cover: Simon Storage's Shannon terminal.











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The Institute of Petroleum as a body is not responsible either for the statements made or opinions expressed in these pages. Those readers wishing to attend future events advertised are advised to check with the contacts in the organisation listed, closer to the date, in case of late changes or cancellations.

ROUNFrom the Editor

Brown Book blues

Every year the UK's Department of Trade & Industry publishes the so-called 'Brown Book' which contains comprehensive data on the UK sector of the North Sea. This 'bible' of the industry is usually published in May, but this year's was delayed until mid-July. Rumour has it they were were waiting to launch the next licensing round, but the complications of environmental impact assessments have produced a major delay to this.

Generally, this year's Brown Book makes gloomy reading. Exploratory drilling in 1999 (16 wells) was at the lowest level since 1965. Appraisal wells (20) were the fewest since 1971. When compared with 47 exploration and 33 appraisal wells in 1998, the impact of low oil prices on a higher cost province are painfully clear.

This year has seen a modest revival, with six exploration rigs operational at the time of writing. However, the survey of operators intentions clearly signals that exploration and appraisal well totals will only be 2–7 wells ahead of the 1999 totals in 2000 and 2001.

Only a very limited number of new field developments have been sanctioned this year, the latest of which is ExxonMobil's 95mn boe Skene field (see p5) which joins Jade and Blake as firm development projects for 2001. Leadon and the Harding development are virtual certainties, while Clair and Goldeneye will be seeking sanction early next year.

There are, in fact, a large number of small accumulations with the potential to be tied back to existing infrastructure. However, sudden and unexpected as it may seem, it is hard to escape from the idea that the UK sector is now a province in fundamental decline.

Careful examination of the Brown Book data shows that in 1999 only 32 out of 130 producing fields (14 have ceased production) registered year-onyear growth in output with all the others recording declines. This is unfortunate but is hardly surprising. *Petroleum Review* has calculated (from the various Brown Book figures) that 21 fields had by end-1999 depleted more than 90% of their most recently estimated initial recoverable reserves. A further 13 have depleted over 85%.

The truly impressive achievement is that the oil companies have managed to maintain such a high level of UK production for so long. Decline rates for postplateau fields vary widely from year to year, but average about 10%/y. The industry has, over recent years, had to run hard in terms of new developments in order to offset the decline of the older and larger fields. This process is coming to an end as there are simply not enough new projects to offset the increasing number of fields in decline. It is starting to look as though 4Q1999/1Q2000 was the UK sector's all-time oil production peak.

Optimistically, the DTI does not expect significant decline before 2002. It is also optimistic in maintaining that investment can be held at around \$3bn/y to 2010. It will take some large and unexpected discoveries to really alter the emerging pattern of gentle decline. These themes will be examined in rather greater detail in next month's issue of the magazine.

This autumn, the Institute will be running a series of four discussion meetings specifically on this issue, entitled 'The Late Life of the North Sea' (for details, see p53).

Assets, assets, assets

BP Amoco has just announced a dramatic increase in its capital spending (see p8). This will enable it to accelerate investment in high-return projects, notably gas in Trinidad and oil from the Gulf of Mexico.

Investment is all about assets but over recent months there has been much talk about 'virtual companies' owning few, if any, assets and using web-based linkages to efficiently deliver goods and services. This, however, raised the question 'If you own no assets and there are no real barriers to entry using the web – how do you define and defend your corporate turf?'

Andersen Consulting are now challenging the notion of the virtual oil company (see p42).

The emerging conclusion seems to be that assets really are what it is all about, otherwise you are just an agent or an agency. High oil prices, further investment in assets and websites to make them productive – the outlook for the international oil industry is really very bright.

Petroleum Review is very grateful to all those readers who took the time to fill in our questionnaire in the July issue. It is already proving most helpful in showing where we can align our coverage more closely with readers' interests.

So, if you have not filled in a questionnaire yet, please do. Your opinions really will help shape *Petroleum Review.* If you cannot find your questionnaire, but would like one, contact the editorial staff.

Chris Skrebowski

The Energy Industries Council, the trade association for companies involved in the supply of capital goods and services to the energy industries worldwide, has launched phase one of its website at www.the-eic.com The site provides information about the Council, its people and its activities.

Catalist has unveiled a new website at www.catalist.com The site allows users to visit a map of every service station in the UK, search the database and purchase data that meet specific requirements and keep up to date on fuel prices. It also features industry news.

Chevron has announced the formation of Silicon Valley Oil Co (SVOC) – an online marketplace which plans to enable sales of fuels and lubricants to commercial and industrial customers via the Internet. SVOC plans to open the new portal in 3Q2000. For further information, visit www.chevron.com

Parity Solutions, Infobank and e24 plc have announced plans to build what they claim is the first turnkey electronic trading community for the oil and gas industry. The new e-hub at energy24.com will use the Infobank InTrade e-hub trading community software and will offer an online e-procurement marketplace and information platform. The new portal will officially launch in August 2000. Initial efforts will focus on the UKCS, before moving on to other geographic regions.

GSR-Software Development's new web-based Safety Management System – e-MS – provides online viewing of safety manuals, HSE plans and hazard registers, all of which are hyperlinked for efficient use. Further details can be found at www.gsr-hse.com

The independent oil distributor and marketing company Vitol, has formed a strategic alliance with Houston-based **RedMeteor.com** – the recently launched Internet trading platform for crude oil, products, natural gas and electricity. Vitol is to provide liquidity and help market and promote **RedMeteor.com** in the global trading arena.

A new site – **www.Moor-It.com** – has been launched which is claimed to 'revolutionise the efficiency of design, planning and procurement for deepwater mooring developments for the future.'

International engineering and construction companies Amec, Bovis Lend Lease, Hochtief and Turner, together with Skanska have unveiled plans to launch a new independent global B2B venture – www.aceventure.com – in 4Q2000. The new venture aims to 'revolutionise the entire architectural, engineering and construction (AEC) industry by linking global and regional portals in an innovative business model.'

continued on p6...

NEW_{Upstream}

In Brief

World energy demand remains flat

The world's demand for energy again remained essentially flat in 1999, growing by only 0.2% – well below the average increase for the past ten years of 0.9%, reports BP Amoco in its recently published *Statistical Review of World Energy 2000*. If the significant fall in Chinese energy use is excluded, however, global consumption rose by 1.4%.

The weakness in growth in 1999 was concentrated in the emerging and developing economies whose energy consumption fell by 12.3% during the year, compared to 1.4% growth in demand in the OECD area.

The report indicates that in 1999 there was a dramatic change in energy use in China, with overall demand falling by 10.7%, including a 16.8% fall in demand for coal. This occurred without discernable impact on Chinese economic growth. Excluding the fall in demand in China, energy use in the Asia-Pacific region rose 2.5%. Last year also saw the first rise since 1990 in energy consumption in the countries of the former Soviet Union, growing by 1.4%.

Oil prices recovered strongly from the lows seen in 1998, rising 39% to an average \$18.25. Opec production was reduced by 5.4% to 29.3mn b/d. If Iraqi production (which rose by almost 20% under changes in UN sanctions) is excluded, Opec production declined by 7.2% to its lowest level since 1994. There were also falls in non-Opec production – down 3.8% in the US and down 4.8% in Mexico. UK output, however, rose by 3.4% with ten new fields commissioned during the year.

Oil demand recovered, up 1.6% across the world. Demand was particularly

Algerian deal for BHP

BHP has signed an agreement with Sonatrach covering the development of four gas/condensate reservoirs in the Ohanet region of Algeria. The fields are estimated to hold total proven and probable reserves in excess of 3.4tn cf of gas, 107mn barrels of condensate and 116mn barrels of LPG. Total project development is expected to cost \$1bn.

First production is slated for October 2003, with a plateau production of 30,400 b/d of condensate, 27,700 b/d of LPG and 655mn cf/d of gas. Liquids production is forecast to peak at 58,000 b/d.

Project partners are BHP (60%), Japan Ohanet Oil & Gas (30%; a consortium comprising JNOC 50%, Itochu 35% and Teikoku 15%) and Petrofac Resources (10%). strong in the Asia-Pacific region, up 3.6% on 1998, as the recovery from the Asian economic crisis continued. US demand rose 2.2%.

Gas continues to gain market share, rising to over 24% of total energy consumption. Demand rose 2.4% in 1999, significantly above the 10-year trend of 1.7%, driven by increasing market deregulation, the environmental benefits of gas and the technical advances in combined cycle gas turbine power generation. Demand in the US, the world's largest market, rose by only 0.5% due to warm weather and the low price of fuel oil.

Gas production rose 2.5% with 12 countries increasing supply by more than 10%.

Coal continued to lose market share, demand falling by 5.1%. The huge fall in coal use in China, the world's second largest market after the US, resulted from its deliberate policy of closing mainly small mines and coal consuming state-owned enterprises. Elsewhere, coal consumption continued to decline in Europe, down 5.2%, remained flat in the US and Asia consumption (outside China) grew by just 0.6% against the 10year average of 2.8%.

The use of nuclear power rose 3.8% in 1999, largely due to an 8% rise in the US where re-licensing of existing plant supported output despite no new plant commissioning. Use of hydroelectricity continued to slowly grow, up 0.9% in 1999. Production of energy from other renewable sources – of which wind is the fastest growing source – remains tiny by comparison with other sources.

Further data can be downloaded from www.bpamoco.com/worldenergy

Harding gas area plans

BP Amoco is reported to have placed a number of contracts for its Harding Area Gas Development project in the North Sea which aims to bring the Rhum and Devenick stranded gas assets onstream as tie-backs to the Harding platform by end-2003.

Kvaerner is understood to have secured the pre-FEED contract covering facilities and structures, while Brown & Root Energy Services is to study process and flow assurance. Aberdeen-based Boreas has been awarded the pipelines concept contract. The project, which may involve two platforms, is expected to move into the the front-end engineering design phase in October 2000. Appraisal drilling is expected to begin in Rhum this summer, with Devenick to be appraised in 2001. Ranger Oil (UK) has signed a Heads of Agreement for the life of field development of the North Sea Kyle field with Shell UK on behalf of the Curlew field owners and with Maersk Contractors, owner and operator of the Curlew FPSO. Subject to the successful further appraisal of the field, regulatory approval will be sought to bring the field onstream in March 2001. It is proposed that the Curlew FPSO will process production from both Kyle and Curlew.

UK

Intrepid Energy is reported to have acquired a 40% stake in Outer Moray Firth part-blocks 15/6a and 15/7a from Texaco for an undisclosed sum.

Shell UK has sold its 4.375% stake in the Elgin and Franklin gas condensate fields to Onepm (UK) (a subsidiary of Oranje-Nassau) and Dyas UK (a subsidiary of SHV Holdings).

BP Amoco's T35 satellite to the Foinaven field in the Atlantic Margin has come onstream and is producing 14,5000 b/d of oil. The T35 accumulation is estimated to hold 10mn barrels.

The UK Offshore Operators Association (UKOOA) has acquired data management company Common Data Access (CDA) in order to facilitate the smooth implementation of DEAL (Digital Energy Atlas and Library), the webbased one-stop-shop for information and data on the UKCS.



Statoil is understood to have chosen to develop its Norwegian North Sea Kristin field via a semi-submersible production platform. Kvaerner Oil and Gas has won the FEED study contract for the unit, although it is reported that the licensees plan to continue to evaluate alternative approaches. First production is forecast no sooner than 3Q2005.

Norway's Aker Maritime is reported to have secured a contract from Vastar Resources of Houston to build a spar floating oil and gas production platform for the deepwater Gulf of Mexico Horn Mountain field. The platform will be built at Aker Finnyards' Rauma yard in Finland. The field is due onstream in 2Q2002. Production is expected to peak at 65,000 b/d of oil and 50mn cf/d of gas.

NEW_{pstream}

In Brief

Enterprise Oil expands GoM portfolio

Enterprise Oil has acquired all of R&B Falcon's exploration and production interests in the Gulf of Mexico for \$127.25mn. The assets include R&B's 50% stake in the Boomvang field development and 100% interest in, and operatorship of, the Gyrfalcon field, together with interests in 19 other deepwater Gulf of Mexico exploration blocks.

Boomvang, in East Breaks blocks 641, 642, 643, 688 and 732, is operated by Kerr-McGee (30%) and has reserves put at between 70mn and 100mn boe. To be developed via a Spar platform designed to handle 30,000 b/d of oil and 200mn cf/d of gas, the field is due onstream in 1H2002. The third partner in the project is Ocean Energy, with a 20% holding. Gyrfalcon is a gas field in Green Canyon block 20, with reserves of 3mn boe. The field is currently producing 10mn cf/d of gas through a single well tied back to Shell's nearby Boxer platform.

The deal follows Enterprise Oil's recent agreement to farm-in to a 25% interest in a further 12 exploration blocks operated by Texaco, located in the Green Canyon and Walker Ridge areas of the Gulf of Mexico. An exploration well (Catahoula), operated by Texaco, is to be drilled on this acreage later in the year. Enterprise Oil also acquired exploration acreage in new leases in the Atwater Valley and Mississippi Canyon as part of the OCS Gulf of Mexico lease sale in March 2000.

Ramco sells stake in Azeri, Chirag, Guneshli fields

Ramco Energy has sold its 2.08% stake in the Azeri, Chirag and Guneshli fields – currently being developed in the Azeri sector of the Caspian Sea – to Amerada Hess for \$150mn, payable in four tranches. The deal boosts Amerada Hess' holding to 3.76%.

Total gross field reserves are estimated in excess of 4bn barrels of oil. The fields are currently producing 105,000 b/d and have the potential to output 1mn b/d in 2008. Members of the AIOC consortium developing the fields, are currently considering options to expand the oil export systems to handle these increased volumes, including the planned main export pipeline from Baku to Ceyhan on Turkey's Mediterranean Sea coast.

The acquisition is subject to Azeri Government and project partner approvals. If approved, the revised project interests will be: Socar 10%, BP Amoco 34.14%, Delta Hess (Khazar) 1.68%, Delta Hess (ACG) 2.08%, ExxonMobil 8%, Lukoil 10%, Itochu 3.92%, Pennzoil 4.82%, Statoil 8.56%, TPAO 6.75% and Unocal 10.05%

Amerada Hess and Ramco have also agreed that for three years after the completion of the acquisition (expected in about five months' time), Amerada Hess will have the first opportunity to partner Ramco in any oil and gas project in which it seeks third-party participants.

The deal forms part of Amerada Hess' planned strategy to establish one-third of its reserve base outside its traditional core areas of the Gulf of Mexico and the North Sea. It already has interests in the Kursangi and Karabagly fields onshore Azerbaijan and the company predicts that by 2008 its total equity production from its Azeri interests could be in excess of 40,000 b/d.

Prospects looking good for marine industries

The world's marine industries seem set for a period of growth according to UK analysts Douglas-Westwood. Partner John Westwood reports that marine activities over the next five years are 'looking good' for industries ranging from shipbuilding and port operations to offshore oil. He said: 'The tide has turned, with business activity in southeast Asia, whose decline caused the earlier downturn, increasing and global economic activity forecast to grow at some 2.5% over the next few years. If historic patterns are repeated, this should result in an increase of 4-5% in marine trade, bringing benefits right across the spectrum on marine industries."

The offshore oil and gas industry was particularly hard hit by the economic crisis in the Far East and oil majors continue to take a 'very conservative' view of oil prices despite the current \$30 plus levels. 'Over the last decade oil prices have averaged \$18,' said Westwood, 'so the view of some oil majors in basing their economic analysis of new field investment on \$14 is, in theory, wellfounded. But in a number of regions contractors are reporting increased enquiries and many believe that 2001 is going to be a busy year. As this view builds, oil companies will start to recognise that key resources available for new projects are in reality quite limited and demand will grow very rapidly.

Lyngdal Recycling is reported to have secured the platform removal contract for Statoil's 2/4-S riser platform.

Aker Maritime subsidiary Aker Verdal has secured the NKr600mn contract to fabricate the jacket for Statoil's Kvitebjorn oil and condensate field in the North Sea.

PGS is understood to be supplying its Petrojarl 1 FPSO to Statoil's Glitne field in the Norwegian sector of the North Sea. First production is expected in July 2001.

Enterprise Oil and co-venturers Statoil Exploration (Ireland) and Marathon International Petroleum Hibernia has announced that the 19/20-3 appraisal well in the Corrib gas field in Ireland has tested at rates up to 60mn cf/d and will be suspended as a potential producer. A further well is to be drilled on the field this summer.

Kvaerner is reported to have secured a \$15mn contract from Shell to provide engineering, procurement and construction services for a subsea system to be installed on the Garn West field in the Norwegian sector of the North Sea. The field is to be developed as a satellite to the Draugen field.



McMoRan Exploration is reported to be selling its 35% stake in the Brazos block A-19 field and its 50% interest in the unexplored Brazos block A-26, both in the Gulf of Mexico, to Shell for \$70mn.

Canada's Yukon territory authorities are reported to be planning a second licensing round in 2001.

Unocal is reported to have secured a 15.6% working interest in an expanded area covering the entire Mad Dog field in the Gulf of Mexico. Prior to the revised equity distribution, Unocal held a 25% stake.

Canadian Occidental's Gulf of Mexico Gunnison prospect is understood to have reserves estimated between 150mn to 250mn barrels of oil.

The Canadian Government is reported to have given the Hibernia project partners permission to increase production to 200,000 b/d from 150,000 b/d.

4

NEW_{Upstream}

In Brief

BHP to proceed with ROD project

BHP has announced that it plans to proceed with development of the 300mn barrel Rhourde Oulad Djemma (ROD) integrated oil field project in the Berkine Basin of Algeria. Partners in the \$500mn project are state oil company Sonatrach, Agip and Eni.

A total of five fields will be developed – ROD, SFNE, RERN, BSF and RDB – all of which are located on BHP-operated exploration blocks 401a/402a in the Sahara Desert. The largest of the fields, ROD, extends in to the neighbouring

First gas from Yetagun

Premier Oil reports that gas production has commenced from the Yetagun field located in the Andaman Sea offshore Myanmar. Development of the field was completed on time and on its \$650mn budget, states the company. Initial gas volumes of up to 70mn cf/d are currently being delivered to the gas buyer PTT of Thailand. The full take-or-pay contract quantity of 200mn cf/d is to commence from 1 July 2000.

Yetagun partners are: Premier Oil (26.67%), Petronas (30%), PTTEP International (14,17%), Nippon Oil Exploration (14.17%), Myanmar Oil and Gas Enterprise (15%).

Caspian potential

The Caspian region has the potential to produce almost 4mn b/d by 2015 – although, given the complex geopolitics, distances to world markets and availability of financing, this figure is likely to prove optimisic – reports the Wood Mackenzie consultancy in its latest review of the region. If potential exploration failure and project delays are taken into account, a more realistic production figure plateaus instead at around 2.4mn b/d.

For further information, please contact Wood Mackenzie on Tel: +44 (0)131 225 8525, Fax: +44 (0)131 243 4435, e: info@woodmac.com

STOP PRESS

Our review of the Royal Bank of Scotland's Oil and Gas Index is not featured in this issue due to the Index's late publication as we went to press.

However, will will provide a full update in the next issue of Petroleum Review. block 403 concession operated by Agip and Sonatrach.

The fields are to be developed via a new dedicated processing train that will be built at Apip and Sonatrach's existing BRN production facility on block 403. From there, oil will be exported via the existing pipeline infrastructure to terminals located on the Algeria coast, while the associated gas will be reinjected underground.

First production is slated for the 1H2003, with a gross peak production rate of 80,000 b/d.

Amerada boosts reserves

Amerada Hess has acquired from Veba a further 34.46% interest in the Ivanhoe, Rob Roy and Hamish North Sea fields and the associated AH001 floating production facility. The deal increases Amerada Hess's total stake in the fields and production facilities to 76.545%.

The acquired interest, together with a new development well which was recently completed on the Ivanhoe field, are expected to provide Amerada Hess with additional production of nearly 9,000 b/d this year. Together, they are said to provide the company with access to proven reserves of 11mn barrels.

Skene development

The UK Government has approved the £244mn development of the Skene field in North Sea block 9/19. Field reserves are put at 95mn boe. Due onstream by early 2002, Skene is to be developed via a subsea tie-back to the Beryl Alpha platform, with gas export via the Scottish Area Gas Evacuation (SAGE) pipeline to St Fergus. The field is expected to produce up to 180mn cf/d of gas and 25,000 b/d of associated liquids.

Field partners are: Mobil North Sea (operator, 38.22%), Kerr McGee (33.33%), Enterprise Oil (15.89%), Amerada Hess (9.07%) and OMV (UK) (3.49%)

News in Brief Service

Keep abreast of the most recent developments, deals and contracts in the global oil and gas industry.

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Middle East

TotalFinaElf is reported to have awarded a contract to double production from the Al Khaleej oil field in Qatar to 60,000 bld.

Oman's Mukhaizna field is reported to have come onstream and is currently producing 15,000 b/d of oil. Output is expected to rise to 25,000 b/d later this year. Field reserves are put at 2.4bn barrels of oil.



The Russian Government has approved a construction plan for the Baltic Pipeline System which grants Transneft full ownership rights over the new pipeline, reports the United Financial Group's Russia Morning Comment.

Lukoil and Socar are understood to have agreed a production sharing contract covering onshore block Govsani-Zih. A total of 12 wells have been drilled on Govsani-Zih to date, and remaining reserves are put at 20mn tonnes of oil.

Surgutneftegaz reported in its recent AGM that it plans to produce 800,000 b/d of oil and 200,000 boeld of gas in 2000. The company also announced a mediumterm production target of 900,000 b/d of oil and 360,000 boeld of gas.

Russian crude production rose by 4.6% to 1,151mn barrels in the 1H2000, reflecting the increased levels of capital expenditure by the Russian oil industry.

Kazakoil President Nurlan Balgimbayev is reported to have announced that the Kashagan prospect in the Caspian Sea contains 50bn barrels of oil reserves, six times the size of the Tengiz field, making it the world's largest oil discovery for the past three decades. The consortium developing the field is to release its own statement at the end of July once field testing has completed.

Fletcher Challenge Energy is reported to have discovered a large gas field offshore New Zealand's North Island. Development of the Pohokura field is expected to cost NZ\$500mn (\$417mn). Reserves are put at 40mn barrels of condensate and 750bn cf of gas. First production is slated for 2004.

NEW_{Upstream}

Uzbekistan blocks put out to tender

The Uzbek Government is preparing to offer 16 blocks, covering 78 fields and numerous exploration prospects throughout Uzbekistan, reports Wood Mackenzie. In addition, eight individual fields have been earmarked for potential foreign exploration, some of which are already onstream (*), see table.

Foreign investors are also to be invited to bid for up to 44% equity in several of Uzbekneftegaz' subsidiary

companies in 2001.

| Field | Basin | Reserves (mn boe) |
|--------------------|-------------------|-------------------|
| Dzharkukuk | South West Gissar | 115.6 |
| Gumbulak | South West Gissar | 214.8 |
| North Shurtan* | Amudarya | 11 |
| Shakarbulak | Amudarya | 47.7 |
| South Kemachi | Amudarya | 350.8 |
| South Kizilbairak* | South West Gissar | 27.9 |
| South Tandircha | South West Gissar | 314.4 |
| Umid* | Amudarya | 116.6 |

NZOG drilling plans

New Zealand Oil and Gas (NZOG) has announced plans to drill 11 wells in Australia and New Zealand during the 2000/2001 financial year. The prospects to be tested cover a range of objectives and play styles, from appraisal wells designed to increase oil reserves and flow rates from existing production licences, to wildcat drilling.

In Taranaki, the work programme includes the drilling of an exploration well near the Ngatoro oil field and testing of the Opito and Tui prospects.

In Australia, the initial focus will be on the offshore Carnarvon Basin, where the company is to drill the Tusk oil prospect, located near the recent Corvus gas find and Oryx oil discovery, in August. Extensive seismic and drilling is also planned in the Chervil oil production licence and adjacent TP7 exploration licence, in partnership with Apache, Santos and Mobil.

Deutag UK is reported to have secured a three-year, \$47mn contract covering the drilling and completion of up to nine extended reach wells from the Chirag 1 platform, offshore Azerbaijan.

Gazprom is reported to be planning to invest up to \$3.5bn in capex in 2000, some 45% more than in 1999. Around 30% is expected to be invested in the Zapolyarnoye gas field, which is forecast to produce 32bn cm/y by 2002. Gazprom urgently needs to bring new gas fields onstream in order to replace the 20–25bn cm/y production decline from its two large Yamburg and Urengoy fields.

E-world news

A new site claimed to enable OEMs, distributors and users to identify and order spare parts over the Internet has been launched at **www.justspares.com** by Media Solutions Interactive. Users can view illustrated parts diagrams over the Internet and obtain technical information on spare parts. The system can also provide information on stock availability and depot location.

SeaLogistics and OneSea Direct – the chartering subsidiary of **OneSea.com** – are to combine their two online exchanges to create what is claimed to be the first, comprehensive, neutral, online shipping exchange for the global petroleum industry. The new venture, will retain the name SeaLogistics.

BUPA International has launched a new site – www.bupa-intl.com/oilandgas – to provide online advice and information about the BUPA International oil and gas medical care and evacuation cover scheme for oil and gas workers.

Asia-Pacific

Woodside Petroleum and Shell are reported to have sold a 10% stake in their Timor Sea gas fields offshore northern Australia to Osaka Gas Company for an undisclosed sum.

US firm Unocal is reported to be planning to invest \$350mn on developing a new gas field in the Gulf of Thailand and expanding the Pailin oil field project into its second phase in 2001.

Statoil is reported to be planning to invest up to NKr2bn over two years to develop the Nam Con Son gas project offshore Vietnam.

In Brief

Shell is reported to be planning to present a new merger proposal to Woodside Petroleum. The Australian company has already rejected Shell's original \$3.3bn bid to boost its share in the company from 34.27% to 60% in return for a package of Shell upstream assets in Australia, New Zealand and Iran.

Sinopec of China is understood to be planning to increase output from the Tahe field in the Tarim Basin to 140,000 b/d by 2005 as well as boost output from the Yakela gas field to 70bn cf/y by 2004 and raise the field's proven reserves from 1tn cf to 10tn cf.

The small Gypsy and North Gypsy fields offshore Australia are to be developed as subsea satellites to the Harriet Alpha platform. First oil is slated for January 2001.



Having finalised funding for the \$2.5bn Barracuda/Caratinga field development offshore Brazil, Petrobras has awarded a \$2.5bn-plus contract to Halliburton covering engineering, procurement, construction and installation of wells and field facilities. Work is to commence in July 2001 and will include construction related to 51 wells and two FPSOs each with a production capacity of 150,000 b/d of oil.

Crestar Energy of Canada has acquired all the outstanding shares of CMS Oil and Gas Ecuador for C\$142mn.

Petrobras of Brazil is reported to be planning to put out to auction 73 mature oil fields in 11 blocks, equivalent to 35mn barrels of oil.

Africa

ExxonMobil's Jade platform in the Zafiro field offshore Equatorial Guinea is reported to have commenced production from its first well at more than 12,000 b/d. The \$560mn project is expected to eventually add 60,000 b/d to Zafiro's current output of 112,000 b/d when it reaches peak production in 2002.

ExxonMobil's has made a seventh oil discovery on block 15 offshore Angola. The Mondo find has tested at 4,200 bld. Block 15 is estimated to hold recoverable reserves in excess of 2bn boe.

NEW_{industry}

In Brief

Opec raises oil production ceiling

Opec agreed to raise its oil production ceiling by 700,000 b/d to 27.3mn b/d, up 2.6% on the previous quota, at its latest meeting on 21 June. Individual member countries new output levels are listed in the table below.

Opec states that while this step is being taken in recognition of its

| Country | New quota | | |
|--------------|----------------|--|--|
| Algeria | 811, 000 b/d | | |
| Indonesia | 1,317,000 b/d | | |
| Iran | 3,727,000 b/d | | |
| Kuwait | 2,037,000 b/d | | |
| Libya | 1,361,000 b/d | | |
| Nigeria | 2,091,000 b/d | | |
| Qatar | 658,000 b/d | | |
| Saudi Arabia | 8,253,000 b/d | | |
| UAE | 2,219,000 b/d | | |
| Venezuela | 2,926,000 b/d | | |
| TOTAL | 25,400,000 b/d | | |
| | | | |

responsibility to contribute to market moderation and stability, it is also being taken 'in the hope that it will meet with an appropriate response from consuming countries, especially those in Western Europe whose excessive domestic taxation of petroleum products, amounting to as much as 70% of the price to the final consumer, is the major cause of the high pump prices currently being paid.

Those attending the Opec meeting also stressed that the current high level of crude prices was 'not due solely to market fundamentals, crude oil stock levels remaining adequate, but was also the consequence of market speculation,' while higher product prices were, in part, 'the result of new environmental regulations application in the US where the legislative introduction of reformulated gasoline has resulted in supply bottlenecks for consumers.

Cutting sulfur emissions

UK Environment Minister, Keith Hill, has stated that new regulations cutting the amount of sulfur in industrial oils will reduce sulfur dioxide emissions by 60 kt (kilotonnes) per year from 2003, helping to combat acid rain and clean up urban air quality.

The regulations, which implement a European Directive agreed under the UK's Presidency of the European Union in 1997, limit the sulfur content of gas oil to 0.2% from 1 July 2000 and 0.1% from 1 January 2009 (from a current average of 0.2%), and the sulfur content of heavy fuel oil to 1% from 1 January 2003 (from a current average of just over 2%).

The new measures will complement incentives aimed at encouraging the uptake of ultra-low sulfur diesel and petrol in recent Budgets.

EU–Mexico free trade

Companies in the energy industry will have better access to lucrative Mexican Government contracts, including business from state oil company Pemex, under the EU–Mexico free trade agreement which came into effect today. The agreement to end all industrial goods tariffs by the end of 2007 will provide UK companies, small and large, with tarifffree access to a market of 100mn people and offer a springboard into the US.

Under the terms of the agreement, EU exports to Mexico will be granted similar treatment to that enjoyed by the US and Canada. The Union will liberalise 82% of its trade with Mexico immediately, while remaining tariffs will be eliminated by 2003. More than 50% of EU exports will enter Mexico tariff-free as soon as the accord is in place, with further reductions staggered through to 2007.

BP Amoco does Dominican LNG deal

BP Amoco is to provide AES Corporation with 100mn cf/d of LNG for its Dominican Republic power projects under a deal valued at \$2.5bn. It is understood to be the first time that BP Amoco has sold LNG under the BP Amoco brand where gas reserves have not been assigned.

According to Richard Flury, Chief Executive of BP Amoco's Gas & Power division, the deal provides a long-term outlet for the Group's equity gas, but also allows it 'considerable flexibility in the way we source and deliver gas to the customer while providing security of supply.' He stated that this flexibility would allow the company 'to optimise supply by product swaps with fuel oil, create value from supply and transportation optimisation in the Atlantic Basin and to secure rights to access the LNG receiving terminal in the Dominican Republic for additional volumes.'

First LNG deliveries are slated for yearend 2002.



BP Amoco reports that it has completed its £3bn purchase of Burmah Castrol.



Aker Maritime is reported to have acquired a 26.39% stake in rival contracting company Kvaerner after the recent current rights issue.

Global technology group ABB is to buy the oil and gas activities, including the installation business, of Norwegian service company Umoe for an undisclosed sum. The acquisition does not include Umoe Schat-Harding, Umoe Karmsund or any of the other companies in the Ultviet-Moe Group.



US E&P companies Forest Oil and Forcenergy have merged their operations in a \$813.6mn deal. The merger is said to create one of the 10 biggest independent E&P companies in the US, with a market capitalisation of \$1.5bn. The new company will be known as Forest Oil Corporation, and 56% owned by Forest Oil shareholders.

Chevron and Phillips have received the necessary regulatory clearance to proceed with the 50:50 merger of their chemical businesses to create Chevron Phillips Chemical Company (CPCC).



The Russian Federal Energy Commission has approved a 12.1% increase in average Transneft tariffs in order to compensate for the construction of the \$160mn Chechnya bypass pipeline, according to the United Financial Group's Russia Morning Comment. The new tariffs will cost an additional \$0.04/b of production, causing only very minor earning reductions for the oil companies in 2000, comments UFG.

Gazprom's AGM was described by the United Financial Group's Russia Morning Comment as 'a success for minority investors.' Two representatives of minority shareholders – former Finance Minister and found of UFG Boris Fedorov and Ruhrgas Deputy CEO Burchardt Bergman – were elected to the board.



BP Amoco outlines future plans

BP Amoco has stated that it expects to increase gross capital spending to an average of \$13.5bn/y over the next three years, and aims to grow underlying earnings for the Group by at least 10% per annum over the same period. The additional spend – up from a comparable annual average of \$12mn for the three years to 1999 for BP Amoco, Arco and Burmah Castrol combined – will be used to accelerate high-return projects from the Group's enlarged portfolio, in particular gas production from Trinidad and oil production from the Gulf of Mexico.

'We anticipate disposals of some \$1.5bn a year over the next three years, as we continue to high-grade our portfolio', Chief Executive Sir John Browne told journalists. 'This means total net investment will average around \$12bn per annum, so capital employed should grow by around 4% to 6% a year. Add to that improved productivity of between 4% and 8% a year, which we believe we can achieve across the Group, and we can see bottom-line growth of 10% a year, and possibly more.' He stated that this would be done while working existing assets, as well as new ones, so that the new level of performance can be achieved without any pause in earnings growth.

Browne said that the newly enlarged company had oil reserves of 7.5bn barrels and 43tn cf of gas, a global retail network of 28,000 sites and a 'worldclass' petrochemicals business. He stated that over the next three years he expected Group oil production to rise by 5% to 8% per year, and gas by 8% to 10%. By 2003, he forecast that gas would account for over 40% of overall output. Sales of gas are targeted to rise by between 9% and 11%, and petroleum products by up to 4%. Petrochemical volumes are set to increase by 8% to 10%, and convenience market sales by up to 15%.

Gross capital spending on E&P is to be increased to an average of \$8bn per year, on refining and marketing to \$2.8bn and on petrochemicals to \$2bn. The Group's new gas and power business is to spend \$400mn, and annual investment in renewables is to double to \$500mn.

Browne also stated that the Group expected to deliver cost-savings of \$4.7bn by year-end – 80% of the projected total of \$5.8bn, well ahead of schedule. This is expected to ensure that BP Amoco achieves its target of a five to six percentage point underlying improvement in return on capital employed by end-2000.

In Brief

The Russian Minister of State Property is reported to have confirmed plans to begin the privatisation of an 85% stake in Onaco, a 150,000 b/d Orenburg oil producer. The sale is forecast to be finalised by October 2000.

The Russian Government is planning to raise the crude export duty from euro 20/t to euro 27/t from 1 August 2000, reports the United Financial Group's Russia Morning Comment. If the oil price remains in the range of \$29/b, the duty may be raised further to euro 34/t, comments UFG.

Gazprom's exports to Europe rose by 2.3% against the same five-month period in 1999. Turkey was the market showing the largest increase.

BP Amoco is understood to be planning to increase its stake in Rusia Petroleum from 22% to 33% by purchasing a new share issue. Rusia holds 1.4tn cm of gas reserves in the Irkutsk region.



The Gas Authority of India (GAIL) and Shell are understood to have formed a strategic alliance to identify various projects in India's upstream gas sector as well as evaluate import possibilities and pipeline development in the country.

Woodside Petroleum is reported to have rejected Shell's \$3.3bn bid to boost its share in the Australian company from 34.27% to 60% in return for a package of Shell assets in Australia, New Zealand and Iran.

BP Amoco is understood to be planning to acquire a 2.2% stake in Sinopec, when the Chinese company launches an initial public offering later this year. The purchase is expected to cost BP Amoco several hundred million dollars, and follows its recent acquisition of a 2.2% interest in PetroChina.



Petrobras of Brazil has launched a public offering of up to 28.48% of its common, voting shares, corresponding to 16.63% of the company's total capital.

Repsol YPF and Petroparaguay are to jointly develop a number of projects covering the provisioning, transport, storage and marketing of oil products in Paraguay and other markets.

Update on WTO trade commitments

Delegates at the new Round in Services that was launched this March at the World Trade Organisation (WTO), are debating whether to negotiate trade commitments for individual sectors in groups, setting broad commitments affecting all such related industries, reports Keith Nuthall.

David Hartridge, WTO Services Director, told Utility Europe that a 'cluster for energy might also cover drilling, mineral exploration and geosurveys. However, WTO diplomats could decide to lump mineral exploration in another cluster, for example one centred on rules promoting the environment.

Diplomats are also discussing whether to make these linkages legally binding, so that trade rules concerning the clustercore would affect those more peripheral sectors that had been grouped with it. Hartridge said this would be unlikely, but the mere fact that the negotiations for trade rules for certain utility services would be tied to a particular broad subject, would have an effect. 'Some governments have a high priority for energy, some have a high priority for the environment. If you put something in an energy cluster, you might lessen some of the interest shown in it by the environmentalist lobby,' he said.

Discussions on broad negotiating tactics are to end next March, when WTO member countries are scheduled to launch detailed talks on widening mutual access to markets for energy and other services.

Visit the Institute of Petroleum's website @ www.petroleum.co.uk

Downstream In Brief

Wellhead-to-wire LNG power plant first

BP Amoco has sanctioned a multi-million dollar investment for what is claimed to be the Atlantic Basin's first fully-integrated, 'wellhead-to-wire' LNG power plant, in northern Spain. The Bahia de Bizkaia project, in which BP Amoco has a combined 25% stake, comprises a 800-MW combined cycle gas turbine power plant, a 2.75bn cm/y regasification facility, LNG import terminal and a total of 300,000 cm storage capacity.

The three other project partners are Repsol YPF, Iberdrola and EVE (the Basque Energy Authority). Each has a 25% interest in the groups developing the facilities – the Bahia de Bizkaia Gas group that will develop the regasification plant, and the Bahia de Bizkaia Electridad group that is to develop the power station.

Bilbao-based contractor Babcock and Wilcox Espanola will lead the construction consortium for the \$310mn power plant, while Spanish company Initec will lead the building programme for the regasification plant at a cost of \$240mn. Construction is due to begin in 2000. The power plant is slated to begin generating by end-2002 and the regasification facility commissioned by mid-2003.

Of the regasification plant's output, 1.1bn cm/y will be supplied to the power plant, 1bn cm/y for Gas de Eiskadi, the gas distributor for the Basque country, and 0.6bn cm/y supplied to Repsol YPF. The facility will be designed for potential future expansion to 6bn cm/y.

Earlier this year, the Government of Trinidad and Tobago approved a twotrain LNG expansion project for the Atlantic LNG facility in which BP Amoco and Repsol are shareholders. BP Amoco will supply just over 60% of the natural gas for the two trains and some 60% of the output of the expanded plant will be sold to Spanish buyers, including Repsol, for use in the Spanish market.

UK fuel prices continue to rise

UK fleet and fuel management company PHH Vehicle Management reports that the price of unleaded petrol has risen by over 25 p/l since May 1996, with the price of diesel increasing by over 24 p/l in the same period. 'For an average motorist, this means that it now costs over £12.50* more to fill a vehicle with unleaded petrol than five years ago', states the company.

The rate of price rises is reported to have 'accelerated alarmingly' over the past 12 months. While the cost of unleaded petrol rose by around 5 p/l each year between 1996 and 1999, the price has risen by 10 p/l between May 1999 and May 2000. Director of Fuel at PHH, Keith Greenwood, believes that, whatever the fluctuations, the general price trend will rise steadily upwards for the foreseeable future.

* Based on a fuel tank size of 50 litres.

Fuel type May 2000 Diesel Lowest: Stoke on Trent 79.27 Highest: Dover 82.88 National average 80.74 Unleaded Lowest: Stoke on Trent 78.25 Highest: Dover 82.37 National average 80.23 Super Unleaded Lowest: Bradford 79.62 **Highest:** Dover 87.30 84.12 National average Source: PHH Allstar Fuel Report

BP launches 'cleaner' unleaded petrol

BP has launched BP Cleaner Unleaded as a replacement for regular unleaded 95 octane petrol at all of its 164 service stations within the M25 at no extra cost. The introduction of the new fuel is forecast by BP to reduce hydrocarbon emissions in the capital by 1mn kg and carbon monoxide emissions by 5mn kg by 2005.

Vehicles running on regular unleaded 95 can switch to BP Cleaner Unleaded without any adjustment, states the company, and the two fuels can be regularly mixed.

The new fuel meets European regulations for 2005 with sulfur levels reduced by 66%. The fuel, which contains advanced detergents to clean up engine deposits and improve performance, is said to reduce hydrocarbon emissions by up to 25% and to produce less carbon monoxide and nitrogen oxide emissions, UK

Powershift, the UK Governmentbacked initiative that aims to kick-start the market for clean fuel vehicles, is to provide financial assistance worth £1,000 per vehicle to help fund the introduction of Honda's revolutionary new hybrid petrollelectric car – known as Insight – into the UK market. The vehicle is to be launched on the UK market on 1 September. The Powershift funding will mean that each car will cost £16,000, a £1,000 reduction on Honda's on-the-road price. The funding programme will cover the first 200 vehicles sold in the UK.

The Virgin Group is soon to launch a web-based gas and electricity joint venture with London Electricity, the UK subsidiary of French utility Electricite de France. Virgin will hold 75% of the venture.

European logistics company Christian Salveson has secured a multi-million contract with Shell for the distribution of over 50mn litres of packaged lubricants throughout the UK over the next five years.

Europe

Poland is understood to be planning to import 5bn cm/y of gas from Norway under a new agreement. First gas is expected in 2004 or 2005. The country currently imports some 7bn cm, primarily from Russia, to help meet domestic gas demand of 11bn cm/y.

It is reported that the proposed merger between Veba Oel of Germany and Austrian company OMV will push the latter to second place in the Hungarian fuel retail market. Under the terms of the merger, OMV will take over the Aral network of service station in Europe, including 240 sites in Poland, Hungary, the Czech Republic and Slovakia. OMV currently has 113 outlets in Hungary and lies in third place behind Mol and Shell.

Finnish energy company Fortum is to triple the production capacity of its synthetic-like EHVI base oil at the Porvoo refinery to 150,000 t/y.

Vopak has transferred the 1.5mn cm capacity Botlek Tank Terminal facility in Rotterdam to Odfjell of Bergen, Norway, at a final purchase price of euro 70mn.

Downstream In Brief

Growth in demand for diesel engines in Europe

Consumer demand for higher levels of fuel economy and a comparable requirement by car manufacturers to reduce average carbon dioxide (CO2) emissions are driving rapid growth of diesel engines in Europe's passenger car and light commercial vehicle markets. In terms of overall market size, five of the top six markets - France, Germany, Spain, Italy and Belgium - all experienced significant sales increases, whereas UK demand continued to fall.

These are the findings of Ricardo's latest annual diesel report, which also concludes that further significant increases in diesel penetration from the current 25% level is likely to occur over the next decade. The independent automotive consultancy states that the major driving forces behind this trend are the need to reduce CO2 emissions coupled with considerable improvements in diesel engine performance and driving characteristics.

'Prospects for the diesel car market seem to be for continued rapid growth and it would not be surprising to see up to 40% penetration over the coming decade,' says report author Martin Love. 'In the longer term, it is probable that penetration will then plateau for the simple reason that we cannot increase much above current levels the proportion of diesel taken from each barrel of oil.'

'The increasing diesel penetration is underscored by the voluntary agreement between car manufacturers and EU Environment Ministers to reduce average CO2 emissions to 140g/km by

2008,' comments Ricardo, 'which the EU hopes to further reduce to 120g/km by 2010. Given the present mix of gasoline and diesel engines, the figure for new cars is currently in excess of 180g/km."

Overall, diesel penetration across Europe in the first 10 months of 1999 reached a new record level of more than one in four cars (27.6%), states the report, eclipsing the previous year's record of 24.8% market share. Diesel sales over the past two years have been increasing at approximately 20% per annum.

Diesel penetration of the UK market, however, has completely bucked this trend, falling from a peak of 23% in 1994 to 14% in 1999 with sales of 304,000 vehicles. This decline completely reverses the succession of dramatic rises in diesel car sales and market penetration in the UK market prior to 1994 and is largely attributed to the UK being the only major market in Europe that favours petrol in terms of price, comments the consultancy. Another important factor is the perception of the relative seriousness of petrol and diesel emissions.

Diesel penetration of the UK light commercial vehicle market, however, has not suffered the same fate as the car market, and remains the second largest market in Europe with sales almost doubling from a low point of 130,000 in 1992 to 229,000 in 1998.

For further information, contact Ricardo at Tel: +32 26 441828, Fax: +32 36 443009, or visit www.ricardo.com

GdF unveils third-party tariff rules

Gaz de France has outlined the tariff rules it is to apply for third-parties wishing to use its French gas pipeline network from 10 August, the date the French gas market begins to deregulate. A European Union Directive requires all Member States to liberalise at least 20% of their markets by this date, rising to 33% by August 2008. Plans are for GdF to meet the August target, even though the EU Directive is not expected to be enshrined in French law before the end of 2000.

The tariff rules are said to be 'simple' - with 18 different prices based on the distance that the gas will be transported, the volume and the cost of maintaining the network.

Greece and Turkey sign gas agreement

Greece and Turkey have joined with the European Commission in an agreement to promote the development of gas transport networks and interconnections between the two Aegean countries, who have had a history of animosity and non-cooperation, writes Keith Nuthall. The three have agreed to set up a trilateral Working Group, within the INOGATE system which aims to develop pipelines and terminals allowing oil and gas to be moved from central Asia to the European Union.

The group is also to examine integrating networks involving Greece and Turkey via investment projects starting 2002. EU External Relations bv Commissioner Chris Patten said the move would 'promote the strategic interconnection of gas supplies to the countries of southeast Europe."

North America

BP Amoco is to sell its 250,000 b/d Alliance oil refinery in Belle Chasse, Louisiana, to Tosco Corporation for \$660mn.

BP Amoco has agreed to buy Idahobased natural gas and power trading and transport company IGI Resources from Intermountain Industries for an undisclosed sum. IGI sells some 600mn cfld of gas in the western US and Canada.

It is rumoured that Shell is planning to spin off its downstream gas and power divisions into an enlarged \$3bn, 75:25 joint venture with US construction group Bechtel. Plans are to expand the existing 50:50 InterGen joint venture to include Shell's Coral Energy gas marketing arm and Tejas downstream gas division.

Russia and Central Asia

The Druzhba-Adria pipeline project is reported to be targeting a September 2001 start-up. The project plans to use free capacities in the Druzhba and Adria oil pipelines to export between 5mn and 15mn t/v of Russian oil via the Croatian port of Omisalj, bypassing the straits of Bosphorus and Dardanelles.

Tyumen Oil Company is understood to have secured a 67% interest in the 320,000 b/d Lisichansk refinery in eastern Ukraine. The company is reported to have paid \$9mn for the facility and assumed \$62mn in outstanding liabilities.

Russia's private gas company, Itera, has approached the Georgian capital of Tbilisi with an offer to acquire 75% of the city's gas distribution company for \$1.5mn, reports the United Financial Group's Russia Morning Comment. Itera is understood to have an ambitious investment plan to upgrade and rehabilitate the city's gas distribution infrastructure, at a cost of up to \$200-250mn. US company AES is reported to be the counter-bidder, valuing the company at \$1mn for all outstanding shares, with a commitment to spend \$300mn over the next 12-15 years on investment projects.

The Port of Novorossiysk is planning to invest \$70mn in the construction of a second oil terminal, reports the United Financial Group's Russia Morning

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NEW Downstream In Brief

Texaco unveils buried treasure hunt



Texaco's buried car treasure hunt publicity stunt – launched on 7 July – proved a great hit with the public. It took just five days for all five brand new Mercedes SLK convertibles – worth over £35,000 each and buried in different locations across the country – to be found. Clue cards were available from the company's 1,200 service stations. Each one of the 30mn cryptic and geographical clues issued led the best treasure hunters to their prize. Only one clue card could be claimed per purchase per day.

So successful was the publicity stunt, that the company relaunched the hunt on 18 July with the announcement that it had buried a further three cars.

Centrica to expand North American operations

Centrica is to acquire the Direct Energy Income Fund's North American energy supply business, Direct Energy Marketing, as well as the assets of Direct Energy's primary marketing agent, Natural Gas Wholesalers, for £406mn.

The deal comes as the gas and electricity supply markets in North America deregulate and as the pace of development accelerates. It will provide Centrica with a strong base for future growth into the US market.

Direct Energy is said to be the largest unregulated retailer of natural gas in North America, with approximately 820,000 gas customers, primarily in Ontario. It also owns and operates natural gas reserves in Alberta, which provide up to 20% of its customer demand. Direct Energy also has a 27.5% interest in Energy America, a joint venture with Sempra Energy, which currently has 450,000 customers. Comment. 'Provided that it manages to raise enough cash for the project, the terminal would increase Russia's oil products export capacity by 400,000 b/d, a 30% rise over current levels,' comments UFG.



Mitsui Oil & Gas is understood to be planning to sell its 62 service stations in the Kyushu area of southern Japan to Kyushu Oil for an undisclosed sum. Mitsui Oil currently operates 902 outlets in Japan.



Repsol YPF is to acquire 45% of the Lipigas Group, Chile's leading LPG company holding 40% of the domestic LPG market, for an undisclosed sum.

US company Reema International is reported to be planning to construct a \$300mn, 10,000 b/d gas-to-liquids facility in western Trinidad. The plant is due to be commissioned in three years' time.

TotalFinaElf is to acquire BHP's 33.3% interest in BBPP Holdings which holds a 29% stake in the Brazilian company Transportadora Brasileira Gasoduto Bolivia-Brasil – owner and operator of the Brazilian section of the Brazil-Bolivia gas pipeline – for A\$70mn. The deal gives TotalFinaElf a 9.7% stake in the 3,000-km pipeline. The transmission capacity of the pipeline, which is already contracted, should rapidly attain 30mn cm/d of gas and could be increased to a higher capacity as needed, reports TotalFinaElf.

UK Deliveries into Consumption (tonnes)

| Products | †May 1999 | *May 2000 | †Jan–May 1999 | *Jan–May 2000 | % Change |
|---|------------------------|-------------------------------|------------------------------|-------------------------------|----------|
| Naphtha/LDF | 232,847 | 115,704 | 1,357,753 | 1,017,346 | -25 |
| ATF – Kerosene | 838,233 | 852,020 | 3,619,322 | 3,833,225 | 6 |
| Petrol | 1,792,072 | 1,781,692 | 8,742,224 | 8,689,232 | -1 |
| of which unleaded | 1,535,352 | 1,641,947 | 7,348,563 | 7,955,135 | 8 |
| of which Super unleaded | 29,590 | 31,259 | 142,721 | 170,383 | 19 |
| of which Premium unleaded | 1,505,762 | 1,610,688 | 7,205,842 | 7,784,752 | 8 |
| Lead Replacement Petrol (LRP) | 0 | 139,745 | 0 | 734,097 | - |
| Burning Oil | 189,860 | 238,186 | 1,767,452 | 1,823,612 | 3 |
| Automotive Diesel | 1,210,523 | 1,293,877 | 6,175,422 | 6,346,066 | 3.1 |
| GasOil/Marine Diesel Oil | 503,987 | 537,325 | 2,935,118 | 3,011,000 | 3 |
| Fuel Oil | 158,919 | 120,079 | 981,615 | 716,175 | -27 |
| Lubricating Oil | 66,956 | 65,917 | 323,910 | 332,213 | 3 |
| Other Products | 665,041 | 728,494 | 3,593,569 | 3,490,052 | -3 |
| Total above | 5,680,940 | 5,733,294 | 29,496,385 | 29,276,921 | -0.7 |
| Refinery Consumption | 515,998 | 444,559 | 2,666,838 | 2,206,871 | -17 |
| Total all products | 6,196,938 | 6,177,853 | 32,163,223 | 31,483,792 | -2 |
| + Revised with adjustments * Figures dated from Feb | 2000 onwards are the f | inal figures as supplied by m | eporting companies, they are | no longer provisional figures | |



E&P

North Sea

The 43,000-tonne Elgin production-utilitiesquarters (PUQ) platform recently left Barmac's Nigg fabrication yard in Scotland and was installed on Elf Exploration's Elgin/Franklin fields some 240 km east of Aberdeen. The field, which has reserves put at 58.2mn cm of condensate and 48.5bn cm of gas, is the largest high temperature/high pressure development yet undertaken by the international offshore oil and gas industry, writes *Kim Jackson*.

North Sea giant sails away

n 800-strong team will carry out offshore hook-up and commissioning over the next five months, in readiness for first production in November 2000. Field development is via a wellhead platform on each field, controlled from the central Elgin PUQ platform, which will process sales quality gas onsite. The platform is designed to handle up to 14.6mn cm/d of gas and 27,800 cm/d (175,000 b/d) of condensate. Gas is to be piped via the new 34-inch diameter, 468-km long SEAL (Shearwater Elgin Area Line) pipeline to Bacton, East Anglia. Condensate will be exported through a new 24-inch diameter line connecting to the Forties pipeline system for transport to shore at Kinneil for processing. The field is expected to have a 22-year life span, with between four and five years of plateau production of 200,000 boe/d beginning in 2001/2002.

The huge PUQ structure - which is heavier than the combined weight of 172 jumbo jets and at 246 metres is taller than London's Canary Wharf building - is claimed to be the largest jack-up ever built. It is also claimed to be the largest steel structure platform to be installed as a single structure in the North Sea to date. Based on the TPG 500 jack-up platform conceived by Technip desian. Geoproduction, the platform has been build as a complete unit and largely commissioned onshore in order to reduce offshore heavy lifts and extensive hook-up operations. The platform is self-installing and can be refloated and removed from the field once production has ceased. Fabrication has taken some 11.5mn manhours to complete, with the workforce reaching a level of 3,600. continued on p16...

Bulk storage industry review



If operators of bulk liquids storage capacity in Europe expected 2000 to bring disappointing results after the heady days of 1999, they will have been pleasantly surprised so far. Utilisation remains very high – indeed, there are some parts of Europe where the availability of tankage is extremely tight – and throughput has increased for many products.

The story of the past 12 months is, however, not limited to full tanks. There has been an ongoing rationalisation in the pattern of ownership of independent storage capacity right around the world and Europe has not gone unaffected. The main event by any standards was the successful merger of Pakhoed and Van Ommeren – at the second attempt – to form Vopak (see *Petroleum Review*, August 1999, October 1999). The Rotterdam-based company has an interest in oil, gas and chemical logistics and distribution on a global basis and is now far and away the largest operator of independent terminals worldwide, with a chain of 71 sites offering total capacity of around 23mn cm.

The price of the successful merger was the loss of some of the combined operation's assets in Rotterdam and Antwerp. The disposal of vegoil storage capacity will not have been too much of a wrench, but the EC Merger Task Force also insisted that Vopak sell off Pakhoed's Botlek terminal, at 1.52mn cm – just about the largest independently owned storage facility in Europe. This had proved to be a sticking point the first time the two Dutch companies discussed the merger, but it seems that the potential benefits outweighed any sentimental attachment to Pakhoed's flagship facility.

As might be expected when dealing with such a large asset, there was some delay before Botlek's new owner was announced. The Norwegian shipping company Odfjell ASA acquired the facility as part of its own expansion into chemical and oil logistics services. Odfjell, best known as a leading operator of chemical parcel tankers, already had some interests in storage facilities in the US, Latin America and China and also has a deepsea tank container venture in partnership with German transport company Hoyer.

Subsequent to the merger, Vopak also undertook an asset swap with USbased terminal operator GATX, with which Van Ommeren had three 50:50 joint ventures. Vopak took control of the Tees Storage terminal in northeast England in exchange for its share of the Gamatex facility in Antwerp and Tankstore in Singapore. GATX had already sold out of its UK operations,

Bulk storage industry review



with another US operator, ST Services, taking up the network of sites.

Facility investment

Since these changes the various new owners have begun to trim their acquisi-

tions to meet their requirements more closely. ST has invested in upgrading the UK facilities and is now preparing one, at Eastham in northwest England, to handle gasoline again. This involves the installation of vapour control equipment and bottom loading arms on its road tanker racks. Vopak has also announced plans to expand capacity at what is now known as Vopak Teesside, in response to growing demand for storage capacity on the UK's east coast.

Speaking about the investment, Vopak Teesside's Managing Director, David Bishop, outlined some of the changes that the site has undergone over the past 10 years. One development is of particular interest - the rationalisation of the independent terminalling business is widely seen as a reaction to a similar process of consolidation and globalisation in the oil and chemical industry, both in terms of the mergers of major companies and the trend towards the outsourcing of ancillary activities and a concentration on core businesses.

As their customers are now fewer in number but have a wider geographic reach, terminal operators now more than ever need a worldwide network of assets if they are to compete successfully. However, at the level of the individual terminal these changes are having quite a different impact. Ten years ago Tees



Storage had only four clients, one of which - ICI - dominated the local industry and accounted for around 90% of the site's throughput. Today, as a result of the restructuring of the oil and chemical industries worldwide, Vopak Teesside has around 17 regular clients and, rather than being primarily geared to serving the needs of the local industry, has become more of an integral part of Vopak's global logistics network. Simon Storage is also having to cope with a similar change in the area after buying the Riverside terminal on the River Tees from ICI late last year.

It is clear that a number of companies aside from Odfjell were interested in acquiring the Botlek site. This was a rare opportunity to buy into the massive Rotterdam market, where the opportunities for creating new, grassroots terminals are very limited. French operator LBC was fortunate to have the opportunity to buy the relatively small C&P Botlek terminal from Dow Chemical last year and has announced plans to expand capacity. LBC has also added new tanks at its Antwerp site and is putting in additional stainless steel capacity over the course of this year.

Looking further afield

Other European operators are having to look further afield for growth: Stolt-Nielsen Transportation Group (SNTG) has announced plans for a grassroots terminal in Louisiana, US, and makes no secret of its ambitions to develop a major, global terminal network. LBC has also turned to the US and, following its acquisition two years ago of PetroUnited's two Gulf coast sites, recently announced plans to buy Celanese's chemical terminal near Houston to boost its capacity. Odfjell is also expanding capacity at its Houston terminal and German operator Oiltanking is building new tankage at its Pasadena, Texas site as well as at Singapore.

New tankage demand

If tank capacity is tight in certain parts of northern Europe, industrial development along the Mediterranean coast is also providing new demand for tankage. This long-term trend has led to investment in new terminal facilities in southern Spain, especially in Tarragona where Terquimsa, in which Vopak holds a 50% interest, is adding to capacity. On Spain's north coast, Tepsa has recently finalised a major expansion of its Bilbao terminal to cope with growing demand for petroleum and chemical storage.

Turkey is another country with a growing need for storage and Solventas has just begun the latest stage of development at its Gebze terminal. New petroleum tankage was completed at the end of last year and this will be augmented with additional tanks dedicated to heated products and/or chemicals.

One significant European operator not so far mentioned in this review is Petroplus. The Rotterdam-based company has interests in refining and marketing as well as third-party product storage, which it has built up through the acquisition of former oil or chemical company sites. Its largest storage terminal remains the 1.5mn cm Milford Haven site in the UK, acquired two years ago, but this year it took a major step forward through the purchase of Shell's Cressier refinery in Switzerland, which brought with it 875,000 cm of



Bulk storage industry review

non-associated liquids storage capacity. Petroplus is also investing in the Middle East, where it has a significant share in the new Arabtank terminal on Saudi Arabia's Red Sea coast, phase one of which is due for completion this coming November.

Regulatory requirements

The good level of returns available to terminal operators over the past two years has come at a fortunate time as they are under pressure, both commercial and regulatory, to upgrade or redefine terminals. Following on from the rationalisation among the oil and chemical producers, terminals' customers now wield greater power when demanding specific services or equipment. Regulators also have terminals in their sights - even if their operations are not as straitened as those of their counterparts in the US. The use of vapour control equipment for marine loading is not yet compulsory in most of Europe, although the EC is considering such a move. The introduction at the start of this year throughout the EC (except in France) of a requirement for all

North Sea

... continued from p12

Construction first began at Barmac's Nigg and Ardersier facilities in May 1997.

Delayed and over budget

The project has completed some four months behind schedule. However, according to Joel Fort, Elf Exploration Project Director, this delay is considered 'marginal' against the three and a half years since the contract was signed. In addition, a number of design changes were made during the construction process – some relating to changes in the safety regulations regime, others to improve operational efficiency – which pushed the project over budget to £1.65mn and added some 20% to the final weight of the PUQ.

According to Don Wright, Managing Director, Barmac, the Elgin PUQ contract is the largest job to be handled in the UKCS as a single project, covering design, fabrication, installation, hookup and commissioning. He also pointed out that among the many milestones achieved during the project, was the world record for a self-jacking onshore lift – over 32,000 tonnes – when the platform systems were tested earlier this year.

Completion and sailaway of the PUQ

companies handling dangerous goods to appoint a qualified safety adviser has led to increased costs for those terminals which operate in the chemicals market. And some countries are also introducing stricter rules - such as COMAH in the UK for facilities that present a risk of explosion and/or pollution.

The move towards greater integration in the oil and chemical logistics business is, conversely, helping terminal operators meet the financial demands that go along with such commercial and regulatory imperatives. It is increasingly difficult for small, independent terminal operators to survive the vagaries of the market while providing the levels of safety and service that are required.

The terminal of tomorrow will undoubtedly be part of a bigger chain, with strong financial backing. Longerterm contracts with customers brings greater stability for shareholders and improves the possibility of persuading lenders to back investment projects. Integrated companies can also derive stability from the fact that the structure of the logistics business is such that when demand for storage services is low, demand for capacity in other links

E&P

in the chain, such as shipping or trucking, is likely to be higher. It is hard to see how privately owned, singleton terminals can compete in such an environment, unless they can find a niche handling specific products for a tightly delineated market.

Looking ahead

For the near future, it seems that terminal operators can rely on having full tanks for a few months longer at least. A significant commercial stockdraw will probably not arrive until such time as there is a fall in the price of oil and petroleum products and the industry is confident that such a fall will stick.

In the meantime, operators are being careful only to install new tankage when there is a definite need for it and the chances of overcapacity arising from supply-side factors look very distant.

This is just one more piece of evidence that shows liquids producers and traders that they are dealing with a very much more professional terminalling industry than may have been the case in the past.

closes the current book of major projects for the Barmac yard, which will now enter a phase of care and maintenance as it competes for new work. However, there are few North Sea projects in the offing at present, with BP Amoco's Clair field in the Atlantic Margin regarded as the next 'major' development. But even Clair's production facilities will not be in the same league as the Elgin PUQ, which some industry pundits have stated has 'marked the end of an era of largescale projects'. As Wright put it: 'Clair is not the panacea the sector needs... it would get lost in a yard the size of Nigg and would not create the number of jobs required to keep a yard this big economic, let alone support our sister yard, Ardesier.' He added that in addition to Clair, Barmac would also be targeting smaller southern North Sea projects as well as looking to the Gulf of Mexico and West Africa.

Future prospects

When asked about future prospects, Wright acknowledged that the business was currently going through a 'period of uncertainty' and cited a list of economic influences beyond Barmac's control as being responsible. Chief among these were low levels of capital expenditure by oil companies – which has led to a collapse of the UK fabrication industry – and a strong pound which has made bids for overseas projects uncompetitive in the past. 'We have been working closely with local enterprise companies to find alternative employment for our workforce, but there is no disguising the seriousness of the situation,' he said.

The current market conditions have led the company to diversify away from not only its traditional businesss within the oil and gas sector, but also geographically and into other industrial sectors. 'We are well placed to secure any offshore-related decommissioning work as we already have planning permission to undertake this at Nigg,' commented Wright. 'Other areas of opportunity include nuclear decommissioning, renewable energy projects and IRM [inspection, repair and maintenance] and marine work. Collectively, these have the potential to represent up to 20% of our future business." Despite such plans, Wright conceded that a tough future lay ahead. 'The bottom line is that Barmac is not going to go away, but with low volumes of future work and fewer opportunities, we will inevitably become a much smaller business than we have been over the past few years.' .



WE WOULDN'T MIND IF DAVINCI PAID AVISIT.

In fact, we think Leonardo would be quite impressed with the new technologies of today's Oiltanking terminals. Since he foresaw automation, we'd show him the hydraulic, articulated loading arms. And point out the advantages of our computerized control rooms: better in/out efficiencies, contamination-free product handling. Then we'd invite him to sit in as our professional engineering teams explore even more ways to customize the best of modern science to better serve our customers. Da Vinci might admire Oiltanking technology. You, however, can profit from it.



THE ART AND SCIENCE OF UNCOMMON SERVICE

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Bulk storage IT

Automatic benefits of terminal control

Tank storage comprises an increasingly complex set of situations that can be simplified, managed and monitored through the use of information technology. Such a management system, however, needs to take account of the very specific needs of the industry. A broad-based package alone will not do the job, writes *Mathieu Janssen*, Director–Corporate Communication, Bluegate Group.

The key issues that need to be taken into account in this particular sector of the oil and gas industry include:

- co-ownership the sharing of terminal facilities, including the potential hazards of co-mingled stock;
- tracking details and value of stock owned by customers;
- safety in an area where mistakes are simply not an option;

managing contracts;

- the 'paperless trail' (less manual paperwork, more computerisation); and
- keeping track of stock transactions.

Operational resource planning

Some of these areas can be streamlined through information technology (IT). For example, all stock movements can be recorded with factors such as density, temperature, volume and weight. A good system will ensure that the current stock position is in real-time, easily accessed and displayed for the user. A computerised system that enables automation of operational processes once controlled through manual administration systems, however, must not only pay close attention to specific details but also be highly flexible.

Topas-Bluegate, which joined forces last year, has developed such a system with a suite of integrated software packages – IS Operations, IS Planning, IS Product Documentation – to cover the whole downstream supply chain, from production to order processing, inventory management, distribution route planning and sales accounting.

IS Operations offers an ERP (Enterprise Resource Planning) concept but is industry specific with strong emphasis on operational support. Preferring to use the term Operational Resource Planning (ORP), Topas-Bluegate's system addresses operational complexities with a flexible approach. It can be fine-tuned to the specific logistics issues of storing (and moving) large quantities of hazardous liquids.

The IS Operations Bulk Storage Management module (formerly Peridot) holds information on storage facilities, customers, contracts and products specific to the business. This facilitates an automated operations system within a terminal to enhance customer service, and to make information accessible and visible to management at all levels. It is also designed to integrate and interface with other systems, including process control and any corporate systems still running.

Automatic benefits

Instant control and real-time information speed up processes and makes operations easier. From receipt to dispatch, movement of stock can be tracked. With facilities fully utilised, staffing and, therefore, costs are reduced. Online stock reconciliation

Internet initiative

In a bid to bring together information and services with high added value to drive collaboration within the European chemical industry, Bluegate recently unveiled its Virtual Logistics Platform for the transportation of chemicals in Europe. The company sees the portal as the preferred meeting place for chemicals companies and accredited hauliers (by road, rail and water), to contribute towards planning, optimising and streamlining the European goods transport market for the chemicals sector.

Chemicals companies and hauliers will pass details of their transport requirements and available resources to the Virtual Logistics Platform. The platform will enable participants to find best matches, manage transport contracts, process orders, group and

prevents the need to stop for business operations when required.

When handling hazardous liquids, security and safety are key issues and both aspects can be kept under keen control. Problems are quickly identified and rectified.

The system functionality is flexible enough to allow either reconciliation of a product or tank. In a co-mingled stock environment the reconciliation process will detail volume of product by product owner, duty status and contract. The same process can be used at any time to identify product owner volumes and the potential product losses/gains.

Reliable administration, such as accurate invoicing, has obvious business benefits. Secure remote access enables client-customers to update and enquire on their own stock transactions. Improved report generation, with status both accessible and visible, means that management decisions are based on accurate, up-to-date information from one system integrating commercial and operational elements.

The ultimate advantages are financial, measurable in terms of efficiency, profitability and business performance. Improved customer service results from total flexibility, responsiveness to clients' needs, changing circumstances and flexible contract support. Diverse company and country specific requirements can also be supported, with the system continuously improving to ensure that business trends and future customer demands are satisfied.

Typical functions include:

- Handling both bulk and packaged liquid and dry goods.
- Management of storage transac-

plan the goods to be transported. In turn, this will allow them to optimise the distribution of loads and build the best routes for distribution operations.

One of the key advantages of the Virtual Logistics Platform is a reduction in transport costs. The platform will provide tools for measuring and reporting transport costs, to be integrated into the ERP systems of participating companies.

Bluegate is currently putting together its future strategy for the bulk storage industry. Interested parties should contact the author direct on +32 234 06 711, or Lesley Hudson, Marketing Manager, at the UK office on +44 (0)1628 810999, if they have any thoughts on how they would like to see this concept move forward.

> tions – receipts, liftings, stock takes, blends, regrades, transfers, decants to/from containers and particularly loss/gain analysis.

- Co-mingled storage and tank layering.
- Comprehensive layer/batch tracking.
- Temperature accounting for petroleum and chemical operations.
- Reconciliation by owner, product, storage facility and duty status.
- Online stock reconciliation.
- Stock position by customer, product, storage facility, duty status and customer contract.
- Complex product specification and quality control recording and validation.
- Tighter control on stock posting and product movement providing more accurate requirement forecasting and duty deferment allocation.
- Real time information sharing, removing duplication of entry between various parties.
- HM Customs & Excise reporting.
- Flexible contracts management clauses for rentals, throughput, product handling and any miscellaneous charges and invoice production.
- Comprehensive reporting and enquiry options.

Two new modules – Automated Gate Access and Rack Loading Modules – were recently added to the software portfolio and facilitate the option of a totally automated and integrated terminal. These also link into weighbridge systems. Bulk storage

measurement

Methods and uncertainties in tank calibration

Dr J Miles, Consultant, SGS Redwood, describes the three most popular methods employed for the calibration of vertical storage tanks. The basic procedures involved in the strapping methods – Optistrap and laster-based electro-optical distance ranging (EODR) – are outlined and some of the advantages and disadvantages highlighted.

part perhaps from water filling (which is applicable only to smaller tanks), the traditional strapping method represents the original technology used for tank calibration. It involves wrapping a pre-calibrated tape around the circumference of the tank at various levels from the base to the top. The standards specify the levels at which strapping is to be undertaken and the tension to be maintained on the tape in order to minimise calibration uncertainty.

There are, however, a number of fundamental measurement problems associated with the method. Most notable among these is the fact that the tape will inevitably bridge any depressions in the contours of the tank wall and will ride over the welds at the joints between the plates. By definition, therefore, the method must overestimate the volume of the tank. There are also issues concerning the ability of the operator to maintain the correct tension on the tape and to avoid sagging around the circumference. These problems tend to introduce a random element into the process that may produce a scatter in the results on top of the bias mentioned above.

The strapping technique also presents safety problems in that the calibration technician needs to 'climb' the outside of the tank in order to wrap the tape around it at the required heights. In the past a 'bosun's chair' was used, but this equipment is now virtually outlawed for safety reasons. Scaffolding and 'cherry pickers' are acceptable, but of course the cost of the work increases as a result of their use. Various compromises have therefore been introduced to overcome the safety problems and keep the costs down.

Optistrap

The optistrap (optical reference line) method uses traditional strapping as its foundation

but employs optical tech-



come the safety problems involved in calibrating the higher levels of the tank. The starting point is to measure the circumference around the bottom course of the tank using a standard calibration tape. A mean radius of the tank is inferred from this measurement and from this point every other measurement is referred to the mean radius. This means that any errors in the measurement of the bottom course are transferred to the remainder of the tank.

The method involves the use of a trolley which is clamped magnetically



20

to the wall of the tank and suspended in such a way that an operator at the top of the tank can pull the trolley progressively from the bottom to the top of the tank. A rule projects horizontally from the trolley, the rule being graduated in millimetres. A second operator at ground level uses an optical sight mounted on a tripod. This sight is arranged to project vertically upwards so that as the trolley is pulled up the tank wall, following its contours, the rule moves in and out correspondingly and the operator uses the vertical sight to determine the offset from the base radius at various heights up the tank (see Figure 1). By taking measurements at a number of circumferential positions a view of the complete tank can be established.

EODR method

The electro-optical distance ranging (EODR) method uses laser theodolites to make all the measurements and the specially developed software allows a complete 3D representation of the tank to be created. The great advantage of EODR compared with the other methods described is that because all the data are recorded automatically on a data logger, many more measurement points can be taken on the surface of the tank.



A series of measurement stations is set up around the outside of the tank (see **Figure 2**). At each station, not only are measurements taken of the tank itself, but also the distance and angles to a target set up on the adjacent measurement station. This process is carried out at each station around the tank to the point where the measurement from the last measurement station back to the first should produce a closure of the 360° progression around the tank.

This check verifies that the basic pro-

cedures have been followed correctly and if closure is not achieved the whole calibration must be repeated. The measurements of the tank which are carried out from each station involve projection of the laser beam onto the tank wall to establish its radius and a series of measurements of both vertical tangents of the tank walls as viewed from each measurement station (see **Figure 3**).

The combination of all these measurements allows the computer to reconstruct the physical shape of the tank without the need to assume that

| | Cumulat | ive volumes | | | | Volumes by | slice | | | |
|--------|-----------|-------------|----------|--------|--------|------------|----------|----------|--------|--|
| Metres | (litres) | (litres) | Vol diff | % diff | Metres | (litres) | (litres) | Vol diff | % diff | |
| 0.00 | | | | | 0.00 | | | | | |
| 0.50 | 59,834 | 61,652 | -1,818 | -3.038 | 0.50 | 59,834 | 61.652 | -1.818 | -3.038 | |
| 1.00 | 110,806 | 112,850 | -2,044 | -1.845 | 1.00 | 50,972 | 58,198 | -226 | -0.443 | |
| 1.50 | 162,353 | 164,208 | -1,855 | -1.143 | 1.50 | 51,547 | 58,358 | 189 | 0.367 | |
| 2.00 | 220,722 | 222,430 | -1,708 | -0.774 | 2.00 | 58,369 | 58,222 | 147 | 0.252 | |
| 2.50 | 279,090 | 280,633 | -1,543 | -0.553 | 2.50 | 58,368 | 58,203 | 165 | 0.283 | |
| 3.00 | 337,459 | 338,831 | -1,372 | -0.407 | 3.00 | 58,369 | 58,198 | 171 | 0.293 | |
| 3.50 | 395,828 | 397,046 | -1,218 | -0.308 | 3.50 | 58,369 | 58,215 | 154 | 0.264 | |
| 4.00 | 454,197 | 455,270 | -1,073 | -0.236 | 4.00 | 58,369 | 58,224 | 145 | 0.248 | |
| 4.50 | 512,566 | 513,518 | -952 | -0.186 | 4.50 | 58,369 | 58,248 | 121 | 0.207 | |
| 5.00 | 570,935 | 571,779 | -844 | -0.148 | 5.00 | 58,369 | 58,261 | 108 | 0.185 | |
| 5.50 | 629,304 | 630,066 | -762 | -0.121 | 5.50 | 58,369 | 58,287 | 82 | 0.140 | |
| 6.00 | 687,673 | 688,362 | -689 | -0.100 | 6.00 | 58,369 | 58,296 | 73 | 0.125 | |
| 6.50 | 746,042 | 746,650 | -608 | -0.081 | 6.50 | 58,369 | 58,288 | 81 | 0.139 | |
| 7.00 | 804,411 | 804,927 | -516 | -0.064 | 7.00 | 58,369 | 58,277 | 92 | 0.158 | |
| 7.50 | 862,780 | 863,187 | -407 | -0.047 | 7.50 | 58,369 | 58,260 | 109 | 0.187 | |
| 8.00 | 921,149 | 921,442 | -293 | -0.032 | 8.00 | 58,369 | 58,255 | 114 | 0.195 | |
| 8.50 | 979,518 | 979,703 | -185 | -0.019 | 8.50 | 58,369 | 58,261 | 108 | 0.185 | |
| 9.00 | 1,037,886 | 1,037,967 | -81 | -0.008 | 9.00 | 58,368 | 58,264 | 104 | 0.178 | |
| 9.50 | 1,096,255 | 1,096,225 | 30 | 0.003 | 9.50 | 58,369 | 58,258 | 111 | 0.190 | |
| 10.00 | 1,154,624 | 1,154,473 | 151 | 0.013 | 10.00 | 58,369 | 58,248 | 121 | 0.207 | |
| 10.50 | 1,212,993 | 1,212,712 | 281 | 0.023 | 10.50 | 58,369 | 58,239 | 130 | 0.223 | |
| 11.00 | 1,271,362 | 1,270,940 | 422 | 0.033 | 11.00 | 58,369 | 58,228 | 141 | 0.242 | |
| 11.50 | 1,329,731 | 1,329,163 | 568 | 0.043 | 11.50 | 58,369 | 58,223 | 146 | 0.250 | |
| 12.00 | 1,388,100 | 1,387,385 | 715 | 0.052 | 12.00 | 58,369 | 58,222 | 147 | 0.252 | |

Note: From 2 metres upwards the volume of each slice is identical in the strapping data, suggesting that the barrel was not strapped above this height.

Table 1: Strapping to EODR comparison

Bulk storage meas

measurement



any of the tank sections is circular (a requirement for both the other methods). Since all the measurements are taken from ground level the use of EODR overcomes the very significant safety problems associated with strapping and the less significant ones associated with Optistrap. Furthermore, a tank calibration is completed very quickly (typically half a day) with minimal disturbance to site operations.

Floor surveys

All the descriptions given above refer to measurements of the barrel of the tank made from outside the tank. A survey of the floor inevitably involves access to the inside of the tank which is only likely to be possible when the tank is being cleaned or refurbished. However, to establish the total volume contained within the tank – important for monthend stock measurements and when tanks are completely emptied – an accurate floor survey is essential.

Traditional methods involve the use of water tubes or dumpy levels and the EODR method can also be applied here, albeit with a different type of theodolite. A comparison of the results obtained by the various methods is shown later.

EODR verification

When the EODR technology was under development a number of tests were carried out to establish the repeatability and ultimately the uncertainty of the method. It is well understood that measurement accuracy is affected by random variations in the equipment, errors made by the operator, external influences such as the weather, etc. To accommodate as many of these variables as possible, a series of 33 separate calibration exercises was undertaken on one storage tank. Four different operators were used, three different sets of equipment were employed and the work was undertaken in a variety of weather conditions.

As a result of these trials there were many thousands of data points to be analysed. The data from each calibration were processed by the EODR software to the point where volumes were established for each of a series of horizontal slices through the tank. The mean volume for each slice was then determined, using the data from all 33 calibrations. It was then possible to cal-



culate the percentage deviation from the relevant mean value for each slice for all the calibrations and to group the results according to the percentages. The results of this exercise are depicted as a frequency distribution in **Figure 4**.

The results follow a Gaussian distribution indicating that any errors involved in the method are random and that there are no significant bias errors to skew the data. This confirms that the procedures requiring closure of the measurements achieve their objective in avoiding such errors.

It is now possible to determine the uncertainty of the EODR method of calibration. It can be shown that the uncertainty of the mean calibrated volume of the tank is 0.01%, but to achieve this requires a number of repeat calibrations as employed here – hardly a practical proposition.

It is more realistic to consider the uncertainty in the volume determination of the slices of the tank as described above. Using the data of Figure 4 the standard deviation (o) of all the results is 0.023%, giving an uncertainty based on 2o of 0.046%. Looking in more detail at the data the maximum standard deviation in the data for any one slice was 0.029%, obviously implying a greater uncertainty. However it may be argued that a calibration involves the combination of all the slices of the tank and that the random errors will cancel out to some extent. The uncertainty of 0.046% for the EODR method is therefore considered reasonable.

EODR/Strapping comparison

When calibrations by EODR and strapping methods were compared for a number of tanks during an earlier study in 1997, the comparisons implied a very poor uncertainty (approx 0.43%) for the traditional strapping method. The comparisons were in fact relatively simple in that the total calibrated volume of each tank was considered. It was acknowledged that the comparisons might not be valid because the time elapsed between the original calibration of a particular tank by strapping and a subsequent calibration by EODR was as much as ten years in one case.

Further study of the data has now shown that by comparing total tank volumes the differences in the floor calibrations tend to dominate the whole analysis. A new study has therefore been carried out, this time on eight tanks that had first been calibrated by strapping and subsequently by EODR within a period of two years. It was felt that the two-year time interval would give a realistic comparison and in any case data based on shorter time inter*continued on p26...*

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oil and gas

Record year for Canadian oil patch

Thanks to commodity prices hovering above \$30/b for oil and \$4/mn cf for natural gas, Canada's oil patch has rebounded from the doldrums of 1998–1999 to record one of its best years ever, reports *Gordon Cope*.

Canada

n 1999, a total of 123 Canadian oil and gas companies had a combined profit of C\$3.27bn, representing a massive turnaround from the C\$426mn loss in 1998. A study by Calgary-based investment firm FirstEnergy Capital predicts that overall earnings for the sector could hit a spectacular C\$10bn in 2000. That means more money to explore and drill. The Petroleum Services Association of Canada (PSAC) conservatively forecasts 15,345 wells drilled this year, up from 10,000 in 1999. 'We may have to increase our forecast numbers in the next quarter,' says Roger Soucy, President of PSAC. 'We're on pace to equal the 1997 record of 16,500 wells, based on the first six months."

The Arctic warms up

The Mackenzie Delta, Canada's perennial bridesmaid of exploration, took a step closer to the altar this year. In February, Imperial Oil, Gulf Canada Resources, Shell Canada and Mobil Oil Canada announced a feasibility study to exploit 6tn cf of previously discovered Mackenzie Delta reserves. 'Our first step is to assess the commercial viability,' said Hart Searle, spokesman for the consortium. 'It's a complex situation of evolving regulatory process, markets, Northern parties, regulatory approvals, environmental considerations and fiscal terms.'

Their announcement was partially inspired by recent gas discoveries and the settlement of long-standing aboriginal land claims. The most important factor, however, is the marketplace for natural gas. 'North American gas demand is very robust,' said Bob Reid, Vice President of Northern Development for Trans Canada Pipe Lines (TCPL). 'The demand is being driven by power generation and the fact that natural gas is more environmentally-preferred.'

In addition to the 6tn cf of discovered gas in the Mackenzie Delta and an estimated 35tn cf of gas in Prudhoe Bay, scientists believe that the undiscovered reserve potential for the far North could exceed 150tn cf.

Building a pipeline capable of delivering such immense volumes of gas to the American market is key to development of the Arctic. The C\$4bn Alliance pipeline is nearing completion, and is due to begin delivering 1.3bn cf/d of natural gas from northeast British Columbia (BC) to the Chicago market in October 2000.

The Alliance pipeline ends 1,000 km short of the Polar mark, however. The Alaska Natural Gas Transportation System (ANGTS) proposal – which routes its way through Alaska, the Yukon and the North West Territories – would deliver both Prudhoe Bay and Mackenzie Delta gas to northeast BC. It is one of the more expensive alternatives, however, at around C\$6bn.

BP Amoco, which already produces 1bn cf/d of gas in North America, is considering taking an ownership role in an Arctic pipeline. 'Optimistically, we could have it built and operating in the 2007 time frame,' commented Tim Holt, Chief Executive of BP Amoco Canada, at a recent conference. The pipeline would allow the company to exploit the 8bn cf/d of Prudhoe Bay gas that is currently re-injected to maintain reservoir pressure.

Arctic Resources is also proposing a \$4bn pipeline from Prudhoe Bay, through the Mackenzie Delta, to existing pipelines in Alberta. The Houston-based company, which intends to raise the money through bonds, says the pipeline could move 4.5bn cf/d by 2006.

Regardless of which route is chosen, Imperial Oil's Chairman Bob Peterson doesn't see construction of an Arctic pipeline being fast-tracked. 'I used to say it was seven to eight years away, and that was 27 years ago,' he noted during the recent World Petroleum Congress in Calgary. 'It's still seven or eight years away.'

Comfort from gas

Throughout the period of low oil prices in 1998–1999, natural gas provided some degree of financial stability to beleaguered Canadian companies. 'Nymex prices for 1999 ranged from \$1.80–\$2.50/mn Btu,' says Tom Ebbern, a researcher at NewCrest Capital. 'This year, the range is \$2.50–\$3.50, with some spikes.'

The continued strength of the commodity is attributed to high depletion rates of reservoirs, relatively sparse drilling in 1998 and 1999, and a growth in demand. Fueled by power generation requirements, North American gas consumption is expected to inflate from approximately 66bn cf/d this year to 80bn cf/d by 2010. Canada is in the position to help meet that demand. The country currently exports approximately 9.5bn cf/d to the US. With new production from the Arctic, Foothills and East Coast, experts predict that Canada could bump exports to 13.5bn cf/d by 2010.

The only cloud on the horizon is, paradoxically, the robust state of natural gas prices. 'Some fertilizer and aluminum plants have shut down in the last few months,' says Ebbern. 'Demand from marginal users has come down.'

Crude alternatives

The general shift from conventional to non-conventional oil production in Canada has continued apace. As ageing Devonian reef fields slowly deplete, the drop in conventional crude production is being offset by increases in offshore East Coast and non-conventional heavy oil and synthetic crude production. Overall crude oil production is expected to rise 4.8%, from 2.1mn b/d in 1999 to 2.2mn b/d in 2000.

The Hibernia field, primarily owned by Mobil, Chevron Canada and PetroCanada, has already exceeded its design capacity of 150,000 b/d and is hoping to boost production to 180,000 b/d. Terra Nova is scheduled to add 125,000 b/d in 1Q2001, with Husky's White Rose development adding 100,000 b/d in late 2001. Chevron's Hebron-Ben Nevis is scheduled to come onstream in 2004, with 150,000 b/d.

New information from drilling and seismic has driven up estimates of the total recoverable reserves on the Grand Banks of Newfoundland by 33%, from 1.6bn barrels to 2.1bn barrels. Gas reserves rose 13%, from 8.2tn cf to 9.3tn cf.

Natural gas production also began on the Scotian Shelf, off the coast of Nova Scotia. Late last year, the Sable gas field came onstream, with 100mn cf/d being delivered to shore. By the end of 2000, production is expected to climb to over 500mn cf/d.

Official estimates place undiscovered potential for the Scotian Shelf at 18th cf, but some experts think it may go as high as 50tn cf, and the exploration companies are proving them out. PanCanadian made a new gas discovery last winter under the Panuke oil field on the Scotian Shelf, drilling into a deeper zone beneath the field and testing over 50mn cf/d. 'One possible scenario (for gas reserves) is 1tn cf, but there's still a long way to go,' said Al Boras, a spokesman for PanCanadian. The company predicts eventual production in the 60,000-80,000 boe/d range by 2008.

Investment in the heavy oil and oil sands regions in Eastern Alberta has continued at a healthy clip. Several of the C\$25bn in new projects announced for the next decade are already underway:

- Suncor moved ahead on its C\$2.2bn Project Millennium expansion to raise production to 220,000 b/d.
- Syncrude is spending C\$6bn to double production to 400,000 b/d by 2006.
- Shell Canada, Chevron and Western Oil Sands began construction on their C\$3.5bn, 155,000 b/d Muskeg River mine.

A total of 19 in-situ, underground extraction projects were also approved.

Over the course of 2000, heavy crude production is expected to increase by 1.6%, to 793,000 b/d, and synthetic crude from oil sands will jump 16.6%, to 378,000 b/d.

Polyester back in fashion

Thanks to an inexpensive and abundant supply of ethane from natural gas, major petrochemical companies have planned C\$2.3bn in expansions to Alberta's C\$6bn petrochemical industry:

- Union Carbide and NOVA's ethylene III plant will begin production of 1.3bn kg/y in August.
- Union Carbide's C\$320mn polyethylene plant is scheduled to begin production in 3Q2000.
- BP Amoco plans to build a C\$250mn linear alpha olefins plant in 2001.
- Shell Canada's 400,000 t/y ethylene glycol plant near Edmonton will come onstream in July 2000.

The expansion comes at a time when demand for petrochemical feedstock is returning to the market. 'The recovery of the Asian market has firmed up commodity prices,' says Ed Condrotte, the Director of Chemicals and Petrochemicals for Albert Economic Development. 'Over half of Canada's ethylene glycol is exported to Asia for the manufacture of polyester.'

The inexpensive and plentiful supply of ethane may not last, however. 'With developments such as the new Alliance pipeline, the capacity to export natural gas from the province will increase substantially,' predicts Condrotte. 'The tariff structure for shipping ethane and the contractual arrangements between gas producers and the pipeline owners make it more attractive to ship ethane to the US than to extract it for use in Alberta. There may not be a sufficient supply of ethane available in Alberta to support another ethylene plant by the year 2005.'

Refineries upgrade

Starting in 2000, refiners began to move toward meeting federal government regulations stipulating an interim target of 150 ppm sulfur in petrol by 2002, and an average of 30 ppm by 2005. Irving Oil, for instance, converted its 150,000 b/d refinery in St John, New Brunswick, to the interim target. Others, like PetroCanada, Imperial and Sunoco, intend to bypass the interim step and concentrate on the 30 ppm goal for 2005. They hope to install a new technology, selective HDS, or hydro-desulfurisation, which is currently being tested for commercial application at pilot plants.

'Canadian refiners have always had problems with this first step of 150 ppm,' says Bill Levy, a Vice President at the Canadian Petroleum Products Institute (CPPI). 'The CPPI proposed an option to average 30 ppm by 2004 (without the intermediate step), but the option was rejected.'

The cost of compliance, estimated at C\$1.8bn, will be mitigated somewhat by the expected increase in fuel consumption. 'Annual demand is growing in the 1–2% range,' comments Levy. 'We are using larger cars, and it's a hot economy.'

The urge to merge

Thanks to low stock prices, a weak Canadian dollar and cheap finding costs of gas, Canadian companies have been a hot merger and acquisition (M&A) target over the last five years for international companies. In 1998 alone, they accounted for C\$17.6bn out of C\$23bn in purchased assets.

And the trend is continuing. This spring, Hunt Oil purchased Newport Petroleum for C\$760mn. Husky Oil, controlled by the Li Ka-shing family of Hong Kong, acquired Calgary-based Renaissance Energy in a cash and stock purchase estimated at C\$4.4bn.

Unlike 1998, however, homegrown companies are getting into the action, as well. Canadian Natural Resources offered C\$1.6bn to take over Ranger Oil. Alberta Energy, of Calgary, purchased McMurray Oil of Denver for C\$910mn. 'It's still cheaper to buy reserves, and there are strategic advantages, such as Canadian Natural's purchase of Ranger,' says Frank Sayer, President of Sayer Securities. 'It gave them international assets as a starting base that would have taken years to duplicate.'

The buoyant M&A activity, which is on-track to top C\$20bn this year, creates a prolific divestiture market. BP Amoco sold off C\$1bn worth of proper

| | 1998 | 1999 | 2000 | |
|-------------------------------|-------|-------|-------|--|
| Alberta Light/Med/Hvy | 858 | 784 | 763 | |
| Alberta Bitumen | 282 | 244 | 248 | |
| Saskatchewan | 399 | 374 | 401 | |
| Other Crude | 171 | 187 | 232 | |
| Total conventional crude | 1,710 | 1,589 | 1,644 | |
| NGLs | 655 | 649 | 675 | |
| Synthetic crude | 308 | 323 | 337 | |
| Total Canadian Liquids | 2,673 | 2,560 | 2,657 | |
| | | | | |

Source: IEA Monthly Oil report, July 2000 *Projected on six-month actuals

Table 1: Canadian crude and liquids production 1998-2000 ('000 b/d)

Canada

ties to Canadian Natural Resources after its merger, and Canadian Natural, in turn, will also look at disposing some of Ranger's assets. All of which allows junior companies to accumulate valuable properties. The Calgary oil patch is an incubator for small companies,' explains Sayer. 'As you buy big companies, non-core properties automatically come up for sale. The billion dollar companies take over a billion dollar company, and \$100mn in properties comes up for sale. It's a cascade effect.'

Heading abroad

Canadian companies are also continuing to seek out and exploit exploration opportunities around the world. In June, PanCanadian purchased an offshore oil block in Brazil's prolific Campos Basin for C\$2.61mn. That same month, Canadian Occidental Petroleum announced a major oil and gas discovery in Colombia's Guando field, located 70 km southwest of Bogota. Initial estimates indicate 1.4bn barrels of 30° API sweet crude in place, with 280mn recoverable.

lan Doig, author of the recently study released Canadian Energy Ventures Abroad, estimates that 185 Canadian exploration and service companies are currently conducting business in 118 countries around the world. 'You

Canadian crude output (b/d average) Alberta Conventional Lite 525,000 Alberta Heavy 250,000 Alberta Bitumen 275,000 Saskatchewan Lite 95,000 Saskatchewan Heavy 300,000 Condensates from gas 185,000 Synthetic crude 350,000 Other (BC, East Coast) 196,000 Total 2,176,000

oil and gas

Source: National Energy Board (NEB) Note: IEA has included NGLs, which the NEB does not include. The IEA is also a little conservative on the Alberta bitumen and synthetic crude, and does not include condensates.

Table 2: Canadian crude output (b/d average over the year 2000)

have probably 20% of people in downtown Calgary working on nothing but international projects,' he notes.

The move to international plays is spurred by the maturity of the Western Canadian sedimentary basin. 'If you want to grow and get into prolific fields at a low cost, then the international patch gives you that opportunity,' says Tim Jeffery, Manager of Investor Relations for Canadian Occidental Petroleum. This year, CanOxy's total exploration and development budget is C\$335mn, of which C\$260mn is targeted for international plays.

Canadian companies also have a leg up over their US cousins. 'Being Canadian does help,' comments Jeffery. 'We're not seen as a threat to anyone. We have a good reputation for being able to fit in and not be disruptive. We're good guests, and we take our obligations as guests seriously."

While the shadow of the recent downturn in oil prices still hangs over some sectors of the Canadian oil patch, the return to profitable commodity levels has generally created an atmosphere of optimism for the near future. 'The mood is upbeat whenever activity levels are this high,' says PSAC's Soucy. 'Assuming that the prices for oil and gas stay in the same range, we should expect 2001 to be similar to this year.' 6

Bulk storage

... continued from p22

vals simply aren't available. Several key points are evident from this analysis:

Floor survey

Some extremely large differences (as much as 8% in one case) have been noted between the floor volumes derived by traditional methods and by EODR. Leaving aside the EODR verification given above, which applies to the cylindrical section of the tank, the method has been verified in a number of other applications such as the measurement of irregular stockpiles of coal, minerals and grain, the latter stored in warehouses.

Such measurements have shown agreement on volume against other methods to within 0.1%. It is therefore reasonable to assume that the errors in the floor surveys lie mainly with the traditional methods.

Errors in the floor volume may not be significant when oil transfers are confined within the cylindrical section of the tank. However as noted above, some tanks, particularly product tanks are regularly emptied and in refineries month-end stocks involve the measurement of the total volume in the tank.

Although the influence of floor errors

measurement

diminishes with increasing tank contents (see Figure 5 which shows a typical example), these errors nevertheless introduce a significant bias in all the measurements taken from a particular tank. Given this situation it was felt that a fairer comparison of the two calibration methods would be obtained by removing the floor volumes from the figures and concentrating only on the barrels of the tanks.

Strapping Data

Before looking at the comparisons it is worth reviewing some of the strapping data which form part of this study. In most cases it is possible to infer from the data at how many levels the tank was strapped and generally speaking it appears that strappings have been taken at five or more heights. However, in one case it is guite clear from the data that the tank has been strapped only at the base with possibly one strap at the top. This is evident from the fact that the volume increments for each half metre step up the tank are identical from 2 metres upwards (see Table 1). As noted earlier this approach is sometimes used to reduce the cost of calibration by traditional methods. The effect on measurement accuracy is noted below.

In the EODR/Strapping comparison the volumes contained within each halfmetre horizontal slice were determined and the difference between the volumes derived by the two methods calculated. Variations in these differences with height are shown for one particular tank in Figure 6. This is typical of the eight tanks which have been studied.

By looking at all of the slices in all of the tanks, it is possible to derive a mean difference in the volume calibration of the slices between the two methods. This strapping method produces volumes larger on average by 0.048%, confirming the earlier comments about the overestimation of volumes by the strapping method. It is also interesting to look at the differences between the volumes determined for individual slices. These vary quite significantly in percentage terms and the standard deviation of all the differences indicates an overall uncertainty of 0.32% (based on 2σ) in the comparisons between the two methods. Since an uncertainty has already been derived for EODR, the strapping uncertainty can be determined from these figures. This gives a strapping uncertainty of 0.31%, calculated on the same basis as the EODR figure.

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North America E&P

Supply a problem for North American oil and gas

Statistics concerning the US domestic oil and gas industry continue to make for gloomy reading, writes Judith Gurney. Oil production – which has been falling since 1971 – declined a further 5.6% last year to 5.9mn b/d*, with output from Alaska down 10.7% to an average of just over 1mn b/d. The rate of decline in crude reserves, down 30% since 1977, appears to be accelerating. The situation in western Canada, also a mature oil province, is similar.

he scene for natural gas isn't guite so depressing, with US and Canadian production and reserves more-or-less holding their own. There is a lot of interest in gas reserves recently discovered in northwest Canada and increased production of unconventional sources of gas, especially US coalbed methane. But although the number of gas wells drilled in both countries is increasing, the quantity of gas discovered per well is falling. In addition, many current wells have steep decline rates so that, despite current strong drilling, production remains the same and, in some areas, is decreasing.

What is alarming with regard to gas is the forecast of rapidly growing demand in the North American market, mainly from new electricity generating plants, with US prices currently at an all-time high. Although geologists insist there are ample untapped gas reserves to support increased demand, many of the sites where these reserves are located the Arctic National Wildlife Reserve, the eastern region of the Gulf of Mexico, much of the Rocky Mountains, and the offshore US eastern coast - are currently off-limits to exploration and development. Unless the US Government agrees to lift these limits, the gas resources of these sites are merely paper reserves.

Hopes for future production of both oil and gas are focused on the deepwaters of the Gulf of Mexico and the arctic regions of the US and Canada.

Gulf deepwaters

Encouraged by the passage of the 1995 Deepwater Royalty Relief Act, oil companies have invested more than \$4bn in non-refundable bonuses for leases on some 2,600 Gulf of Mexico blocks with water depths greater than 800 metres. This legislation, which reduces royalty obligations on deepwater production, is due to expire in August this year; if it is not renewed there could be a dramatic decline in deepwater Gulf operations.

Exploration in deepwaters, and especially ultra-deepwaters, is limited by the number of available rigs. Of the 27 rigs working on average in Gulf deepwaters in 1999, only a handful were capable of drilling the 450 ultra-deepwater blocks currently under lease. There are about a dozen ultra-deepwater rigs under construction, but some of these are destined to go to West Africa and Brazil. Rig shortage has encouraged farm-outs and cooperative drilling arrangements, such as the recent agreement between ExxonMobil and Agip whereby Agip will drill exploration wells in return for project equity. Inevitably, many deepwater blocks will revert to the MMS (Minerals Management Service) due to inactivity after their 10-year leases expire and will then be re-auctioned.

Estimates of the reserves of a deepwater discovery often vary according to the source of the data. Information issued by the MMS is the most reliable as it only releases official statistics after formal procedures have been followed. Companies, however, often announce reserves before contacting the MMS. Sometimes this is done by partners with equity in a project, despite silence on the part of the operator, presumably in order to enhance their standing with financial backers.

Nine new deepwater fields came onstream in 1999, bringing the total of producing deepwater fields to 30 (see **Table 2**). Both oil and gas production increased by about 50% over the previous year's output.

Most deepwater discoveries and producing fields are located in the Mississippi Canyon and Green Canyon areas, although there are some in Viosca Knoll and Garden Banks. All four of these areas contain large amounts of the Gulf's massive 28,000-mile pipeline system which serves to transport production to shoreline plants. And although exploration in these areas has been very heavy, there are still pockets believed to contain undiscovered reserves, with some of the highest bids in recent MMS block auctions made in search of such pockets.

Reserves potential

There are three other deepwater areas that are considered to contain ample reserves and possibly large, or even giant, oil and gas fields (see Figure 1). The first of these, the Mississippi Fan Foldbelt Play, has yielded three discoveries by BP Amoco - the Mad Dog and Atlantis fields in Green Canyon and the Neptune field in Atwater Valley - and one by Texaco, the Champlain field in Atwater Valley. The second area, the Perdido Foldbelt Play, has yet to be tested except for a single well drilled in the Baha project in Alaminos Canyon. The third area, the Tertiary Fan/Mesozoic Play, is heavily leased but untested.

Key players

Major oil companies account for more than 75% of Gulf of Mexico deepwater production and about two-thirds of all deepwater discoveries, with Shell, BP Amoco and ExxonMobil dominating the scene. Economies of scale and size are valuable in deepwater activities and major companies have the advantage of combined technological and practical experience in deepwater systems in the Gulf and elsewhere, as well as the ability to shift investment and work assignments between current and future projects.

Most decide on the development of discoveries on the basis of a strict financial yardstick. BP Amoco, for instance, considers a deepwater discovery a commercial proposition if estimates for the total cost of its finding, developing and operating do not exceed \$5 or \$6/b. Finding and appraisal costs are expected to account for 20% of this total, development costs for 60% and ongoing

North America E&P



operating costs of lifting the oil and running the production operation for 20%.

Shell still has the largest proportion of deepwater oil and gas production, with oil output of about 210,000 b/d and gas production of 1.2bn cf/d. It operates 11 producing deepwater fields, is currently developing several new fields and has made a half dozen relatively small deepwater discoveries over the past two years. It has bid very lightly at recent MMS auctions, presumably concentrating on its existing large portfolio of blocks acquired in earlier auctions.

Most of BP Amoco's current deepwater production of 125,000 b/d of oil and 220bn cf/d of gas comes from equity holdings in fields operated by Shell, although it serves as operator of the Troika and several smaller deepwater fields. In 1999, it announced four deepwater discoveries including the Crazy Horse field with its estimated reserves of 1bn barrels of oil. If the reserves are proven it will make Crazy Horse easily the largest oil field in the Gulf of Mexico, with reserves more than double those of its nearest rival the producing Mars field. Amoco brought to the merger equity in several ongoing projects and the deepwater Marlin field that came onstream in late 1999. Vastar brought both equity holdings and two projects, the currently producing King field and the Horn Mountain field due to go onstream in late 2002. BP Amoco hopes to increase oil output to 800,000 b/d by 2009.

Until very recently, the main focus in the Gulf of both Exxon and Mobil was on gas reserves in the Norphlet formation located in the shallow waters of the OCS off the coast of Mobile Bay, Alabama. Both companies had equity in deepwater projects operated by others, yielding oil production of about 30,000 b/d and gas production of 220bn cf/d, and both had extensive holdings of deepwater blocks acquired in recent MMS auctions. ExxonMobil's deepwater Hoover and Diana fields have just come onstream and development of its 1991 sub-salt Mickey (now known as Mica) discovery is under consideration.

Mixed success

Success in deepwater ventures has been mixed for other major companies as operators, despite their considerable holdings. Texaco, which recently announced the discovery of the Champlain field, has a producing sub-salt field, Gemini. But production from its Petronius field has been delayed and it

| 1998 | 1999 | 2000* |
|-------|--|--|
| 1,175 | 1,050 | 969 |
| 904 | 840 | 815 |
| 1,383 | 1,238 | 1,195 |
| 1,231 | 1,353 | 1,552 |
| 1,563 | 1,398 | 1,373 |
| 6,256 | 5,879 | 5,904 |
| 1,753 | 1,834 | 1,952 |
| 362 | 386 | 401 |
| 8,371 | 8,099 | 8,257 |
| | 1998 1,175 904 1,383 1,231 1,563 <i>6,256</i> 1,753 362 8,371 | 199819991,1751,0509048401,3831,2381,2311,3531,5631,3986,2565,8791,7531,8343623868,3718,099 |

Source: IEA Monthly Report, July 2000 * Projected on six-month actuals ** Federal waters

Table 1: US crude and liquids production 1998–2000

recently abandoned its Fuji field as uncommercial. Chevron, which operates the Genesis field, is developing its Typhoon field, expected to come onstream in late 2001. Spirit Energy, as Unocal is known in the Gulf, has an impressive portfolio of deepwater blocks but little deepwater output as yet.

Several exploration and production companies are active in deepwaters, usually as partners in projects managed by majors but also, in some cases, as operators of fields. Notable among such companies are Mariner Energy and Walter Oil and Gas, which have deepwater fields in production and equity in other projects, and Kerr-McGee, which is developing its deepwater Boomvang and Nansen fields for production in 2002.

Like Kerr-McGee, which acquired Oryx in 1999, many of these companies have expanded their deepwater activities through mergers and acquisitions. Anadarko, which is acquiring UPR, has been a major player in shallow-water, sub-salt projects for several years and has recently expanded into deepwaters, announcing the discovery of the deepwater Marco Polo field this spring. Sante Fe, which acquired Snyder Oil and is now about to be taken over by Devon Energy, is active in deepwater projects as is Ocean Energy, which acquired Seagull Energy at the end of 1998.

Some non-US companies are also involved in deepwaters. Elf Aquitaine has its Virgo field in production and is hoping to schedule its Aconcaqua field for start-up in late 2001. BHP has recently become more involved, as has Eni following the acquisition of British-Borneo.

Production solutions

A company's choice of a production system is partly determined by water depth. Fixed platforms are not considered an option beyond a water depth of 450 metres, compliant towers beyond 900 metres, and tension leg platforms (TLPs) beyond 1,500 metres. Spars and subsea systems, the current favoured choice for producing most deepwater fields, are suitable, as are other floating systems, for production in greater depths.

Field location is critical in production system costings. Fields which are located close to the existing extensive OCS pipeline system can tie into this infrastructure for the transport of product to shoreline plants. The situation is different for fields in ultra-deep areas remote from shore, such as in Keathley Canyon, Atwater Valley, Walker Ridge, Lund and most of Alaminos Canyon. Although these areas are heavily leased, exploration has been minimal and production has yet to begin.

The cost of laying a pipeline to service

| Project | Area* | Operator | Water depth (metres) |
|---------------|-------|---------------|----------------------|
| Habanero | GB | Shell | 650 |
| Medusa | MC | Murphy | 670 |
| Oregano | GB | Shell | 1.110 |
| Mirage | MC | Vastar | 1.130 |
| Nansen | EB | Kerr McGee | 1.205 |
| Sumatra | GB | Spirit Energy | 1,210 |
| K-2 | GC | Conoco | 1.300 |
| Holstein | GC | BP Amoco | 1,408 |
| Marco Polo | GC | Anadarko | 1.410 |
| Champlain | AV | Texaco | 1.410 |
| Entrada | GB | Vastar | 1.415 |
| Magnolia | GB | Conoco | 1.530 |
| Horn Mountain | MC | Vastar | 1.646 |
| Devil's Tower | MC | Mariner | 1.830 |
| Atlantis | GC | BP Amoco | 1.840 |
| Crazy Horse | MC | BP Amoco | 1,960 |
| Mad Dog | GC | BP Amoco | 2,205 |
| Aconcagua | MC | Elf | 2,295 |

*AV=Atwater Valley, EB=Ewing Bank, GB=Garden Banks, GC=Green Canyon, MC=Mississippi Canyon

Source: US Minerals Management Service (MMS), company announcements

Table 2: Gulf of Mexico deepwater discoveries, 1999–2000

a single, isolated ultra-deep field could be prohibitive and the MMS has not yet approved the use in the Gulf of floating production, storage and offloading (FPSO) vessels – widely used in the North Sea and the Brazilian deepwaters – whose output is taken to shore by shuttle tankers. It is concerned about the danger of spills during the offloading of oil from FPSOs and the question of harvesting gas found in associated fields. Attaching a pipeline to a FPSO for the export of gas is a new technique, currently under trial in the North Sea by Amerada Hess.

The Arctic

The second focus for future oil and gas production for the combined US Canadian market lies in the far north of the continent, in Alaska and the Canadian northwest.

The rapid decline of output from Prudhoe Bay has added urgency to the quest for new Alaskan oil reserves, as by law the 800-mile TAPS pipeline to the icefree southern port of Valdez must be closed and dismembered when throughput falls too low. Companies with major Alaskan interests – BP Amoco, ExxonMobil, Phillips and Anadarko – are counting on tapping the substantial undiscovered oil reserves believed to be in Alaska before this happens.

To date, all Alaskan production comes from state lands, with the first federal lands offered for exploration early this year in a section of the Alaskan National Petroleum Reserve. The MMS estimates that there are 24.3bn barrels of untapped reserves in federal lands, but most are located in the Arctic National Wildlife Reserve (ANWR) where exploration and production is forbidden. This may change if George Bush is elected President. Al Gore, on the other hand, is adamantly opposed to allowing the oil industry into ANWR.

Alaskan gas is another story as, in addition to ample presumed undiscovered gas reserves, there is a lot of gas (currently being reinjected) in Prudhoe Bay. The problem is how to get Alaskan gas to market. Until recently, talk has focused mainly on a gas-to-liquids (GTL) plant either on North Slope or in Valdez, or on a high-pressure pipeline from Prudhoe Bay to a LNG terminal in Valdez.

Recent world-class gas finds in Canada's Northwest Territories have revived interest in a pipeline project aimed at bringing both Canadian and Alaskan gas to southern markets by connecting a new pipeline to existing Canadian gas export lines in Alberta. The potential gas reserves of the Canadian Mackenzie Delta and the Beaufort Sea have been estimated as 64tn cf.

Given the cost and time involved in pipeline construction, and the improvements needed in GTL technology to make it cost-effect, it would be unrealistic to expect development of Arctic gas reserves in the near future. Oil and gas reserves in the Gulf of Mexico deepwaters presumably will come on much sooner. In the meantime, onshore oil and gas production elsewhere in the US and Canada is expected to continue on a decreasing level with a few spurts of expansion in offshore eastern Canada and in the various onshore US areas, such as the Rocky Mountains.

* This figure is for oil only. If gas liquids are included, the figure is 8.1mn b/d – down 3.6% on 1998's 8.4mn b/d (see **Table 1**).

Strategic gas planning for the future

With the increasing interest in gas worldwide and the gas sector's need for integrated development, attention is increasingly focused on the challenges of planning for gas sector development on a national basis. A computer-based model can be used to address such issues in the planning process – meeting economic criteria while illustrating gas sector policies and identifying the priorities for development and investment, writes *Chris Phipps-Jones.**

as is projected to be the fastest growing primary energy source through to 2020. Widely available, it is increasingly the principal alternative to oil or coal, having become the fuel of choice for new power generation worldwide due to its benefits as a clean fuel. This trend highlights the possibility that the age of oil has reached its peak. The international oil companies are increasingly recognising that gas will become an ever more important part of their business in the future, as low cost oil that is predominantly under the control of national bodies becomes more important.

Despite using related technology, the economic development of gas fields is more complex than for oil fields and needs to be integrated with the development of the complete gas sector. Oil fields can be developed independently, with oil readily transported to markets worldwide. However, in the gas sector, there is a need for integrated development of the markets and related infrastructure for its transmission and distribution, in conjunction with the gas field supply. This is dictated by the high cost for infrastructure and the time it may take to develop gas markets. It is this long-term commitment to dedicated infrastructure and markets, and the need for integrated development, that establishes the requirement for strategic gas planning for the gas sector.

Strategic gas planning

Strategic gas planning is the process of analysing a (national) gas supply and demand position, to determine a preferred development plan. Such a plan



may involve a large number of individual projects across the country. These plans need to be consistent with national policies and pressures, recognising the longer term benefits that a country may gain through the development of indigenous resources, the replacement of other energy sources and support made to industrial development. Nevertheless, these need to be assessed with full consideration of the individual projects and overall economics.

Typical questions relating to gas planning include:

- What should the priorities be for new field development or other supply?
- What are the 'best' new markets to supply?
- What are the costs (both production and infrastructure) of supplying those markets?
- What is an economic price for gas pipeline tariffs?

The approach for strategic gas planning as discussed here is the iterative use of a transparent model that provides cost reports and comparative economics, rather than the use of an optimising 'black box'. An iterative, dynamic model enables a range of options to be considered and the impact of differing assumptions and plans to be evaluated and compared. In this way, an improved understanding of the gas sector is gained, covering the sometimes complex interactions of key elements in an overall plan.

In a national 'real-life' situation there are invariably factors and issues relating to the country's development and strategy that cannot be sensibly quantified or factored into a model. If all factors are incorporated and 'optimised', there can be a concern with acceptance of the output solution. For practical solutions - that people will not only understand but implement - an iterative model has advantages. The planners can get involved in the building of the model, and in trying out the model - testing its solutions. In this way, familiarity is gained, not only with the model, but with understanding the overall situation nationally and even the international effects.

The gas planning process involves analysis of demand, supply and infrastructure; the initial (physical) gas balancing; the economic gas balancing; and consideration of the indicated project preferences in the light of the national situation and priorities (see **Figure 1**). For example, the national priorities may be for one or a combination of a number of the following: increased export revenue, oil substitution, industrial development, employment, fertiliser production to enhance agriculture, or environmental priorities (reduced greenhouse gases to meet Kyoto targets). Such priorities may over-ride the indicated economic preferences for the gas sector. However, with such an approach it is open to the planners/decision-makers to balance the reduced (quantified) economic return against the contribution to the national benefit in more closely meeting the declared priorities.

Further, the purely gas sector implications on investment requirements and outcome can be assessed when differing national policies are considered – for example, industrial development to encourage economic diversification and increased employment, which may or may not be preferred markets from a gas sector point of view.

For the gas planning process, as outlined in **Figure 1**, the use of a computer is inevitable for the gas planning model. The specification for model-building is likely to include the following:

- Visually intuitive presentation (GUI

 graphical user interface) able to reflect geography, gas flows and money flows. This facilitates model building and ready comprehension.
- Transparency, to facilitate data auditing at entry level, and at subsequent levels of consolidation or calculation.
- The ability to handle a range of supply projects and demand sectors, allowing complexity of interaction.
- The ability to consider and record different scenarios (combinations and variations of projects, including for example, their timing) in a structured manner.
- The ability to calculate individual project economics – under any fiscal regime if required, pipeline economic factors and overall gas sector economics.

With generic modelling software optimising routines can readily be incorporated, as already successfully completed. It is up to the model-builder to decide how the model is to be incorporated in the decision-making process – and hence what form of model and optimising function is required.

The applications for such a gas planning model tool can be illustrated by considering different countries.

Azerbaijan

Azerbaijan has a challenging gas situation with field development prospects that may meet a range of markets and necessitate a corresponding range of infrastructure investment. In the recent past, the country had significant pro-



duction, an established (satisfied) market demand and with infrastructure – extensive transmission and distribution system – to match, incorporating transnational trunklines as part of the USSR gas system.

Since its independence from the USSR. and its markets, Azerbaijan has experienced reduced gas production and is now recovering from a period of economic decline. There is significant gas production projected for the future, as associated gas from current oilfield developments and from the recent Shah Deniz gas field discovery, as well as potentially from as yet unexplored prospects. In the recent past the country has received imports of gas to counter the reduced domestic production, yet in the future there is a need for export markets once domestic demand is satisfied, to maximise the

benefit to the economy of exploiting available resources.

In principle, the situation can be modelled as a simple structure, with supply essentially from offshore fields and imports coming to a central location before distribution to markets throughout the country and exports. (see Figure 2). This is detailed by the range of possible fields and the options on gas demand markets (home and export). The model elements may include producing fields, those under development and prospects both onshore and offshore, associated and non-associated gas as well as domestic market sectors divided by geographic region which can be linked with explicit infrastructure items such as pipelines, compression stations, processing and storage. The costs of these can be related to demand for economic assess-



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forecasting



ment and comparison.

Figure 3 indicates how this maybe expanded on both the supply and demand side of a gas planning model.

Iran

Iran provides a more complex country situation than Azerbaijan – it has geographically more varied sources of supply and much higher levels of supply with the world's second largest gas reserves. Despite this, the country currently imports gas to the industrial north, which is distant from the location of most indigenous reserves, using the relative convenience and availability of Turkmenistan supplies.

Iran has also a greater range of sig-

nificant domestic markets in addition to the 'standard' ones of power generation and the residential sector. These market sectors include oilfield injection to increase oil production (total recoverable reserves and revenues); for road vehicles, where it substitutes for petroleum products; for petrochemical plant where it is used as feedstock; and for industry with high energy use. There is also a wider range of potential export markets, for example not only northwest to Turkey and Europe, but also east to the Indian sub-continent, Japan and China when both LNG and pipeline transport options are considered.

As with Azerbaijan, there is existing infrastructure, a history of oil and gas production, indigenous industrial capa-



bility and an economy that has suffered a major downturn but has the potential for significant growth aided by the oil and gas sector. With the greater geographic diversification of markets and supply, the resulting model is less straightforward (see **Figure 4**).

The importance of the South Pars gas field – with perhaps over 7% of the world's proven gas reserves – cannot be overstated. However, there are other gas reserves – onshore fields and associated gas requiring a gas gathering scheme. Some of the questions that may be asked include:

- At what stage is it more attractive to invest in the development of the other reserves?
- Should imports from Turkmenistan to the industrial north be continued, allowing South Pars gas to be developed for new export markets?

Not all countries have gas sectors that are as complex as Iran, but nevertheless have different issues that benefit from such a gas planning approach.

Eire

Ireland is a more modest consumer of gas, with limited indigenous reserves. The country is experiencing severely declining gas production from its current developed reserves – the offshore Kinsale Head and satellites. Ireland has recently committed to major development of peat reserves for power generation, and has gas supply options from the UK. However, the new discovery of the Corrib field offshore the northwest coast by Enterprise Oil re-establishes the prospect of energy self-sufficiency.

The issues for gas planners here have related more to the preferred new supply routes and capacities from Corrib, recognising the existing infrastructure in place. There is also the question of timing of new supplies availability. If these – and other reserves – are large enough, exports to and beyond mainland Britain may be a possibility, with the prospect of a more open gas market in Europe. This again has infrastructure implications.

The final word

Modern software enables widely differing and complex gas planning situations to be modelled and evaluated, readily calculating the implications of alternative scenarios, and presenting them in a comprehensible manner at the level of detail required. The Gas Planning Software can be used for a range of applications, as indicated in **Figure 5.**

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E-commerce

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Putting e-business sites to work

The oil industry is entering its third phase of e-business development with new initiatives being launched daily in the most significant re-engineering exercise in its 100-year history,

reports Brian Davis.

aving got their e-procurement strategies in hand, new e-trading initiatives are well underway and Phase Three heralds the introduction of e-business initiatives affecting most elements of business process and management throughout the value chain. There are also strong moves towards online asset portfolio management and further government licensing rounds via the Internet (to be covered in the September issue).

A digital business

BP Amoco is reinventing itself as a 'Digital Business' and virtually every element of the organisation is being reengineered to utilise the Internet. According to John Leggate, Group Vice President of Digital Business, the corporation is spending about \$0.5bn on developing e-business. 'There's no separate e-business strategy, as it's completely integral to the way we run our business.'

The group is well on-track to bringing online the new Energy Industry Exchange (in partnership with 13 other leading energy and petrochemical companies, including Shell, Conoco, Dow, Occidental, together with Philips Petroleum, TotalFinaElf among others) by 3Q2000 on the CommerceOne Marketsite platform, with a collective annual procurement spend of \$125bn. In May this year, BP Amoco set up a new organisation in Houston with a team of 80, that is busy building the basis of the new, as yet un-named, company which is heading towards being a corporation in the near future, according to Leggate.

BP Amoco's Chief Executive, Sir John Browne, has promised that 95% of cataloguable items will be procured via the exchange within one year. Leggate says: 'We're building up from MRO [maintenance, replacement and operations] for the basic cataloguable items and will then build up to more complex services.' He estimates that in any procurement portfolio, roughly 20% is in simple cataloguable activity sets.

The virtual Hive

In terms of capital projects, there is a major set of initiatives around The Hive, a virtual reality environment which allows cross-functional teams to sit in a room in the presence of a wide range of geological data for 3D visualisation, discussion and project optimisation. BP Amoco now has over a dozen Hive installations worldwide and is investigating the opportunities for collaboration in other project management schemes where a vast volume of data can be visualised and analysed collectively.

As Leggate explains: 'The main issue for BP Amoco is scaleability and knowledge transfer worldwide. A big issue is to ensure that we are always deploying good ideas globally, so that they come to fruition and don't simply live in silos constrained by geography.'

BP Amoco has put enormous effort into creating uniform communications across the world with a \$650mn contract last November with MCI WorldCom to create a global telecommunications system including Internetbased services – called the 'Common Operating Environment'. This will enable BP Amoco employees to communicate online at any time and any place, and replaces a system previously managed by 1,000 contractors across the world – which was considered 'hopeless', he admits.

So when does BP Amoco anticipate becoming a Digital Business? Considering the sheer scale of the company, Leggate suggests 'the journey will take well into 2001. However, my hunch is it will never be done! We're completely committed to this agenda and will make phenomenal steps, but the goal posts keep moving down the field.'

As a digital Business, BP Amoco is considering outsourcing web hosting, management of the LAN (local area network) and WAN (world area network), and the group is looking to put to the market much of its legacy of software applications management.

BP Amoco is also hot on the dot.com acquisition trail and has a number of investment funds for this purpose. Recently it acquired ASERA, an Internet software company with expertise in order-to-cash technology, reported to be particularly useful for the chemicals division.

In a further initiative, BP Amoco signed a \$600mn global contract last December with human resources (HR) business process management services provider Exult, which also serves other Global 500 companies. Exult is providing HR administrative, transactional and information services to employees and management using the latest webenabled technologies.

BP Amoco has also acquired stakes in other (not upstream-related) initiatives including:

- Oceanconnect.com an Internetbased system for purchase and sale of marine fuel participating in a joint venture with FAMM (Fuel and Marine Marketing), BP Marine and Shell Marine.
- Levelseas.com a joint venture of BP Amoco, Cargill, Clarksons and Shell to provide a life-of-voyage, freight management solution.
- An equity stake in Greenmountain.com – the premier US green and clean energy service marketer of gas and solar power.

So what does Leggate see as the key threats in the moves towards digital business? He considers the biggest advantage will go to those who have speed of deployment of the new technology. This sounds very much like the 'first mover advantage' commonly mentioned in e-business circles. Although it will also mean that some companies are first to discover hurdles.

Does he see any threats from new players? Leggate says: 'People may nibble at the edges of the business, so you must

ensure that your peripheral vision is quite active, because these people at the edge will be quite inventive."

Market opportunities

In the upstream arena, BP Amoco has identified a list of key areas to investigate for e-business opportunites.

- Building capability How do you up-skill the teams across the world using e-education, for example, to build competency in e-business and new Internet technology?
- Project development Using data management tools like The Hive for visualisation. BP Amoco is looking at innovative ways to make data accessible, and to accelerate new developments.
- Operations of the future How do you run your operational plans more effectively i.e. using remote devices, collaborative systems, and putting in the right infrastructure for rapid data transfer?
- Game changes Examining things which change the nature of business at a fundamental level.' This calls for radical thinking. 'Some ideas will not come true, others may, but it is vital to think the unthinkable – some call it "scenario planing,"' says Leggate.
- Knowledge management multiple initiatives.
- Productivity and collaboration using the Internet for net meetings, via portals where people can exchange information in special communities of interest.
- Office of the future Big discussions are underway to determine how teams will work best for improved productivity in the Internet Era.

There is also a bid to determine the further potential of the e-procurement exchange itself. 'Today it is being considered as a procurement exchange in the simplest sense, but over time it will evolve for different companies to offer different kinds of services.

Networked world

At Chevron, Don Paul, Vice President of Technology and Environmental Affairs, sees the emergence of a networked world playing a vital role in the oil industry. 'Networks will soon be taking a big leap in bandwidth and it will become practical to manage that data on the net using ASPs [application service providers], rather than oil companies managing that data themselves, as they do now at considerable cost and complexity."

Ultimately a broad array of data and derivative process information will be handled on the Net. 'Increasingly nobody operates 100% any more, so there's a natural sharing with partners, governments and suppliers,' he says. Because of the interconnectivity around operating the asset today, there's an intrinsic incentive to start constructing environments where shared information is available. As there's a high degree of redundancy in information sources today, the first impact will be in areas where there are joint operating relationships, such as the Gulf of Mexico, where many companies basically have the same data.'

Paul does not believe that confidentiality is a major issue, as it is already managed well by service companies like Schlumberger and Halliburton who collect data and sell it many times over. Even if it is proprietary data, the companies are used to managing multiple owners with security risks around the use of that data. 'The bigger challenge is getting everyone into the same network, but it is not an insurmountable problem,' he says.

Paul suggests the dramatic growth of centralised management of data will offer an opportunity for many new players to get in on the game. 'Large volumes of data that are processed internally will create an opportunity for a whole new class of ASPs. In addition, there will be small companies with key, niche inventions to come and plug into such things because they don't have to manage the distribution system, which was always a challenge for small firms.'

Paul has no doubt that the role of the major oil company will continue to be stewardship of assets. 'We're also going to hold on to this integrative capability, in order to extract value out of the assets and beyond. Oil companies will continue to be major integrators, managing the whole value chain. But whether we will own all parts of the value chain remains to be seen.'

He continues: 'The decision to farm out a particular piece of that asset will be a matter of location, opportunity and cost among other things. But you have to retain enough knowledge of all those parts to do that, and where necessary step up to the gate and do it all, if you have to. Everywhere there's a major business process and customer-supplier interface, there's an opportunity for an e-business model to develop.'

Procurement partnerships

Chevron's e-procurement marketplace Petrocosm.com went live at the end of June as a global procurement marketplace in partnership with Ariba and Crosspoint Venture Partners.

In May, Chevron, in partnership with EDS, Raytheon and The Information Store, launched **UpstreamInfo.com**, a neutral e-business portal which will enable oil companies to access massive amounts of technical and business information and associated applications that support their oil drilling operations worldwide. The aim is to dramatically lower the cost of information management and applications in the petroleum industry.

Chevron is also participating in Petrocore, a new global, oil and gas information exchange, in partnership with PricewaterhouseCoopers, to focus on information sharing among companies that jointly own oil fields, as well as royalty owners, venture partners, service companies and others.

At the far end of the chain, Chevron plans to offer **RetailersMarket Xchange.com**, as the first Internet trade exchange for US conveniencestore and small business retailers and their suppliers, in partnership with Oracle and McLane Company. 'In some respects, that's kind of the cash register at the end of the chain,' remarks Paul.

Natural fit initiatives

Chevron claims is has been focusing where e-business is seen to be a natural fit to improve efficiencies and expand the customer relationship, and where sharing that interface with others is valuable.

Another Chevron initiative is called 'The Net Enablement Initiative' and has three components:

- To look at core relationships and transactions and where possible, to Net-enable them in order to gain efficiency and reduce costs. That could mean analysis of relationships with governments, employees, between management and employees, suppliers, and between people and the assets they manage.
- Simultaneously, Chevron is Netenabling the relationship with transactions, examining the fundamental business process and re-engineering those processes as appropriate. For example. the evolution of Chevron's RetailersMarketXchange started as an internal initative, where they restructured relations between Chevron and convenience stores. Development of an Internet-based site is estimated to take about \$35mn of operating costs per year out of the business end.

E-commerce

upstream

 Thirdly, where possible the aim is to leverage and extend the benefits out of the Net-Enablement into a broader arena, external to the company.

When Chevron purchased the Rutherford Moran Company it gained a 50% stake of an E&P operation in Thailand. This was an extremely rapid start-up where the company had to take up operationship of a very aggressive and cost sensitive drilling development programme. For reasons of cost and speed, the company moved a fairly small staff into Thailand and Internetenabled its relationship with the operating staff in Thailand and all the major people they interact with, with support back in San Ramon in the US, partners Pogo in Houston, the Thailand National Oil Company and various contractors.

As the concession is a highly fractured offshore terrain with a lot of small fault blocks and multiple reservoirs, Chevron needed to drill a lot of wells very rapidly and efficiently. Using the Net to process all documents speedily and communicate with technical staff and partners, the company managed to drill a well every five to 10 days.

The second component of the strategy means increasingly building new external relationships with suppliers, customers and partners. This requires a robust infrastructure, with network directory security. The system must allow e-business interaction with external people and involves seamless integration, via the desktop, from front to back office using the latest ERP tools.

Paul also suggests that a key area of study for the future will involve melding those pieces using more *intelligent sensor devices* in the chain, whether associated with wells or producing platforms, refineries, pipelines or gasoline pumps

Technology ventures

An integral part of Chevron's venture capital investments, under a programme lead by Chevron Technology Ventures, is addressed to the convergence of sensors and computer networks.

Chevron Technology Ventures has invested in a company called Ten Square which is creating intelligent gasoline pumps. Further up the chain, it has taken equity in, In Viso who are developing wearable, high resolution mobile information systems. It has also acquired equity in Illumina, which is developing high-speed fibre optic molecular detectors, called bead arrays.

Chevron argues that the return on capital employed in high-tech ventures is twice that of the corporation's target, and introduces start-up products and services in the business. Chevron Technology Ventures is investing \$60mn in the first portfolio fund, which will include between 15 and 20 start-ups.

Paul estimates that Chevron will be significantly web-enabled within three years.

Dramatic changes upstream

Greg Vesey, Vice President of e-business for Texaco, based at White Plains, New York, sees a dramatic change in how the workforce will operate upstream in the e-business environment. Despite the high level of cost rationalisation in the industry over the last 10 years, he sees the need to do 'some dramatic things to get to the next level of efficiency.'

Texaco has been developing some tools internally and others with outside partners. Peoplenet is an online resumé system, which is used to define skill sets in the organisation, and team up relevant talents in global operations for various projects, and has been operational about six months. The system is currently being used to aid development of fields in Nigeria involving global teams of experts.

Texaco has also worked with a company called Microsolutions to develop a virtual meeting room application called TeamSpace, which allows people to share presentations and ideas in an online chatroom. Discussions will be retained as a historical knowledge base that can be referred to years down the line.

Rather than initiate an independent e-procurement site, Texaco joined Chevron's **Petrocosm.com** site, based on the Ariba platform, which is scheduled to go live in January 2001. Surprisingly, Vesey does not have an inordinately high expectation of the savings from e-procurement. 'We've been a little more realistic than a lot of firms. Having done the economics we reckon there will be about 1.5% savings, rather than the 5%-10% savings mentioned by some. This is fine as our annual procurement bill is about \$2.7bn.'

Texaco has also taken a small equity stake in the e-trading commodity site **Tradecapture.com** 'Whereas many of these sites are still under construction, we came upon this site which came onstream in February. Now we're trying to take that and build an effective marketplace, with the technology already in place.' He recognises that a major cultural shift is necessary to get all the world's traders to embrace the Internet and use the new technology, and says: 'That's the struggle we're going through right now.' Texaco is pushing to convert its whole trading department with offices in Singapore, Kazakhstan, UK, Houston and New York.

'Generally we're trying not to overwhelm our upstream organisation with e-business. They've got a lot on their plates,' he says. The company has also been converting its back office. It chose to go through the 2000 rollover with a legacy system, and then turnaround and implement a SAP system right after the New Year.

Texaco has also announced participation with Landmark to create a software tool for geoscientists and geophysicists to analyse drilling and production data internally on an Intranet-based system, replacing a system that currently uses three different geophysical tools. The most important effort will be ensuring that they will have consistent data across the globe from an upstream standpoint. By 2001 all the offices will be standardised on a front office, which will then standardise the data in the warehouse for use as a data mining tool.

Texaco has also worked with Indigopool.com, the Internet-based asset management site, during the evaluation stages. 'We actually have a property out there – a prospect, with a little data and details of Texaco strategy, but we're still at the evaluation stage.' Texaco is also involved in **Upstreaminfo.com**, alongside Chevron.

Consulting alliance

In an unusual initiative, Texaco is soon to announce an alignment with an Internet consulting company. The idea is to use people who think very differently, and who have not had a career with an oil company. We aim to create a strategic relationship, so they can work with our business units and encourage them to think *out of the box*. We consider this is very important in the Internet Age. We keep asking people: "Are you really thinking differently now?" It's all about speed. This is most important from the dot.com standpoint."

So how does he see the future for a major oil company? According to Vesey, 'They'll still have to drill wells, but even more effectively. There'll be a lot of collaborative relationships. Oil companies will reduce themselves to experts. You'll see the separation and skill sets and specialities being more and more outsourced. We'll be more like integrators. I like to think of the Dell model. They don't do anything but they bring it all together perfectly. So you've got to have all the skill sets internally to pick the best players from all the key areas that can help you perform that function."

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IP Week 2001 IP THE INSTITUTE OF PETROLEUM London: 19 – 22 February The Institute of Petroleum's 'IP Week' is the focal point in Europe each year when leading figures in the oil and gas industry travel to London for an intensive round of conferences, industry and trade association events, company meetings and social functions. The Institute's own programme of events forms the core of these activities. The programme of events will include: **International Finance Conference** Monday: 19 February **Tuesday: 20 February** Seminar in Seminar in Seminar in co-operation with the co-operation with co-operation with International Bunker Wood Mackenzie Andersen Consulting Industry Association Andersen Consulting WOOD MACKENZIE global consultants THE INTERNATIONAL BUNKER INDUSTRY ASSOCIATION IP Annual Luncheon held at the Dorchester Hotel Wednesday: 21 February

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IPIECA

Seeking a magic solution

Deregulation of the electricity and gas markets in the US and, at a much slower pace, in Europe, has resulted in a massive growth in power trading, writes *Maria Kielmas*. This has also ushered in a whole new set of risk that the utility must manage – price, volume, weather, credit and environmental risks. In the days when utility trading was restricted to bilateral deals between neighbouring regional or national monopolies it was the captive customer who bore the risks. In today's markets the management of weather risk is acquiring an ever-increasing public profile.

The weather derivatives market developed in the US as a way of stabilising utility earnings as some states did not permit utilities to pass through to the consumer the costs of dealing with adverse climatic conditions. According to Cambridge-based Weather Risk Advisory, there have been an estimated 3,000 such weather derivative deals in the US since their introduction in 1997, comprising a nationally traded market of some \$5.5bn.

Trading

Electricity market deregulation in the US has heightened the perceived inability of utilities to relate weather patterns with their summer maintenance programmes. Since 1997 US consumers have been suffering early summer blackouts as unseasonably high temperatures and increased air conditioning use coincided with traditional generating plants being closed for summer maintenance. Designed as an adaptation of the hedging instruments available in the financial and commodity markets, the market for weather derivatives is now taking root in western Europe's deregulating energy markets. But northwestern Europe's chaotic climate will mean that weather derivatives market growth on this side of the Atlantic is a more turbulent prospect.

The most common variable used in weather derivatives is the 'degree day'basically the variation in one day's temperature against a standard of 65°F or 18°C. Each degree above the base is counted as a cooling degree day (CDD) and each degree below is a heating degree day (HDD). There are four basic instruments:

- Caps, or call options, usually bought by energy users to specify a maximum purchase price,
- Floors, or put options, usually bought by energy producers to define a minimum price

These first two instruments provide the right, but not the obligation, to enter into a long or short position at a specified price. They allow energy producers and consumers to benefit from any favourable price changes.

- Swaps, where two parties exchange or swap price risk exposures. These can be used by both energy producers and consumers to lock in the price they will pay or receive for the commodity.
- Collars, which force price to move within a defined range and limit extremes.

However, the problems with an instrument based on the financial and commodity markets is that electricity and the weather behave as neither. Electricity, unlike any other commodity, such as oil or sugar, cannot be stored. It functions when a user connects into an operating system and power generation has to react in real time. Even the forward electricity market in the US is not indicative of how the spot market will react on the contracted day of delivery. Under low power loads, or if the contracted day of delivery is some months away, prices in the deregulated markets tend to be very stable. But as the day of delivery approaches or the load increases, prices display volatility, dubbed price spikes, reflecting short-term risks.

This volatility is to a large extent weather driven, which creates imbalances in supply and demand, and is also dependant on the time of day. Events such as a power generation plant coming offline or unexpected extremes in weather can push prices further. Cold spells in the UK in December last year pushed electricity spot prices to \$80 per megawatt-hour (MWh) while in May this year unexpectedly warm weather in New England pushed spot prices to \$6,000 per MWh from a typical May average of \$30 to \$50 per MWh.

Slow uptake in Europe

There has not been any rush on the part of European utilities to buy weather derivatives. The Weather Risk Advisory estimates that by June this year about 30 such deals had been completed in Europe worth about £30mn. The companies buying weather derivatives have tended to be in the food or leisure industries rather than energy. One of the more obvious problems has been that the weather derivative instruments have usually been tied to temperature, rather than rainfall, the most crucial variable in Scandinavia, which is Europe's longest deregulated energy market.

For Hydro Energy, a subsidiary of Norsk Hydro, the monitoring of rainfall and reservoir levels is the crucial factor says Hydro Energy Director Thorstein Jenssen. Scandinavian hydroelectric utilities seek to hedge against early autumn seasonal electricity demand and the run down of reservoirs prior to rainfall and snowmelt. So the company needs to model and forecast river inflows as well as rainfall into reservoirs. But there is a lack of homogenous historical data that could be used as a database. Not only does the monitoring of river levels depend on the season, it also depends on the individual carrying out the work. Jenssen says that his company has explored the use of weather derivatives, particularly with Enron Europe's weather risk management department in London. But so far existing weather derivative providers have products that are not relevant to the Norwegian market.

According to Joanne Butler, weather trader at TXU Europe, rainfall-based weather derivative products will become available eventually and the market will grow. TXU Europe finalised its first weather derivative deal in May. This was a temperature-related swap contract covering the period from 1 November 2000 to 31 March 2001, handled through energy brokers Intercapital. For TXU Europe this is a hedge against a mild winter and for the counter-party with supply contracts, which was not named, it was a hedge against a cold winter. The deal payments will be made by either side depending on the average temperature recorded at Heathrow airport for the period either side of the agreed reference average temperature.

Stumbling block

The biggest stumbling block for aspiring weather traders in Europe has been the unavailability of homogenous weather date. The acquisition and analysis of historical and instrumental weather data is a fundamental tool for estimating at least the probabilities of future trends. Data gathered at various weather stations, usually airports or similar major locations, changes as the local environment changes – urbanisation produces a local heating effect while changes in instrumentation produces varied quality of data over decades.

European government Meteorological organisations, such as the Meteorological Office in the UK or Méteo-France in France. are able to provide homogenised, or 'clean', data for any user - but for a fee. The cost of data was £3,000 to £4,000 per weather station in the UK, but has now fallen to about £2,000 for eight weather stations. Nevertheless, in the US such data has been available for only a small administrative cost. US Government meteorologists privately criticise the European system saying that the Europeans are using historical weather records not as a matter of public interest but as commodities to be sold.

Energy traders now say that European meteorological offices are beginning to understand the needs of the financial markets but even so, beyond the UK, France, Germany and Scandinavia, the quality of the data available leaves much to be desired. There is also a reluctance on the part of both business and climate scientists in Europe to take on the same enthusiasm for weather derivatives as the US simply because of the more temperate climate in northwestern Europe, the principal market for this product.

One energy derivatives trader at a major European bank explained that he preferred to hedge price and volume risks through a simulation approach rather than using weather derivatives. His idea is to model the spot price through to physical delivery using multiple Monte Carlo-type simulations. Eventually the trader begins to acquire an intuitive approach to likely problems such as blackouts and other factors affecting the price.

According Harold Brooks, to Meteorologist at the National Oceanic and Atmospheric Administration (NOAA) National Severe Storms Laboratory in Oklahoma, cloud cover in summer in Phoenix, Arizona, can cause temperatures to drop from 45°C to about 30°C. Each °C drop in temperature cost the local electricity utility \$80,000/d in lost earnings due to reduced air conditioner usage. Thunderstorms over this period can tear down transmission lines over long stretches causing extended blackouts. But Europe has to deal with much subtler temperature changes than the US while windstorm patterns are entirely different.

Facing the challenge

The forecasting and modelling of weather data to determine a good cost for weather derivatives is the challenge for utilities in a deregulated market. Climate scientists will begin to have a serious input into such modelling as utilities try to determine longer-term weather patterns and weather extremes.

Western Europe is hit by major storms approximately every 10 to 15 years. Some climate scientists have tried to link the depressions over the North Atlantic which cause these storms to phases of the North Atlantic Oscillation (NAO). This atmospheric pattern operates at present with a low pressure region over Iceland, where circulation is anti-clockwise, and a high pressure region over the Azores, where the circulation is clockwise. This has been named as the NOA's positive mode, bringing warmer and wetter winters to western Europe and colder winters to North America. But it switches to an opposite pattern, the negative mode, every 10 to 11 years, bringing North America more benign winters and colder winters to Europe.

The warmest year on instrumental records since the 19th century has been 1998, but climate scientists also link this to the effects of an unusually strong impact of the 1997–98 El Niño Southern Oscillation, the periodic warming of sea surface temperatures in the eastern equatorial Pacific. Until recently northwestern Europe has been regarded as immune from the effects of El Niño phenomenon. But now there is an emerging belief among climate scientists that each of these teleconnections - such as the NAO, El Niño, similar circulations over the Pacific and North America, as well as the thermohaline



circulation in the oceans – influence each other. In addition, geomagnetic storms caused by solar activity, which some scientists have also identified on a 10-to-11-year cycle, is receiving increasing attention as an influence on the earth's weather. All this before anthropogenic effects such as the increase in greenhouse gas emissions and land or near-shore water use can be considered.

Scientific sceptics

But as energy utilities and traders try to devise longer-term products, some climate scientists remain unimpressed. Professor Lennart Bengtsen, Head of Climate Modelling at the Max Planck Institut für Meteologie in Hamburg, thinks that weather derivatives may make sense in the western and the southern US, and in tropical locations, but northwestern Europe's weather is so chaotic that these instruments are 'pretty useless.'

For Bengtsen, weather in northwestern Europe is forecastable for up to one week, after which it becomes guesswork. He remains sceptical about the observed periodicity of effects such as the NAO, while the growing emphasis on solar cycles in relation to the earth's weather is a 'hoax.' He believes that it may be straightforward to apply transform functions, such as Fourier analysis or any other kind of spectral analysis, to a time series to try to identify periodicities - but it is necessary to keep an open mind. When dealing with longer-term effects, for which the data interpretation becomes subjective, the climatologist moves into the realm of probabilities in the same manner as an earthquake seismologist, Bengtsen says. The important matter is to keep an open mind and not to apply any more theories than necessary to solve a problem.

statistics

Retail Market Survey update

This year's *Retail Market Survey* (RMS) – published with the March issue of *Petroleum Review* – has attracted some concern from readers who regard the reported level of forecourt closures in 1999 as too low. We believe this view is erroneous.



The apparent discrepancy arises because these readers appear to concentrate on the independently owned and managed sector of the forecourt market and this is the area under the greatest pressure. In contrast, some other sectors have been doing reasonably well.

In order to reassure both ourselves and *Petroleum Review* readers we have undertaken an exercise to reconcile the numbers reported in the RMS with those generated by Catalist, the Bristolbased company that monitors forecourts and their attributes.

In terms of the collection of data both the RMS and Catalist draw on the same source – the retail companies' own databases.

For the RMS annual survey the basic details are provided in response to a questionnaire sent out by the Institute of Petroleum in November. It requests an update of the statistics that appear in the RMS, including total number of outlets.

The information supplied to Catalist is much more detailed and includes addresses of individual sites. This enables Catalist to photograph and survey every site thoroughly.

The Catalist database is updated constantly using information supplied by operators themselves, by other operators and by their own surveyors.

Catalist is also able to monitor sites on a day-to-day basis by checking credit card returns from retail sites.

Numbers

Figures from both Catalist and RMS for the major retailers, supermarkets and even minor operators with more than around 10 sites are very close or identical. This covers not only the total numbers of sites but also fuelling positions, self-service and company-owned sites, and sites retailing diesel. Numbers of sites by area are also very similar.

It should be noted that with a total forecourt population of around 14,000 operational sites it is effectively impossible, even with the most extensive resources, to be accurate to less than 1%, or 140 sites.

For BP the RMS showed 1,525 as a total number of retail sites open. Catalist had 1,554. Texaco's figures were RMS – 1355, Catalist – 1328. Proteus: RMS – 160, Catalist – 159. BP/National: RMS – 145, Catalist – 141.

The only major discrepancy we have been able to discover was in the figures supplied by CPL, owners of the 'UK' brand. The RMS return from CPL gave 860 UK branded sites while Catalist has 444 branded as UK. However CPL also supplies to Corralls, BFL and Peva which together bring the CPL total up to around 800.

Final totals

Looking at the figures from the RMS questionnaires sent out, the total for the companies who responded showed a drop of 308 sites in total for the year, consistent with the figures over the past 10-20 years.

Other and Unbranded

These figures are provided by Catalist.

At the end of 1999 the total number of Other/Unbranded sites was 867. This was up on the previous year but, rather than indicating there were more sites than in the previous years, this may show that more sites had been discovered. Undoubtedly some sites, shut down by major retailers, were reopened as independents.

The figures published in the RMS went up from 601 in 1998 to 867 in 1999. This, unfortunately, may have led to some double counting as a number of those listed 'Others and Unbranded' by Catalist were already included in the main RMS listing either as operators or included in other operators' figures, for example Texaco's.

Our analysis shows that there are now four distinct forecourt markets – each characterised by rather different market pressures and exhibiting different trends.

The hypermarket and supermarket sector continues to expand with site numbers continuing to increase. The sector also has a high proportion of the really large volume sites.

The oil company operated sites, after a period of rationalisation and contraction, now appear to be stabilising with the number of sites being brought into direct management broadly balancing those being closed or sold off.

In sharp contrast, the branded but independently owned and managed sector remains under severe pressure with a significant number of closures occurring.

The fourth and final sector, Other and Unbranded, represents a long tail of predominantly small sites. Somewhat surprisingly the numbers in this category are rising, partly because there appears to be a quite active market for sites sold off by the larger groups and partly by a process of discovery in which small sites are identified and catalogued (they often take their fuel from a variety of sources).

As with many other small business sectors it is not actually clear how many of these ventures are actually fully profitable. They are most unlikely to be bringing the returns oil companies are currently seeking.

From next year the RMS will be more clearly divided into the four areas of forecourt business identified above. At a time when some of the sectors are expanding and some contracting, aggregating all the sectors together has become somewhat misleading.

NE Publications and Data Services

1999/2000 Pipeline Industries Guild Directory

(Pipeline Industries Guild, 14/15 Belgrave Square, London SW1X 8PS, UK). 300 pages. Price: £17.50.

This latest edition has been published in a new format – with new typefaces, more colour and a better quality binding – and is said to contain even more reference information on players in the pipeline industry than earlier editions. The directory (formerly called a yearbook) contains details of the Guild's Corporate Members, a rapid guide to Members' services, a Consultants' Register, an Expert Witness Register, and a programme of Guild events. New sections include details of UK water companies, pipeline operators and gas suppliers in the UK and Northern Europe, pigging companies, related associations and organisations, travel data, and a summary of Members' international activities.

Multi-dimensional Simulation of Engine Internal Flows

Editor: Thierry Baritaud (Éditions Technip, 27, rue Ginoux, 75737 Paris Cedex 15, France). ISBN 2 7108 0771 8. 176 pages. Price: FFr 300 (euro 45.73).

Computational fluid dynamics (CFD) is a widely used tool in understanding and designing vehicle engines. This Special Issue of the journal Oil & Gas Science and Technology (Vol 54, No. 2, 1999) looks at recent developments in CFD and its use in developing state-of-the-art engine technologies.

Gas Cycling - A New Approach

Editor: Alexandre Rojey (Éditions Technip, 27, rue Ginoux, 75737 Paris Cedex 15, France). ISBN 2 7108 0759 9. 148 pages. Price: FFr 320 (euro 48.78).

Although gas cycling is not a new concept, its range of applications has been rather limited. One of the most significant uses has been to maximise the production of condensate while recycling residual methane. While this still remains important, the conceptual and applications approach considered in this book is much broader in range. It covers all situations in which gas is split into two fractions – one to be exported, the other to be reinjected underground – an approach which is of great interest to gas field operators looking to enhance hydrocarbon recovery and minimise the atmospheric release of greenhouse gases such as carbon dioxide.

Energy Company Briefings

(FT Energy, Maple House, 149 Tottenham Court Road, London W1P 9LL, UK). Price: £95 (discounts available when two or more briefings ordered).

This new series of publications presents individual briefings for over 60 companies in Western, Central and Eastern Europe. Each briefing contains details of the company's market position; the changing nature of its core markets, financial issues and threats; operations and production; and an outlook for future development.

Safety and Offshore Installations 1999

(ERA Technology, Cleeve Road, Leatherhead, Surrey KT22 7SA, UK). ERA Report 99-0808. 230 pages. Price: £125 (£110 to members of ERA's Technical Services Scheme).

This compilation of 28 papers from the Safety and Offshore Installations Conference held in London at the end of 1999 looks at how companies have minimised the risks of working offshore while responding to market pressures to reduce their operating costs. It will be of particular use to those involved in the preparation of safety cases for new and existing offshore facilities.



Information for Energy Group (IFEG)

Date for your diary: Thursday 7 September 2000, Afternoon Seminar – 'Your Future in Your Hands: Selling Yourself and Your Services.'

New Editions to Library Stock

- Energy for Tomorrow's World Acting Now! WEC Statement 2000. 1st Edition. World Energy Council, London, UK, 2000.
- Gas and Power 2000: An Insight into Europe's Developing Gas and Power Market. Edited by Martin Quinlan, Patrick Heren et al. 1st edition. Petroleum Economist, London, UK, January 2000.
- Oil Prices and Fiscal Regimes. By Bernard Mommer. Ist Edition. Oxford Institute for Energy Studies, Oxford, UK, May 1999.
- World Energy Yearbook 2000. Ernst & Young, Petroleum Economist, London, UK, March 2000.
- OTC 2000: 32nd Annual Offshore Technology Conference. Three volumes. Offshore Technology Conference, Society of Petroleum Engineers, Richardson, Texas, USA, 2000,

Library & Information Service Hours

- The IP Library Is open 9.30am to 5pm Monday to Friday (except Bank Holidays).
- Non members are welcome on payment of an entrance fee of £19 for a half day or £27 for a full day.

Student non-members may use the library for ± 1.50 per day if they bring a letter of introduction from their tutor together with their student ID card.

New Information Officer

We welcome Sally Ball to the IP as our new Information Officer. Sally has just graduated from Leeds Metropolitan University with a degree in Information and Library Studies.

Contact Details

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- Catherine Cosgrove, Head of LIS, +44 (0)20 7467 7111
- IFEG Queries to:
 - Sally Ball, Information Officer, +44 (0)20 7467 7115

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E-business industry

Exploding the virtual oil company

Notions of the 'virtual oil company' have been touted by commentators and consultants as the next stage in the evolution of the industry [see July issue -Ed]. This follows the wave of consolidation and rationalisation in response to oil price volatility and the need for better returns for shareholders. We at Andersen Consulting are not convinced by this notion, write Paul Fockens and Paul Spence.*

hat is not to say that we don't believe e-commerce will impact oil companies, particularly in their upstream activities – it is just that we think it will have a much greater impact than most have suggested.

We are not convinced by the concept of a virtual oil company – by definition it is virtualising the traditional concept of an integrated oil company. We believe that this concept has been overtaken because e-commerce offers greater potential than the simple replication of existing strategies online. Each stage of the E&P lifecycle – explore and appraise, develop field, produce hydrocarbons, abandon – may be transformed by e-commerce: overturning existing business and creating a whole new landscape.

We believe e-commerce will have a significant impact on the exploration and production lifecycle. Indeed, it has the potential to transform the industry.

- Exploring and appraisal relies on sophisticated financial and technical evaluation tools. These tools are used to structure and understand prospect opportunities, to breakdown increasingly complex decisions, and to compare the risk and return profiles of diverse investment options.
- In developing fields, players need to create a network of project partners to reach first oil faster.
- Once in production, the focus shifts to maximum recovery and sharing resources whenever possible so that economies of scale and rebalancing the asset portfolio are reached.
- Having reached abandonment, regulatory and fiscal opportunities need to be optimised to drive value. Resale or reuse of platforms and the sharing of assets and manpower reduce investment in abandonment equipment.

The adoption of e-commerce strategies has positive implications in each of the stages outlined below.

Explore and appraise

E-commerce initiatives in the *explore* and appraise stage will encourage communication, interaction and the sharing of information to create the right portfolio. E-commerce can structure the use of evaluation tools and increase transparency of value and risk. New initiatives such as Oildex and Energyprism will provide the information at the right time to the right people, supported by the right tools to make investment decisions.

Access to information and the tools needed to compare options, improvements in analysis technology and increased insight to buyer and seller values will improve functions such as the bidding processes for acreage.

Already, the impact of e-commerce has seen the development of companies that are providing online services for the industry. Schlumberger, for example, has been an early mover with **IndigoPool.com** which lists sales of oil and gas properties, equipment sales, sales of other data and provides interactive online data rooms and portfolio management and virtual interpretation centres (see **Figure 1**).

Other developments that could occur include e-commerce companies offering financial and physical portfolios, exploration companies that netsource the majority of activities or online services that provide risk ratings for individual fields.

E-commerce has the potential to be a critical factor in the management of portfolios. It can support the comparison of seemingly disparate opportunities and the making of important capital allocation decisions. The portfolio profile – value and risk – can be shared globally, encouraging constant re-evaluation of the entire portfolio. Learning across projects and sharing key issues and similar discussions can be accelerated through online case studies and online communities.

Develop field

Initiatives at this stage of the lifecycle centre around making the value points of the network (e.g. shared knowledge and tools) transparent and promoting specific collaboration. Others centre around project planning and management, use of alliances, efficient supply chains and the integration of skills data and information.

The ability of e-commerce to improve collaboration, specialisation and interaction will lead to improvements in the effectiveness and efficiency of alliances put together to develop opportunities. In addition, increasing returns to scale encourage the expansion of the network, in turn allowing even more specialisation and collaboration. Networks of companies will become easier to build so that project activities and technical resources are shared. It will also be possible to manage field development online and to share information with those who need to track project process. Companies that are already to the fore in this process include **Worldoil.com** – an online marketplace for oilfield services and equipment which also offers industry news (see **Figure 2**).

Produce hydrocarbons

During *production*, success depends on reducing costs and improving asset utilisation. E-commerce lowers costs and makes wider sharing possible. Online remote diagnostics and other tools reduce time spent offshore and unplanned maintenance. For example, **gulfshare.com** is designed to facilitate the sharing of assets from helicopters to warehouses.

As in the development part of the cycle, e-commerce will enable companies to increase specialisation and collaboration and achieve further returns to scale. By exploiting the shift in the value/cost curve and increasing returns to scale more value can be extracted at the same cost base. Examples of companies sharing resources include the recently announced Procurement Exchange and Petrocosm (a joint venture with Chevron, Texaco and Ariba) which are global Internet marketplaces that links buyers and sellers in the energy industry.

E-commerce can transform the cost structure associated with producing assets. As production accounts for approximately 40–50% of the lifecycle cost/barrel, these savings could be significant.

Abandonment

The benefits of e-commerce during abandonment are perhaps the most diverse. E-commerce reduces the cost of accessing regulatory and service provider information from the disparate sources where it is currently stored, facilitates collaboration, specialisation and thus increase returns to scale by sharing resources to reduce decommissioning costs and generates value from the reuse of surplus and used assets and equipment.

Abandonment is perhaps the least developed area in terms of e-commerce to date. Early initiatives include **Easigoe.com** which specialises in decommissioning projects and promotes the re-use of equipment through its online database and sourcing service, and the University of Aberdeen



which is currently developing a database of decommissioning knowledge.

Costs and benefits

Major oil companies will face substantial financial risk by not embracing ecommerce. Using economic modelling, Andersen Consulting has calculated that across the full lifecycle, a conservative estimate of the potential cost of doing nothing is 5–10% of market capitalisation – that's \$10–\$25bn for any one of the supermajors, or almost one to four times 1999 earnings.

There has been substantial speculation in the market and the media about the exact cost savings that will be accrued through e-commerce. We believe the savings will be between 3–10% of current costs.

Value is not, however, just derived from cost savings. There are also opportunities for e-commerce to drive new revenue. Placing a figure on this potential new revenue is more difficult. Part of the revenue could be non-energy related, for example, developing the solution horizontally for other industries. The revenue gathered by these enterprises will also depend on the specific opportunity and the success of execution. What is clear is that there is substantial value potential in the market.

A strategy for engagement

Companies such as Shell and BP Amoco view portfolio management as key to driving investment decisions and selecting the right technical and financial evaluation tools. At Andersen Consulting we believe that the road to success lies in adopting a portfolio of e-commerce initiatives and finally crafted strategies that allow you to 'think big, start small and scale fast'.

Portfolio approach to ecommerce initiatives

By far the best way to embrace e-commerce initiatives is the portfolio approach. The different type of e-commerce functions can be characterised into three groups. In the first group our efforts to improve existing business functions are largely internally focused. The second includes extending the business model to create value – i.e. initiatives such as e-procurement. The final area includes the creation of entirely new enterprises, for example, GE Capital is creating an online valuation tool for upstream properties.

For each of the four stages in the E&P lifecycle, integrated oil companies need to ask a series of critical guestions when planning e-commerce initiatives. In explore and appraise questions centre on commercial viability. What can be commercialised, can it be replicated and does this risk existing advantage? In develop field the value of relationships are examined. Questions that need to be addressed include what is the value of existing relationships and how can ecommerce increase the value of those relationships? In produce hydrocarbons critical questions centre around whether you are getting the most value from the physical assets. Are there opportunities to commercialise spare resources and would existing advantage be eroded? In abandon



questions centre around whether benefits such as improved stakeholder reputation are to be reaped through managing the process and whether existing advantage risks being eroded.

E-business

Once companies have asked all these questions, they have to rethink

their business strategies before they become obsolete. Possible market outcomes need to be analysed to get going and a fast and flexible plan of action needs to be developed. Successful companies should identify a set of possible long-term directions

industry

and then plan a set of quick, small steps to get started. Once this happens they must be willing and able to scale fast to benefit from technology advancements and achieve market domination. The gap between big thoughts and small beginnings is rapid development. Small projects must be able to be scaled across geographies quickly, before low barriers to entry enable others to overtake.

The final word

Companies that decide to adopt e-commerce solutions must place them at the heart of their business and not as an addition to their existing business strategy.

Having identified where and how to begin e-commerce initiatives, companies need to start small but be able to scale fast.

Companies that follow this strategy will soon find old business rules questioned. This is what e-commerce is about. It's not about creating virtual oil companies, but transforming the whole landscape of the industry.

*Paul Fockens and Paul Spence are Partners in Andersen Consulting's Global Energy Practice. They can be contacted at paul.fockens@ac.com and paul.spence@ac.com

Petroleum *review*

What do you want from us?

Petroleum Review Questionnaire

Thank you to all readers who have taken the time to fill in our questionnaire in the July issue. It is already proving most helpful in showing where we can align coverage more closely with readers' interests.

Your opinions count

If you have yet to fill in a questionnaire, please do. Your opions really will help to shape *Petroleum Review*.

Just drop us a line

If you cannot find your questionnaire, and would like another one, please contact the editorial staff.

Write to Kim Jackson, Associate Editor, *Petroleum Review*, 61 New Cavendish Street, London W1M 8AR or Tel: +44 (0)120 7467 7118, Fax: +44 (0)20 7637 0086, e:**kjackson@petroleum.co.uk** Don't forget to provide your address so that we can mail a copy of the question-naire directly to you.

Thank you!



Petroleum Review has always included a comprehensive European bulk storage survey in the August issue.

As readers will have noticed, this year we have not run the survey in its usual format. Instead we have run an overview feature and two technical articles.

For those of you who would like access to our European Bulk Storage Directory, it is shortly to be transferred to the Institute of Petroleum's website at *www.petroleum.co.uk* We plan to regularly update the listing, which will act as an always-accessible source of data on European bulk storage facilities.

If you would like your companies details included in the listing or your current entry updated, please contact Emma Parsons, Production Manager, Petroleum Review, 61 New Cavendish Street, London W1M 8AR or Fax: +44 (0) 207637 0086, e:eparsons@petroleum.co.uk

Training Courses 2000

Planning and Economics of Refinery Operations (PERO)

enspm

organised in association with ENSPM Formation Industrie

London: 25–28 September 2000

This intensive four-day training course will cover: Technical Resumé Present Situation of the Refining Industry Refinery Margins and Costs Optimisation of Refinery Operations
 Scheduling of Refinery **Operations** How to Improve Refinery Profitability . Future of the Refining Industry

Who should attend?

- Technical, operating and engineering personnel working in the refining industry
- Trading and commercial specialists
- Independent consultants
- Process licensors
- Catalyst manufacturers and refining sub-contractors

Trading Oil on the International Markets (ITO)

organised in association with Invincible Energy

Cambridge: 23-27 October 2000

Delegates will become part of Invincible's fictional trading team, taking decisions about the company's activities to maximise profits through an under-standing of the economics of trading and the management of inherent price risks. Delegates will trade the live crude oil and refined

product markets worldwide under the guidance of an expert team of lecturers, reacting to events as they happen and using real-time information from Reuters and Telerate screens and daily price information from Platt's and Petroleum Argus.

Exercises are performed in syndicates, with comprehensive debriefs assessing the consequences of the decisions taken. The course expects a high degree of participation from delegates.

Who should attend?

Anyone whose work is affected by changes in the international oil price, including those in: • Supply, trading, risk management, refining, finance, trans-portation, E&P in the oil industry • Oil trading and distribution companies • Energy-related government departments
 Purchasing, planning and finance in major energy consumers
 Energy publications
 Banks, accountants, auditors and others associated with oil companies and oil financing

Economics of the Oil Supply Chain (ESC)



organised in association with Invincible Energy

Cambridge: 16–20 October 2000

Delegates will examine the various activities of the fictional Invincible Energy Company to explore the economic forces which drive the oil supply chain. They will concentrate on the main areas of risk and opportunity from the crude oil supply terminal, through transportation, refining and trading to the refined product distribution terminal.

During their time in Invincible's refinery, delegates will learn about the quality aspects of product supply. They will study refinery process economics and the effects of upgrading. Blending to meet quality requirements at optimal cost will be examined. Delegates will construct and negotiate a processing deal. They will then follow the crude oil and the refined products from the refinery and look at the economics of various alternatives. International markets and trading will be studied, together with the various methods of price risk management.

Vho should attend?

This five-day course is the essential foundation for people entering the oil industry or for those with single function experience. It is ideal for those: New to the downstream oil industry single function experience in supply, transportation, refining or trading In the E&P, finance, downstream marketing or IT departments of oil companies Working in energy-related government departments Writing about the industry accountants, auditors and others associated with oil companies and oil financing.

Environmental Risk Management (ENV)



organised in association with Cordah Ltd

London: 30 October – 1 November 2000

This challenging and interactive three-day course provides delegates with essential practical skills to manage their environmental risks and liabilities. Using presentations and discussions, a team of experienced lecturers will guide delegates through strategic, managerial and technical issues in environmental management. Simulation exercises from actual oil and gas projects provide hands-on experience of environ-mental risk assessment, strategy development, prioritisation and management.

Who should attend? Anyone whose work includes environmental respon-sibility or who needs to understand environmental issues, including:

 Policy makers/senior management
 Technical managers/specialist personnel
 Civil servants/regulators
 Environmental/project engineers
 Engineering/facilities management contractors
 HSE

 managers/specialists • Reputation managers/specialists.

For more information please contact:

INVINCIBLE

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e: nwilkinson@petroleum.co.uk

Technology drilling

New drilling method cuts costs

The potential downsides of cemented monobore completions – such as remedial cementation and the possibility of failing to get the string to total depth (TD) due to hole problems – has previously stopped companies from using this technology. However, the need to deliver a low-cost solution in today's high-cost North Sea environment has driven KCA Drilling and Shell Expro to challenge the traditionally accepted practices and standards to design and deliver the first cemented completions, write *Fraser Lawson* and *Craig Falconer*, KCA Drilling.*

The cemented completion concept is a fundamentally simple one. The reservoir open hole section is drilled to the required depth and following electric logging (if required) the completion tubing is run into the open hole and cemented back inside the previous casing shoe or window. The christmas tree is then installed and the well perforated in the normal manner.

Industry benefits

The advantage of cemented over conventional completions is commercial in that it saves five to seven days' rig time during installation by eliminating such operations as running and cementing liner, wellbore clean-up and packer setting procedures. In addition, the amount of liner and completion accessories required – such as packers, liner hangers, PBRs (polished bore receptacles), nipples etc – are greatly reduced. The saving per well due to time and hardware savings can be as much as £500,000 to £1mn.

Cemented completions have already been used in low-cost operating areas around the world, but well CA-2852 on Shell Expro's Cormorant Alpha platform marked the first cemented completion to be performed in the North Sea. At the time of writing, two Cormorant Alpha and three North Cormorant wells have been successfully completed in this manner. All have demonstrated considerable cost savings as a result, with three of the five wells completed in 50% of the planned time.

CA-2852 was selected as the ideal candidate for evaluating the method due to its short 6-inch open hole length of 708 ft and near vertical inclination. Since then, open hole lengths have been progressively increased, culminating in CN-2851 which was successfully completed with 6,500 ft of 8 ¹/2-inch open hole at 67° inclination.

Design considerations

Although the basic concept is simple, careful planning and attention to detail are essential if the operation is to be performed effectively.

Prior to cementation the tubing hanger is landed off, tied down and pres-

sure tested. The control and balance lines are attached back to the control system. The big bore safety valve dummy is then removed to avoid a restriction for the cementing plugs. The cementation takes place through the completion tubing, with returns back through the A annulus valves. Both A annulus outlets should be used to minimise back pressures.

Since cement acts effectively as the completion packer in this design it is imperative that cement is returned back inside the previous casing window. Careful consideration of the cement volumes used must be given and in these circumstances a LWD (logging while drilling) or electric line caliper log is valuable. Extensive modelling is required to predict the likelihood of losses and channelling. Also, with the presence of control and balance lines no rotation is possible during cementation. Optimal centralisation therefore takes on an addi *continued on p48...*



LNG

Gas-fired power generation plans fall behind schedule

Plans to increase the use of LNG for power generation have fallen about 12 months behind schedule due to delays in completing a submarine pipeline to supply two power plants in northern Taiwan. The delay is preventing Changsheng power station, Taiwan's first independent power producer (IPP) scheme, from starting commercial operation, while plans to convert nearby oilfired Tungshiao power station to gas-firing have also been held up. David Hayes reports.

aiwan

State-owned Chinese Petroleum Corporation (CPC) currently holds an import monopoly on gas and petroleum products. It imported 4mn tonnes of LNG in 1999, compared with the previously planned 4.5mn tonnes, after a delay in completing the subsea pipeline prevented any commercial quantities of gas being supplied to the two northern power stations.

As a result Taiwan's LNG imports remained almost unchanged in 1999 compared with the 3.92mn tonnes imported the previous year. In 1999 some 2.45mn tonnes, or 61% of Taiwan's total LNG imports, were supplied to Taiwan Power Company (Taipower) to fuel Talin, Hsinta and Nan Pu power stations in southern Taiwan. Talin is the largest customer representing 43% of Taipower's LNG import requirement. The other 1.55mn tonnes were supplied to industrial, commercial and residential customers.

CPC is now planning to import 4.5mn tonnes of LNG this year, a 12.5% increase compared with 1999. Assuming the pipeline is completed shortly, Changsheng power plant is expected to take 170,000 tonnes of LNG while Tungshiao power station will burn about 330,000 tonnes.

Projects in the pipeline

CPC is building a 306-km submarine gas pipeline from Yung An LNG terminal in the south, up Taiwan's western coastline to supply gas to four power stations in the northern region and increase feedstocks to city gas companies in the Taipei area. Completion of the pipeline, whose landfall is near Tungshiao power plant, is running 12 months late against the original completion date of December 1999. Consequently, Tungshiao power plant will not fully convert to gas-firing until about March 2001 at the earliest.

Progress on the submarine pipeline was initially delayed by typhoon damage last year which damaged a pipeline section being laid by project contractor Hyundai. Work then stopped last October for six months due to seasonal offshore weather conditions and an agreement that CPC has with local fishermen not to disturb their fishing grounds during the fishing season. Consequently, restrictions on construction since the start of the project mean that CPC only has six months each year in which to construct the pipeline.

With gas supplies unable to be transmitted through the incomplete submarine pipeline, CPC has had to start supplying gas to Tungshiao and Changsheng power stations with gas for test burning via overland pipelines.

Commercial quantities of gas cannot be supplied to Changsheng and Tungshiao because CPC's onshore north-south gas transmission trunkline is already operating at full capacity and is unable to supply more than a small quantity of gas for test burning. Sufficient gas will only become available when the submarine pipeline is completed.

Built by the Everpower consortium, the 960-MW Changsheng station is the second in a series of IPP power plants due to start up in Taiwan by 2004, three of which are planned to burn imported LNG. Everpower has signed a 410,000 t/y LNG supply contract with CPC for the Changsheng plant.

Block one at Changsheng power plant is due to start up once the submarine pipeline is completed, followed by the second block four months later. CPC expects to supply about 170,000 tonnes of LNG to Changsheng this year. The volume of LNG consumed is expected to rise to between 350,000 and 400,000 tonnes in 2001 when the power plant enters its first year of full operation.

Meanwhile, two oil-fired combined cycle power plant units at Tungshiao power station are due to convert to gasfiring this year followed by four more units in future. The plant is expected to burn 330,000 tonnes of LNG this year. Eventually, 800,000 t/y of LNG will be used when all six combined cycle units are converted to gas-firing.

Apart from the Tungshiao and Changsheng power stations, CPC will supply gas to two other IPP power plants in the future – the 600-MW Hsingtao plant being built on a coastal site 50 km south of Changsheng station and the 450-MW Chiahui power station in Chiayi county in southern Taiwan. Negotiations are underway to supply both plants with 350,000 t/y each. Hsingtao power plant is due to start up in 2001, while Chiahui's start-up date is now expected to be in 2002. Taiwan

LNG

Currently, Indonesia supplies CPC with 1.54mn t/y of LNG under the first longterm contract which started up in 1990 along with about 750,000 tonnes of LNG under the second long-term contract for 1.84mn tonnes which started up in 1998. Shipments under the second contract are due to reach their full contractual volume in 2001. Malaysia, meanwhile, supplies 1.75mn tonnes of LNG under a 2.25mn t/y long-term contract that started up in 1995.

LNG consumption rising

Meanwhile, Taiwan's LNG consumption is planned to rise by about 50% over the next four years as mediumterm plans to develop power generation facilities will rely increasingly on gas-fired combined cycle stations. Taipower forecasts that its LNG fuel requirements will rise from 2.45mn tonnes in 1998 to 3.4mn tonnes in 2002, by which time privately owned IPP power stations will burn an additional 1.2mn t/y of LNG.

By 2006 Taipower forecasts it will need an additional 2.8mn t/y of LNG, raising its total annual LNG consumption to 5.18mn tonnes. IPP power plant LNG consumption is expected to reach 2.26mn tonnes annually in 2006.

Second import terminal

Meanwhile, competition to build Taiwan's second LNG import terminal has intensified since Taiwan Power Company recently issued tender documents for the supply of 1.8mn t/y of LNG for Tatan power station to be built in northern Taiwan. Tatan will be built with 12 combined cycle blocks totalling 4,384 MW installed capacity. The blocks will be commissioned over a four-year period from 2003 to 2007.

Taiwan's second LNG terminal will be built and run by a private consortium. The government is limiting CPC's involvement in the terminal to a minority shareholding. CPC has tied up with ExxonMobil to bid for the second terminal project, although other consortium members have not been finalised.

Although Total and Shell also are interested in supplying gas to the Tatan power plant, Tuntex Distinct Corporation of Taiwan appears to have regained the front-runner position to build the second terminal. According to Tuntex's latest proposal, Tatan LNG terminal will be built in two phases to handle 3mn tonnes of LNG a year. Tuntex expects Taipower to take 1.8mn tonnes for Tatan power plant, while the remaining 1.2mn tonnes will be supplied to IPP power producers and industrial customers.

Phase Three IPPs

Meanwhile, gas-fired power generation is due to receive a further boost since the government announced plans in 1999 to launch a Phase Three IPP programme to replace three IPP projects using various fuels that have withdrawn from the ongoing Phase One and Two IPP programmes. Nine companies are understood to have submitted documents to the Ministry of Economic Affairs for the IPP Phase Three programme which is being limited to gasfired plants only.

The nine power plant projects proposed total 7,770 MW installed capacity and are all combined cycle stations ranging from 480 MW to 1,400 MW. Two plants are proposed for northern Taiwan, two for central Taiwan and five for southern Taiwan.

Taipower has announced it will buy a maximum of 3,500 MW from Phase Three developers. However, although the utility can buy 2,000 MW in the north, transmission line capacity limitations mean that Taipower can only buy a maximum of 1,500 MW from the central and southern regions combined.

Technology drilling

... continued from p46

tional importance and again must be modelled.

Fallback options have been developed for most of the likely failure scenarios. If cement is not achieved back inside the window, for instance, one fallback option developed is to cut and recover the tubing above top of cement and then re-complete with an overshot and conventional packer.

Cementing is performed via a surface launch cement head. A single combination bottom plug is launched prior to cementation to confirm passage of the plug through the completion and calculate actual displacement volumes. Dual combination top plugs are launched behind the slurry to minimise the risks of cement bypass and a cement sheath remaining inside the tubing. This is particularly important since the slurry is displaced with seawater with no planned clean-out prior to perforation.

Bumping the plug is important under these circumstances. However, remedial clean-outs using coil and 2 7/8-inch pipe were performed on the first two jobs due to cement plug bypass and congealed mud residue respectively. Learning points derived here included further simplifying string internal diameter (ID) changes and using dual top plugs behind the cement. Rigorous wellsite procedures have also been developed for clean-out of surface lines prior to cement displacement.

Early concerns surrounding the passage of cement and plugs through an unprotected safety valve nipple have proven to be unfounded. The nipple is greased internally prior to installation and hydraulic fluid is flushed through it continuously during the cementation. To date, no problems with the subsequent installation and testing of the safety valve have been experienced.

The tubing is pressure tested on bump and both the tubing and annulus are inflow tested. Wireline runs are then performed to drift the tubing, clean the SSSV (subsurface safety valve) nipple profile and set a dummy or protection sleeve at this stage as required by the forward programme. Meanwhile, the cement slurry is designed to have achieved adequate compressive strength development at this time. A nominal annulus pressure test is then performed to in excess of the shoe fracture strength to ensure adequate well integrity prior top removing the blow-out prevention stack (BOPS) and installing the tree. Later, following the cement bond log, an annulus pressure test to full design pressure is performed.

Proven method

The cemented monobore completion concept has been taken and refined as a proven method of delivering cost effective North Sea production wells. Much learning has already taken place along the way to ensure this. Meticulous planning and attention to detail are critical to minimise the risks. The results to date over the five North Sea production wells have been remarkable, with the revised economics now impacting on field development potential.

*KCA is the lead drilling contractor to Shell Expro's Northern Business Unit (NBU). It manages NBU drilling operations, including provision of drill crews and drilling engineering support for all nine NBU platform rigs – Brent A, B, C, D, Cormorant Alpha, North Cormorant, Tern, Eider and Dunlin.

NEWTechnology

Furmanite claims world first in engineering design

A unique design engineered by Furmanite has enabled a new induced gas floatation unit (IGFU) to be successfully installed without shutdown on the Shell Expro-operated Gannet platform in the North Sea. The solution – which incorporated hot tapping, leak sealing and double line-stopping technology – is said to be a world first in engineering design.

The IGFU has been installed in order to reduce oil-in-water discharge levels of the platform to 20ppm. Final tie-ins for the installation were due to be completed during a 30-hour shutdown, but when shutdown was postponed arrangements had to be made for installation to be undertaken online, without disrupting platform production.

To do this, the tie-ins had to be made while the existing piping system remained fully operational, and with batches of produced water diverted for the purpose of commissioning the new IGFU vessel. Furmanite's solution met both these requirements, while alleviating the need for any piping system intervention until the main platform shutdown planned for 2001.

The need for hotwork or plant shutdown was eliminated by combining a conventional hot tap saddle with a leak sealing clamp to give a bolted configuration. Once the clamp was bolted in position, sealing compound was injected to seal the joints, and the entire clamp pressure tested. This then allowed conventional hot tapping procedures to be used and the bypass pipework hooked up.



To allow batches of produced water to be delivered to the new IGFU vessel for commissioning purposes, while retaining the ability to revert to the original process at any time, a double line seal was developed. Once inserted and energised, and the seals tested to ensure integrity, this enabled isolation of the existing produced water flash drum.

The piping configuration and severely

restricted access around the job site was an added complication to overcome, comments the company. A special clamp was designed to bolt around a 12-inch nominal bore, short-radium elbow. Height limitations meant that a driling machine also had to be specially developed.

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Longer-lasting anodes

Increased life and fewer replacements are claimed to be the two key benefits of BAC Corrosion Control's new Isoline magnesium sacrifical anodes. 'Extruding the magnesium, rather than casting, gives a smooth surface finish resulting in uniform anode consumption and increased operational efficiency, leading to a greatly improved cathodic protection system,' explains the company.

Two anode types are offered. The BAC Isomag, with an electrical potential of 1.7V, is designed for use with older and less well coated pipelines and buried structures. BAC Isorod, with an EP of 1.5V, is suited to use with well-coated pipelines and soils with a low resistivity. Both types are manufactured from virgin magnesium alloys and are supplied in 18 standard sizes, ranging in weight from 1.3 kg to 27.3 kg.

The anodes are supplied in readily identifiable cotton bags – Isomag in red and Isorod in grey – which are backfilled with a mixture of 75% gypsum, 20%



bentonite and 5% sodium sulfate. The advantage of supplying with a built-in backfill is that as soon as the anodes are placed in the ground and electrically connected to whatever they are protecting, they begin to work, states BAC.

The anodes are also available in ribbon form for applications where flexible anodes are required.

Tel: +44 (0)1952 290321 Fax: +44 (0)1952 290325

Flexible safety solution



Fortress Interlocks has unveiled Amgard 2000 – a new range of modular interlocks claimed to combine the convenience of gate switches with the adaptability of trapped-key interlocks.

The range includes various options, including tongue or handle actuator, internal release mechanism and an override key switch.

Tel: +44 (0)1902 499600 Fax: +44 (0)1902 499610

NEWTechnology

Cost-effective inventory management

Enraf has unveiled its SmartRadar LT, a level gauge designed for reliable and accurate inventory management in intermediate liquid storage applications. The new radar level gauge employs planar antenna technology, a method of measurement originally developed for satellite use, and is based on the SmartRadar gauges that have been on the market since 1995.

The manufacturer reports that the unit has been designed to produce reliable readings without the extra cost required for Weights & Measures-certified instruments. For measurements requiring Weights & Measures accuracy, Enraf can supply its W&M-certified SmartRadar level gauges.

The SmartRadar LT supports the measurement of average temperature, density and water interface and is claimed to be accurate to within 3mm. It is compatible with a number of storage tank configurations and, as it is non-intrusive, can be used for measuring a wide range of products, including asphalts, chemicals, oils and liquefied gases.

The self-contained unit is protected in

Critical low-flow control



The Badger Meter RC 200 low-flow control valve from Pump Engineering is available as a globe or angle pattern valve in either 1/4-inch or 1/2-inch sizes, with other valve sizes offered up to 2-inches. The compact unit is offered in 33 different trim sizes and can be supplied with 'smart' digital positioners and actuators. It can operated at pressures up to 5,000 psi and temperatures of -80°C to +500°C.

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a weatherproof, explosion-proof and lightening-proof housing. It has no moving parts and requires virtually no maintenance, states Enraf.

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Gauging approval

Saab claims that its new TankRadar Rex is the first radar level gauge in the world to be approved to the new, international recommendations for custody transfer OIML R 85(E).

Tested by the Swedish National Testing and Research Institute, the system is reported to have met all the requirements according to OIML R 85(E), the standard temperature range even being extended from between -25° C and $+55^{\circ}$ C to -35° C and $+70^{\circ}$ C.

The tests performed covered a number of different issues and are said to be the most 'ambitious' currently performed for a tank gauge system. Accuracy requirements are within ±1mm. Performance is also checked under disturbed conditions, such as high/low temperature, high humidity, thermal shock, effects from hysteresis, EMC disturbances and power interruptions.

The certificate and test report for the level gauge can be downloaded from www.saab.tankradar.com

Tel: +46 31 33 70 151 Fax: +46 31 25 30 22

A breath of fresh air in emergencies

The new Saver PP positive pressure Emergency Escape Breathing Apparatus (EEBA) from Draeger Safety is designed to provide safe and unhampered escape from hazardous environments where breathing has become difficult or endangered.

The apparatus is fully operational as soon as the carrying system is opened, and is claimed to be simple to re-set in the event of a false alarm. Housed within an instantly recognisable orange bag, complete with photo-luminescent panels, the unit is easy to locate in very low ambient light or poor visibility conditions and can be used with other forms of personal protective equipment (PPE), such as helmets and ear protectors.

The lightweight, compact escape system provides low breathing resistance and a consistent air flow rate at all cylinder pressure levels. In addition, the pressure reducer is said to ensure excellent flow characteristics, while the positive pressure lung demand valve has a balanced piston design that is first-breath activated and extremely quiet in use.

The Saver PP is supplied complete with the company's Panorama Nova facemask and offers a low exhalation resistance, close and comfortable fit and a selfdemisting visor for clear vision. In use, the pressure gauge can be inspected quickly



and easily, without dismantling or adjustments, via a transparent viewing window on the outside of the bag. Once depleted, the cylinder can be charged using standard charging connectors. The system can be supplied with 10 or 15-minute duration, as well as a wide range of accessories, such as outside storage cabinets.

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NEWTechnology

KCA cuts costs on North Sea wells

Aberdeen-based KCA Drilling reports that its drilling team on the Shell Exprooperated North Cormorant platform in the North Sea has reduced sidetrack drilling and completion times by 50% through the application of Delivering the Limit (DTL) methodology. 'DTL is a systematic approach to well delivery that involves rigorously analysing and challenging every part of the process from conceptual design through to detailed execution,' explains KCA. 'The aim is to get as close as possible to the theoretical "technical limit" time and cost for a well.'

According to Maurice White, Managing Director, the company is continuing to reduce sidetrack drilling and completion times. He reports that the North Cormorant's cheapest ever sidetrack, CN-01S1, was recently drilled and completed for just over £1mn in 18 days.

One technique used in DTL is the 'DWOP', or Drill the Well On Paper, exercise. This exercise is performed two weeks before the start date for the well. Specialist operations personnel, including offshore staff, are involved in this process, and may dedicate a full or half-day to examine every aspect of the execution plan in detail.

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Cost-effective corrosion protection coating

Galvatech, the UK distributor of the Zinga corrosion protection system, reports that the zinc coating is currently undergoing a series of trials on the Bruce and Marathon platforms in the North Sea. Results to date are reported



Zinga corrosion protection coating being applied to Fina Petroleum storage tanks in Spain.

to be 'excellent'.

The single component zinc coating can be spray-applied much like paint, allowing large items such as tanks or structural steelwork to be galvanised in-situ without incurring any expenses for removal and transport to blasting yards or paint shops. It offers the same finish as hot-dip galvanising and does not crack, peel, blister or flake like paint. Once dry, the Zinga coating can be left for up to 40 years before being over-coated, states Galvatech.

The Zinga coating wears away due to corrosion and erosion in the same way as hot-dip or thermal-spray zinc coating. The rate of corrosion is said in many cases to be slower than that for hot-dip galvanising and less than half the rate of corrosion of thermal spray zinc. Zinga also has the advantage that it can be over-coated with conventional paint systems without first having to be acidwashed or etch-primed.

The Zinganizing system is guaranteed for a minimum of ten years, reports Galvatech. 'If more than 5% of the surface area has rust spots in that time, the entire project is classified as a failure – no hidden clauses or fine print!'

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Gas processing alliance

Engelhard Corporation and Shell Global Solutions International have formed an alliance to design, market and license a new hydrocarbon dew pointing process for natural gas. It is claimed that the new process will enable gas to be conditioned and transported more cost effectively than existing technologies.

The foundation of the alliance is a process that removes heavy hydrocarbons and water from natural gas onto a proprietary adsorbent based on Engelhard's Sorbead technology. The process changes the dew point of the gas, which enables it to be transported more economically. Another cost saving is the recovery of heavy hydrocarbons. Use of Sorbead, which also allows longer run times and reduces unplanned unit shutdowns, is also said to contribute to overall cost efficiency.

Englehard Process Chemicals

Dr Thomas Schulz, Tel: +49 511 540 5615 Andreas Binder, Tel: +49 511 540 5622

Shell Global Solutions

Dr Danny Brands, Tel: +31 20 630 2391 Dr Jay Rajani, Tel: +31 20 630 2774

Interlock valve safety



The new Ellis type GG safety interlock from Smith Flow Control is designed for use with diaphragm valves and can be adjusted to any variations in the valve's final closed position to enable the key to be freed. The interlock ensures that all valve handling procedures are carried out in the correct sequence, reducing the chances of operator error.

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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 W1M 8AR, UK

Membership News

NEW MEMBERS

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Information for Energy Group

Your Future in Your Hands – Selling Yourself and your Services

Afternoon Seminar, 2pm to 5pm, Thursday, 7 September 2000 Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR, UK

Learn how to develop your potential!

Speakers will include John M Wilson, JMW Mosaic Limited; Sheila Pantry, OBE Information Management Consultant; and Diana Edmonds, Instant Library.

Further information from Catherine Cosgrove, Vice Chairman, IFEG

61 New Cavendish Street, London W1M 8AR, UK. Tel : +44 (0)20 7467 7111; Fax: +44 (0)20 7255 1472; e: lis@petroleum.co.uk

NEW CORPORATES

Joboil Ltd, 10–16 Tiller Road, London E14 8PX, UK Tel: +44 (0)207 345 5148 Fax: +44 (0)207 987 0176

Representative: Andrea Midas, Marketing Manager A unique, Internet-based oil industry recruitment service. We provide access with a 48 hour response time for employers seeking candidates for temporary or permanent positions. We also provide an online editing and update facility for job candidates for maximum impact job-hunting.

Hibernian Insurance Company, 1 Clanwillian Court, Lower Mount Street, Dublin 4, Republic of Ireland Tel: +353 1 6078300 Fax: +353 1 6686974

Representative: Mr Eric Bergin, Principal Engineer. Electrical Insurance and statutory inspection of the following types of plant: lifting, pressure and electrical installation.

Datamonitor, 9 Swiss Terrace, Swiss Cottage, London NW1 UK

Tel: +44 (0)20 7675 7830

Representative: Dr Shon Loth, European Oil Analyst Datamonitor is a market analysis firm specialising in the downstream oil industry. Each year we produce a series of reports examining the dynamics of the European fuel retailing and LPG markets and the strategies and performance of competitors. Strict adherence to a robust research programme ensures we produce the most accurate and up-to-date data and analysis.

DEATHS

We have been notified, over the past few months, of the deaths of the following members:

| | Born |
|----------------|------|
| Mr P R Angove | 1930 |
| Mr A J Boldero | 1916 |
| Mr S Naghavi | 1919 |
| Mr J J O'Neill | 1939 |
| Mr C G Peacock | 1939 |
| | |



Guidelines for the Management, Design Installation and Maintenance of Small Bore Tubing Systems

Please note this publication is priced at £60.00, not £7.00 as was published in the July edition of *Petroleum Review*.

IP Discussion Groups & Events

IP THE INSTITUTE OF PETROLEUM

IP Week 2001: 19-22 February

The Institute of Petroleum Annual Dinner

Wednesday 21 February Grosvenor House, Park Lane, London W1

The Institute of Petroleum Annual Dinner will be held on Wednesday, 21 February 2001 at the Grosvenor House Hotel, Park Lane.

Tickets are limited, and members are therefore recommended to book early to avoid disappointment.

Application for tickets can only be made on the official ticket application form, which will be published in the October edition of *Petroleum Review*, and the main table allocation will take place at the beginning of November.

In view of possible delays, overseas members may request that a ticket application form be faxed to them by contacting Pauline Ashby at the IP.

For further details on IP Week 2001 contact the Conference Department on Tel: +44 (0)20 7467 7100 Fax: +44 (0)20 7255 1472 e:pashby@petroleum.co.uk

P P THE INSTITUTE OF PETROLEUM

The Late Life of the North Sea

A series of four discussion group meetings for Autumn-Winter 2000

UK North Sea oil production probably peaked in late 1999/early 2000 but there is plenty of life in the province yet. Early predictions about its possible life had suggested that it would have been completely exhausted by now, but additional finds, more effective ways of identifying remaining pools, better exploitation of known fields and new technological solutions have ensured that those predictions were wrong.

It is timely to look at what remains of the life of these resources and ask how the UK might maximise recovery from existing fields and maintain interest and investment in further development.

Each of the Discussion Group meetings will approach these issues from a particular angle.

Firstly, a theoretical analysis of approaches to managing mature assets. Secondly, a focus on special technological factors which need to be applied with a case study of a recent major project (Shearwater). Thirdly, what is the appropriate fiscal regime to ensure maximum recovery and continuing investments? Finally, a review of financing mechanisms appropriate to this environment.

The events are:

- 14 Sept: North Sea Strategies and Scenarios by Tom Windle, Director, Ariadne Business Consultants
- 9 Oct: Shearwater the management of a Major Capital Intensive Project by John Stubbs, Shearwater Project Director, Shell Expro
- 24 Oct: The Fiscal System Needed for the Next 25 Years of the UKCS by Christine Wheeler, Chairman, CW Energy Tax Consultants
- 16 Nov: Financial Issues Colin Bousfield and Kevin Price of Barclays Capital

IP contact: Jenny Sandrockon tel: +44 (0)20 467 7104, e:jsandrock@petroleum.co.uk

For more information on IP Discussion Groups and Events visit the website: www.petroleum.co.uk

IP Conferences and Exhibitions

International Seminar on Opportunities for Foreign Participation in the

Nigerian Oil and Gas Industry London: 5 October 2000

Organised in co-operation with the Nigerian law firm Okonjo & Okonjo and supported by Inter-Consulting, and Trade Partners, UK. The seminar will focus on upstream, downstream and oil services sectors. The speakers include:

- Peter Ellis Jones, Director, Tawe Oil Managements
- Dr Rilwanu Lukman, Special Adviser to the President of Nigeria on Petroleum Resources and Energy, and Secretary General, Opec
- Aret Adams, former Special Adviser to the Head of State of Nigeria on Petroleum Resources and Energy, and former Group Managing Director of the NNPC
- Jackson Gaius-Obaseki, Group Managing Director, NNPC

- Salisu M Liadi, Director, Privatisation Bureau of Public Entreprises
- Juste Rwamabuga, Manager, Infrastructure & Privatisation Division, African Development Bank
- Hakeem Belo-Osagie, Chairman, United Bank of Africa plc
- Sena Anthony, Group General Manager, Corporate Secretarial and Legal Division/Secretary to the NNPC
- JK Naiyeju, Accountant General of the Federal Republic of Nigeria, and former Chairman of the Federal Board of Inland Revenue
- Patrick Okonjo, Princiapl Partner, Okonjo & Okonjo, Barristers, Solicitors & Legal Consultants

Please see below for contact details

International Conference and Exhibition

INTERSPILL 2000 Brighton, UK 28-30 November 2000

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



Speakers

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

Confirmed speakers:

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

Technical Programme

There will be five sessions at the conference:

- 1. Salvage and cargo/bunker transfer
- 2. Spillage response at sea and in inshore waters
- 3. Shoreline response, waste disposal and recycling
- 4. Inland spills response and remediation procedures
- 5. Future developments and innovations

These sessions will cover oil and chemicals, environmental impacts, requirements and responses, liabilities and compensation, as well as regulations and training.

The first four sessions will present and discuss changes recently introduced, about to be introduced or otherwise not widely known; the fifth session is intended to introduce new possibilities for the future which may become operationally significant.

Who should attend?

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

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

Brochure with full conference programme is now available

For further information on either of the above conferences please contact: Pauline Ashby, Conference Department, Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR, UK Tel: +44 (0)20 7467 7100 Fax: +44 (0)20 7255 1472

e: pashby@petroleum.co.uk

or view the IP Web Page: www.petroleum.co.uk

EVENT Forthcoming

AUGUST 2000

6-11

22-25

SEG 2000 International Exposition & 70th Annual Meeting Details: Society of Exploration Geophysicists, US Tel: +1 918 497 5500 Fax: +1 918 497 5557

Offshore Northern Seas Details: Offshore Northern Seas International Conference and Exhibition, Norway Tel: +47 51 59 81 00 Fax: +47 51 55 10 15 e: ons@ons.no www.ons.no

23-24

4th Annual Latin Upstream 2000 **Details: Global Pacific & Partners** Tel: +1 281 597 9578 Fax: +1 281 597 9589 e: global.pacific@pixie.co.za www.glopac.com

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Houston How New Oil E-markets will Change the Way Fuel is Bought and Sold Details: Opis Energy Group, US Tel: +1 301 287 2645 Fax: +1 301 816 8945 www.opisnet.com

SEPTEMBER 2000

Prague, Czech Republic 4-7

Pipeline Rehabilitation & Maintenance **Details: Energy Logistics** International Ltd. Tel: +44 (0)1628 671717 Fax: +44 (0)1628 671720 e:enquiries@energylogistcis.co.uk

10-14 Dubai, UAE World Fiscal Systems for Oil & Gas Details: The CWC Group, UK Tel: +44 (0)20 7704 6161 Fax: +44 (0)20 7704 8440 e: bookings@thecwcgroup.com www.thecwcgroup.com

11-13 Cranfield, UK Calibration of Flowmeters Details: Cranfield University, UK Tel: +44 (0)1234 754766 Fax: +44 (0)1234 751875 e: pase@cranfield.ac.uk

11-15 Oxford LPG - Supply, Economics, Markets and International Trading

19-22

Oxford

Oxford

Barcelona

London

International LPG Trading and Pricing - Supply, Shipping, Contract and Risk Management

27

Calgary

Stavanger

LPG Direct Marketing, Operations and Safety

Details: The College of Petroleum and Energy Studies, UK Tel: +44 (0)1865 260211 Fax: +44 (0)1865 791474

13-14

Iberian Energy Details: SMi Ltd, UK Tel:+44 (0)20 7252 2222 Fax: +44 (0)20 7252 2272 e:

customer services@smiconferences.co.uk www.smiconferences.co.uk

| 4-15 | | | |
|-------|-----|--------|--|
| /orld | LNG | Summit | |

И Details: The CWC Group, UK Tel: +44 (0)20 7704 6161 Fax: +44 (0)20 7704 8440 e: bookings@thecwcgroup.com www.thecwcgroup.com

18-20

1

Brazil

Belgium 16th International Conference on Fluid Sealing Details: BHR Group Ltd Tel: +44 (0)1234 750422 Fax: +44 (0)1234 750074 e: fluid@bhrgroup.co.uk

19

Houston

Subsea Houston 2000 Details: Quest Offshore Resources Inc, US Tel:+1 281 493 6180 Fax: +1 281 496 3564 e:SubseaHouston@guestoffshore.com

20-22 Zaragoza, Spain 2nd PowerExpo International Energy Exhibition and Latin American Energy Conference Details: PowerExpo, Spain Tel: +34 976 764700 Fax: +34 976 330649 e: comunicacion@feriazaragoza.com www.feriazaragoza.com

20-22

Aberdeen Environmental Decision Making Details: Cordah Ltd, UK Tel: +44 (0)1224 414211 Fax: +44 (0)1224 414250 e: jbutler@cordah.co.uk

25-28

Planning & Economics of **Refinery Operations** Details: Nick Wilkinson, The Institute of Petroleum

Istanbul, Turkey

3rd Annual Gas & Power in Turkey Details: IBC Global Conferences Ltd, UK Tel: +44 (0)20 7453 5491 Fax: +44 (0)20 7636 6858 e: cust.serv@informa.com

26-28

26-27

Bahrain Middle East Petrotech 2000 **Details: Overseas Exhibition Services** Ltd, UK Tel: +44 (0)20 7862 2071 Fax: +44 (0)20 7862 2078 e:ajones@montnet.com www.montnet.com

27-29

Cape Town Africa Upstream 2000 Details: Global Pacific & Partners, South Africa Tel: +27 11 782 3189 Fax: +27 11 782 3188 e:global.pacific@pixie.co.za

27-29 **Dresden, Germany** Synthesis Gas Chemistry Details: DGMK www.dgmk.de/termine.htm

OCTOBER 2000

London

3-4 Engineering Asset Management 2000 - Strategies for Operational Excellence Details:ERA Technology Ltd, UK Tel: +44 (0)1372 367152 Fax: +44 (0)1372 377927

9-10

London Liquefied Natural Gas Details: IBC UK Conferences Ltd, UK Tel: +44 (0)20 7453 5491 Fax: +44 (0)20 7636 6858

10-11

Vienna Oil & Gas Transportation in the CIS & Caspian Region - Major Pipeline & **Distribution Projects** Details: The Energy Exchange Ltd, UK Tel: +44 (0)1242 529090 Fax: +44 (0)1242 529060 e: wra@theenergyexchange.co.uk

www.theenergyexchange.co.uk

Warsaw

24-26 3rd Central and East Europe Refining & Petrochemicals Roundtable Details: World Refining Association, UK Tel: +44 (0)1242 529090 Fax: +44 (0)1242 529060 e: wra@theenergyexchange.co.uk www.theenergyexchange.co.uk



Apache Corporation has appointed **Dwayne Schultz** as Vice President of the Southern Region comprising the Permian Basin of Texas and New Mexico, South Texas and the Texas-Louisiana Gulf Coast. The appointment takes immediate effect.

The UK Pipeline Industries Guild has appointed a new President, **Dr Michael Conlon** for the session 2000–2002 and a new Chairman, **Dr Alan Ryder**, for 2000–2001.

Dr Paul Upton has been appointed Managing Director of Gibb Environmental. He will also become a Director of Gibb Ltd. His previous roles include General Manager for Dames & Moore's Europe operations and Deputy Divisional Manager for the company's operations in Europe, Africa and the Middle East.

John Mumford of BP was elected as the new President of UKPIA at its Council meeting in April. Mumford has been a Director of BP Oil since 1998 and Treasurer of UKPIA for the last two years. He replaces **Christian Cléret**, formerly of Elf Oil UK Ltd.

Providence Resources plc has announced the appointment of **Stephen Carroll** to the Board of the company and his appointment as Finance Director. Carroll has been Group Finance Manager since 1999. Prior to this he was Head of Finance and Company Secretary with Tuskar Resources plc and previously Group Financial Controller with Silvermines Group plc.

Craig Jarcho has been named Director of Information Technology and E-business at Apache Corporation. He joined the company in 1997 after several years in research, exploration, exploitation and business development at Amoco Corporation.

Ram Savoor, Chief Executive of Castrol India will become Business Unit Leader for operations in India, Middle East and South Asia (IMESA) of the merged BP Amoco-Burmah Castrol division. He will also continue with his responsibilities to Castrol India.

Bob Malone has been named Regional President, Western United States, of BP Amoco. He will be responsible for the company's external presence and reputation in the western US as well as working with the company's business units in the region.

Zsolt Hernadi has been appointed President of Hungarian oil and gas company (MOL). He replaces **Janos Csak** who resigned in June.

H C van Westenbrugge has decided to step down as a Member of the Executive Board of Vopak where he was responsible for Oil & Gas Logistics. The Supervisory Board intends to appint **P R M Govaart** as a Member of the Executive Board. Govaart joined Van Ommeren in 1970 and is currently President, Chemicals Logistics Europe.

Alfonso Cortina, Chairman and CEO of Repsol YPF, has been appointed Member of the Board of Directors of the French Petroleum Institute by the French Minister of Economy, Finance and Industry, Laurent Fabius.

The UK Health & Safety Executive (HSE) has announced the appointment of **Tony Powell** as the new Head of Offshore Division (OSD). Powell will take over from **David Bainbridge**, currently Acting Head of OSD and report to **Dr Paul Davies**, HSE's Chief Scientist and Director, Hazardous Installations Directorate.

David Keane has been appointed Vice President of European Governmental Affairs at Dynergy. He will lead the company's legislative and regulatory activities associated with the EU's continued liberalisation of the power and natural gas industries.

Lee Tzu Yang has been appointed Chairman, Shell Companies in Singapore with effect 27 July. He will retain his current post of Vice President, Strategy and Portfolio, for Shell Oil Products East. Current Chairman **Simon Lam** has been named Managing Director for Shell Nanhai, the company's petrochemical project in Huizhou, Guangdong province, China. **Tom de Jong** will replace Lam as Managing Director of Shell Eastern Petroleum Pte. Ltd. De Jong is currently Refinery Manager, Pernis, The Netherlands.

The Board of Directors of Apache Corporation has approved promotions for the following key executives:

Lisa A Floyd has been promoted to Executive Vice President, Business Development and E&P Services. Roger B Plank has been promoted to Executive Vice President and Chief Financial Officer. H Craig Clark has been promoted to Executive Vice President, US Operations and John A Crum has been promoted to the newly created position of Executive Vice President, Eurasia and New Ventures. Michael S Bahorich has been promoted to the position of Executive Vice President, Exploration & Production Technology.

Richard Liddell has been appointed Operations Director of Premier Oil with effect from 3 July. He joins the company from BG Exploration and Production where he was Director of Development.

Industry body Logic (Leading Oil & Gas Industry Competitiveness) has appointed **Charles Miskin** to the position of Collaborative Project Co-ordinator. Miskin will be responsible for a number of industry cooperation projects including the new Satellite Accelerator initiative. He joins the team from Transocean Sedco Forex where he was International Business Development Manager.

Enterprise Oil plc has appointed a new Managing Director for its Dublin-based subsidiary Enterprise Energy Ireland Ltd. Current Managing Director **John McGoldrick** will relocate to Houston in August to become President of Enterprise Oil Services Inc, while **Brian O'Caithain**, currently General Manager, Corporate Development, in London, will replace McGoldrick in Dublin.

The Broken Hill Proprietary Company Ltd (BHP) has announced details of the Portfolio Leadership Team (PLT) for the company. The new model includes a six-member team replacing the existing eight-person Petroleum Executive Committee. The new members are as follows: President BHP Petroleum, **Philip Aiken**; President Integrated Business Development, **Mike Weill**; President Deepwater, Discovery & Appraisal, tba; President Project Development and Operations, **Keith Hunter**; Vice President Finance & Strategic Planning, tba, BHP Chief Financial Officer **Chip Goodyear** will also be a member of the PLT.

The Robinson International Group Ltd has appointed **Linda Geiger**, previously President and owner of ComSource Inc as Vice President of its US subsidiary. Geiger will be developing a Houston-based Petroleum and Testing operation serving the Western Hemisphere. **Clive Johnston** has been appointed to the Group's London office as Manager of International Operations. he IP Awards 2000 represent a significant new opportunity for the achievements of companies and individuals to receive acknowledgement at the most senior level in the industry. This exciting venture promises to be a keenly contested and prestigious event, enjoying the support of major international companies.

The presentation of the IP Awards will take place at the IP Awards Lunch at the Savoy Hotel, London on 13 November 2000. The Guest of Honour will be Lord Levene of Portsoken KBE, Chairman, Investment Banking Europe, Deutsche Bank AG.

For further information on the IP Awards Lunch please contact: Pauline Ashby at the Institute of Petroleum on Tel: +44 (0)20 7467 7100, e: pashby@petroleum.co.uk

For further information about the IP Awards please contact Sarah Frost Mellor on +44 (0)20 7467 7150.e:**sfm@petroleum.co.uk** or visit the Awards web-

www.ipawards.com/2000

International Platinum Award

(the achievement with the greatest global impact)

Judging Criteria

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

Sponsored by Deutsche Bank

Innovation Award

(most outstanding innovation)

Judging Criteria

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

Good development prospects

Sponsored by IndigoPool.com

Safety Award

(best example of safe practice)

Judging Criteria

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

The Institute of Petroleum Awards in association with



Information Technology Award (best application of new IT)

Judging Criteria

Innovative

://awards/2000

- Commercially available
- Wide application for industry
- Good development prospects Sponsored by EDS



Communication Award

(greatest contribution to awareness of industry issues)

Judging Criteria

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



Environment Award

(best new initiative to benefit the environment)

Judging Criteria

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

Sponsored by Ernst & Young

Community Initiative Award

(best new initiative to benefit the community)

Judging Criteria

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

Sponsored by Lasmo



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